THE INTELLIGENCE OF SEEING

An inquiry into the relationships between perception theory, communication theory, and the practice and teaching of drawing.

Submitted in candidature for the degree of Doctor of Philosophy of the University of Wales by

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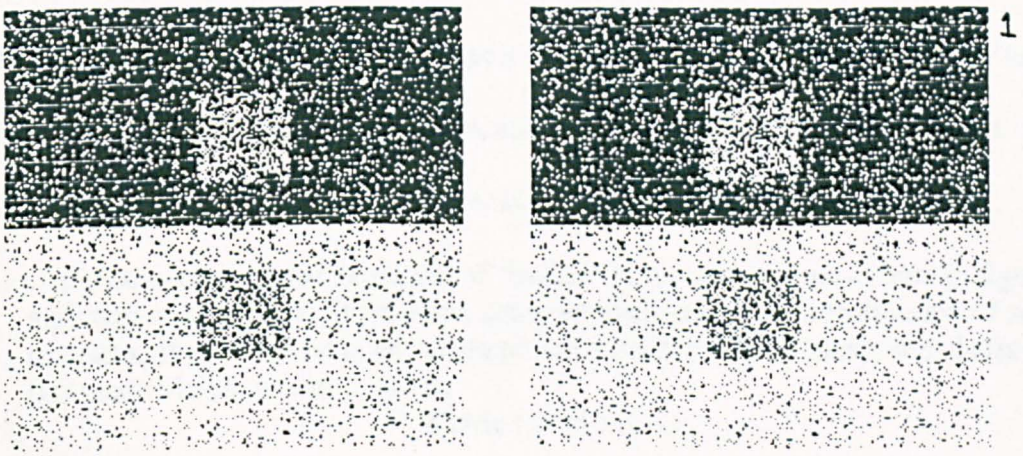
May 2001.

To the memory of my parents, Glenys and Harry Riley. Also to my wife Lon, and our son Dyfed Harry.

Acknowledgements

Cyswllt yn unig



In 1987 a sabbatical at the Royal College of Art was granted to me by the School of Art and Design, Curtin University, Western Australia, and kindly arranged for me by Dr Christopher Frayling, then Professor of Cultural History at the College.

The culmination of my research was an exhibition of drawings and paintings held at Curtin in June 1988. In the catalogue notes, I suggested:

> The tension-laden contradiction between the unpredictability of chaos and its boring inevitability drives humans to devise systems of order so that Nature may be stabilised with meanings relevant to cultural aspirations at any given time. Perhaps this is the basis of Ideology, the psychological space within which those systems that transform Nature into Culture are generated. But any ideology which becomes dominant quickly marks out its own boundaries by authorising only those meanings that maintain the cultural *status quo*.
>
> Just as there is no perception of space without the perception of a background surface, so any ideological space is similarly defined by a boundary which separates it from other alternative spaces as yet suppressed, undetected, or even simply forgotten. My own preoccupation happens to be drawing, but most other transformational systems that communicate experiences of a three-dimensional world upon a two-dimensional surface generally rely upon some conception of Geometry – that ghostly insertion between the individual and the surfaces and edges of the material world.
>
> Thanks to the Russian Formalists and the Australian-based school of social semiotics led by Michael Halliday and developed in the visual arts by Michael O'Toole, among others, a credible platform for the elaboration of Saussure's original proposal of a semiology has been established which allows such visual

> codifications of human belief systems as geometry to be analysed so as to reveal the ideological assumptions which underlie their conventions.
>
> Riley (1988)

The themes adumbrated in the above extracts continued to inform and develop my teaching and practice of drawing in Australia, Malaysia, and from 1991 in my homeland, Wales. In 1995 I read Robert Witkin's new book *Art and social structure.* In it, he wrote:

> ...the construction and depiction of 'bodies' in representations of human figures and inanimate objects [is] in some sense an analogue of the construction of social relations; that, at the level of aesthetic form (rather than content), social structure [is] made visible in works of art.
>
> Witkin (1995 : ix-x)

If these disparate lines of inquiry and the ideas of the individuals from different academic disciplines mentioned here could only connect with, and inform, the day to day teaching and practice of drawing, then perhaps a discipline of drawing as *visual philosophy* relating theory and practice in a socially relevant manner may be established. Such was my initial motivation, and this thesis may not have been completed but for the stimulating ideas of those mentioned above. It certainly would not have been written without the inspiration from the work of Professor Michael O'Toole, of the School of Human Communication, Murdoch University, Western Australia, and the encouragement from Paul Green-Armytage, my close colleague of twelve years at Curtin University.

I offer thanks to Dr John Willats who has kindly permitted reproduction of several figures illustrating geometrical projection systems.

At Swansea, I have received the support of the Institute and my supervisors, Dr Bill Gaskins, recently retired from the Deanship of the Faculty of Art and Design, and Dr Anne Price-Owen. Both have offered constructive advice based on their close reading of

the drafts of this thesis. My sincere thanks to Jennifer Stapleton, who processed these many thousands of words with efficiency and patience. Gwyn Jones, my I. T. guru, facilitated the processing of the images. Staff at the Townhill library have been friendly and helpful at every opportunity. Life drawing classes don't work without the presence and energy of models; the most stalwart of these in recent times have been Cassie Whittaker and David Hemmings.

Teaching and learning are collaborative practices. I would like to offer my final thanks to all the students I have worked with from 1980 to 2000 in Australia, Malaysia and Wales who collaborated with enthusiasm and good humour.

Note

1. The illustration *Simultaneous contrast phenomena under Cyclopean stimulation* is from Bela Julesz 1971 *Foundations of Cyclopean perception*. Univ. of Chicago, Chicago, Ill.

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RILEY, H. 1988 *Back to square one.* Exhibition catalogue, Curtin University, Perth, W.A.

WITKIN, R. W.1995 *Art and social structure.* Polity, Cambridge.

Prifysgol Cymru **SUMMARY OF THESIS** **University of Wales**

This summary sheet should be completed by the candidate after having read the notes overleaf. The completed sheet should be submitted by the candidate to his Head of Department together with two copies of the thesis, two copies of Section 1 of the combined Notice of Candidature/Report and Result form and either a certificate regarding financial obligations or the required fee.

Candidate's Surname: RILEY Institution at which study pursued:

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Candidate for the Degree of PhD (MPhil *or* PhD *or* Doctor by Examination and Thesis *or* Eng D)

Full title of thesis: **The intelligence of seeing. An inquiry into the relationship between perception theory, communication theory, and the practice and teaching of drawing.**

Summary:

The aim of this research is to develop a method of teaching drawing that empowers fine art undergraduates' practice by broadening their awareness of the inter-relationships between ways of seeing, social belief-systems, and ways of drawing.

The domain of drawing is explored *via* a synthesis of perception and communication theories. This combination is mapped as a matrix integrating the social functions of drawing with the systems of semiotic choices and levels of perception which facilitate students to realise meaning *in* drawings, and which facilitate viewers to negotiate meaning *from* existing drawings. The matrix builds on, and develops, existing material in the field of systemic-functional semiotics.

Within the parameters of a constructivist paradigm of research, a new drawing-teaching programme is designed, tested over a period of two academic years, and evaluated using the recognised criteria of authenticity proposed by Egon Guba and Yvonna Lincoln. Two classes of data are collected and analysed. Primarily, those gathered using Rensis Likert's method, which elicits group attitudes, indicate positive shifts in the student groups' attitudes to ontological constructs concerning relationships between perception, communication and drawing. Secondly, students' drawings, analysed using the systemic-functional semiotic matrix, provide visual evidence of an expansion in the range of ontological constructs.

Analysis of the data demonstrates the validity of the hypothesis: that a drawing-teaching programme based on a synthesis of perception and communication theories may expand students' awareness and understanding of a range of constructions of reality, which ultimately may empower their drawing practice.

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Introduction

> *...Even the most obvious occurrences of everyday life might appear utterly transformed if we were inventive enough to construe them differently.*
> George Kelly (1970 : 1)

This investigation probes the possibility that a new approach to the teaching and practice of drawing may develop, in first-year undergraduates, an inventiveness for construing those everyday occurrences, to which Kelly[1] refers, in ways previously unimagined. Specifically, the possibility explored is whether students may come to recognise that their understanding of everyday perceptual occurrences may be construed differently, and constructed in visual terms through drawing practice based upon an increased awareness of perception theory and communication theory.

For the purposes of this thesis, drawing is defined as the making of any hand-wrought response to the experiences of perception, emotion and imagination through the use of dry media or pens upon a two-dimensional surface.

The three R's revisited

The three *R*'s, *R*eading, w*R*iting and a*R*ithmetic, are generally agreed to stand for the important educational priorities of literacy and numeracy. However, w*R*iting itself is implicit evidence of another faculty of educational value: our ability to inscribe marks upon a surface so as to make representations of our experiences visible to others.

It may be argued that the centrality of w*R*iting within the familiar mantra has usurped the cultural importance of that other faculty for which there is no name. Perhaps *visualcy*? This invented term refers to the distinct capacity of the human mind that Bruce Archer identified as "analogous with the language capacity and the mathematical capacity for cognitive modelling" (Archer & Roberts, 1979). Deanna Petherbridge has commented that "Drawing is

the primal means of symbolic communication, which predates and embraces writing, and functions as a tool of conceptualisation parallel with language"[2] (Petherbridge 1991 : 7).

In the wake of such authorities, a more balanced and coherent version of the three R's may be proposed: Reading, *Routing*, and 'Rithmetic. According to the *Oxford English Dictionary*, to rout means "to cut a groove in a surface". A router is "one who routs out or draws forth". These are venerable words, redolent of a pre-industrialised era. However, here they are revitalised, to remind us of the hand/eye co-ordination essential to much material cultural production even in this digital age of the twenty-first century, and to remind us that the activity of drawing facilitates the uniquely-human aspiration to share through visual communication our physical, emotional and spiritual experiences of the world.

This study scrutinises assumptions about drawing which have long been taken for granted, and instead takes them apart. In doing so, a new validity for the practice and teaching of drawing is advocated. A validity akin to other disciplines concerned with systematic research and the sharing of discovery, founded not upon the vagaries of individualism (whilst allowing individual expression) but upon a new, clearly-articulated basis derived from perception and communication theories.

The fundamental problem identified

A historical review of methodologies applied in the teaching and practice of drawing is presented in Section 1. The review is intended to confirm the observation that few approaches to teaching drawing articulate their philosophical bases, and none appears to align its methodology with the other two parameters required for the clear articulation of any philosophical position, namely, those of ontology and epistemology. The identification of this problem reveals a fundamental need for students to be *empowered.* Firstly, in the sense of acquiring an understanding of how the study of drawings and the practice of drawing may

expand awareness of the existence of ontological and epistemological constructions within the self and others; and secondly, of how such awareness may then stimulate the production of visual work.

The hypothesis

The aim of this research is to discover whether a proposed new teaching programme of drawing, based upon a synthesis of perception theory and communication theory, may expand students' awareness and understanding of a range of cross-cultural constructions of reality made visible through drawings, and may empower them to produce more varied, more informed constructions of reality in the form of drawn responses and other visual practices than they would hitherto have done.

Structure of the thesis

Section 2 reviews the development of perception theories, with particular emphasis upon the ecological approach to visual perception and the computational theory of vision.

In Section 3, a review of twentieth century developments in communication theory takes place. Structuralist and semiotic approaches to the negotiation of meanings are discussed in detail.

A synthesis of perception theory and communication theory is begun in Section 4. The relationships between ways of seeing, ways of constructing semiotic codes (particularly systems of geometry) and types of social structures are theorised. The possibility of a relationship between language and the constructions of social realities is debated. The Section culminates in a proposal for a systemic-functional semiotic model which maps the domain of drawing, and which may be useful both for the analysis and synthesis of drawings.

It is argued that this model may also be used as an instrument for the qualitative assessment of students' drawings.

In Section 5 the structure and content of the proposed new programme for teaching drawing is presented in detail. Methods of data collection are described, and the data are analysed. A conclusion about the validity and authenticity of the research is reached.

Paradigms of research and criteria of assessment

Perhaps one of the most contentious issues currently exercising the community of researchers, supervisors and examiners in art and design is the nature of research within those fields.

Archer (1995 : 6) categorised several types of research activity in the scientific tradition which, he maintains, are generally recognised and widely accepted. It may be useful to reiterate them here.

1. *Fundamental research.* Systematic inquiry directed towards the acquisition of new knowledge, without any particular useful application in view.
2. *Strategic research.* Systematic inquiry designed to fill gaps in fundamental research and/or to narrow the gap between fundamental research and possible useful applications.
3. *Applied research.* Systematic inquiry directed towards the acquisition, conversion or extension of knowledge for use in particular applications.
4. *Action research.* Systematic investigation through practical action calculated to devise or test new information, ideas, forms or procedures and to produce communicable knowledge.
5. *Option research.* Systematic inquiry directed towards the acquisition of information calculated to provide grounds for decision or action.

Archer observed that "the greatest volume of research in the Science tradition is categoriseable as Applied Research". (Archer 1995 : 6)

With these scientific paradigms established, he went on to discuss research in the Humanities' tradition, and in particular, the arts. Research in the arts, he argued, consists of "finding new things to know, or of identifying new ways of knowing them, or in refuting previous commentary on existing material". (Archer 1995 : 9)

Arguably, the fundamental difference between science and art, in general terms of their research attitudes, is that science is motivated to *explain* the world quantitatively whereas arts' research is motivated to *evaluate* qualitatively. Of course, this stark distinction may become blurred in practice.

Archer (1995 : 9) maintained that science has become less reductionist in its attitudes and the humanities more empirical. He suggested this may be due to their mutual use of databases and information technology.

It may also be suggested that the gradual amalgamation of previously independent art schools with universities and other institutions of higher education – the history of which is examined in Section 1 – has narrowed the gap between what Charles Percy Snow (1959) famously called "the two cultures" once perceived to be mutually exclusive.

What is certain is the evidence of a current concern about whether *arts practice* may be deemed legitimate research. The present Rector of the Royal College of Art, Christopher Frayling (1994) was one of the first to articulate the circumstances under which artistic practice may be regarded as research.

He identified three specific trends within art and design research: research *into* art and design; research *through* art and design; and research *for* art and design. Research *into* art and design may include historical, theoretical, critical or aesthetic research, and is essentially qualitative. The methodologies for this category are firmly established in disciplines such as sociology,

anthropology, philosophy, and are commonly applied to research in art and design history. Research *through* art and design, involves studio project work. This may be understood in terms of Archer's category *applied research*, in which a systematic inquiry results in the acquisition or extension of knowledge for use in particular applications. Methodological precedents may be found in the disciplines of engineering and material science, and may be quantitative.

Frayling pointed out that methodological problems arise in qualitative research *for* art and design. Such research culminates in some form of artefact, and may be likened to Archer's category of *action research*. Few methodological models existed for this type of research at the time of his writing. However, recent collaborative work between Alex Seago, who directed the Research Methods programme at the Royal College of Art between 1991 and 1995, and Anthony Dunne, has begun to address this problem with a proposal for a new qualitative approach. (Seago & Dunne 1999; Seago 1995) [3]

All paradigms of research may be defined as constructions of belief systems involving ontological, epistemological and methodological assumptions.

Ontological assumptions deal with the form and nature of reality adopted; epistemological assumptions deal with the relationship between the researcher – the would-be knower – and what can be known; methodological assumptions deal with how the researcher actually approaches the research. All of these factors are tabled in Figure (i).

PARADIGMS OF RESEARCH

	Positivism	Post-positivism	Critical theory	Constructionism
Ontology	Naïve realism. Reality as an absolute understanding	Critical realism. Reality only imperfectly understandable	Historical realism. Reality shaped by social, political, economic values	Relativism. Realities constructed specifically under local conditions.
Epistemology	Dualist/ Objectivist. Findings deemed true	Modified dualist/ objectivist. Findings deemed probably true.	Transactional/ subjectivist. Value-mediated findings	Transactional/ Subjectivist. Findings socially constructed
Methodology	Experimental/ manipulative. Verification of hypotheses. Quantitative methods.	Modified experimental. Falsification of hypotheses. May include some qualitative methods.	Dialogic/ Dialectical	Hermeneutical/ Dialectical

Figure (i) Paradigms of research

Qualitative research such as that demonstrated in this thesis implies an emphasis on the study of processes and meanings that are not measured in terms of quantity. Qualitative research stresses the socially constructed nature of reality. It acknowledges the relationship that exists between the researcher and what is studied, and the situational constraints that shape inquiry. The answers that qualitative researchers seek are concerned with how social experience is made meaningful. This is in contrast to quantitative studies which emphasise the measurement of relationships between variables, not processes. In addition, quantitative research assumes the objectivity of the researcher within a value-free framework.

The traditional, *positivist* paradigm of research argues for four criteria with which to judge the worthiness of research. These are to be applied to any disciplined inquiry, whether qualitative or quantitative in nature. They are *internal validity*, the degree to which findings correctly map the phenomenon in question; *external validity*, the degree to which findings can be generalised to other settings; *reliability*, the extent to which findings may be replicated

by another inquirer; and *objectivity*, the extent to which findings are free from bias. (Denzin & Lincoln 1994 : 100)

A second paradigm, which may be called *post-positivist*, argues that a set of criteria unique to qualitative research needs to be developed. This is because it represents an alternative paradigm to quantitative research. Martyn Hammersley (1992) suggested post-positivist criteria, amongst which were the following:

Assessing research in terms of its ability:

1. to generate generic/formal theory
2. to be empirically grounded (and scientifically credible)
3. to produce findings that can be generalised or transferred to other settings
4. to be internally reflexive in terms of taking account of the effects of the researcher and the research strategy on the findings that have been produced

Hammersley (1992 : 64)

A third paradigm of research activity, a *postmodernist* one, argues that "the character of qualitative research implies that there can be no criteria for judging its products." (Hammersley 1992 : 58)

Advocates of a fourth, *post-structuralist* paradigm, argue that a new set of criteria, not associated with positivist and post-positivist traditions, needs to be constructed. Post-modernist and post-structuralist paradigms may be combined in various proportions under the generalised label of a paradigm of *critical theory*. This term is one that Jürgens Habermas (1987) used in his typology of approaches to research:

1. The *empirical-analytic sciences*, comprising natural science but also including attempts to apply natural science methods to the study of human behaviour.

2. The *historical-hermeneutical sciences*, consisting of the discipline of history and those parts of social science that are guided by an interpretative orientation.

3. *Critical theory* is exemplified in the work of Marx and the Frankfurt School. It is based on the assumption that by providing an analysis of a social system, any oppressive ideologies may be revealed, and members of such oppressed groups may thus be enlightened.

Egon Guba and Yvonna Lincoln (1994 : 109) favour a paradigm called "*constructivism.*" In order to avoid possible confusion with the Russian art and design movement of the same name, this term has been replaced by a widely accepted alternative *constructionism.*

Two sets of criteria for judging the quality of research within a constructionist paradigm have been proposed. Firstly, the four proposed by Guba (1981) and Lincoln & Guba (1985) which parallel the four positivist criteria: They are the four so-called *trustworthy* criteria of *credibility*, similar to the positivist criterion of internal validity; *transferability*, similar to the positivist criterion of external validity; *dependability*, paralleling reliability; and *confirmability*, paralleling objectivity.

Secondly, the set of five called by Guba & Lincoln (1989) the *criteria of authenticity: fairness*, that is, a demonstrable openness between researcher and subjects; *ontological authenticity*, or an indication of expansion in the range of personal ontological constructions; *educative authenticity*, or an indication of improved understanding of the ontological constructions of others; *catalytic authenticity*, an indication of the degree to which the individual or group has been stimulated to action; and lastly *tactical authenticity*, an indicator of how the individual or group has been empowered to act beyond the confines of the research parameters. These five will be elaborated shortly, when it will be argued that they appear to be particularly relevant and appropriate for the assessment of changes in attitudes of students exposed to a new teaching programme.

The paradigm of research adopted for this thesis is a constructionist one, with a relativist ontology which accepts that realities are socially constructed under specific local conditions. Although they may be shared across groups of individuals or even whole cultures, those

constructions are deemed to be not more true or less true than one another, but more or less informed and sophisticated. Constructions of reality are deemed to be alterable. It is this ontological position that differentiates constructionism from other paradigms.

The adopted paradigm's epistemology may be defined as subjectivist, in the sense that the researcher has been interactively linked to the subject under investigation.

Having assumed the above ontological and epistemological positions, where the variable nature of social constructions may be elicited through interaction between researcher and (in this case) students, a methodology based on hermeneutics and dialectics was considered suitable. Varying social constructions, made visible in the form of drawings, are discussed and interpreted using the methodological tool of systemic-functional semiotics designed in Section 4.6. The dialectical relationship between drawing practice and the social constructions of reality is also demonstrated in Section 4.

The final objective of the research is to demonstrate how the proposed teaching programme laid out in Section 5 may expand students' awareness of cross-cultural visual constructions, and their capabilities of producing more varied, more informed constructions in the form of drawings than was hitherto the case. To this end, the criteria of authenticity proposed by Guba and Lincoln are adopted.

The authenticity criteria for assessing research within a constructionist paradigm.

Fairness refers to the degree of integrity with which different points of view and constructions of reality along with their underlying ideological values are elicited and recognised as valid throughout the evaluation process.

In the specific context of the research described in this exploration, all information was elicited with the complete agreement and non-coerced participation of the student groups. All stages of the process of gathering data about student views were conducted in full view of

the student groups. All stages of the research were explained to students, and all data were accessible to students at all times.

Ontological authenticity refers to the extent to which an individual's own internal, emic constructions are expanded, matured, and elaborated to a more sophisticated level of use. Ontological authenticity is "improvement in the individual's (or group's) conscious experiencing of the world". (Lincoln & Guba, 1986 : 81). Guba & Lincoln (1989 : 248) identify two techniques for demonstrating ontological authenticity. Both are applied in this research.

1. Testimony of participating students. When students can attest to the fact that they recognise a broader range of approaches to drawing as being valid for describing a broader range of responses to a broader range of constructions of reality, then that is deemed to be evidence of ontological authenticity. When their own drawings can be shown to illustrate such recognition, that too is regarded as material evidence.
2. A questionnaire in the form of a Likert Set (see Note 9, Section 5) completed by student groups before and after the delivery of the new teaching programme will be collated and analysed in order to reveal the changes in the student group attitudes to, and understanding of, ontological constructions.

Educative authenticity refers to the extent to which an individual's understanding of, and appreciation for, the constructions of others outside their own group are enhanced.

> It is not enough that the actors in some contexts achieve, individually, more sophisticated or mature constructions, or those that are more ontologically authentic. It is also *essential* that they come to appreciate (apprehend, discern, understand) – not necessarily like or agree with – the constructions that are made by others and to understand how those constructions are rooted in the different values systems of those others.
>
> Lincoln & Guba (1986 : 81)

Two techniques have been identified by Guba & Lincoln (1989 : 249) for establishing that educative authenticity has been achieved. Both are applied in this research:

1. Testimony of participating students. When students can attest to the fact that they understand the constructions of others different from themselves, then that is deemed to be evidence of educative authenticity. In this particular context, students' drawings may well provide material evidence of educative authenticity.
2. Questionnaires in the form of Likert sets completed by student groups will be used before and after the delivery of the new teaching programme. These are collated and analysed to reveal any changes in the student groups' understanding and appreciation of the constructions of others.

Catalytic authenticity. Guba & Lincoln (1989 : 249) define this criterion as "the extent to which action is stimulated and facilitated by the evaluation process". In this particular research context, the students' drawings will be shown as evidence of such action.

Tactical authenticity refers to the degree to which research participants are empowered to act outside the confines of the new teaching programme itself. Tactical authenticity may be demonstrated by evidence of the student's own expanded recognition and understanding of personal constructions and the constructions of others appearing in work produced outside the confines of the new teaching programme itself.

Summary

The fundamental problem has been identified, and a hypothesis proposed. The paradigm of research adopted for this thesis, a constructionist one, has been described and compared to a range of alternatives. The criteria with which to evaluate the quality of the research, known as criteria of authenticity, have been described and compared to a range of alternatives.

SECTION 1 : DRAWING IN HISTORY

Introduction

1.1 Drawing in history: Teaching and professional practice

1.1.1 From the early Italian academies to the English Schools of Arts and Crafts 1563-1914

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1.2 Methodology: Alternative philosophical bases for the teaching and practice of drawing.

SECTION 1 : DRAWING IN HISTORY

> *Good art theory must smell of the studio, although its language should differ from the household talk of painters...*
>
> Rudolph Arnheim (1974 : 4)

Introduction

This Section reviews the history of drawing with the aim of identifying a dialectical relationship between the history of the organisation of art education and the history of pedagogical methodologies.

Both these histories are articulated in some detail, emphasis being given to the key moments in Russia and Germany between 1917 and 1933, and the teaching of drawing in England during the latter half of the twentieth century.

Alternative philosophical positions and their corresponding ontological and epistemological parameters are presented with a view to articulating the bases of each of the teaching methods discussed. Such a review will establish a clearly defined basis for the development of a new teaching programme proposed in Section 5.

1.1 Drawing in history: Teaching and professional practice

Professional practice is generally considered a necessary component in the education of visual artists. In contemporary usage, the term refers to the acquisition and application of skills and attitudes deemed useful in negotiating a competitive market economy, for example, business acumen and strategies for self-promotion. These, it is usually argued, are necessary for successful visual arts practice in what is commonly referred to as the 'real world', a term which describes one particular construction of reality in which visual philosophy is usurped by commodity aesthetics.

Contrary to this position, it may be argued that it is the reality of the art school which has influenced the professional practice of visual art. The art school is where material work is

produced in an atmosphere of inquiry, co-operation and encouragement, and discussed in relation to a broad socio-historical context.

The condition of visual arts practice has been dependent upon the condition of art education since the days of the earliest Academies and before. To illustrate this argument, consider the canons of human proportion taught to the craftspeople whose practice is evident upon the walls of the tombs of the Egyptian Pharoahs, and the theories of ideal human proportions laid down in the Canon of Polykleitos, made visible through the practice of ancient Greek sculptors. By the time Cennino Cennini (c1390) was teaching from his *Craftsman's Handbook* – with the intention of raising painting's social status from that of a lowly manual craft to the heights of intellectual achievement then accorded poetry – the influence of education upon artistic practice was ready to be formalised through the establishment of an *academy*.[1] Appropriately-named, the word itself derives from the Athens park named after the hero Academus in which Plato had elevated scholastic discourse.

1.1.1 From the early Italian Academies to the English Schools of Arts and Crafts: 1563-1914

Leon Battista Alberti's (c1435) book *On Painting* may be regarded as one of the first teaching texts to support this new academic stance for the visual arts. It laid down the theoretical basis for an academic curriculum consisting of drawing, perspective, and the study of classical history. Alberti was the first to advocate the importance of teaching life drawing and anatomy. This emphasis upon observation from life indicated a serious challenge to the earlier teaching from traditional canons:

> Before dressing a man, we first draw him nude, then we enfold him in draperies. So in painting the nude we place first his bones and muscles which we then cover with flesh so that it is not difficult to understand where each muscle is beneath.
>
> Alberti (c1435 : 73)

Throughout the fifteenth century in Italy other texts consolidated and elaborated upon Alberti's radical foundation, and much of this teaching material was written by practising artists. For example, Lorenzo Ghiberti published his *Commentaries* in the late 1440's. This was a series of three papers, one dealing with antiquity, the second with his own artistic background, and the third which aimed to elevate the social status of the visual arts by discussing some of the complex theoretical issues underpinning optical illusion.

Antonio Averlino, known as Filarete, wrote a treatise on architecture which included a section on the art of drawing (Welch 1997 : 127). Piero della Francesca published *On Perspective* in 1480 which was followed by Piero's friend, the mathematician Luca di Pacioli's book *On Divine Proportion* c. 1498. The 1509 edition of the latter was illustrated in Milan by Leonardo da Vinci, himself the writer of the *Treatise on Painting* (Macmahon 1956) and arguably the founder of the first academy of art in that city around 1498 (Pevsner 1940 : 27).

By the mid-sixteenth century, Alberti's original curriculum had been adopted as the established basis for artistic practice, as confirmed by Giorgio Vasari (1550 : 210) who echoed Alberti:

> But above all, the best thing is to draw men and women from the nude and thus fix in the memory by constant exercise the muscles of the torso, back, legs, arms and knees, with the bones underneath...having seen human bodies dissected, one knows how the bones lie, and the muscles and the sinews, and all the order and conditions of anatomy, so that it is possible...to place the limbs and arrange the muscles of the body in the figures we draw.

The effectiveness of such a teaching philosophy upon artistic practice of the time can be seen in the output of painters of the time, but it is particularly evident in the work of Leonardo and Michelangelo (Figure 1.1).

The use of the term 'academy' to describe meetings between artists and pupils was applied to Baccio Bandinelli's establishments in Rome, 1531 and Florence, 1551. But the first academy

proper, one with clearly articulated aims and a constitution, was initiated by Vasari in 1563. The *Accademia del Disegno,* Florence, aimed to teach Alberti's curriculum of drawing, anatomy and the theory of geometry and perspective. The term *disegno* had as complex a set of connotations as its usual translations, 'drawing', or 'design'. Vasari himself defined the term as

> an apparent expression and declaration of the judgement that is held in the mind and of that which...has been imagined in the intellect and fabricated in the idea.
>
> Goldstein (1996 : 14)

The fact that the term was contentious during this period is illustrated by the series of attempts to define it initiated by Federico Zuccaro, head of the *Accademia di San Luca* in Rome. This academy had been established in 1577, but with the advent of Zuccaro in 1593 it became much more philosophical in its approach to the education of young artists. Zuccaro invited academicians to articulate their understanding of *disegno*, but their limited offerings, to do either with the practical ways of graphic activity such as mark-making (the Latin root *signum,* 'mark'), or the arrangement of figures within a composition, seemed severely limited to Zuccaro's philosophical bent.

His own discussion of the term (Goldstein 1996 : 31-32) encompassed complexities of meaning that few practising artists of the time understood. To begin with, he differentiated between two types of *disegno. Disegno interno* was an internal principle akin to a spark of divine inspiration, and *disegno esterno* was a visible representation. Arguably, Vasari had conflated the two in a way strikingly similar to our own contemporary conflation of the two meanings 'insight' and 'execution' which co-exist within the term 'drawing'; drawing conclusions and drawing marks.

Having referred to two terms of central importance to this thesis, 'drawing' and 'education', it may be appropriate to discuss here the etymological relationships between them, with a view to clarifying their relationship in praxis.

According to the *Oxford English Dictionary*, the term 'drawing' has deep Germanic roots, and has grown into English via Gothic, Old Norse, Old High German, Old Saxon and Old English. Its meanings are many, but condense around the sense of pulling, as in drawing pen across paper, or drawing someone or something out. The term 'educe', meaning "to draw forth, to bring out, develop from a condition of latent, rudimentary or merely potential existence" (OED) has its root in the Latin *educare*, to lead out. Hence, 'educate', from the Latin *educare*, related to *educere*.

It may be argued that the two verbs 'to lead' and 'to draw' have senses that are synonymous, which allows the fortuitous proposition that drawing is synonymous with education.

On a more serious level, it should be made clear that such Academies as those in Florence and Rome were in opposition to the craft Guilds of the time which were perceived as lower-status institutions, passing on from master to apprentice the manual skills of their craft without any intellectual or theoretical basis.

The practice of life-drawing symbolised the difference in attitude. Life drawing was regarded proprietarily by the academies as a sign of their intellectual superiority to such an extent that by 1596 the *Accademia de San Luca* in Rome forbade students from studying the nude figure anywhere but within its walls. (Bickers 1996 : 71).

The perceived status of the academic curriculum was so important that endorsement by nobility was keenly sought. The Florence Academy, with Michelangelo as its head, enjoyed the patronage of the Grand Duke Cosimo de'Medici. This relationship effectively legitimised the influence of academic teaching upon the artistic practice patronised by him.

The emerging role of those early Italian academies as publicly-authorised guardians of standards of artistic practice based upon the revival of interest in Classical values, attracted attention further afield in European countries coming to terms with their common cultural

ancestry in Greece and Rome. Throughout the late sixteenth and seventeenth centuries, versions of the Italian model proliferated across western Europe.

Some were more private affairs like that of the Carracci family, Ludovico and his cousins Annibale and Agostino, founded in Bologna in 1582 after the tradition of private tuition by recognised masters, as in Leonardo's and Bandinelli's academies. (Goldstein 1996 : 33) Indeed, Rembrandt Harmensz van Rijn's teaching in the 1630's may be recognised as the Dutch equivalent of this approach, eventually leading to the *atelier* system in which private students were tutored in the ways of their chosen master in his workshop.

Prominent among the more formalised public establishments was the Paris Academy, founded in 1648. Offering a curriculum of anatomy, drawing, and perspective similar to that of the Florence and Rome establishments, the Paris version developed more as a professional association promoting the interests of its artist-members. Here the concept of the *Salon*, an annual exhibition of members' work, was initiated in 1667 as a means of promoting and perpetuating the classical values of the academy. Close links between Paris and Rome were maintained, made evident by the appointment of Charles Errard, director of the Paris Academy's outpost in Rome, as president of the *Accademi di San Luca* in 1672. (Goldstein, 1996 : 45)

In eighteenth-century Europe, the academy became recognised as the principal means of artistic education. The Berlin Academy of 1697 for example, was conceived as "a university of art like the academies in Rome and Paris". (Pevsner 1940 : 119) The Academy in Vienna was reorganised in the 1720's along the lines of the Paris Academy, Madrid's was established in 1744, Copenhagen's Royal Danish Academy in 1754, and the St Petersburg Imperial Academy in 1757. Virtually every large city in France established its own academy from 1738 onward. (Goldstein 1996 : 49)

However, none of these academies epitomised the Florentine and Parisian doctrines so clearly as the Royal Academy founded in London in 1768 for the "two principal objects: the establishing of a well-regulated School or Academy of Design, for the use of students in the Arts, and an Annual Exhibition, open to all artists of distinguished merit" (Hutchinson 1968 : 43).

The term 'Design' attempted a broad translation of *disegno*, as in the Florentine *Accademia del Disegno*, and was intended to encompass both senses of practical drawing and an understanding of composition. The Annual Exhibition was clearly influenced by the Paris academy's initiative.

The founders of the Royal Academy, led by Joshua Reynolds, were faced with a situation unique in Europe: English painting had no tradition of recording the grand social themes of history, religion, and literature, but rather had been dependent upon private patronage and its demand for portraiture. Reynolds was determined that the teaching programme should address this lack, and early set pieces for the annual competitions echoed the Classical themes of the Paris competitions, *Hercules and Antaeus* in 1770 and *Venus entreating Vulcan to forge the arms of Achilles* in 1771. However, from 1780 themes uniquely English, drawn from the literature of Shakespeare and Milton, were set, thus establishing a tradition that distinguished the Royal Academy from its European counterparts.

The familiar academic curriculum of anatomy and perspective was articulated through stages of the drawing course. Students first studied plaster casts and anatomical *écorché* before graduating to the life class. (Figure 1.2) The final stage was the annual competition based upon historical themes. At the prize-giving events from 1769 until 1790, Reynolds elaborated upon his inaugural presidential address of 1769, emphasising the importance of history painting through various methods of visual representation as taught by the Academy. These *Discourses* were to become the arbiter of the principles which dominated attitudes

towards professional artistic practice until the advent of the first Government-controlled School of Design[2] set up at Somerset House under the auspices of the Board of Trade in 1837, with the architect John Buonarotti Papworth as its inaugural Director.

This event marks a significant moment in the history of English, if not European, art education, as it formally established the rift between the fine arts and applied design which has polarised art education ever since. It also marks the significant attempt to change patterns of professional artistic practice in Britain by manipulating the structure of the art education curriculum. Of course, as we have seen, the precedent for this division was in the philosophical differences between the mediaeval craft Guilds and the newly-formed academies in the sixteenth-century Italy.

Those academies had sought to raise the social status of the fine arts. We shall now review the formidable efforts made on the part of the English academicians and others to maintain the perceived supremacy of the fine arts over crafts and design, and how this struggle has affected attitudes towards drawing.

The primary objective of the School of Design was to produce designers for the manufacturing industries which were proliferating at the time. Mass-manufactured products made possible by the Industrial Revolution and distributed by rapidly-expanding communication networks, required a visual desirability which would stimulate mass consumption and therefore profits.

From November 1841, a 'Normal class' had been set up in the School of Design with the aim of producing teachers capable of establishing the norms of design teaching throughout the country. In 1842 the Council of the School had approved applications from Manchester, Coventry, Norwich and Birmingham to become designated Government Schools of Design.

Graduates of the Normal class were eventually to become Masters at Sheffield, York, Nottingham and Manchester.

Although the first teaching appointment at Somerset House was for a Principal Master in drawing, indicating the centrality of this discipline to the School's curriculum, it was drawing for decoration and not life-drawing as intellectual perceptual inquiry. Life-drawing was regarded as the province of the Royal Academy schools, and academicians and their supporters who sat on the council of the new School of Design with control over its curriculum made certain that it remained so. According to the *Manchester Guardian*, Richard Burchett, a member of staff and from 1852 the headmaster of the School in its second incarnation as the Metropolitan School of Ornamental Art based at Marlborough House, said "We wish to teach art, but to teach it in a way that it should not interfere with that kind of art which comes within the province of the Royal Academy". (Burchett : 1877) However, such efforts to annexe life-drawing were to no avail. Far from developing the strengths of potential designers, the Board of Trade's School of Design attracted the leisured classes who were eager to develop their *dilettante* taste for the fine arts. And so William Dyce, who had been appointed Superintendent in the Autumn of 1838 after Papworth's departure, compromised by introducing life-classes, but only "for the purpose of ornament". (Bickers 1996 : 73) Such ambiguity was bound to attract criticism and by 1849 the obvious failure of the School of Design to produce designers precipitated an inquiry by a Parliamentary Select Committee.

As a result, and after his successful rôle in the organisation of the Great Exhibition in 1851, Henry Cole was appointed director of the newly reconstituted Schools of Design which became known as Schools of Art.

Cole argued the case for these schools to become a nation-wide network of "centres of instruction for public education in drawing" (Macdonald 1973 : 91) and he extended their

rôle to include supervision of the teaching of drawing in elementary schools. However, this strategy did nothing for the development of well-designed manufactured products. Accordingly, into this vacuum stepped members of the Art-Workers' Guild who were followers of William Morris and opposed to the Schools of Art producing only more drawing masters. Through the initiative of William Richard Lethaby, a founder member of the Guild, the London County Council sponsored tuition in the crafts from 1895 onwards at technical-education centres in Battersea Polytechnic, Camberwell School of Arts and Crafts, the Regent Street Polytechnic and later the Hammersmith College of Art and Building in Lime Grove, Shepherds Bush. Perhaps the most important establishment set up by the L. C. C. was the Central School of Arts and Crafts, Regent Street, opened in 1896 under the direction of Lethaby himself.

These developments may be understood as manifestations of two opposing theoretical positions. On the one hand, masters in the Schools of Art believed that an understanding of fine art principles could be passed on, or rather passed *down* to designers. On the other hand, Lethaby's position was the opposite - he advocated that the health of society's design and craftwork was of primary importance to the state of the fine arts – and his ideas began to infiltrate the Schools of Art.

Lethaby's colleagues were appointed to posts at Manchester in 1893, Liverpool in 1896, Birmingham in 1903, and perhaps the most gifted of William Morris's group, Walter Crane was appointed Principal of the Royal College of Art in 1898. The Royal College of Art (RCA) had been so named by the Government in 1896 after its earlier incarnations as the original 1837 School of Design, from 1853 known as the Normal Training School of Art, and from 1864, after its move to permanent headquarters on the Brompton site acquired with funds from the Great Exhibition of 1851, the National Art Training School.[3] (Frayling 1987 : 37, 48)

At the same time as directing the Central School of Arts and Crafts, Lethaby was Professor of Design at the RCA, a fact which illustrates the degree to which the Arts and Crafts curriculum was being taught side by side with the fine arts in the Government's flagship RCA.

Even though another official inquiry, this time by the Board of Education's Departmental Committee of April 1910, proposed that the RCA and the provincial Schools of Art should specialise in regional-based craft and industrial practice, the masters already teaching in the network of provincial Schools of Art organised by Henry Cole argued successfully through the National Society of Art Masters that their Schools (most of which were actually located in industrial centres) should retain courses in painting and art teacher education, and that the London-based Arts and Crafts schools should continue to specialise in training crafts people for industry nation-wide. That such illogicality should have prevailed may be argued either as an indictment of the Government's lack of conviction over the development of industrial design education (expenditure on workshops and equipment would have been substantial), or as evidence of a persuasive evangelism on the part of Schools of Art staff towards the preservation of the autonomy status of the fine arts.

The Ruskin School and the Slade

Apart from the centres of art education sponsored by central Government or local authorities, two other schools of note were established in the early 1870's with an endowment from the collector Felix Slade. The Slade School of Fine Art was set up in 1871 at the University College, London with Edward Poynter as principal. In Oxford, where a Government School of Art was already running at the Randolph Gallery, John Ruskin was appointed Slade professor at the university in the same year. Ruskin further financed a Drawing School in an attempt to counteract the teaching philosophy of the Government schools, whose principal

National Art Training School was by then operating at South Kensington, and from where in Ruskin's opinion "the professorship of Sir Henry Cole...has corrupted the system of art teaching all over England into a state of abortion and falsehood from which it will take twenty years to recover". (Ruskin 1877 : Vol. VII)

Ruskin's own teaching methodology derived from an empiricist notion of observational objectivity, and he advocated to his students a close study of nature. This was illustrated with a collection of teaching aids comprising examples of natural form and selections from his own drawings. (Figure 1.3)

Both the Ruskin School and the Slade enjoyed a freedom from the restrictions of Cole's state system, and adopted stances independent of the Academy too. At the Slade, this was expedited by a succession of outstanding drawing teachers. Alphonse Legros, trained in the French method of fine line drawing and diagonal-line shading, upon an initial framework of the points indicating key junctions of the pose, (Figure 1.4a) was appointed in 1876, and specialised in virtuoso demonstrations of speedy drawing. One of his pupils, William Rothenstein (Figure 1.4b) described Legros' teaching method:

> As a rule we draw larger than sight-size, but Legros would insist that we studied the relations of light and shade and half-tone, at first indicating those lightly, starting as though from a cloud, and gradually coaxing the solid forms into being by superimposed hatching. This was a severe and logical method of constructive drawing – academic in the true sense of word...We were also encouraged to copy...in the National Gallery and in the Print Room of the British Museum.
>
> Holroyd (1974 : 39)

Henry Tonks arrived in 1893 after Legros' retirement. He was a surgeon who had recognised the advantages of anatomical knowledge to 'objective' figure drawing, and advocated an incisive line technique taught with a severe enthusiasm. The underlying philosophy of this kind of line-drawing is that drawing should be the representation of three-dimensional form by the study of contours and this was quite opposed to the style prevalent in the Government Schools of Art, where a hard outline was filled with dark hatching or stippling.

The difference between these two approaches is important, since they represent a crucial difference in ways of seeing: Tonks was encouraging students to notice that objects are not isolated from their surroundings by virtue of an outline, but rather they are distinguished by the nature of the discontinuities of surface and particularly edge contours between the object and its surroundings: "Notice the constant change of line that forms the contour" he observed on his own drawing (Figure 1.5)[4]

In 1875 Edward Poynter had left the Slade to become Principal of the National Art Training School, South Kensington. He had brought with him Legros, who continued to teach at the Slade also, and the sculptor Jules Dalou. As Christopher Frayling, the current Rector of the RCA, put it: "Suddenly the School moved dramatically towards the fine arts and the great reputation that the Royal College of Art enjoys in the fine arts today rests firmly on the foundation laid by those two close friends of Rodin". (Frayling 1987a : 2)

A possible interim conclusion from this general review of English art education up to c1914 may point out that the resistance to crafts training on the part of Cole's national network of Schools of Art contributed to the relative stagnation of the Arts and Crafts movement in England. However, on a more positive note, such a network may be argued to have been instrumental in nurturing a distinctly English aesthetic. Ironically, the RCA's great reputation, the foundation of which Frayling attributed to Rodin's friends, is fashioned from the work of students who first attended those provincial Schools of Art. There they had been taught the English strength of empirical observation, rather more than the philosophies which were driving continental Modernist art movements between 1875 and 1914.

To illustrate this point, we may consider the early 1920's at the RCA, when Edward Bawden and Eric Ravilious were demonstrating versatility, along with Henry Moore (Figure 1.6) and Barbara Hepworth, who had both arrived there in 1921 from Leeds School of Art. John Piper

had left Richmond School of Art for the RCA in 1927. All of these artists feature in the construction of a particularly English aesthetic. Even the post-World War II generation of Pop artists may be seen as part of this ongoing tradition. Peter Blake, (Figure 1.7) Joe Tilson, Richard Smith, David Hockney (Figure 1.8) all provided a specifically English slant on the Americanisation of popular culture in the 1950's and 1960's.

Much as this aesthetic appears to have eclipsed the Arts and Crafts movement in England, William Morris' theories, applied with such vigour by Lethaby, were to bear fruit of a decidedly un-English flavour in revolutionary Russia and post-World War I Germany. The development of this most spectacular example of artistic practice dialectically entwined with theories of perception and communication is discussed in Section 1.1.2.

1.1.2 Vkhutemas [5] and Bauhaus 1917-1933

In Russia, the pre-revolution radical directions of visual research by artists such as Kazimir Malevich, Olga Rozanova, Liubov Popova, Alexander Rodchenko and Vladimir Tatlin were considered by themselves to be counterpoint to the socio-political changes that had begun in 1905 and had culminated in the October 1917 revolution carried through by the *Bolsheviks.* As early as November 1917, just weeks after the *coup*, the People's Commissariat for Enlightenment (*Narkompros*) was set up under the direction of Anatoly Lunarcharsky, incorporating a Visual Arts Department (IZO) headed by Tatlin. Reorganisation of art education in early 1918 saw the amalgamation of the academic Moscow Institute of Painting, Sculpture and Architecture with the Stroganov art school to form the Moscow Free Art Studios (*Svomas*) which, as the name implies, had no entry restrictions. Although painters who had held important positions in the academies were invited to contribute to this reorganisation, most of the new posts were allocated to younger *avant-garde* artists who were already committed to the principles of Modernism.

Olga Rozanova, (wife of the poet Aleksei Kruchenykh), attached to IZO, organised Svomas across the country throughout the period of civil war immediately following the Revolution, travelling immense distances under difficult conditions until she succumbed to diphtheria in November 1918. Popova and Rodchenko became senior lecturers in the Moscow Svomas, as did Malevich and Tatlin briefly, before leaving for the Petrograd Svomas (formerly the St Petersburg Academy of Arts).[6] Malevich returned to the Moscow Svomas again in 1919. At the Vitebsk Svomas, Lazar (El) Lissitsky had been developing a new graphic syntax for the new society, based on Malevich's *Suprematist*[7] work first exhibited in 1915. At the end of 1919, when twenty-six year old Vera Ermolaeva was appointed director at Vitebsk, she invited Malevich to join her and students in the formation of *Unovis*, The Affirmers of the New Art, an association dedicated to integrating artistic practice with the community at large by organising shows, discussions and theatre events. Unovis staged the opera *Victory over the Sun* in 1920. (This was a more modest version than the 1913 original which is discussed more fully in Section 3).

The theoretical motivation for such rapid revolutionary changes to art education was generated from within the Institute of Artistic Culture (*Inkhuk*) instigated in Moscow in the Spring of 1920. This pedagogical think-tank emerged through the initiative of the painter Wassily Kandinsky, with Rodchenko, his wife Varvara Stepanova, Popova and the architect Alexander Vesnin as co-directors.[8] Subsequently, the following November, Svomas were reorganised as Higher State Art-Technical Studios (*Vkhutemas*) with the express intention of training artists in directions useful to the Soviet economy in much the same way as the 1837 School of Design in London had aimed to provide a vocational alternative to the Royal Academy's teaching aims, but with rather more revolutionary zeal.

Within the Moscow Vkhutemas, first year students studied graphics, colour and space-volume issues, before specialising in their second to fifth years in one of the departments of

printing, painting, textiles, sculpture, ceramics, wood and metal working, or architecture. Figure 1.9 details this academic structure which emphasised the utilitarian functions of the visual arts.

In this educational structure, the teaching and practice of drawing permeated all workshops as the means of processing ideas towards industrial production rather than as any means of exploring inner and outer concepts of 'reality'. This latter psychological approach to drawing and painting had been strongly advocated by Kandinsky in his 1910 publication *Concerning the Spiritual in Art*, as well as being demonstrated in his own practice. It is inevitable that he should have felt uncomfortable with the burgeoning 'productivist' ideology of Inkhuk.

At the end of 1920, Kandinsky's resignation from Inkhuk cleared the way for an approach to education and practice more influenced by Tatlin's 'culture of materials'.(9)

As we shall see, Kandinsky was later to live through this ideological clash once more at the Bauhaus, where he developed his expressionistic approach to teaching in opposition to, but alongside, the productivist pedagogy of Lazlo Moholy-Nagy and Marcel Breuer.

However, in Moscow the Productivists held sway, and announced their intention at the *5 x 5 =25* exhibition in September 1921. This show, organised by Inkhuk, displayed five pieces of work each by Rodchenko, Stepanova, Vesnin, Popova, and Alexandra Exter, all of whom taught at the Vkhutemas. (Figure 1.10)

The five all made statements that declared the demise of drawing and painting as a process of contemplative reflection, and in doing so reflected the mood of the younger generation of artists. This mood had been articulated in a previous exhibition by the Association of Young Artists (*Obmokhu*) held in May 1920, in which the philosophical differences between the production of 'real' objects and a 'pure' object of the so-called 'laboratory stage' of painting had been identified.

But this laboratory stage was itself in stark opposition to what was perceived as an elitist notion of painting for its own sake, whether patronised by the rich or not. Drawing now became visual studies in space-volume, colour-surface, and space-force. These were developed in non-objective form as preparations for the production of utilitarian objects. They represented experiments in developing a visual aesthetic which would bridge the chasm between art and industrial production.

In the catalogue for the *5 x 5 = 25* show, Popova did acknowledge that, although her experiments in "spatial-force construction"[10] were still pictorial, they were to be considered "merely as a series of preliminary experiments leading to concrete material constructions" (Sarabianov & Adaskina 1990 : 139).

The term 'constructivist' had appeared in print for the first time in the January 1921 catalogue of an earlier exhibition by three Obmokhu members, the Stenberg brothers Vladimir and Georgii, and Konstantin Medunetsky. It described the sixty-one constructed three-dimensional forms on display and the artists' anti-art and anti-beauty stance. For those early constructivists, experimental art was allied with experimental science for the betterment of the new social order.

The Obmokhu group's principles were widely discussed in the art journals of the day, and they too became influential at the Bauhaus through the teaching of Moholy-Nagy. However, it was within Inkhuk during the summer and autumn of 1921 that Constructivist aims and objectives were fully articulated.

Varvara Stepanova's lecture *On Constructivism*, delivered at Inkhuk in 1921 and published in the first issue of *Lef* 1923 (left front of the arts journal), indicates the point at which the term 'constructivism' replaced 'production art'. All connotations of individual expressive 'style' were repressed in favour of an emphasis upon 'technique':

> The material formation of the object is to be substituted for its aesthetic combination. The object is to be treated as a whole, and thus will be of no

discernible 'style' but simply a product of an industrial order like a car, aeroplane and suchlike. Constructivism is a purely technical mastery and organisation of materials on three principles:

a) the tectonic (act of creation)
b) the factura (manner of creation)
c) the construction

Stepanova (1921)

But of course, the very lack of those materials, technological resources and, not least, the lack of understanding on the part of these enthusiasts of the technical skills required for the realisation of such monumental schemes as, for example, Tatlin's *Monument to the Third Internationale* 1919-20, (Figure 1.11) were insurmountable. There were contemporary commentators who recognised these failings, one of whom was Viktor Pertsov (1922; 1988 : 231-234), poet and writer on Russian literature.

> Hitherto, production and art have not known each other and have lived nurtured on the haziest rumours. Despite the fact that history, by its very nature an incomparable matchmaker, has done everything possible over recent years to bring them together, they have, nevertheless, remained 'strangers'. The state, in the person of the People's Commissariat for Enlightenment, created for them innumerable rendezvous in the form of all kinds of artistic-technological workshops, but many of those have subsequently closed down. Nevertheless, despite all of these efforts, production remained a complete sphinx for art, and vice-versa – with the only difference that art was active and production passive. Without having any positive facts, artists began to engage in wild fantasies about their future life together with industry...
>
> ...a new conception of these problems was formulated in Moscow under the name 'constructivism'. This is what has happened. The scale of work that art-productional workers have set themselves has been extended. If the latter are prepared to help in the production of small articles, then the constructivists are ready to act as counsellors to the state on all questions of its material installations. They are mesmerised by the monumental construction projects of the Revolution's honeymoon (1918-1919) and after stuffing themselves on it then, they now talk about it with their mouths full. However, it is easy to talk about an artist's constructing a 'material installation' (an algebraic sign that means heaven knows what), but it is difficult and scandalous to set about building a viaduct or a station when your head is full of impressionisms and suprematisms and such technological authorities as Tatlin and Malevich. Such are the 'good intentions' of the constructivists.
>
> (Pertsov (1922; 1988 : 231-4)

Such scathing criticism may appear fairly levelled at Tatlin and his fellow constructivists, eager to transform materials into three-dimensional evidence of their ideological commitment to the new social structure, without heed to their own technological limitations. But Malevich's practice had always positioned him apart from that faction.

His only venture into industrial production had been with the Petrograd Lomonosov porcelain factory in 1923, when he and other Unovis members worked on designs for new forms of crockery with decorative patterns derived from Suprematist paintings and graphics.

Malevich had moved to Petrograd from Vitebsk in the spring of 1922, along with Ermolaeva and students Nikolai Suetin[11] and Ilya Chasnik who collaborated in his Lomonosov commission. He became director of the Museum of Artistic Culture (*Mkhuk*) there in August 1923 and presided over its transformation into a research-orientated State Institute of Artistic Culture (*GInkhuk*) the following year. Ginkhuk was organised into five Departments with Malevich the head of Painterly Culture and Tatlin the head of the Department of Material Culture.[12] During this Petrograd phase, as throughout his post-1917 career, Malevich's concerns can be seen to be more pedagogical than industrial. As he said himself, the Museum was concerned with education and the "enlightenment of the broad mass of the people" (Barbican 1999)

Even though Malevich and Tatlin had exhibited together as far back as February 1912 at *The Donkey's Tail* exhibition in Moscow, where Tatlin had shown a series of life drawings demonstrating the changing focus of his attention from surface form to underlying construction (Figure 1.12), the two had never been in harmony over the dichotomy between a synthetic/subjective abstraction and an analytic/objective abstraction.

This may be illustrated by the fact that coincidentally with *The Donkey's Tail* show, Malevich was contributing work to the second *Blue Rider* expressionist group show in Munich, alongside that of Kandinsky.

To further emphasise the pair's dissimilarities, consider the *Tramway V : First Exhibition of Futurist painting* in Moscow, March 1915. Malevich had exhibited his *zaum*, 'a-logical' experiments in drawing and painting, developments from Cubo-Futurism which were attempting to break the false logic of illusionistic space on a flat picture-plane (as in Figure 1.13 *An Englishman in Moscow*), whilst Tatlin had exhibited his painting-reliefs, constructions of angular planes protruding from the picture-plane, attempting to bring painting into real three-dimensional space, as in Figure 1.14.

By December that year in Petrograd at the *'0.10' Last Futurist Exhibition*, Malevich had developed his drawing inquiry into the Suprematist works (Figure 1.15) which demonstrate his consistent commitment to a perceptualist philosophy, transcending objectivity, whilst Tatlin's reliefs had become fully-fledged constructed objects in three-dimensional space. (Figure 1.16)

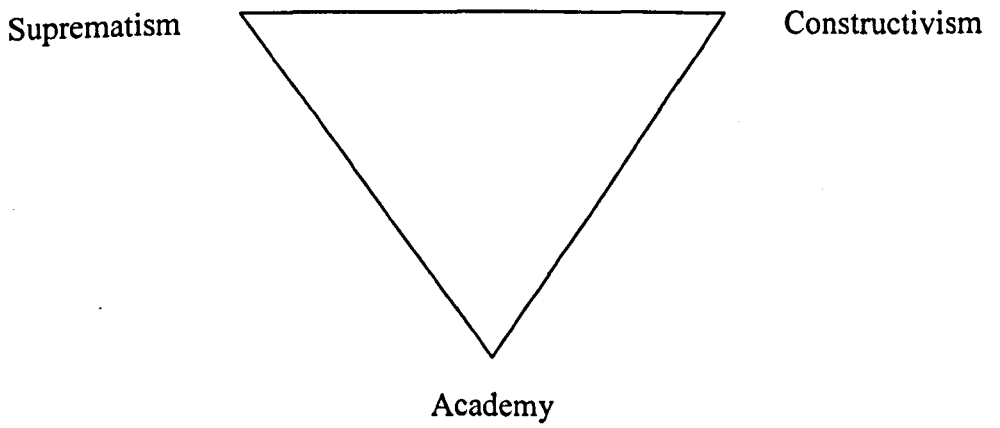
The rift between their ideological positions so clearly demonstrated in their work, is also evident from their insistence upon having separate rooms, and separate catalogues with separate statements.

Far from any practical commitment to material production, Malevich's obsession had been with *light* ever since his involvement with the operatic production *Victory over the Sun* in 1913.[13] The movement of projected light beams appeared to him to fragment and animate material objects, and render individual segments autonomous in the process. His drawing experiments of that year included trying to represent intersecting rays of light. In *Death of a man simultaneously in an aeroplane and on a railway*, 1913 (Figure 1.17) there are intersecting shafts of light that fall across the picture to produce a maze of overlapping planes which serve to dematerialise objects rather as Mikhail Larionov's *Rayist* [14] experiments had done (See Figure 3.4).

Let us consider what is represented in Malevich's drawing: from the top left an aeroplane, viewed from above, with discernible wheels, wings, and rotating propeller, is angled towards the centre of the composition. Also converging toward that exploded focal point from bottom left may be seen telegraph wires on poles viewed from above. The aeroplane appears again in fragmented form at the top right, this time viewed from below through parallel lines which may represent the telegraph wires viewed from below. Emerging from the vortex of overlapping triangular shapes at bottom left, a shape that appears twice, resembling the front of a railway engine, viewed in oblique projection. It appears that this composition invites viewers to adopt two different viewing positions simultaneously as they witness the dynamic convergence of aeroplane and railway engine along and through the telegraph and railway lines towards their inevitable crash indicated by diverging lines from the fragmented central focal point.

Unlike the Cubist strategy of revealing form through rotation, here Malevich takes on much more complex relationships between viewer and viewed which visually explore the then-contemporary new ideas of the relativity of simultaneity.

Thus it could be argued that Malevich's Suprematism, by attempting to de-objectify visual representation and deal with the de-materialised, represents one node in a triad of mutual oppositions:



Of course, both he and Tatlin were united in their loathing of what Malevich referred to as "the rubbishy slough of academic art" (Malevich 1915 : 118)

Such contrast is discussed here not merely to defend Malevich against Pertsov's criticism quoted above, but for a reason far more pertinent to this thesis: to position Malevich as a pioneer in the attempt to synthesise perception theory and communication theory in the practice of drawing and painting.

Malevich was one of the earliest to tear down the classical screen between private process and public product, preparatory drawings and finished paintings; drawing emerged as a legitimate vehicle of *exploration* through which process *became* product. This exploration is not about ways of describing objective form, but is a psychological exploration of the relationships between eye, brain, and hand; an exploration of the relationship between perception and communication; an exploration of the forces acting upon and between objects and people – kinetic and potential energies, dynamic and static forces of tension, torsion, compression and shear, and how to visualise them without reference to a fixed viewing position. Malevich made equivalences in visual language for those physical forces, refreshing the familiar just as the poets and theorists of his circle were doing with language. He was involved with the cutting-edge of literary theory then being developed by Roman Osipovich Jakobson and his colleagues in the Moscow and Petrograd linguistic circles.[15] He also engaged with the poets, writers and musicians who were experimenting with such theory in their practice. These engagements, together with his interest in the new physics of relativity which challenged old perceptions of simultaneity, stimulated his artistic practice, and may be understood as a sustained attempt to articulate a conceptual convergence of all these concerns. Jakobson later spoke of those times:

> Those of us who were concerned with language learned to apply the principle of relativity in linguistic operations; we were consistently drawn in this direction by the spectacular development of modern physics and by the pictorial theory and practice of Cubism...
>
> Jakobson (1971 : 632)

Malevich takes us well beyond Cubism. As mentioned earlier he may be seen as a pioneer in the attempt to synthesise perception theory and communication theory through drawing practice. And this attempt to philosophise the relationship between drawing and experience affected subsequent professional artistic practice, not only in Russia, but within the Bauhaus too, as we shall see.

For example, Paul Klee's drawing Figure 1.18 shows this continuity between the productive action of drawing and the final form. In Klee's (1925 : 33) terms, "The work as human action (genesis) is productive as well as receptive."

Even though the Russian experiment was short-lived – the demise of the Moscow Vkhutemas and its later version the Vkhutein (Higher State Art-Technical Institute) was complete by 1930 when the cycle ended with the re-establishment of the Moscow Art Institute – and despite the suppression of information about that revolutionary era throughout the period of the Cold War, it can now be seen to have had powerful repercussions around Europe.

In Weimar, Germany, following the by-now familiar pattern, an Academy of Art had been established in 1860, and a School of Arts and Crafts in 1906. This latter had been set up by the Belgian architect-designer Henri van de Velde, a man with a similar outlook to Lethaby in England. Unlike its counterpart in London, the Weimar Academy had been seeking a more secure footing in the increasingly industrialised locality since the early years of the twentieth century. During the first world war in 1915 when van de Velde was forced to leave Weimar as an 'enemy alien' and the School of Arts and Crafts closed down, it was proposed that a craft department became part of the Academy.

Walter Gropius had been involved in the German Werkbund[16] (founded in 1907) since 1910 as a colleague of van de Velde, one of the Werkbund's founder members. The Werkbund's policy was to bring together art and industry with the aim of improving German manufactured goods, an aim to which Gropius had been fully committed before the war to the extent of drafting a proposal for a new school for the purpose. Therefore in 1915 he was approached by the Academy to develop its new arts and crafts initiative. However, having experienced war and the post-war turmoil and revolutionary changes which had been occurring in Germany, and of course also in Russia, Gropius' attitude towards social needs had been transformed. As with many of his contemporaries, he was fired with the spirit of revolutionary social change, and from this perspective the Werkbund, its principles and his own plans for a new school seemed conservative and outdated. So did the Academy's proposal.

As an active member of the Work Council for Art (AfK) Gropius had been corresponding with Kandinsky and Tatlin at IZO in Moscow. Their 1918 message to the AfK about "progressive fighters of the new art working to construct a new universal artistic culture" (Lodder, 1983 : 234) had an inspirational effect upon Gropius and his fellow-members. The AfK's reply of 24 March 1919 indicates Gropius' sympathy with the Russian experiment in art and design:

> Comrades, this, our handshake, is the sign of our unity, our promise that we....carry our fiery seriousness silently in our hearts...
> We are ready to send representatives to a conference where we could plan together what we as artists must do to unite with the people.
> (Hochman 1997 : 68-69)

What he *did* was to negotiate with the Weimar local authorities so that the Weimar Art Academy, along with its craft department which he had been invited to manage, should amalgamate with van de Velde's defunct School of Arts and Crafts to form a school which

would "eventually produce everything related to building: architecture, sculpture, painting, furnishings, and handicrafts". (Hochman 1997 : 73)

On 21 March 1919, three days before the AfK reply to the Russians had been delivered by Gropius, the Bauhaus celebrated its opening.

Gropius set out to transcend the rift between fine art and the crafts by producing, as he proclaimed in the Bauhaus manifesto, "a new guild of creators...without...presumptuous class distinctions". (Wingler 1969 : 31).

He planned to achieve this by integrating art classes with craft workshops and the history of the Bauhaus could be constructed around the fluctuating degrees of success and failure of this early aim.

Only a year or so after its opening, the Bauhaus was in chaos. The expressionist pedagogy advocated with religious zeal by Johannes Itten, one of Gropius's first appointments to head the Preliminary Course (Vorkurs), was becoming philosophically challenged as irrelevant to the objective of adapting students to the requirements of industry. Itten's drawing exercises (Figure 1.19) were devised as a means of liberating students emotionally. This is confirmed by the anecdote of Itten's colleague Oskar Schlemmer relating to his comments on their study of the weeping figure of Mary Magdalen of the Grünewald altar.

> "If you had any feeling for art, you would not draw in the presence of this representation of weeping which is so sublime that it could be the weeping of the world, you would just sit there, dissolved in tears". So saying, he slams the door!
>
> (Schlemmer, O. 1958 : 112)

Schlemmer himself taught at the Bauhaus from 1920 to 1929, involving himself in stage design and theatre production. His course on *Man* involved life drawing, but conceived the human subject as a totality of formal, biological and philosophical aspects. (Figure 1.20)

Along with Itten, and at his suggestion, Paul Klee had been teaching on the Vorkurs from 1920.

Klee's comments to his wife upon Itten's drawing practice illustrate the latter's studio manner:

> (Itten) walks up to an easel...he grasps a piece of charcoal, his body gathers itself, as though he were charged with energy (He draws) two energetic strokes, upright and parallel to one another...the students were instructed to do this as well. The teacher checks their posture. Then he instructs them on the stroke, then he tells them to do the same assignment for homework. It seems to be a kind of bodily massage...
>
> Klee (1979 : 970)

Klee's own teaching notes published by the Bauhaus (Klee 1925) reveal an approach to mastering the elements of line and colour (Figure 1.21) which attempted a synthesis of empirical analysis with individual expression, and recognised the ecological relationship between humans and nature:

> For the artist, dialogue with nature remains a *sine qua non*. The artist is a man, himself nature, and a part of nature within natural space.
>
> Depending upon the attitude of the individual with reference to his sphere of influence, it is a matter of the number and the kind of paths he may pursue, both in his productivity and in the related nature studies.
>
> ....
>
> The object grows beyond its appearance through our knowledge of its inner nature. It grows by the knowledge that a thing is more than its outward appearance suggests. Man dissects the thing and with plane sections demonstrates the inner structure of it, whereby the character of the object is built up by the number and kind of the required sections. This is visual penetration, partly by means of the simple, sharp knife, partly with the help of more delicate instruments that can reveal the material structure or the material function to us
>
> ....
>
> Here, in the eye, all these ways come together and, being transposed into form, lead to a synthesis of 'outward sight' and 'inner vision'. At this point constructions are formed which deviate totally from the optical image of the objects and yet, from an overall point of view, do not contradict it.
>
> Klee (1923 : 24)

More agitation, in the person of Theo van Doesburg, arrived at Weimar in January 1921. Doesburg was the leader of the Dutch group of rationalist artists and designers De Stijl and, from his position of visiting lecturer, proceeded to attack Itten's mystical expressionist pedagogy with some vehemence. Faced with such turmoil, the former Academy staff

inherited by the Bauhaus pressed for, and achieved, the re-opening of the old academy in April 1921 under the name State College of Fine Arts. Understandably, Gropius took this as a "slap in the face" (Schlemmer, T. 1990 : 103) which, together with other personal difficulties, led to his nervous collapse.[17]

Itten had recognised that his pedagogical stance was not conducive to the stated aims of the Bauhaus which were to do with enhancing material production, yet he appeared either unwilling, or incapable of changing his position.

Ironically, it was the unexpected availability of another expressionist, Wassily Kandinsky, which gave Gropius an opportunity to remove Itten. Kandinsky had relinquished his position in the Moscow Inkhuk under pressure from the Productivists , and had arrived once again in Germany. He took up the post Gropius offered him in July 1922.

Kandinsky's teaching methods had much in common with Klee's, and the two contributed to the Vorkurs, Kandinsky through a programme of drawing which he termed 'analytical', but not in the Academy sense. His exercises encouraged students to compose and observe still-life arrangements, and to analyse them in terms of the basic visual elements which he identified as point, line and plane. (Figure 1.22) The theory underpinning his teaching was published as the ninth Bauhaus book (Kandinsky 1926) a year after that of Klee.

Under the pressure of such powerfully-articulated pedagogy, the influence of Itten's mysticism waned, and he left the Bauhaus. Almost immediately, in April 1923 the Hungarian constructivist Laszlo Moholy-Nagy was appointed to take charge of Vorkurs, imbuing the course with his uncompromising Constructivist ethic (Figure 1.23).

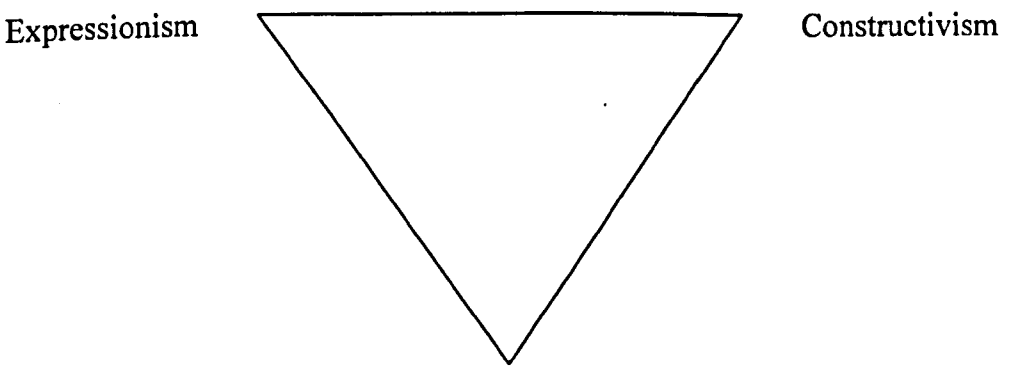
Joseph Albers shared the Vorkurs teaching with Moholy-Nagy at Weimar, and after the move to Dessau in 1925, Albers took charge of the first semester Vorkurs (Figure 1.24) whilst Moholy-Nagy concentrated on a materials-based second semester Vorkurs. When Gropius resigned in 1928, Moholy-Nagy left too, and Albers took sole responsibility for the Vorkurs

until the closure of the Bauhaus in 1933.[18] According to Howard Dearstyne, who was a student at the Bauhaus: "it is Albers' version of the basic course which has been imitated by emulators of the Bauhaus through the world". (Dearstyne 1986 : 94)

For example:

> Learning...with emphasis on technical and economical rather than aesthetic considerations makes clear the difference between the static and the dynamic properties of materials. It shows that the inherent characteristics of a material determine the way in which it is to be used. It trains the student in constructive thinking...It counteracts the exaggeration of individualism without hampering individual development.
>
> Albers (1928, 1975 : 116)

Gropius recovered from the stresses of 1921 and went on to lead the Bauhaus until his resignation in the Spring of 1928. However, from the early twenties onwards, the now-familiar rift between the social status of fine art and the industrial crafts, which had distinguished the first academies from the guilds, became construed rather as one between an expressionist stance towards the fine arts and a more commercially motivated approach to industrial production.



The tensions produced by this rift continued to drive the Bauhaus dynamic and dissipate its energy throughout the various re-locations from Weimer to Dessau, and ultimately Berlin. Writing about the period 1925-26, Hochman (1997 : 200) commented:

> The school was now divided into two distinct camps: those mostly younger masters, such as Moholy and [Marcel] Breuer, who pursued the creation of model household objects suitable for industrial production; and the mostly older painters, such as [Lionel] Feininger, Klee, [George] Muche and Kandinsky, who opposed such commercially mediated creating.
> Hochman (1997 : 200)

However, the influence of Malevich, who was to visit the Bauhaus in 1927, had been felt even during the most public demonstration of the Bauhaus's stated intent in the August 1923 Weimar exhibition of student work *Art and Technology: The New Unity.* (Figure 1.25) This exhibition has become one of the key moments in the history of art and design education. It created the impression that the Bauhaus was at the leading edge of a new international style, an impression prevalent throughout the intervening decades. In semi-humourous style, the journalist Paul Westheim reviewed the show in the Berlin magazine *Das Kunstblatt*:

> Three days in Weimar and one can never look at a square again for the rest of one's life. Malevich invented the square way back in 1913. [A reference to the famous production of *Victory over the Sun.*] How lucky he didn't have his invention patented. The ultimate of Bauhaus ideals: the individual square.
> Whitford (1992 : 153)

Westheim may also have noted Malevich's influence in the exhibition that ran concurrently in one of Weimar's museums, including the expressionist drawings and paintings of Kandinsky and Klee and constructivist graphic work of their colleague Moholy-Nagy; visible manifestations of their opposing pedagogical ideologies.

We may conjecture as to how Western visual education would have been structured had Malevich remained at the Bauhaus in 1927, and had introduced his 'third way' to Western Europe before it was suppressed by Stalin.

1.1.3. Art schools in England and Wales post 1933

It can be argued that the Bauhaus influence on English and Welsh art education has been highly noticeable. For example, Deanna Petherbridge claimed in 1994 that "the tail-end of

Bauhaus basic design principles still dominates foundation courses, if in a watered-down form". (Petherbridge 1996 : 60)

The Council for Art and Industry, established in 1934, echoed Bauhaus aims and objectives by encouraging the Education Board's' network of Schools of Art to concentrate on designing, producing and exhibiting industrial artefacts. By 1946 this increased specialisation was formalised under the National Diploma in Design (NDD) qualification. Painters too, were awarded the NDD, reflecting the designerly attitudes of the education authorities. However, earlier in 1937 a group of painters who were concerned about this trend away from pure drawing and painting established a private school, initially in Fitzroy Street and later in Euston Road, London, with the specific aim of encouraging realistic painting and drawing from the everyday urban environment

The Euston Road school

This school was based on the *atelier* system and was founded by Claude Rogers (who had been trained by Henry Tonks at the Slade, see Figure 1.26a) and Victor Pasmore. Co-founders of the school, Tonks-trained William Coldstream and Graham Bell, as well as students including Lawrence Gowing, Rodrigo Moynihan and Colin McInnes, had a great influence upon the direction of art education in the years immediately preceding the second world war. Moreover, some of them were to have an even greater effect in the post-war period as we shall discover.

Coldstream's teaching was based on rigorous measurement, using the traditional method of holding the pencil vertically at arm's length, and sighting through it using one eye. (Figure 1.26) The head remains static, but arm and eye revolve. This enables judgement of relative proportions free from anomalies of scale that can occur due to 'size constancy'. This

term refers to the psychological phenomenon whereby the brain disregards the size of object-shapes presumed on the retina in favour of pre-knowledge of the object.

One of Coldstream's students in the 1940's and after the war at Camberwell Art School, Christopher Pinsent, explained the process in detail:

> The pencil is held at arm's length – care being taken that the arm is fully extended for each measurement – in such a way that it is a plane at right angles to the line from the artist's eye to whatever part of the subject he (sic) is looking at. The thumb should be near the end of the pencil so that it can be moved up and down (or along if the pencil is held horizontally) and the thumbnail act as an indicator. The index and remaining fingers clasp the stem of the pencil in such a way that the right angle to the line of sight is positively maintained.
>
> The pencil is held in this plane to appear either vertical or horizontal to the artist against the subject, and the thumb moved to record a measurement. If for instance the top of the pencil is against the sitter's mouth, the thumb-nail can be moved down to the level of the lowest point of the chin. This length on the pencil is then compared with another distance down or across the model's head which looks likely to be the same or a simple multiple or fraction of it. Such compared distances, as their verifications accrue, are marked on the drawing paper. But a single measurement is not to be transferred direct, not only for the reason that the scale might be inappropriate, but because the process would be mindless. Appraisal of relative distances is fundamental to the art of making drawings.
>
> Coldstream has said that he began measuring from a concern to get things to look really like. But evidently he became fascinated with the business of finding exactly comparable or divisible distances....
>
> His paintings are thus informed with a mesh of simple proportions closely or sparsely knit according to the degree of concentration on and nature of any part of the subject.
>
> Laughton (1986 : 157)

This rigorous measuring approach to drawing was continued by Coldstream in his post-war teaching at Camberwell, and even during the 1960's and 1970's, when objective life drawing was declining in the face of the challenge of a language-based philosophy of art practice, the Euston Road tradition was staunchly maintained by Coldstream's disciples at the Slade and Norwich as well as Camberwell. (Figure 1.27) However, its central claim to objectivity is doubtful. For example, the problem of transferring sight-line ratios from a curved visual field

to the flat picture surface was addressed by only measuring vertical and horizontal proportions thus constructing on the paper a grid of vertical and horizontal dashes which Deanna Petherbridge (1996 : 61) has disparagingly called "the dot-and-carry (or fly-shit) technique". At the peripheries of such drawings, it will be noticed that edges which are straight and horizontal in reality appear to bend upwards on the picture . (Figure 1.28) Therefore, in its professed rigour, the system which claims objectivity and accuracy is patently flawed. Coldstream's was an empirical objectivity, as Pasmore recognised when he wrote in 1982:

> ...the unique response of Bill Coldstream...was not academic but experimental. His concept of a renewed objectivity had nothing to do with that of traditional realism with its science of anatomy, perspective and geometric composition, on the contrary it was based on purely optical phenomena tied strictly to the measurable properties of both the visual object and the picture plane.
> Laughton (1986 : 325)

It may have been such recognition of the flaw in empiricist objectivity that drove Pasmore towards abstraction soon after the second world war, as we shall investigate below.

Bomberg at the Borough: The search for the 'Spirit in the Mass'

Not all of Henry Tonks' students at the Slade kept the faith as rigidly as Coldstream and his followers.

David Bomberg, who had entered the Slade as a student in 1911, broke away to produce some of the most radical work associated with Wyndham Lewis's Vorticist group around 1914, although his defensive independence would not allow him the comfort of actually belonging to the group. He was the first member of the English avant-garde to hold a solo exhibition, at the Chenil Gallery in 1914. After the first world war, Bomberg reverted to a rather precise representationalism as is evident from his views of Palestine made in the 1920's, but this, too, was a passing phase. In 1945, desperate for some kind of security and with a long-standing belief in his own abilities he approached the Slade seeking a teaching

appointment. The bastion of English draughtspersonship turned him down. Twice. Eventually he secured some part-time teaching at the rather less-prestigious Borough Polytechnic in south London and emerged, in the tumult of post-war England, as a teacher of some influence. He set to with characteristic passion, teaching not accuracy or measurement, but a way of drawing that attempted to reveal what he called "the incomprehensible density of cosmic forces compressed into a small space", or put more simply, "the spirit in the mass". (Spalding 1986 : 162)

With slashes of charcoal energising the drawing surface – even breaking through it at times – he and his students strove to realise the innate spiritual nature within the form of the subject-matter. The procedure involved looking into the subject, gaining some idea about its nature, and then to equate the movement of the drawing hand with the movement of the eyes as they ranged over the subject, focusing upon one part before scanning across to another. The resultant conglomeration of marks thus expressed the drawer's engagement with the subject. In place of an Albertian window *onto* the world, Bomberg's method expressed an existentialist notion of being *in* the world. (Figure 1.29)

His own definition of drawing reveals his subjective-expressionist stance quite clearly:

> The most satisfactory definition of drawing I have found is the one that defines drawing as the representation of form. Not the representation of appearance of form, but more the representation of all our feelings about form.
> Bomberg (1937 : 18)

Bomberg's students at the Borough included Frank Auerbach and Leon Kossof. Auerbach began Bomberg's classes in 1948 (Figure 1.30a) and he continued attending throughout his seven years as a student, first at St Martin's School of Art and later at the RCA. The subsequent development of his work (Figure 1.30b) is the legacy of Bomberg's obsession with expressing the inner spirit on the outer surface.

The Basic courses of Victor Pasmore, Richard Hamilton, Tom Hudson and Harry Thubron. 1952-1966

In the aftermath of the war many pre-war English social conventions in addition to educational stances were being questioned and challenged. In what may be described as a parallel of the situation in 1918 Russia, a minority of pre-war British artists who had developed an interest in Constructivism emerged as post-war radicals. They too effected changes in art education which dramatically affected post-war artistic practice.

Kenneth Martin, for example, was teaching part-time at Goldsmith's College and at Camberwell School of Arts and Crafts from 1946 onwards. Camberwell had become the place of post-war reunion for members of the Euston Road school. Victor Pasmore had arrived there in 1943, and soon brought in Claude Rogers and William Coldstream. But there had been individual developments in divergent directions since the 1930's, and there was less unity in their teaching, although Coldstream remained true to his methodology of measuring, and passed it on to students such as Euan Uglow (Figure 1.27b). He arrived at Camberwell in 1948 and later went on to the Slade before becoming an influential teacher of measurement systems himself. Martin, along with his wife Mary Martin, Adrian Heath and Terry Frost, represented an alternative to the Euston Road tradition, with the intention of making a truly constructive, 'objective' art. By 1949 Pasmore was a part of this faction. He had been working between the polarities of representational and abstract art since 1944 (Figure 1.31a), but in 1948 after seeing a Paul Klee painting made up only of coloured squares, he "decided straight away that this was the objective point from which I could start again." (Laughton 1986 : 295) (See Figure 1.31b) In his teaching notes for his students at Camberwell, Pasmore had written: "Drawing is not only the outline and the modelling. It is the structure, the rhythm, the movement, the balance and proportion, the relation of every particular, the tone and the colouring." (Pasmore 1945). Echoing Itten (1964 : 12) who had described his own teaching methods at the Bauhaus in terms of the study of contrasts: "Light and dark, material

and texture studies, form and colour theory, rhythm and expressive forms were discussed and presented in their contrasting effects", Pasmore's notes continued:

> All nature is a harmony of opposites and art, therefore, a matter of question and answer. Dark is answered by light, red by green, the straight line by the curved line the solid by the liquid, the tall by the short, the large by the small, the rough by the smooth, the soft by the hard, symmetry by variety, and in each case one or the other is dominant. By combining one with the other and setting off one against the other, harmony is obtained.
>
> Pasmore (1945)

Perhaps Itten, but certainly his Bauhaus successors, the Constructivist Moholy-Nagy and Albers, would have approved the themes *Growth and Form,* and *Man, Machine and Motion.* These were pedagogical exhibitions organised by Pasmore, Richard Hamilton, Harry Thubron and Tom Hudson at the Institute of Contemporary Arts,[19] London, in 1951 and 1955 respectively.

Pasmore had left Camberwell in 1949 and was lecturing with Hamilton at the Central School in London along with Paolozzi and the abstract painter Alan Davie. There, in 1952, they evolved a prototype 'basic' course formed upon Constructivist principles in art and design. In 1954 Thubron had been invited by John Wood of the Yorkshire North Riding Education Authority to teach a summer school at Scarborough. The following year, Pasmore collaborated and by 1956 when Hudson and Wendy Pasmore had joined them, the course had "assumed a form typical of the fundamental revision of art education which was to follow" (Thistlewood 1981 : 26). These summer schools were in effect prototypes for the full-time basic course applied first by Hamilton from 1953 to 1966 in his design teaching at King's College, University of Durham at Newcastle, followed by Pasmore's basic course in the painting school at King's in 1954, where the professor was Lawrence Gowing. Thubron and Hudson introduced their version at Leeds College of Art in 1957, assisted by Wendy Pasmore and Alan Davie.[20]

> The constant factor in all of the work of Pasmore, Hamilton and Hudson (see Figure 4.32) was a resolution of opposites – in its simplest and most obvious

> form a combination of intellectual and intuitive faculties within entirely fresh approaches to creativity. Their experimentation as a whole having been concerned with minutest technicalities of grammar, and yet as having pursued implications of even the smallest creative act upon the realms of three-dimensional construction, of 'architecture', and of the real world presented in popular culture and performance art. Their images were not conceived as isolated from the real world: such images, to paraphrase Klee's famous dictum, were to make the world real.
>
> Thistlewood (1981 : 44)

The Hornsey Affair 1968

In January 1959 William Coldstream was invited to chair a new National Advisory Council on Art Education (NACAE) with the task of assessing a proposed new Diploma in Art and Design (DipAD) to replace the NDD. Tacitly acknowledging the Vkhutemas and Bauhaus influences via Pasmore, Hamilton, Thubron and Hudson, the Coldstream Report of October 1960 recommended a one-year preliminary course, which became known as the *pre-dip* year, followed by a three-year diploma course in one of five ominously-traditional specialist areas: Fine Art 1, painting with drawing, Fine Art 2 sculpture with drawing, Graphic Design, Three-Dimensional Design (sub divided according to local specialisms) and Textiles/Fashion. However, unlike the Russian initiatives, Coldstream's report advocated a shift away from the design-for-industry trend which had met with limited success since the first School of Design in 1837. The educational "swing of the sixties" (Macdonald 1973 : 96) was towards a more liberal, intellectualised approach, and the subsequent nation-wide implementation of this swing resulted in a larger proportion of colleges approved for Fine Art than the Design disciplines. By 1969, only thirty-nine Colleges of Art in England and one in Wales (Cardiff, where Hudson had been since 1964) had been approved to offer the Diploma in Art and Design. Thirty-six of these were able to offer Painting, eleven were validated for Ceramics, seven for Silversmithing/Jewellery, and a mere six for Industrial Design.

The Coldstream report:

> effectively...changed the structure of art school teaching in Britain introducing compulsory study of art history....and eventually the award of degree status to recognised art school courses.
>
> Compton (1987 : 424-5)

Eventually perhaps, but not before some trauma. On 28 May 1968, students at Hornsey College of Art staged their historic protest, and students at Guildford quickly emulated their actions. These flash-points brought to public attention the general unease students were feeling nation-wide.

One reason may be deduced from the statistics: Across the country, students were recognising that the majority of art schools in England and Wales were unvalidated except perhaps for a pre-dip year. For example, in 1964 there were only 1480 DipAD places available, but there were 3030 students in pre-dip courses. (Macdonald 1970 : 356)

Opposition to the entry requirements of DipAD courses was most forcefully expressed both by those students on pre-dip courses worried about their chances of gaining entry to the nationally-recognised qualifications, and those students who, having completed a pre-dip, found themselves on non-recognised so-called 'vocational' courses, which had a status somewhere around that of a "low level semi-apprenticeship" (Macdonald 1970 : 361)

Underlying these statistics was a deeper social change which has already been mentioned and which was made manifest in Pop. The whole traditional concept of fine art had been challenged by the post-war generation of young artists who dismantled the barriers between élite forms of expression and the popular media. Together with this intellectual shift, a more prosaic one was affecting those industries such as ceramics, textiles and furniture which had been based upon craft techniques: the shift towards automation.

Perhaps the Coldstream recommendation of five self-contained study areas may not have been as flexible as the social changes of the time demanded, and the Hornsey students confirmed this view in their six observations (Black 1973 : 33):

1. There is no dividing line between the so-called fine arts and design, and compartmentalised education is therefore irrelevant.
2. Studies should be based on net-work curricula allowing students to study those subjects which they themselves decide best suit their development.
3. Specialisation is undesirable during this period of accelerating technological development, as techniques studied at school will be out-dated before the student can apply them.
4. The aim of art/design education should be to produce generalists and not specialists.
5. All general education qualifications should be eliminated as a requirement for entry to an art college.
6. Education is an activity shared by staff and students and the students' point of view should be expressed whenever decisions are made which affect the academic or administrative life of a college.

Coventry Conceptualists 1966-1980

The waning of importance of the life-class, and drawing in general in the art schools of the late nineteen-sixties and seventies, which was alluded to in the previous discussion of Coldstream's influence at Camberwell immediately after the second world war, may now be understood in terms of the general questioning of tradition and social convention during that period. The Hornsey affair heralded a generation of art students who were ready for a radical restatement of the aims of art education and the purposes of art practices. The year before, 1967, Richard Long had challenged the very notion of what could be art practice by drawing a line not with hand, pencil and paper, but with the action of walking, his feet continuously treading down grass. The act of walking becomes the work of art and the artist is not simply observing the world, but is an active participant, shaping the world. (This was nothing new –

see the discussion on Nascan geoglyphs in Section 4) At least a visible trace of the art-action still remained, however temporary, on a material surface. (Figure 1.33). However, Terry Atkinson and Michael Baldwin were to eradicate even that. They had met as lecturers at Coventry College of Art in 1966, a few years prior to its merging into the new Lanchester Polytechnic. This proved to be a significant period of difficult transition out of which grew a strict intellectual challenge to the very notion of any kind of material-based art practice:

> It is not beyond the bounds of sense to maintain that an art form can evolve by taking as a point of initial enquiry the language use of the art society.
> Atkinson (1969)

Together with David Bainbridge and Harold Hurell, Atkinson and Baldwin formed the *Art & Language* group at Coventry in 1968. Painting and drawing classes were shunned by many (but not all) of the students in favour of long seminars in which philosophy and language itself were the subjects under discussion. Play with words superseded play with light on pigments, and the discussion group became the producer of art.

The art philosopher Richard Wollheim's observation that it is impossible to imagine art outside a society of language users appears to reflect Art & Language's motivation, and by May 1969 the group's journal *Art-Language* was disseminating their language-art throughout the art schools of Britain.[21] (Figure 1.34)

The effectiveness of the group was to raise consciousness about the futility of any practice/theory divide, and also to keep theory-practice fluid. By the time conceptual projects had been exhibited at the Hayward Gallery as *The New Art* in 1972, it became clear the Conceptual Art had been institutionally accepted, its arteries were hardening, and two years later Atkinson left Art & Language and returned to painting.

After much internecine wrangling within the various factions of the group, Baldwin and Mel Ramsden emerged in 1980 as the two remaining members in a social and political context in

which Conservatism had triumphed (Margaret Thatcher had been elected Conservative Prime Minister in 1979). As a last retort they exhibited a series of paintings collectively titled *A portrait of V. I. Lenin with cap in the style of Jackson Pollock.* Since 1977 Art & Language had been dealing with issues of pictorial representation – what pictures represent and how, emphasising that pictures are produced within specific historical contexts under specific cultural and material constraints, rather than as the products of isolated individual inspiration. *A portrait of V. I. Lenin....* brought together the two antithetical icons of these positions; Lenin the historical materialist and Pollock the individual expressionist. (Figure 1.35)

The organisation of art and design education 1968 – present

Even as *Art-Language* was influencing a drift away from the narrow confine of separate material practices – painting, sculpture, print-making – and even as those Hornsey decrees were being proclaimed from the 1968 sit-in, the Government's Ministry for Education and Science was outlining plans for the further compartmenting of art and design courses. The amalgamation of approved art colleges with technology and teacher-training colleges into polytechnics would effectively widen the gap between DipAD courses and those run by unapproved colleges, perceived as academically inferior vocational courses. Local authorities were invited to submit schemes for amalgamating colleges under their control, and sixteen new Polytechnics were approved in 1968, nine of which included art colleges.

A desperate scramble for inclusion ensued, similar to the one precipitated by the 1960 Coldstream report, since any art college *not* embraced within a polytechnic appeared likely to be cast adrift to fend for themselves in the chaotic, unstructured mixture of vocational, pre-dip, recreational and leisure courses. In the rather patronising phrase used in the second report of the NACAE, *Vocational courses in Colleges and Schools of Art*, published in 1962, "designer/craftsmen and technicians" indicated those "who [have] some measure of creative

ability as well as [those] who, though capable of appreciating creative work, [are] not normally called upon to initiate such work." (NACAE 1962 para. 4). It was deemed this type of student best suited a vocational course "which should be different not only in standard but also in character from courses for the Diploma in Art and Design." (NACAE 1962 para. 10) Not until 1977 did this second tier of design education become nationally organised under a committee of the Technician Education Council (TEC) with the acronym DATEC. (Design and Art Technicians Education Council). When the Business Education Council (BEC) and the TEC were merged in 1983 to form BTEC, DATEC became its Board for Design, validating a wide range of courses as National and Higher National Diplomas which continue to exist, alongside the General National Vocational Qualifications (GNVQ) set up in 1994. In 1974, the National Council for Diplomas in Art and Design (NCDAD), which had been responsible for administering the DipAD award, was amalgamated with the Council for National Academic Awards (CNAA). At the same time, the DipAD was converted to a BA, thus acknowledging its degree-level status.

In 1988, the Education Reform Act allowed the polytechnics and other amalgamated institutions of higher education to become independent incorporated institutions, free from local authority financial control. In the early twenty-first century, most of the Schools of Art which formed Henry Cole's original national network in 1853, and which were amalgamated into polytechnics in the late 1960's, are established as faculties, schools or departments within university-status independent institutions with degree-awarding powers.

A Drawing resurgence

Benjamin Buchloh (1981) has noted the correlation between a cultural climate of authoritarianism, as in a Conservative Britain from 1979 to 1997, and the resurgence of figuration in the arts:

> It is endemic to the syndrome of authoritarianism that it appeals to and affirms the 'eternal' or ancient systems of order....It seems that with increasing authoritarianism in the present, the projection into the past has to be removed further and further away.
>
> Buchloh (1981 : 111)

However, recognition that drawing may encompass a wider range of approaches, essential to the development of artists in the twenty-first century, is also evident.

As well as the establishment of the Centre for Drawing Research at the RCA in 1994 under the professorship of Deanna Petherbridge, a series of conferences and symposia such as Thistlewood (1992), Hetherington (1996), Soddu (1999, 2000), Mottram (2000) bears testimony to the recognition of the need to reconsider the status of drawing in the art school curriculum. Stephen Farthing (2000), Ruskin Master of Drawing at Oxford, has recently called for a radical reconsideration of the 'A' level syllabus in art, with the objective of establishing a more coherent framework for the teaching of drawing at secondary school level. Despite these activities, it may be argued that the majority of courses in drawing throughout this most recent period have consisted of *ad hoc* mixtures of the philosophical and pedagogical approaches discussed in this Section.

It appears that few teaching programmes articulate the range of paradigms from which their teaching methodology derives. This failing is addressed next, in Section 1.2

1.2 Methodology: Alternative philosophical bases for the teaching of drawing

Underlying the history of change in the organisation of art education reviewed in Section 1.1, there is a history of change in the pedagogical methodologies adopted by teachers of drawing which was only partially discussed.

The two histories may appear dissimilar, since the former is driven by the perceived educational needs of a social formation, the latter by a series of competing philosophical positions defined by ontological and epistemological parameters. Since the two are rarely

explicitly discussed in art schools, few teachers of drawing are fully conversant with both. However, it is suggested here that there *is* a connection between the two histories, which is important for drawing teachers, since any philosophical attitude toward the teaching of drawing is constructed in response to an educational need, and the social nature of such need conditions philosophical attitude. A dialectical relationship is evident between the two which will be illustrated in this Section.

Four broad philosophical bases from which a variety of pedagogical methods may be derived are identified in Figure 1.36 and discussed below in terms of their relationships to the social contexts in which they flourish(ed). All four may be identified (in various proportions) in most of the drawing programmes surveyed in Section 1.1.

PHILOSOPHICAL BASE		ONTOLOGICAL ATTITUDE TO DRAWING	EPISTEMOLOGICAL ATTITUDE TO DRAWING	METHODOLOGICAL APPROACHES TO THE TEACHING OF DRAWING
1.	Rationalist	'OBJECTIVE' Reality as absolute	Analytical	Assumption of fixed viewer position. Application of anatomical knowledge, perspective techniques. Distance-values emphasised. The Academy approach.
2.	Empiricist		Observational	Application of measurement techniques based on the natural sciences. Ruskin's "innocent eye". Coldstream's "measured verification". Haptic and proximal values.
3.	Pragmaticist	'SUBJECTIVE' Reality as an individual experience	Psychological	Exploration of emotional responses. Emphasises the 'individual eye'. Distortion of drawn elements, to induce disturbance of emotional response (Kandinsky and Itten)
4.	Constructionist	RELATIVIST Realities recognised as social constructions, including the above categories.	Semiological	Cross-cultural visual studies. Explicit experimentation with both viewer-centred and object-centred representations. Ecological relationships. Distance, haptic and proximal values.

Figure 1.36 Philosophical bases for the teaching of drawing

The chart above summarises the philosophical bases for teaching drawing discussed in this section. It helps clarify the common terms 'objective' and 'subjective', and illustrates the correlations between philosophical bases, their ontological and epistemological parameters, and the main methodological approaches to the teaching of drawing.

1. Rationalist: Analytical objectivity

The familiar term 'objective drawing' may be discussed in terms of an ontological position common to two philosophical bases: those of rationalism and empiricism which share the

belief that reality is a given absolute to be revealed either by reasoning or by empirical observation. Objective drawing is the term most often applied to drawings based on the Renaissance development of Euclidean geometry and the codification of artificial perspective (discussed in Section 4.1). Such an ego-centric construction of geometry may be seen as the visual expression of social attitudes of that time, when the notion of the individual and their central position in the world was becoming established. Hence an emphasis upon *distance-values* may be discerned in such work. The notion of 'accuracy' when applied to drawing which assumes the drawer's single eye at a fixed viewing point, is bound up with rationalist criteria of mathematical measurability and linear geometry. Coldstream's teaching at the Euston Road School epitomises this attitude.

2. *Empiricist: Observational objectivity*

In the period known as the Enlightenment, a growing confidence in the abilities of individuals to achieve knowledge of the world through empirical, scientific techniques became evident. Such an attitude of confidence in the scientific method was later adopted by John Ruskin (1857 : 3) in his teaching based on the concept of "the innocence of the eye" and vision as "patches of different colours variously shaded" to be simply recorded on the drawing surface in a one-to-one correlation. Thus, 'accuracy' was deemed to be measured by the degree of correlation between what was thought to be the retinal image, and what was drawn, with an emphasis upon *proximal* and *haptic* values. More recently, Betty Edwards (1981) has theorised this position on the basis of neuro-biological research into the functions of the brain's hemispheres. Work by Roger Sperry (1968, 1973) had suggested that the right cerebral hemisphere houses functions to do with visual-spatial perception, kinesthetic sensibility, synthetic processing and emotion. The left hemisphere controls functions of logic, linear processing and analytic processing. Edwards claims that the problems people

have in drawing what they see are rooted in the strong tendency to substitute left-brain schemata for right-brain observation. She offers drawing exercises to correct this tendency. For example, focusing attention upon the negative spaces between objects, rather than upon those objects which are familiarised through labelling with language.

The materials-based visual studies undertaken on the Bauhaus preliminary course under Moholy-Nagy and Albers may also be broadly classified under this empiricist, observational objectivity heading.

3. *Pragmaticist: Subjective expressionism*

The rise of mass-democratisation and mass-industrialisation in the late eighteenth and early nineteenth centuries may be cited as factors in the development of a European Modernist aesthetic. One consequence of this, during the later nineteenth and early twentieth centuries, was a burgeoning consciousness of the dialectical relationship between the masses and the individual. Faced with such overwhelming mass-social forces, the psychological need for individual identity became crucial.

Challenges to the Academic analytical objectivity gave rise to more pragmatic approaches to art production, based on the notion of the subjectivity of the individual eye. Reasoning, pragmatist philosophers such as William James (1943) insisted, is dominated by personal and emotional factors. Reality, already challenged as a given absolute, was construed more as an individual subjective experience, to be expressed through non-objective, non-academic means. Drawing that explored individual emotional expression was undertaken outside recognised academia, often through the artist's *atelier* system, where private students would go to study under artists whose individuality was recognised. The distortion of drawn visual elements was deemed to express a disturbance of emotions. Both figurative distortions, as in the examples of Bomberg and Auerbach, and non-figurative, abstract work, in which the

painting itself became subject-matter in its own right, as with Kandinsky from the first decade of the twentieth century, *via* Itten's teaching in the 1920's through to the American abstract expressionists of the 1940's. Of course, any notion of 'accuracy' in the judgement of such practice becomes highly problematic, and has stimulated research into alternative qualitative assessment criteria, as we shall see in Section 5.

4. *Constructionist[22]: Relative constructionism*

The constructionist believes that to understand the world one must interpret it:

> ....what is at stake for the constructionist are systems of representations, social and material practices, laws of discourses, and ideological effects. In short, constructionists are concerned above all with the *production* and *organisation* of differences, and they therefore reject the idea that any essential or natural givens precede the process of social determination.
>
> Fuss (1989 : 3)

The development of the Structuralist project in the first two decades of the twentieth century, and the post-structuralist responses of the nineteen-sixties and seventies have enabled the application of constructionist insights to a wide range of human communication activities, including drawing.

A relativist ontological position may be aligned with an epistemology based on semiotics so as to justify a pedagogical methodology which addressed cross-cultural drawing practices. This methodology, through recognising the previous three, allows students to be increasingly conscious of their own and others' social formations, and aware of how their drawing practice affects and is affected by their habits of perception and their conventions of visual representation.

All teaching programmes of drawing may be understood in terms of these four positions, in various proportions.

For example, the basic courses developed by Hamilton, Pasmore, Hudson and Thubron in the 1950's which were to influence pre-dip and foundation courses in art colleges for so long, (and acknowledged by them as being influenced by Itten, Moholy-Nagy and Klee) may be understood as a combination of empiricist observational objectivity and pragmaticist subjective expressionism.

The reason for the longevity of those courses is that they appeared to resolve the historical divide between fine art and design-for-industry that had perturbed visual education in western Europe since Renaissance times. Only now, in the midst of another social revolution that may be termed the information-technology revolution do those courses seem inadequate.

What I am proposing here is a pedagogy of drawing built upon an explicitly-articulated review of perception theories and communication theories, and which identifies the range of ontological, epistemological and methodological parameters that define philosophical stances towards visual representation, such as those laid out here.

From such a knowledge base, teachers and students may have the opportunity to re-construct the teaching programmes that have been discussed in this historical review of art and design education, with the advantage of being aware of the implications of each programme for practice itself.

Today, at the beginning of the twenty first century, the information-technology revolution has transformed our attitudes to the visual arts and visual communication. More than ever before there is a need for versatile teaching based upon an understanding of the philosophical bases from which pedagogical methodologies derive, along with an understanding of visual perception theory and visual communication theory.

In order to build a new approach to the teaching of drawing, it is now necessary to review the theoretical bases of perception and communication. Such reviews are undertaken in Sections 2 and 3.

Summary

The dialectical relationship between the history of the organisation of art education and the history of teaching approaches to drawing has been illustrated. A range of alternative philosophical positions and their corresponding ontological and epistemological parameters has been tabled, and a corresponding range of teaching methods discussed. From the range identified here, it becomes possible to argue for any particular philosophical basis and its corresponding pedagogical methodology to be applied within a teaching programme. This possibility is realised below in Section 5.

SECTION 2 : PERCEPTION

Introduction

2.1 Empiricism, Rationalism and Immanuel Kant

2.2 Behaviourism

2.3 The Gestaltists

2.4 Critique of Ernst Gombrich's position

2.5 The ecological approach to visual perception

2.6 The computational theory of vision

Summary

SECTION 2 : PERCEPTION

> *...to see is to sense the relatedness in events, and events are changes, not things.*
>
> Robert Witkin (1978: 6)

Introduction

Donald Schön [1] (1983 : vii) has noted that "when people use terms such as 'art' and 'intuition', they usually intend to terminate discussion rather than to open up inquiry". In general, it may be argued that art schools are committed for the most part to a particular epistemology, a view of knowledge that has cultivated the importance of intuition in the production of visual work. It could also be argued that such commitment serves to distinguish the art schools from other centres of teaching and learning. However, there is a danger that in emphasising the undoubted importance of developing the capacity for intuitive responses in students [2], art schools may neglect or even ignore equally important developments in theoretical issues which directly impinge upon artistic practice.

One such issue is perception theory, another is communication theory (discussed in Section 3). This Section reviews the most salient positions in the field of visual perception theory. The objective of such a review is to identify insights relevant to the teaching and practice of drawing in the context of an undergraduate fine art programme.

The question of the relationship between drawing and perception appears, deceptively, to be a simple one. Perhaps that is why many teachers and practitioners of drawing assume the question has been answered satisfactorily, and are therefore content to accept the answer so fluently articulated by Ernst Hans Gombrich in 1956 . [3]

Faced with the question 'what is drawing?' Gombrich's argument appears to be based upon the assumption that it is *the record of a perception.* [4] This has become a standard answer, but an alternative valid answer will be elaborated below.

The theoretical base from which Gombrich developed his argument is essentially that of empiricism, but with aspects of the nativist theory from which the Gestalt psychologists elaborated their theory of image-making as a mode of cognition. (5) The development of both these theories is discussed in Section 2.1.

It may appear quite natural to assume that drawing is an attempt to copy the world: a drawing becomes a visual record of the brain's assumed ability to process from raw sense-data a mental hypothesis which 'matches' reality. This assumption appears natural, particularly in a Western visual culture which has been obsessed with 'realism' throughout its history. (6) It is therefore perhaps inevitable that this approach should have been widely accepted. The danger is that this acceptance allows the problematic but fascinating questions about drawing to be categorised with questions about the *psychology of the viewer,* and to be appropriated therefore by the discipline of psychological science.

The assumptions implicit in this appropriation have led many practitioners and teachers of drawing to abrogate one of their fundamental rôles as inquirers to human perception. However, once drawing is recognised as a process of cultural production, rather than the recording of perception, we may be able to understand that it is an activity which can reveal, isolate and thus bring into question those culturally-based conventions which have been naturalised by Gombrich's argument.

This thesis will argue that drawing affords the production and negotiation of meaning through the selection and combination of visual signs from codes of visual communication within a social context.

A restructuring of art school epistemology is advocated, particularly in relation to the issues of perception and communication theories. Such an epistemology would allow the distinction between the normal biological necessity of humans to receive and respond to

visual information about their environment, and the culturally-acquired ways by which humans communicate through the actions and artefacts of the drawing process.

To end this introduction, let us read how an informed outsider viewed art educationalists' efforts at answering the question 'what is drawing?'

> The lore and literature of drawing masters and schools of art provide no help in answering this question. The manuals on how to draw are thoroughly confusing, for there has never been a coherent theory of the co-operation of the eye and the hand. Courses in mechanical or geometrical drawing using a ruler and compass do not answer the question. Neither do courses in architectural drawing. The courses in so-called graphics that I am familiar with are full of inexcusable contradictions, glossed over for the sake of covering up ignorance. The courses in so-called basic design are equally sloppy. Do we now have a coherent theory of the co-operation of eye and hand? Not yet, but perhaps ... [Gibson's theory] ... will give us at least a beginning.
>
> Gibson (1979: 275)

Before taking up James J Gibson's [7] provocative challenge it will be useful to trace the development of the theories of perception which do *not* make the crucial distinction between seeing-for-survival and interpreting human signs. Then it may be possible to lay Gombrich's ghost of perceptualism once and for all, and begin to structure an approach to the practice and teaching of drawing based on a broader understanding of the alternative theoretical bases.

2.1 Empiricism, Rationalism and Immanuel Kant

Empiricism

During the seventeenth century, discoveries by Johannes Kepler (1604) and Rene Descartes (1637) about the physical properties of light and eyes led to a long-standing belief that the human eye functions much like a *camera obscura*, and that the starting point for vision is a projected retinal image. [8] One's own direct experience of images, however, quickly leads to the conclusion that they lack many of the qualities perceivable in the world. For example, images are flat and static, whereas visual perception reveals a solid, mobile world. The conclusion arrived at by the empiricist philosophers John Locke (1690) and George Berkeley (1709) was that perception must involve processes that go beyond the information present in the retinal image.

They argued that perception was somehow constructed from more primitive sensations by a process of *learning through association,* in other words through experience of the world. Locke's [9] argument may be summarised as a theory of perception which is known as *representationalism* because it asserts that we know only the representations, of things around us in the world, not the things themselves. These representations are in Locke's term "simple ideas", and the ideas of sensation are the raw materials of all experience. The simple ideas are enriched by the mind with secondary qualities such as colour and texture. The mind then projects these secondary qualities into the external world and upon the objects therein. Objects, according to Locke, did possess substance, and also the "primary qualities" of solidity and motion. We do not, however, he argued, experience substance. It is a "complex idea" of the mind. Alfred North Whitehead (Joad 1957: 42) wryly commented upon Locke's argument:

> Thus the bodies are perceived as with qualities which in reality do not belong to them, qualities which in fact are purely the offspring of the mind. Thus nature gets credit which in truth should be reserved for ourselves: the rose for its scent; the nightingale for his song; and the sun for his radiance. The poets

> are entirely mistaken. They should address their lyrics to themselves, and should turn them into odes of self-congratulation on the excellency of the human mind. Nature is a dull affair, soundless, scentless, colourless; merely the hurrying of material, endlessly, meaninglessly.

Berkeley [10] was able to develop Locke's theory in two ways. He eliminated the distinction between "primary" and "secondary" qualities, and he eliminated "substance". It would appear obvious that any distinction between solidity and colour must be an arbitrary one, and Berkeley recognised that if the secondary qualities described by Locke, such as colour, were ideas of the mind, then surely the primary qualities, such as solidity, were too. As for the notion of "substance", Berkeley questioned Locke's assumption that substantial objects even existed outside the mind. If the mind always knows ideas but never objects, then a paradox arises since if we do not know objects we cannot know anything *about* objects, neither their primary nor secondary qualities. The conclusion of this reasoning is that there becomes no need to assume external objects at all. For Berkeley (Joad 1957: 48) to exist is to be an idea in mind:

> Some truths there are so near and obvious that a man need only open his eyes to see them. Such I take this important one to be, viz. That all the choir of heaven and furniture of the earth, in a word all those bodies which compose the mighty frame of the world, have not any subsistance with a mind – that their *being* is to be *perceived* or *known.*

Our sensory knowledge then, according to Berkeley, is always of our own ideas in mind and not of things themselves.

Following Locke and Berkeley, David Hume [11] (1739) took it for granted that what we perceive are our own mental states. There are "impressions" yielded through sense experience, and "ideas". The difference is...

> ...in the degrees of force and liveliness with which they strike the mind, and make their way into our thought or consciousness. Those perceptions which enter with most force or violence, we may name *impressions*; and under this name, I comprehend all our sensations, passions and emotions....By *ideas*, I mean the faint images of these in thinking and reasoning."
>
> Hume (in Joad 1957: 51)

Hume's "impressions" are close to what we would call 'sensations' today, and his "ideas" translate as mental images. The difference appears to be that a sensation has a cause in the external world, whereas images are not caused by contact with external things. However, Hume had already asserted that our knowledge is only of our own mental states. He could not then argue that we distinguish between mental states by reference to external things.

Rationalism

We do, nevertheless, reason about our sense impressions, and the conclusions we reach do apply to the world around us. A rationalist philosophy avoids the empiricists' dilemma by claiming that we can have objective knowledge of the world without relying upon any subjective perceptual experience. According to this argument, knowledge is generated by an innate facility for reasoning. Gottfried Wilhelm Leibnitz [12] (c1710) proposed that such reasoning depended upon certain innate principles which did not rely upon experience of the world in any way.

Space and time were deemed to be intellectual constructs through which we rationalise our experience but which did not exist experientially. Objects in the world were made of substances, but their properties were the product of thought processes that occurred in the mind.

In this way, Leibnitz argued, the world that common sense perceived is only the 'appearance' of the real world. Not quite an illusion, since appearance is the consequence of rational principles of thought. The real world is accessible through reason alone, since only reason can transcend the individual point of view. Reason operates through innate ideas which have been acquired independently of experience.

If our senses provide us with 'impressions' (the raw stuff of experience) but we also have 'ideas' (images derived from reasoning) about the world, then there may be possible a synthesis of these two positions.

Kant

Immanuel Kant [13] (1781) proposed that the 'impressions' of the empiricists were not really raw at all. He argued that our knowledge of the world may be explained as a composite, that is, sense impressions modelled by our minds in the process of becoming experience. If this were so, argued Kant, then it was only to be expected that experience should conform to the general laws which structure our mental processes. He was able to theorise the opposing positions of the empiricists and the rationalists in terms of a dialectical relationship. Neither reason nor experience alone is capable of providing knowledge of the world. Reason provides form without content, experience provides content without form. Only in their synthesis is knowledge possible.

Kant argued that what we know is not reality in any absolute sense, but a reality which our minds have already structured.

Each individual is in direct contact with reality, but we do not perceive the totality exactly as it is, since what we perceive has already been arranged in space-time. Moreover, what we experience changes as we move through space and as our consciousness alters with time.

Following Kant, Hermann von Helmholtz [14] (1866) proposed the notion that perceptions are the result of sensory data which have been *enhanced by previous experience.*

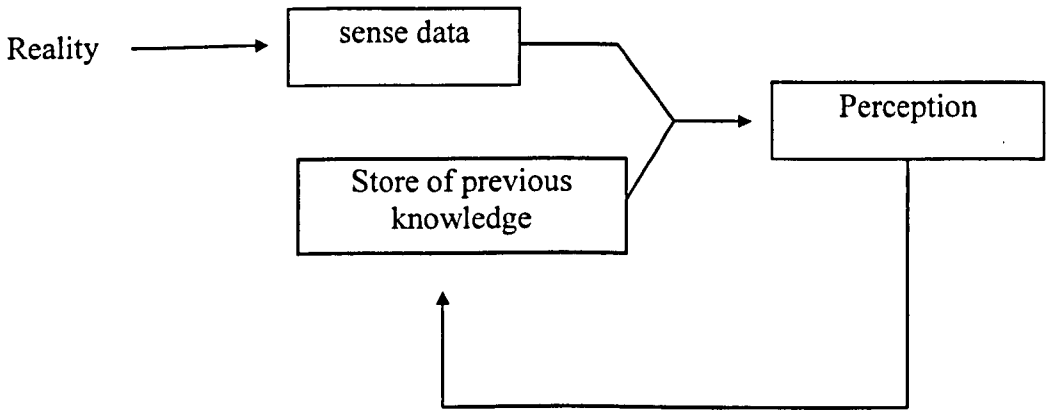


Figure 2.1

Helmholtz's idea of perception involving unconscious inference or conclusions based on acquired experience has been elaborated by more recent theorists such as Richard Gregory [15] (1973), as a comparison between the following statements makes clear:

> ...such objects are always imagined as being present in the field of vision as would have to be there in order to produce the same impression on the nervous mechanism...The psychic activities that lead us to infer that there in front of us at a certain place there is a certain object of a certain character, are generally not conscious activities, but unconscious ones. In their result they are equivalent to a *conclusion.*
>
> Helmholtz (1866: 2-4)

> ...we may think of sensory stimulation as providing data for hypotheses concerning the state of the external world. The selected hypotheses, following this view, are perceptions.
>
> Gregory (1973: 61-63)

This comparison serves to illustrate that the notion of perception as being indirect -that is, relying on contributions from the observer's stored knowledge augmenting sense data to form a hypothesis – is still current, although there have been other theories put forward in the period of time separating Helmholtz and Gregory. These are discussed below.

2.2 Behaviourism

Mentalistic notions such as 'sensations' and 'perceptions', were replaced by

John Broadus Watson [16] (1913, 1924) with objectively observable "discriminative responses". Behaviourists argue that since we can never know how other people experience the world, then we should only observe their behaviour, and how their behavioural responses are related to variations in the stimulii presented to them.

All art theories based on such *spectator-as-responder* theory pre-suppose that it is through perceiving a drawing or other art work that the spectator is caused to respond or behave in certain specific ways. The argument claims that if theorists can ascertain what types of visual stimulii cause what types of behaviour, then they are able to determine if a picture has the properties necessary to bring about the requisite behaviour. Alternatively, they can examine behaviours that occur in the presence of the pictures. Art critics who subscribe to this theory argue that the nature of art is to do with the effect it produces upon the spectator.

This notion, that the nature of art is in the effect that a picture produces upon the spectator, is a commonly-held one. However, it cannot reveal anything concerning the intrinsic meanings of the picture itself, or anything new about the spectator to themselves except through an observer's interpretation, which is not the most direct way to self-enlightenment. Equally disturbing is the assumption of behaviourist theorists that since they are in a position to correlate properties of the stimulus with behaviour patterns, they alone are in a position to judge a picture's success. (A criterion of assessment which is little recognised by the majority who respect such art experts). This assumption can lead to judgements of the behaviour produced and thence to the encouragement of those behaviour patterns deemed effective in strengthening certain conventions. For example, cultural and religious dogma, or other ideologically – determined standards conducive to maintaining the *status quo*. In this way, behaviourist art criticism may retain its mystery whilst retaining the potential for manipulating social behaviour and opinion.

It may be noticed that although the stimulus-object is mentioned in behaviourist theory as that which is discriminated in the perception, it is not *in itself* treated as valuable. According to behaviourist theory, the picture's significance and value to society is determined wholly by the effect it produces. From this point of view the structure of the picture is not relevant *except* as a cause of behaviour.

2.3 The Gestaltists

At roughly the same time as the behaviourist, *spectator-as-responder to stimulii*, theory was being developed, Max Wertheimer (1923) and Kurt Koffka (1935) proposed an alternative which may be termed a *spectator-as-contributor to stimulus* theory. This rejected the empiricist assumption that perception could be explained by analysing the elements of sensations. The Gestalt [17] group supported a *nativist* philosophy, maintaining that perception was the result of *innate dynamic field forces* within the brain.

According to Gestalt psychology, perceptions are the result of spontaneous interactions in the brain which are triggered by sensory stimulation of the retina. For the empiricist, we may remember, perceptions result from unconscious interpretation of sensations based on previous experience.

Although accepting the physiological evidence that boundaries between areas of differing light intensity within the visual field can be identified by nerve cells within the retinae, the Gestalt theorists were sceptical about empiricist suggestions that these low-level components of information received by retinal cells were somehow constructed by a *process of association* into more complex ideas about what was actually perceived.

From the Gestaltists point of view, any analysis of perception into discrete sensations overlooked some important aspects of form and structure. For example, each of the diagrams

in Figure 2.2 has the quality of 'squareness', despite being composed of quite different elements:

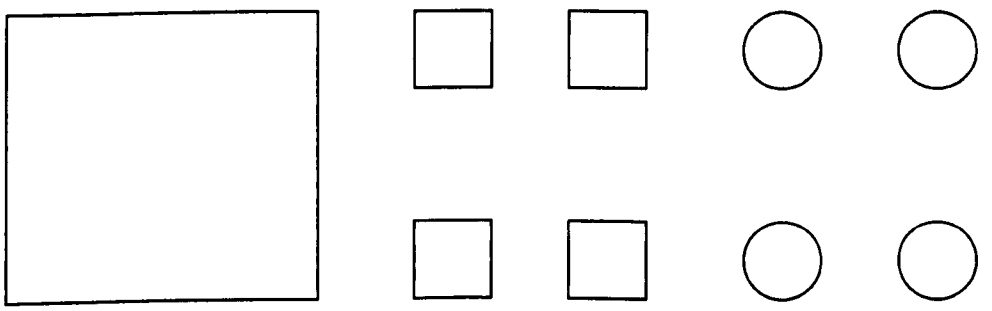


Figure 2.2

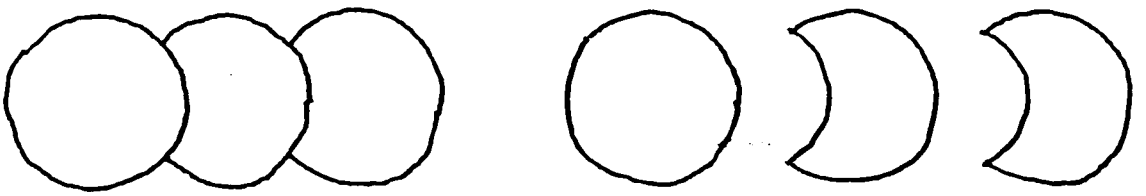
Similarly, a tune is recognisable despite being transposed into a different key, or played at a different tempo.

The spatial and temporal relationships between elements are as important to Gestalt thinking as the absolute size, location or nature of the elements themselves. *Sensation-based* empiricist theory of perception fails to take this into account.

Thus the common phrase *the whole is greater than the sum of the parts* becomes identified with Gestalt psychology.

Gestalt Principles of Perceptual Organisation

In order to explain how we choose a certain perception from the variety of possible interpretations, the Gestaltists formulated a set of principles of perceptual organisation. In Figure 2.3a, diagram (i) is normally perceived as a set of overlapping discs, although diagram (ii) illustrates an equally plausible solution.



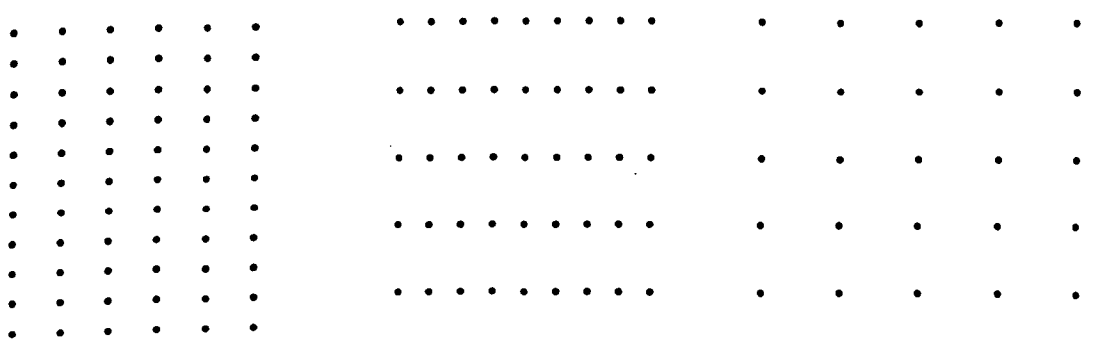
i ii

Figure 2.3a

Some of these principles are concerned with the grouping of sub-regions of figures, and others are concerned with the separation of a figure from its background.

Principle 1 Proximity

One of the most important factors determining perceptual organisation of a scene is the proximity of the elements within it:



(i) (ii) (iii)

Figure 2.3b

In Figure 2.3b, (i) is seen as columns, (ii) is seen as rows, and (iii) is ambiguous.

Principle 2 Similarity

Things which look similar are grouped together:

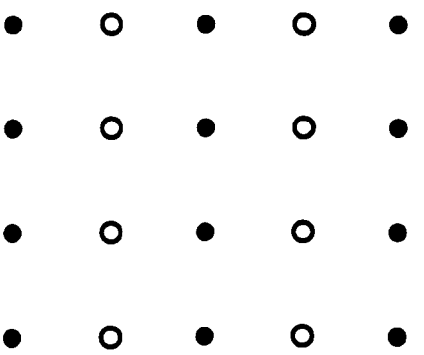


Figure 2.3c

In Figure 2.3c, we perceive columns even though the proximity of the elements suggests rows.

Principle 3 Common fate

Things which appear to move together may be grouped together. A camouflaged animal may only remain well-hidden if it remains stationary against a stationary background.

Principle 4 Good continuation

Gestalt theory argues that perceptual organisation will tend to preserve smooth continuity rather than abrupt changes of direction.

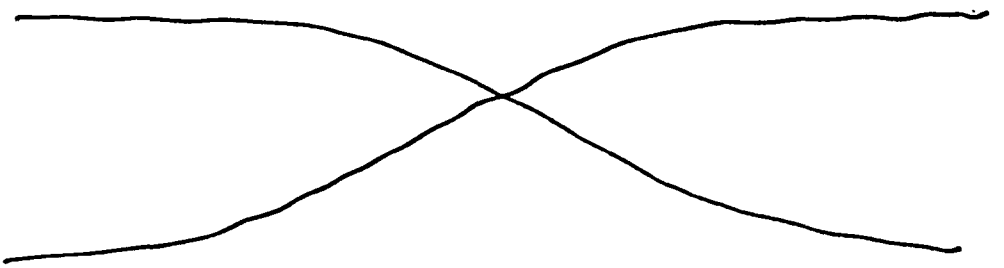
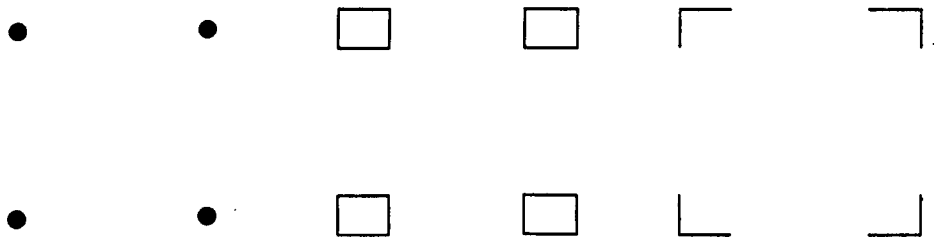


Figure 2.3d

Figure 2.3d is seen as two smoothly-curved lines intersecting, rather than as two V shapes touching.

Principle 5 Closure

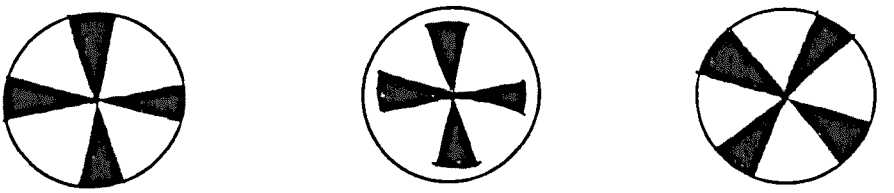


(i) (ii) (iii)

Figure 2.3e

Patterns (i) and (ii) are seen as 'square' rather than as crosses because the square is an *enclosed figure*. Gestaltists suggest that the astrological star formations are identified and labelled because of closure and good continuity.

Principle 6 Relative size



(i) (ii) (iii)

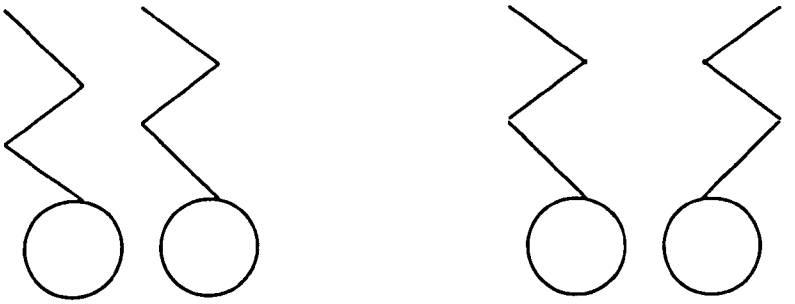
Figure 2.3f

In Figure 2.3f, (i) and (iii), the smaller of the two areas will be seen as the *figure* against a larger background. Surrounded shapes as in (ii) tend to be seen as figures.

Principle 7 Orientation

In the case of Figure 2.3f (iii), there is a greater possibility that the white shapes are seen as figures. Gestaltists argue that there seems to be a preference for horizontally –or vertically – orientated shapes to be seen as figure.

Principle 8 Symmetry



(i) (ii)

Figure 2.3g

Symmetrical areas tend to be perceived as figures against asymmetric backgrounds and *reflected symmetry*, Figure 2.3g (ii)is even more powerful.

The Law of Prägnanz

For Gestalt psychologists, many of these principles of perceptual organisation are held to be evidence of the law of prägnanz:

> Of several geometrically possible organisations, that one will actually occur which possesses the best, simplest and most stable shape.
> Koffka (1935: 138)

Whilst the Gestaltists accept that previous experience of objects in the world might influence perceptual organisation, (thus acknowledging some empiricist thought) they reject any explanation based solely in those empiricist terms.

The original Gestaltist theory maintained that the presence of field forces within the brain was the main factor influencing perceptual organisation. Their *doctrine of isomorphism* proposed that for every sensory experience there is a brain event which is structurally similar to that experience. Thus, it may be argued that when one is confronted with a circle in the world, then a circular trace is established within the brain.

Field forces were held to operate so as to make the resulting perception as stable as possible, just as the forces acting upon a soap bubble produce the most stable structure: a sphere. However, to date there has been no evidence provided to verify such field forces, and so the physiological aspects of Gestalt theory are open to criticism, leaving us with a set of descriptive principles which nevertheless seem to work.

Why do the Gestalt principles of perceptual organisation work?

These principles retain validity because they are the product of ecologically-sound conclusions necessary for survival in a world of physical and biological objects and surfaces. Let us consider each principle in turn:

Similarity

Because the same kind of surfaces absorb and reflect light in the same kind of way, the separate parts of a single object are likely to look similar to us.

Common fate

Because matter – the material from which the world is made - sticks together, adjacent regions are likely to belong together and will retain their adjacency relations even if separate parts of the same object move independently, as is the case with most living things.

Good continuation

The shapes of natural objects tend to vary with smooth changes of direction of their edges, rather than having abrupt discontinuities.

Symmetry

Many naturally-occurring objects - particularly those that grow - are symmetrical about one axis or another.

Relative size

Solid objects (figures) tend to be smaller than their surrounding surfaces in the natural world.

It is clear that any organism's perceptual system which has evolved according to these assumptions would receive information enabling its survival - the exemption being information from a camouflage situation evolved to exploit those very same assumptions. It should, therefore, not be surprising that in our perception of culturally-produced displays, for example, human-made objects and drawings such as the diagrams of the Gestalt psychologists, we rely upon the same visual information that, by and large, allows us to survive in the natural world.

Gestalt theory may be useful in explaining how meaning can be produced through making and looking at drawings. However, we should be wary of extrapolating from this specific strength any general conclusion that drawing is therefore a record of our perception of the natural world.

2.4 Analysis of Gombrich's position

This is perhaps an appropriate place to analyse Gombrich's contribution to the psychology of perception and how it relates to drawing, since it will be argued that his position, which is essentially empiricist, relies to some extent on the same nativist base as the Gestaltists. Gombrich's argument that a drawing is a record of perception is, from an empiricist viewpoint, convincing. It even avoids the weakness of the early empiricists' theory that knowledge of the world is acquired through experience alone, by applying the strength of Karl Popper's [18] (1959) contribution to the principle of induction, the principle which underpins all empiricist thinking. The general logic of induction may be summed up: The observer carries out controlled experiments that yield measurable observations. These are recorded and in due course form a body of reliable data. As the number of recorded observations grow, certain regularities begin to appear within the data which then become the basis for propositions of a general nature. These inductively derived propositions are

therefore based on accumulated data from observation of specific instances. Science is the name given to the overall structure of such propositions, and its development depends on the addition of new propositions of a general and lawlike character to the existing stock of propositional knowledge. (19)

Popper effectively revealed the weakness in the principle of induction by drawing the crucial distinction between *verification* and *falsification*.

To use an example apposite to Western Australia: while no number of observations of white swans enables the derivation of a universal truth that *all swans are white*, one single observation of a black swan is enough to produce the universally valid statement that *not all swans are white.*

In other words, empirical statements may never be verified to give us universal laws, but such laws may be derived by following the path of falsification, not verification.

Therefore, Popper argued, scientific propositions based on empirical observation do not possess the status of universal laws, as the principle of induction had maintained, and the accumulation of such propositions is unlikely to yield an accurate record or copy of the physical world.

According to Popper, these induced propositions should be considered as *hypotheses,* statements which are testable but unprovable. The central activity of science then becomes the process of testing hypotheses through systematic attempts at their refutation.

Gombrich's widely-accepted general argument that a drawing is the record of a perception is based precisely on Popper's logic of scientific discovery.

The early empiricist view of induction corresponds to the Western classical belief in the possibility of a faithful representation of reality.

Just as the inductive scientist starts with observation and the recording of data, so the inductive drawer starts with observation and simply records their findings on the drawing surface. According to the principle of induction, scientific laws are the secondary result of accumulated information, the primary encounter is between the unbiased eye of the scientist and the objects of the physical world. Similarly, the common conception of so-called 'objective drawing' has the eye of the drawer in an unmediated and unreciprocated encounter with the shapes and colours of the world. This was summed up by John Ruskin:

> Everything that you can see, in the world around you, presents itself to your eyes only as an arrangement of patches of different colours variously shaded...
>
> The perception of solid Form is entirely a matter of experience. We see nothing but flat colours and it is only by a series of experiments that we find out that a stain of black or grey indicates the dark side of a solid substance, or that a faint hue indicates that the object in which it appears is far away. The whole technical power of painting depends on our recovery of what may be called *the innocence of the eye;* that is to say, a sort of childish perception of these flat stains of colour, merely as such, without consciousness of what they signify, as a blind man would see them if suddenly gifted with sight.
>
> Ruskin (1857 : 3)

Popper's amendment of the induction principle by his introduction of the testable hypothesis allowed Gombrich to reject Ruskin's naive empiricism. [(20)] The testable hypothesis corresponds to Gombrich's notion of the *schema* as the drawer's initial hypothesis. Thus he avoided having to explain how a state of innocent vision can be recovered from the accumulation of empirical experience, and was able to propose the intervention between the eye and the drawing surface of a whole legacy of *schemata* - the drawer's particular cultural tradition of artistic hypotheses - which are then tested against experimental observation exactly as the scientists' approach.

Although the resultant drawings still cannot be a copy of reality reflecting the world in terms of universal truth, Gombrich argued that they would, at least, be an interim improvement on

the existing hypotheses or schemata, because they had been tested against the world through falsification.

On this basis Gombrich concluded that a drawing would be a record of the drawer's perception, a perception produced by sensory stimuli filtered through schemata. However, Gombrich never satisfactorily clarified the meaning of his term *schema*. In some instances he explained it as a culturally - acquired response to the stimulus:

> Originally ... the artist probably did what we have known artists do in such circumstances. He cast around for an existing schema that would lend itself to adaptation.
>
> Gombrich (1960: 110)

In other instances the *schema* is described as being innate in the brain:

> [the artist] begins not with his visual impression but with his idea or concept.
>
> Gombrich (1960: 62)

The result is a confusing combination which casts doubt on his claim that drawing is the recording of perception, since either interpretation of his concept of perception is one that *assumes* cognition in order to explain cognition. He assumes the drawer to have prior knowledge of the world. Such an assumption implies that perception is an historically - determined process, never capable of yielding direct access between consciousness and the real world outside the perceiver, but instead revealing those limited versions of outer reality that the *schemata* allow: versions of reality mostly dependent on the level to which the *schemata* have culturally evolved, and only occasionally developed through something like 'genius' or 'creative inspiration'.

This is a position which has history as being somehow bound up within the organic workings of the brain, a position which supports the illusion of naturalness in the false process of 'naturalisation' of cultural constructs. Once this stress on the historically - determined psychology of the perceiver as being the 'natural' means of perception is accepted, then the relation between observer and drawing is dehistoricised, making it even more difficult to

recognise a drawing as a cultural product and not the record of a perception. We are also faced with having to accept that the viewer of pictures is as changeless as the anatomy of vision. Norman Bryson, whose argument is laid out above, explained:

> The reality experienced by humans is always historically produced. There is no transcendent and naturally given Reality. A drawing must be understood as the place where a historically-produced reality known by any given visual community is articulated.
>
> The meaning of the term "realism" lies in the coincidence between a representation (drawing) and that which a particular society proposes and assumes as its reality : a reality involving the complex formulation of codes of behaviour, law, psychology, social manners, dress, gesture, posture - all those practical norms which govern the stance of human beings toward their particular historical environment. It is in relation to this socially determined body of codes, and not in relation to an immutable 'universal visual experience' that the realism of an image should be understood.
>
> Bryson (1983: 13)

It is only when we conceive the reading of drawings as being different from the process of 'seeing-for-survival' that we may eliminate the confusion within art education that has been generated and perpetuated by Gombrich's argument that drawing is a record of perception.

2.5 James Jerome Gibson's ecological theory of perception

Gibson has emerged as the only psychologist who denied both empiricist and nativist explanations of perception. He proposed that humans have evolved a visual perception system so as to enable them to "pick up" information needed for survival directly through light reflected from, and therefore structured by, surfaces in the material world. He argued that no additional processes were necessary, either by stored knowledge or innate functions of organisation within the brain.

> Perceptual learning is supposed [by other theories] to be a matter of enriching the (sensory) input, not of differentiating the information. (Gibson and Gibson, 1955). But the process of combining memories with inputs turns out to be not at all simple when analysed. The appropriate memories have to be retrieved from storage, that is, aroused or summoned; an image does not simply accrue. The sensory input must fuse in some fashion with the stored images; or the sensory input is assimilated to a composite memory image, or,

> if this will not do, it is said to be assimilated to a class, type, a schema or concept. Each new sensory input must be categorised - assigned to its class, matched to its type, fitted to its schema, and so on. Note that the categories cannot become established until enough items have been classified but that items cannot be classified until categories have been established. It is this difficulty, for one, that compels some theorists to suppose that classification is *a priori* and that people and animals have innate or instinctive knowledge of the world.
>
> The error lies, it seems to me, in assuming that either innate ideas or acquired ideas must be applied to bare sensory inputs for perceiving to occur. The fallacy is to assume that because inputs convey no knowledge they can somehow be made to yield knowledge by 'processing' them. Knowledge of the world must come from somewhere; the debate is over whether it comes from stored knowledge, from innate knowledge, or from reason. But all three doctrines beg the question. Knowledge of the world cannot be explained by supposing that knowledge of the world already exists. All forms of cognitive processing imply cognition so as to account for cognition.
>
> All this should be treated as ancient history. Knowledge of the environment, surely, develops as perception develops, extends as observers travel, gets finer as they learn to scrutinise, gets longer as they apprehend more events, gets fuller as they see more objects, and gets richer as they notice more affordances. Knowledge of this sort does not 'come from' anywhere; it is got by looking, along with listening, feeling, smelling and tasting.
>
> The child also, of course, begins to acquire knowledge that comes from parents, teachers, pictures and books. But this is a different kind of knowledge.
>
> Gibson (1979: 252-3)

The logic underlying the theories of indirect perception that Gibson criticised is based on Newtonian physics. The assumption, by empiricists and cognitivists alike, that the visual stimulus requires elaboration either by memory or innate psychological processes was the result of the way both groups understood the relationship between time and space. Newton had assumed time as a single dimension with a direction from past, through present, towards the future. Such a linear, essentially Euclidian, concept implies a succession of points or discrete moments in time which gives rise to the notion of 'snapshot' vision. Since no single snapshot can describe its own past or future, the onus of accounting for the perception of the events experienced falls upon the mental processing of the perceiver:

> ...patterns of light at the retina are...one-sided in their perspective, shifting radically several times each second, unique and novel at every moment. (They) bear little resemblance to either the real object that gave rise to them or to the object of experience that the perceiver will construct...
>
> Visual cognition, then, deals with the processes by which a perceived, remembered and thought-about world is brought into being from as unpromising a beginning as the retinal patterns.
>
> Neisser (1967) In Michaels & Carello (1981: 4)

Gibson rejected the fundamental premise of all indirect theories: that the stimulus at the retina is not enough for us to make sense of our environment, and that therefore it is necessary for us to augment the stimulus ourselves, from within.

In its place, he proposed that the stimulation we receive at our eyes has a richness that makes available information specifying the environment as it changes, and as we move through it. Such a position implies the rejection of Newtonian concepts of time and space as separate dimensions in favour of Einstein's concept of the space-time continuum in which *events*, occurrences over time, replace discrete moments of action linked together in a chain. It also implies a rejection of the rationalist split between organism and environment in favour of an ecological approach which recognises the dialectical relationship between the two.

Gibson's theory of visual perception claims that the constantly changing arrangement of light rays reaching an observer's eyes after being structured by surfaces in the world contains information about the layout of those surfaces and about movement within the world and by the observer. This information is received and acted upon directly by the recipient, without need of any further mental processing. Such a radical stance requires detailed discussion, beginning with some explanation of terms.

The ambient optic array

Let us imagine an environment illuminated by sunlight and therefore filled with rays of light travelling between surfaces. At any point, light will converge from all directions, and it is

possible to imagine the point surrounded by a sphere divided into small solid angles. The intensity of light and the mixture of its wavelengths will vary from one solid angle to another. This spatial structure of light may be termed the *optic array*. Light is deemed to carry information since the structure of the optic array is determined by the nature and position of the surfaces from which it has been reflected. Rays of light in the array reflected from a smooth surface, for example, would produce a pattern of structure in the optic array which would differ from the structure produced by rays reflected from a rougher surface.

In addition, any movement in the environment would be specified by a change in the spatial pattern of the ambient optic array. The movement of the earth around the sun which produces a constantly changing pattern of surface illumination, would be specified by corresponding changes in the ambient optic array. More rapid movement, such as the movement of objects and animals, would be specified in short-term fluctuations in the spatial pattern of the optic array.

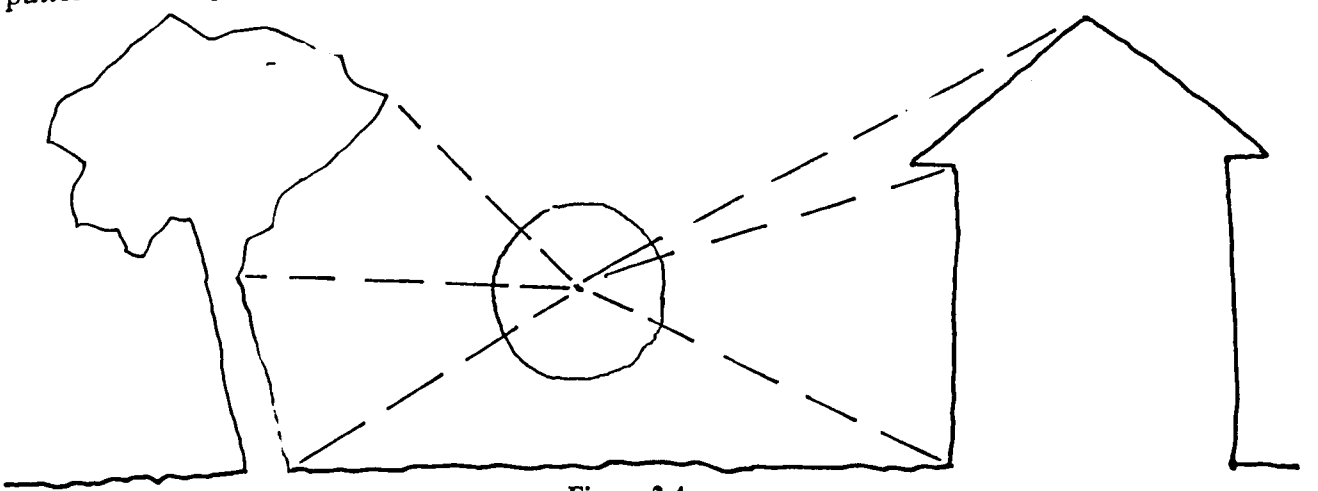


Figure 2.4

Section through the ambient optic array at a point above the ground. The optic array is divided into segments through which light arrives after reflection from different surfaces. Each segment has a different fine structure corresponding to the texture of each surface.

Gibson argued that vision begins not with a retinal image which is passively sensed but with the ambient optic array which an observer actively samples. The ambient optic array at a point of observation is the central concept of ecological optics. Of course, the field of view of

a human observer is able to sample only a limited part of the ambient array of light which has been arranged by the reflected light from surfaces in the environment. Gibson maintained that there are constancies underlying the flow and disturbance in the structure of the total optic array (rather than Gestaltists 'forms' in an 'image') which provide the information for perception, and which unambiguously inform the observer both about the state of the surfaces and about their position amongst them simultaneously. He termed those constancies *invariants.*

Invariant Information

Gibson maintained that the optic array contained information about the world. The information-bearing invariant features in the structure of the ambient optic array are found in the ways that solid angles of rays nest within each other; in the ways they are connected. These ways of connection between elements of structured light rays do not change. Such invariant features underlie the constantly-changing structure of the ambient optic array caused by movement within the environment, and movement of the observer. Gibson himself found difficulty in explaining invariant features:

> The information must consist of features of optical structure that we do not have adequate words to describe ... The information-bearing features are things like the following: alignment or straightness (being "in line" but not necessarily a line as such) as against bentness or curvature; perpendicularity or rectangularity; parallelity as against convergence; intersections; closures and symmetries. These features are present in an unchanging array, but they are best revealed in a changing array, one kind of change being transformation.
>
> Gibson (1973: 45)

The ways in which such information may be converted into constructions of geometry which can then be used to represent aspects of our three-dimensional world upon a two-dimensional surface is discussed in Section 4.1.1.

The visual perception system

The fundamental importance of observer movement in Gibson's theory is reinforced by his notion of *perceptual systems* in contrast to the traditional notion of 'senses'.

> Receptors (retinae) are stimulated whereas an organ is activated.... the eye is part of a dual organ, one of a pair of mobile eyes, and they are set in a head that can turn, attached to a body that can move from place to place. These organs make a hierarchy and constitute what I have called a perceptual system.
> Gibson (1979: 53)

Movement by the observer, it is argued, is one way in which variant information is obtained. The other way is through motion or change in objects in the world over time, i.e. through events. All events are accompanied by disturbances in the structure of the optic array. For example, an object moving across the field of view involves the progressive disappearance, re-appearance and continual shearing of texture elements in the surfaces behind the object. If the object moves towards or away from the observer, this change will be accompanied by the magnification or reduction in size of the texture elements of its own surface, together with the covering up or uncovering of texture elements of the background. Texture elements which are covered up by object motion in one direction are uncovered by motion in the reverse direction. The same is true of observer motion. Gibson's claim is that this principle of reversible occlusion underlies our strong impression of a constant and stable visual world where even those surfaces momentarily hidden are still 'perceived'.

How we differentiate between our movements and movements within the environment.

Gibson argued that eye movements do not change the structure of the ambient optic array. Rather, they allow a different portion of the array to be sampled. Movement of the head is always accompanied by a systematic flow pattern in the total array. Movement of an object within the world produces local disturbances in the structure of the array. Thus the necessary

distinction between movement within the world or by the observer can be specified unambiguously by different flow patterns in the optic array.

Affordances

In the ecological approach to visual perception, the observer and environment are considered to be intimately interlinked. The end product of perception is not seen as an internal representation of the visual world - a 'percept'. Rather, the observer is seen as detecting *affordances*, in Gibson's term. The affordance [21] of some object or surface in the world is what it offers the observer, for example whether it can be grasped or eaten, trodden on or sat upon.

Gibson claimed that there is information in the light to specify the affordances of the environment, whilst acknowledging that:

> This is a radical hypothesis, for it implies that the 'values' and 'meanings' of things in the environment can be directly perceived.
> Gibson (1979: 127)

However, the concept of affordances provides a less than convincing way to overcome the gap that exists in cognitive theories between 'perception' and 'action' since Gibson was unable to identify the high-level invariants which would specify affordances.

Even so, eyes have evolved so as to enable survival within an ever-changing environment, and it would make evolutionary sense if our perceptual systems were able to react *directly* to any potential life-threatening change, rather than to construct intermediary percepts between stimulus and any response.

2.6 David Marr's computational theory of vision

Along with the other theorists already discussed, except Gibson, David Marr [22] (1982) assumed that vision is the result of some kind of processing – interpretation or construction – of the incomplete data provided by the retinal image.

The revolution in information technology throughout the 1960's and 1970's inspired Marr to develop a new model for explaining what happens between the retinal stimulus and our response. This model was based on the hypothesis that retinal images could be processed by the human visual perception system in ways analogous to the processing of input by a computer:

> Vision is a *process* that produces from images of the external world a description that is useful to the viewer and not cluttered by irrelevant information.
>
> Marr & Nishihara (1978 : 269)

Marr's computational model is an attempt to explain vision in terms of *input* to the physiological system – the patterns of light falling on the surface of the retina – and *output*, the information about surfaces, objects and events in the environment which any animate organism requires in order to survive. He shares a great deal with Gibson – for example, both agree that incident light reflected from surfaces and edges of the environment is re-structured as an array of differing light intensities. However, Marr's theory considers the input to be the retinal image, not an array of light. He described visual processing as the means of producing a description of the environment by the construction of a *range of representations* from the values of light intensity falling upon the retina. *Representation* here refers not to retinal or mental images but to "a formal system for making explicit certain entities or types of information, together with a specification of how the system does this." (Marr 1982 : 20) This is perhaps more familiar than it sounds. Any conventional semiotic code is a formal system which has rules for selecting and combining signs from within it in order to describe their referents. For example, the formal system of geometric projection known as 'artificial

perspective' is a code with rules which dictate the two-dimensional geometrical relationships between lines and points of convergence in order to describe the three-dimensional spatial relationships of an environment from a single, static point of observation. Such representations relevant to drawing will be discussed in detail in Section 4.

Marr's stages of representation

The first stage of representation Marr described as the *raw primal sketch*, in which information about edges and textures of surfaces in the world is present. The raw primal sketch represents the various light intensities in the retinal images. These are subject to the orientation and disposition of surfaces in the world; to the reflectance properties of those surfaces; to the illumination of the scene and of course, to the observer's viewpoint. All these factors influence the retinal light intensities, and the purpose of this earliest stage of visual processing is to separate out which factors cause which intensities.

Full primal sketch is the term used by Marr to describe many of the shapes and textures within the retinal image, but this is only part of the first phase of visual processing. The main objective is to describe surfaces *relative to the viewer.* Marr identified the end-product of early visual processing as a *2½D sketch,* a *viewer-centred* representation, which is obtained by an analysis of depth, motion and shading, as well as the primitive structures in the primary sketch.

The 2½D sketch describes the layout of surfaces in the world from a particular point of view which, of course, is a pre-requisite for effective locomotion, and hence survival.

An equally essential requirement of vision is the recognition of objects and other structures within the perceived environment. In order to recognise what object a particular processed shape corresponds to, a third level of representation was theorised by Marr, one *centred on the object,* not the viewer. This third level was identified as a *3D model representation.*

The purpose of vision is to provide information about the world – a description of what is there – from the information in the retinal images. Marr (1982 : 36) proposed that since this is "almost certainly impossible in only one step", we require "a sequence of representations", starting with descriptions that may be accessed from the retinal images and that act as prompts to subsequent representations of the objective world.

Marr's sequence of representation is illustrated in Figure 2.5.

Level of Representation	Purpose	Primitives
Retinal images	Represents light intensities	Intensity values at each point in the retinal image
Primal sketch	Clarifies the geometrical organisation of retinal light intensities	Zero-crossings, blobs, Terminations and discontinuities, Edge segments, Virtual lines, Groups, Boundaries, Curvilinear organisation
2½-D sketch	Clarifies the angle and depth of visible surfaces in a *viewer-centred* co-ordinate system	Orientation of surface, Distance from viewer, Discontinuities in those two primitives
3-D model representation	Describes forms and their organisation in space in an *object-centred* co-ordinate system. This representation uses a modular, hierarchical scheme utilising volumetric primitives and surface primitives	3-D models arranged hierarchically, each one based on a spatial configuration of a few axes, to which volumetric or surface primitives are attached

Figure 2.5

Algorithms

Compatible with a computational theory, Marr proposed *algorithms*, specified procedures for transforming input into output. He argued that the algorithms he demonstrated on computer systems are actually implemented by the physiological structures of neurones involved in the human visual system.

Marr and Hildreth (1980) devised an edge-finding algorithm consisting of a series of mathematical operations performed on a computerised image. This, they argued, was analogous to the way that the human visual system operates at the representational level of the primal sketch. A visible *edge* in the world may be specified as where a material surface either changes direction along a straight, curved, or ragged contour, or occludes another surface or the sky. These conditions are specified on the retina as the boundary formed when an area of a certain light intensity is adjacent to an area of different intensity.

A specific procedure for recognising such an edge could begin by identifying changes, or gradients of light intensity in the retinal image. Of course such gradients may be steep (at sharp edges) or shallow (at blurred or ragged edges). Any change in value of light intensity across a small defined area of the image would therefore indicate an edge.[23]

Marr claimed that many retinal cells, each capable of locating specific gradients of steepness, could identify the full range of contrast boundaries, and therefore edges, within a retinal image.

However, the primal sketch is still only a description of the retinal image, rather than of the world. The materials of the world we see, surfaces and media such as air and water, extend over distance. Some surfaces occlude others, and, of course, the patterns of light reflected from and through them are never static upon the retina. The world moves, as do we, and we constantly need to know where we are in relation to the world.

Marr and Poggio (1976, 1979) offered two algorithms demonstrating procedures by which a viewer's position may be located with respect to the distance and disposition of surrounding surfaces. They argued that the extraction of such stereoscopic information from the input of the play of light upon the retinae is crucial to the formation of a 2½-D sketch. Marr and Poggio (1976 : 284) suggested two rules describing how the primitive descriptions obtained from the left and right eyes may be combined to produce stereoscopic vision:

Rule 1. Uniqueness

Each item from each retinal image may be assigned at most one disparity value. This condition assumes that an item corresponds to something in the visual world that has a unique physical position.

Rule 2. Continuity

Disparity between retinal images varies smoothly almost everywhere. Marr and Poggio utilise the Gestalt principle of *continuity* based upon the cohesiveness of matter to formulate rule 2: Only a small fraction of the area of a retinal image is composed of boundaries that are discontinuous in depth.

Since each eye receives a different array of light, an algorithm designed to represent a 2½-D sketch must be capable of co-ordinating these disparities. Marr & Poggio (1976 : 284) constructed an explicit representation of the two rules, and derived a co-operative algorithm which specified how a representation of the two retinal images may be transformed into stereoscopic vision.

Random-dot stereograms were used as input for the testing of the algorithm:

> When we view a random-dot stereogram, we probably compute a description couched in terms of edges rather than squares, whereas the inputs to our algorithm are the positions of the white squares.
>
> Marr and Poggio (1976 : 285)

Figure 2.6 shows an example in which the algorithm successfully allows disparity values to be assigned to elements in each image. The shapes in the right-hand column are the computed resolutions of the paired inputs at the left. In order to verify the resolutions, the reader is invited to focus their eyes on a plane beyond the page so that the pair of random-dot stereograms fuse together. It is then possible to view all four pairs at once.

We have seen how the 2½-D sketch theorises a viewer-centred perception of the world, so that we may be aware of our position relative to the surfaces within our environment. But how do we differentiate between surfaces which form three-dimensional objects, and those which form the landscape? Marr and Keith Nishihara (1978) proposed a solution for this problem based upon an object-centred description in which the object is described within a frame of reference based on the 3-D form of the object itself. The resulting representation of the object may be assessed in three ways: the co-ordinate system of the representation; its *primitives*, (Marr's term for the primary elements of 3-D form information such as edges, boundaries, textures); and how such information contained in the representation is organised. An object-centred co-ordinate system is one independent of the viewer's position. A single description of an object's spatial structure, for example based on the object's natural axes of length, rotation, or symmetry, could then render the object recognisable from any viewing point.

Sets of descriptive elements, the *primitives* of the representation, are best organised in a modular way, as illustrated in Figure 2.7

Marr and Nishihara discussed the process from representation to object recognition, and in particular the importance of being able to relate object-centred information to viewer-centred information by means of a process of transformation (Marr & Nishihara, 1978 : 285).

Marr (1982 : 25) summarised the different levels at which an information-processing device may be understood in the following table Figure 2.8

Computational theory	Representation and Algorithm	Hardware Implementation
What is the goal of the computation, why is it appropriate, and what is the logic of the strategy by which it can be carried out?	How can this computational theory be implemented? In particular, what is the representation for the input and the output, and what is the algorithm for the transformation?	How can the representation and the algorithm be realised physically?

Figure 2.8

In Section 4.3 we shall see how Marr's methodology has been adapted to the study of children's drawing development.

Summary Section 2 : Perception

Many of the salient positions mentioned in this Section may be construed as responses to what William Epstein has termed "the inverse projection problem":

> For any given three-dimensional (3-D) structure, event in three-dimensional space, or spatial layout, if the physical dimensions of the structure, event, or layout are known exactly, then application of the appropriate mathematics will allow the occurrent retinal spatiotemporal structure to be computed. Solving the direct projection problem, that is, going from the distal state of affairs to the proximal affairs is a straightforward task.
>
> The circumstances are drastically different when the inverse projection problem is assayed: When the occurrent retinal state of affairs is known, it is impossible to pick out a unique distal property, object, or event as the source. In contrast to the direct projection problem, going from the occurrent proximal state of affairs constitutes an ill-posed problem. The difficulty arises from the fact that while a specific distal event or arrangement is compatible with only a single retinal state, a given retinal state is compatible with countless distal states.
>
> Epstein & Rogers (1995 : 1-2)

The problem appeared unresolvable to Berkeley, and he concluded "neither distance nor things placed at a distance are themselves...truly perceived by sight" (Berkeley 1709 : Section XLV).

Helmholtz's hypothesis of unconscious inference may be understood as a means to resolving the inverse projection problem. We may consider his notion of inference as a mental rule-based means of inducing a three-dimensional solution that has a high probability of matching the retinal pattern, but not a certainty. Epstein suggests some examples of this process of induction.

1. Under normal conditions, only 3-D structures generate patterns of binocular disparity.

   The occurrent retinal stimulation is a pattern of binocular disparities. Therefore, the object in my visual field is very likely a 3-D structure.

2. Under normal conditions of illumination, when only a single light source is present, a continuous planar surface illuminated by the source will not exhibit any abrupt discontinuity in brightness.

> This surface exhibits an abrupt brightness discontinuity. Therefore, the surface is unlikely to be planar; it is constituted of two non co-planar surfaces joined at the brightness border, forming a 3-D structure.
> Epstein & Rogers (1995 : 3-4)

Helmholtz has influenced twentieth century thinkers, such as Richard Gregory (1993), who have subscribed to a cognitive constructivist [24] approach to understanding visual perception, in which the rules of construction are posited in the mind of the perceiver.

Advocates of the computational theory of vision, such as Marr, may also be analysed in terms of their attitude to the inverse projection problem. Marr's colleague Tomaso Poggio expressed the problem thus:

> In classical optics or in computer graphics the basic problem is to determine the images of three-dimensional objects, whereas vision is confronted with the inverse problem of recovering surfaces from images.
> Poggio, Torre & Koch (1985 : 314)

Their response is to seek out constraints on the environment that may allow a correlation to be made between events occurring in three-dimensional space and the patterns occurring on the retinae.

There is an important distinction between the cognitivists' rules and the computationalists' constraints. Rules emanate from the mind of the perceiver, albeit from the unconscious. Constraints are deemed to be environmentally-based: they are predictable properties which allow an algorithm to be devised so that output may be predicted from any given optical (retinal) input. Epstein observes that the difference between the cognitive constructive position and that of the computationalists may be put:

> For the cognitive constructivist, the perceptual system is rule following; for the computationalist, the system is rule instantiating.
> Epstein & Rogers (1995 : 8)

Gibson, alone of all the theorists reviewed here, insisted throughout his academic publications (Gibson 1950, 1966, 1979) that the inverse projection problem was a misconstrual of the actuality of seeing. His advocacy of an ecological approach to

understanding perception was based on the premise that we see not objects *via* retinal stimulation, but the whole environment mapped by the visual perception system. For Gibson, stimulation and the environment are linked, providing direct information about the world. However, it may be argued that the availability of such information is contingent upon environmental constraints.

Marr recognised some degree of compatibility between their positions:

> Gibson's important contribution was to take the debate away from the philosophical consideration of sense-data and the affective qualities of sensation and to note instead that the important thing about the senses is that they are channels for perception of the real world outside, or, in the case of vision, of the visual surfaces. He therefore asks the critically important question. How does one obtain constant perceptions in everyday life on the basis of continually changing sensations? This is exactly the right question, showing that Gibson correctly regarded the problem of perception as that of recovering from sensory information 'valid properties of the external world.
>
> Marr (1982 : 29)

The two differ over their explanations of how our physiological apparatus deals with the incoming light.

Gibson claimed we resonate directly in response to the ecologically-structured information contained within the arrays of light arriving at our eyes. Some invariant aspects of the structured arrays specify lower-order information about surfaces – their distance and slant for example. Other invariants are supposed to specify higher-order information about objects and what they may afford us. There is therefore no requirement in Gibson's theory for an intermediate level of information-processing. The reception of affordance information leads automatically to active response. The theory does not address how resonance is accounted for physiologically.

Marr's theory proposes three levels at which perception needs to be explained; the ecological and the physiological, with a level of mediation in between, an *algorithmic* level, in Marr's term, which organises the ecologically-conditioned information arriving at the eyes in a way suitable for representation by the physiological system.

In Marr's opinion, the omission of such a level of mediation – information-processing – invalidates Gibson's theory of direct perception:

> Gibson's...fatal shortcoming...results from a failure to realise two things. First, the detection of physical invariants, like image surfaces, is exactly and precisely an information-processing problem. And secondly, he vastly underrated the sheer difficulty of such detection.
> (Marr 1982 : 30)

Detecting physical invariants may be difficult. However, we *are* able to do it. Marr's difficulty was in demonstrating *computationally* how it is done.

His important distinction between a viewer-centred representation of a scene and an object-centred representation allows interesting insights into the ways people have developed systems of geometry in order to make visual descriptions of these various perceptions. Both of these theorists' relevance to the practice and teaching of drawing is discussed in further detail in Section 4.1 *Geometries of vision.*

SECTION 3 : COMMUNICATION

Introduction

3.1 The Age of Relativity

3.2 Structuralism

3.3 Functions of language and art

3.4 Language and reality

3.5 Communication in a social context

Summary

SECTION 3: COMMUNICATION

Look, the sun obeys my syntax.
Velimir Khlebnikov (1913)

Introduction

The purpose of this Section is to identify and discuss salient positions in communication theory throughout the twentieth and into the twenty-first centuries, with a view to constructing a model relevant and useful to the teaching and practice of drawing. An argument for a dialectical relationship existing between language structure and cultural constructions of reality is presented. This argument, it may be noted, is consistent with the constructionist philosophical basis advocated for a new drawing programme in Section 1.2, and is here cited in support of the two parameters which define that constructionist philosophy. Firstly, an ontological attitude which recognises that reality is a relativist construct, construed according to differing social constraints. Secondly, an epistemological attitude which recognises the value of understanding how semiological systems may facilitate the production and negotiation of meaning and knowledge within a society.

It may be argued that such a constructionist philosophy is inherent in Formalism, Structuralism and semiology. These movements are discussed in detail.

Parallels are drawn between developments in language theory and visual arts practice. As a case study the creative potential of such a marriage of theory and practice, the period of Russian cultural history between 1913 and 1921 is discussed and illustrated, since it may be argued as the first in which theorists and practitioners collaborated so closely.

3.1 The Age of Relativity

In Western Europe between 1905 and 1916, paradigm-shifts of great moment occurred in the disciplines of physics, linguistics and painting. Although these shifts were expounded in different ways and broadcast through different media, they shared a fundamental tenet which

was destined to influence attitudes towards scientific inquiry, the study of language and communication, and the practice of visual arts throughout the twentieth century and into the present.

Albert Einstein (1960) published his *Special Theory of Relativity* in 1905, followed by the *General Theory* in 1916. These were illustrated in mathematical terms. Ferdinand de Saussure (1916) was teaching the relativity of meaning in language through a series of lectures delivered at the University of Geneva between 1907 and 1911. From 1907, Pablo Picasso and Georges Braque were realising in paint a new way of representing the relativity of appearances and experiences of the visual world.[1]

Each was realising, through his chosen medium, the common tenet: that our world is a continuum without division or boundary. Each had understood, through his chosen practice, that it is the culturally-acquired means of structuring experience which divides and binds. Categories such as 'space' and 'time', 'subject' and 'object' were understood to be simply a means of encoding the world. They were conventions inherited from the prevailing cultural context.

A crucial point to emphasise here is that those thinkers and doers were able to construe such innovative paradigm-shifts only after a deep and careful analysis of the very codes that bound their own thinking. It is argued here that this is evidence of a powerful case for encouraging in students such a relativist ontological attitude towards drawing, coupled with visual inquiry into how semiological systems operate in societies to produce knowledge.

As in the case of Einstein and the Cubists, Saussure had inherited the dominant European, essentially objectivist, ontological attitude. Such an attitude allowed an understanding of the world in which objects were perceived as independent entities, imbued with meaning. The study of language in that world was the study of words: how they labelled the objects and events in the world, and how their meanings altered as time passed.

Kant had distinguished between this kind of understanding and the way of thinking termed *dialectical*, dealing with the resolution of apparently contradictory analyses.

As discussed in Section 2.1, he proposed that knowledge was a product of the human mind, and the operations of the mind could only *interpret* the world, not present its reality directly. (This argument resolved the deadlock between the empiricist philosophy of Locke, Berkeley and Hume, and the rationalist Leibnitz. The former had sought to show how the complex ideas with which the mind thinks about the world were composed of simple ideas acquired through the senses, while Leibnitz's rationalist theory posited an innate reasoning faculty which was responsible for structuring reality.)

In Kant's view, the operations of the mind engaged in interpreting the world were so deeply embedded in human understanding that they offered a new goal for philosophy: to find out precisely what were those deep regularities that constitute human understanding.

Giambattista Vico (1725) had proposed that humans possess an inherent 'poetic wisdom', a *sapienza poetica* which serves to formulate our responses to the world in terms of metaphor and myth.[2] This process of structuring may be described as a constantly-operating feature of the human mind, characterised by an innate facility for structuring experience in terms of binary oppositions. The constructions that such a facility produces represent our attempts to order our experiences of the world, and thus to make sense of them.

The structure of that order, according to Vico, is characteristic of the human mind itself, and becomes the world-view that the mind regards as 'natural truth'. Our consciousness of who we are and how we behave is determined by our world-view. Thus, it could be argued, humans construct their social structure whilst the social structure constructs humans as social beings.

Such a dialectical relationship is crucial to the key concepts of this Section (and to the one that follows), and may therefore merit closer scrutiny.

If we accept Vico's *sapienza poetica* as an inherent ability of all humans to structure, then to be human is to be a Structuralist.

3.2 Structuralism

Structuralism is a way of thinking about the world in terms of structures.[3] Jean Piaget (1968:5-16) defined structure as an arrangement of elements which conform to the three fundamentals:

1. the idea of wholeness
2. the idea of transformation
3. the idea of self-regulation

Wholeness is defined as the internal coherence of a structure. The arrangement of elements is complete within itself. However, the structure is not static: it is capable of *transformation*. As an example, consider language, itself a basic human structure with an internal coherence but capable of transforming basic sentences into a wide variety of new speech patterns which are themselves compatible with the wholeness of the language.

The speaker of a language does not construct transformations of speech patterns with reference to anything outside the language structure itself. The structure is *self-regulating* in the sense of its having internal and self-sufficient rules. Language may be understood to be a closed structure, independent of any other systems outside itself.

This insight, that the *relationships between elements within a structure* are more meaningful than the elements themselves, is at the heart of Saussure's model of linguistics. To further his objective of establishing the structure of language as an object of study in its own right, Saussure developed four critical insights which relied not upon empirical experience, but upon the dialectical relationships that operate within the structure of language itself. Those four elements have immense potential for furthering the study of drawing.

1. Saussure made the distinction between *langue,* the structure of language, and *parole,* the individual utterances of speech. The structure *langue* determines *parole,* yet has no concrete existence of its own.

   This distinction implies an awareness that there exists at any particular time a *langue,* or system of drawing, which makes possible individual expressions. As with language, the study and exploration of ways in which the conventions of drawing can be systematised may lead to a greater flexibility and innovation of expression. Innovative combinations of visual elements produce innovative ways of representing experiences of the world.

2. Saussure emphasised the importance of studying language in terms of the relationships between the elements of its structure at any one time, resulting in a *synchronic* analysis. The dialectical alternative to this approach would be the study of words and how they change their meaning over time, and is *diachronic* in structure. Of course, any synchronic analysis is in effect a frozen moment in a process of transformation occurring diachronically. In terms of a drawing programme, it could be fruitful to explore how the process of transformation operates through systems of geometry, for example. When we look to understand the world, we see it simultaneously as a world of things, and a world of processes. These two complementary perspectives, which may be termed the synoptic and the dynamic, may be applied to the visual study of a machine, for example. In order to understand it fully, we would require a synoptic view of its construction, and how the components fit together. We would also need a dynamic view of how it performs over time. The same is true of our understanding of anything else, for example, the structure and transformation of landscape; or the structure and transformation of

personal relationships. Such drawing practice may clarify, challenge, and of course subvert existing conventions and ways of seeing and expressing all socio-ideological constructions.

3. Saussure was concerned specifically with written and spoken language, and he was able to point out that words themselves bear no relation to their referents in the world other than that agreed by social convention. Words, as signs standing for something in our experience of the world, are therefore quite arbitrary. The meaning of any particular word within the language structure is entirely dependent upon its value in relation to other words/signs within the closed structure. Meaning is negotiated within the differences between signs.

Having divorced the system of signs from their referents, thus isolating *langue* as an object of study in its own right, Saussure went a step further: he split the sign itself. The term *signifier* was designated to the physical, material presence of the sign, and the term *signified* referred to the mental concept associated with the signifier. drawings, of course, may bear relationships to their referents which are *not* arbitrary. For example, the marks which exist in drawings may resemble the shape and colour of their referents viewed from a particular position. Charles Peirce's (1932: Vol. 2: 129) term *icon* applies to such signs.[4] His term *index* applies to a sign which has a causal connection to its referent . For example, a sweep of charcoal or brush may carry within it an indication of the speed and pressure of the hand movement which made it. Peirce reserved the term *symbol* to define those signs which are arbitrary. All such icons and indices are produced within a particular social structure. Their values are as culturally-dependent as those of symbolic signs.

4. Having theorised language as a system of structural relationships between signs, Saussure asked the question: how do these relations operate? His answer proposed

that relations and differences between signs fall into two distinct groups which correspond to two forms of mental activity. In speech, words are articulated to form chains, or *syntagms*. Within the structure of *langue*, words may be associated in declensions or *paradigms*; words may be classed together because they rhyme, or because of synonymity, for example.

> From the associative (paradigmatic) and syntagmatic viewpoints a linguistic unit is like a fixed part of a building, e.g. a column. On the one hand, the column has a certain relation to the architrave that it supports; the arrangement of the two units in space suggests the syntagmatic relation. On the other hand, if the column is Doric, it suggests a mental comparison of this style with others (Ionic, Corinthian, etc.) although none of these elements is present in space: the relation is associative.
>
> Saussure (1916: 123-4)

As for architectural construction, so for the production of drawings. Admittedly, the grammar and syntax of classical architecture appears to be a far stronger analogy with language than any contrived for drawing. However, the principles of syntagmatic and paradigmatic relationships are certainly as active in drawing because the process of drawing depends upon the two dialectically-linked processes of selection and combination of surfaces, media and marks.

3.3 Functions of language and art

Saussure had concentrated his dialectical thinking upon the closed system of language. However, he also recognised the potential of his methodology applied to other systems of human communication:

> Language is a system of signs that expresses ideas, and is therefore comparable to a system of writing, the alphabet of deaf-mutes, symbolic rites, polite formulas, military signals, etc. But it is the most important of all these systems.
> *A science that studies the life of signs within society* is conceivable; it would be a part of social psychology and consequently of general psychology; I shall call it *semiology* (from the Greek *semeion* 'sign'.) Semiology would show what constitutes signs, what laws govern them. Since the science does not yet

> exist, no one can say what it would be; but it has a right to existence, a place staked out in advance. Linguistics is only a part of the general science of semiology; the laws discovered by semiology will be applicable to linguistics, and the latter will circumscribe a well-defined area within the mass of anthropological facts.
>
> Saussure (1916: 16)

Saussure recognised the potential of this methodology, as did those linguists and literary historians, poets, painters and film-makers who met in and around the Moscow Linguistic Circle from 1915 and the Petrograd Society for the Study of Poetic Language (*Opojaz*) from 1916.

The Russian Formalists[5] were specifically concerned with the structure of literature. As we shall see, their discoveries may be usefully applied to the study of visual work too.

The general Formalist principle proposed by Viktor Shklovsky (1921: 59) that "the forms of art are explainable by the laws of art" focuses attention upon the *work* itself as the source from which meanings may be negotiated, and not the author. This position, which Roland Barthes (1977: 142) later celebrated as "the death of the author" is entirely consistent with the principles of structuralism as set out earlier in this section.

The Formalists theorised the *functions* of artistic production. Shklovsky advocated that all formal structural devices such as rhyme, rhythm and pattern, metonymy, metaphor, change of viewpoint, or change of scale, could function to shock the reader/viewer out of the anaesthesia with which language smothers our perception of the world. According to him, the essential function of art is to *make strange*;[6] to counteract the staleness of our conventional, everyday ways of seeing. What may be termed an anticipatory mode of seeing in everyday life anaesthetises us. The aim of art is to 'aesthetise' by defamiliarising the familiar:

> As they become habitual actions are automatised. This is a process ideally typified by algebra where objects are replaced by symbols. Through this algebraic mode of thinking we grasp things by counting them and measuring them; we do not see them, but merely recognise them by their primary features. The thing rushes past pre packed as it were; we know that it is there

> by the space it takes up, but we see only its surface. This kind of perception shrivels a thing up, first of all in the way that we perceive it, but later this affects the way we handle it too. Life goes to waste as it is turned into nothingness.
> Automatisation corrodes things; clothing, furniture, one's wife and one's fear or war. And so that a sense of life may be restored, that things may be felt, so that stones may be made stony, there exists that which we call art.
> Shklovsky (1917 : 35)

There is evidence which confirms that the visual artists of this revolutionary period were actively involved with the poets, writers and theorists in and around the Moscow and Petrograd circles.

Roman Jakobson (1964 : 341) the leader of the Moscow circle, who had introduced Saussure's *Cours* (1916) to Russia in the year of its publication, himself confirmed "I have belonged to the ardent and active adherents of abstract painting from the time of the first Russian steps in this direction (Kandinskij, Larionov, Malevic, Bajdin, Romanovic, Rodcenko)..." He was "intimately acquainted with [the poets] Vladimir Mayakovsky and Velimir Khlebnikov, and was an *habitué* of the gatherings of the Moscow 'Cubo-Futurists'." (Erlich 1969 : 65)

According to Natalia Adaskina (1999 : 187-188) he also attended the meetings of the *Supremus* art group held in 1915-16 at the Moscow apartment of Nadezhda Udaltsova, one of the leading women artists of the period.(7) As its name implies the group focused its attention on the Suprematist theories of Malevich, and apart from Malevich himself, and Jakobson, included artists Liubov Popova, Alexandra Exter, Ivan Kliun, Olga Rozanova, and poet and writer Alexei Kruchenykh.

On 13 October 1913 Malevich had attended the Moscow *First Evening of the Creators of Language in Russia* along with Khlebnikov, Mayakovsky, Khruchonykh, painters and writers David and Nikolai Burliuk and poet Benedikt Livshits.

Between 1913 and 1919 Malevich was actively collaborating with poets, composers, and language theorists, and in particular there was a "triangle of co-operation and communication between [himself], Khlebnikov and Jakobson" (Crone and Moos 1991:8).

These three were attempting to make correlations between painting, poetry, and Jakobson's theory of language which, from 1916 onwards, had integrated a Saussurean structuralism within a Husserlian-based framework of phenomenological structuralism.[8]

As a young student of linguistics, by 1915 Jakobson had absorbed the writings of Edmund Husserl (1913) and had understood the latter's aim of overcoming the subjective products of consciousness in order to recognise that the essences of the world transcend mere appearances:

> Thus is the sense of [Husserl's] slogan 'back to things themselves', revealed. It means 'back to universals', but to universals that are not produced arbitrarily...and do not make up a separate realm of being; it means, 'back to universals' as direct objects of intellectual intuition.
>
> Kolakovski (1987 : 50)

With such a phenomenological basis to his philosophy, Jakobson was able to reveal the falsities of realism and naturalism within which he argued poetic language and painting were imprisoned. For Jakobson, Husserl's phenomenology represented the essential condition from which to conceive structuralism. He later explained:

> When naturalistic problems finally yielded to the scientific system of phenomenology, this development was answered in linguistics through the vivid interest in questions regarding systems of language, the inner structure of language, and the correlation between distinct language schemes. The main issue, then, was that the theoretically oriented doctrine of forms gained prominence; the pressing question of the relationship between form and function became urgent, and even in the doctrine of sounds the naturalistic conception capitulated step by step to the analysis of linguistic function.
>
> Jakobson (1936 : 81)

This capitulation was accelerated by Khlebnikov's *zaum*, meaning literally "beyond the mind" (Bowlt 1990 : 180) or "beyond reason". These were transrational language compositions of sounds with no conventional meaning. Malevich's a-logical paintings were

compositions with similar aims. Their efforts were in tandem as Jakobson indicated in an interview with David Shapiro:

> *David Shapiro*: You have written about the work of Khlebnikov with great passion. Do you think that there is a relationship between the phonological element - hypostasized in Khlebnikov's poems - and the abstract art of Malevich and others?
>
> *Roman Jakobson:* Of course, of course. Artists such as Malevich discussed the relation between *zaum* (music, transconscious languages, the utilization of constructions of sounds without words) and abstract painting. Oh, we discussed this a great deal!
>
> Barron & Tuchman (1980 : 18)

A comparison of the formalist devices used by Khlebnikov in constructing his *zaum* poems, and by Malevich in constructing his a-logical paintings appears to bear out Jakobson's reminiscences:

If we consider the poetic devices of repetition, assonance, alliteration, rhyme and rhythm at work in the phonemes of the *zaum* of 1910, *Incantation by Laughter*:

> Hlahla! Uthlofan, lauflings!
> Hlahla! Ufhlofan, lauflings!
> Who lawghen with lafe, who hlaehenlewchly,
> Hlahla! Uthlofan, hlouly!
> Hlahla! Hloufish, lauflings lafe uf beloght lauchalorum!
>
> Hlahla! Loufenish lauflings lafe hlohan ut laufly!
> Lawfen, lawfen,
> Hloh, hlouh, hlou! luifekin, luifekin,
> Hlofeningum, hlofeningum.
> Hlahla! Uthlofan, lauflings!
> Hlahla! Ufhlofan, lauflings!
>
> Translated by Paul Schmidt in Douglas (1985 : 20)

We may notice that the isolating of roots of words and the extending of them with a variety of prefixes and suffices has the effect of multiplying language whilst relinquishing its responsibility of carrying meaning and inviting the reader to slice through the crust of language "back to things themselves", in Husserl's phrase (Kolakovski 1987 : 50).

Malevich uses similar strategies in his a-logical *Portrait of the Composer Matiushin*

(Figure 3.1): The fragments of recognisable images, the pictorial equivalents of phonemes, such as a section of the forehead and hair, a sliver of tie and collar, an isolated keyhole...(where *is* the key to understanding?), are extended in all directions with prefixed and suffixed shapes and tones, some setting up dissonances of tone and colour, others forming texture gradients. Others set up rhythms of contrasting dynamics; broad and sonorous at bottom left, tight and focussed at top right. All measured against the regular ruler of piano keys projected in front elevation. (Choose your own key...). These visual equivalents of language devices defy logic (hence Malevich's term "alogism") and conventional geometries of realistic representation, but do allow equivalences to be made between language, painting and, in this case, the musical structures associated with the subject of the 'portrait', the composer Matiushin. Malevich's pencil study for the *Portrait of the Composer Matiushin* 1913 (Figure 3.1a) provides insights into this process of deconstruction of realism. The piano itself appears to be fragmenting, and musical notation plays with the device of scale.

Malevich's collaboration with such poets, musicians and theorists may be seen to be the catalyst for his developing Suprematism. In July 1913 Mikhail Matiushin had invited Malevich to help produce an opera for the St. Petersburg Union of Youth. Khruchonykh wrote *Victory of the Sun*, with a prologue by Khlebnikov, and music by Matiushin. Malevich designed the costumes and sets.[9] Its theme, in Matiushin's words, (Elliott, 1986: 15) was the "Victory over the old, accepted concept of the beautiful sun...over romanticism and empty verbosity."

Malevich's black square (the opposite of the sun's bright circle) which featured throughout this production on the costume of the man who dug the sun's grave; as the end-view of the sun's coffin; and as the dominant symbol on the painted stage backcloth, was the visual device which estranged the accepted concepts of representation. Two and a half years later, in

December 1915, the drawings and paintings which Malevich exhibited at the *'0.10' Last Futurist Exhibition* included one of a black square and others composed of quadrilateral shapes of flat colour arranged on a white ground. (Figure 3.2)

These apparently random compositions, produced at a time when language itself was being dismantled, in order to understand the relationships between parts, are in fact unfamiliar re-combinations of the inter-connected shapes which are inherent in the harmonious system of geometry of the pentagon and its doubled version, the decagon.[10] (Figure 3.3)

By dismantling these geometric forms Malevich (1916: 122-3) claimed that "...art is the ability to create a reconstruction that derives not from the inter-relation of form and colour...*but on the basis of weight, speed, and the direction of movement.*"

Malevich's Suprematist paintings of 1915 may now be understood as compositions that aim not to analyse the appearance of any object, but to visualise the forces between the elements that make up the object; the forces between objects themselves; and also those between objects and their environment. These comprise forces of tension and compression, torsion and shear; the pull of gravity and the resistance of mass; balance and imbalance, stability and instability, symmetry and asymmetry.

These paintings are supremely indifferent to any of the conventional devices of representation based on "the triumvirate of fundamental tenets that had secured creative man [sic] in his world: a ceaselessly illusionistic representation of observable experience; realism as a measure of truth; and requisite accuracy proclaimed through perspectival systems". (Crone & Moos 1991 : 3)

Malevich may have been a pioneer in his attempts to articulate visually the phenomenology of a non-objective world. However, Mikhail Larionov had also been experimenting with ways of making visible those phenomena which exist in the interstices between familiar objects. He had recognised that people perceive their world through the filters of cultural

conditioning: "The fact [is] that people perceive nature and their environment through the style of their age". (Larionov 1913 : 94). His paintings from the Rayist period (Figure 3.4) preceded Malevich's Suprematism, both chronologically and in the process of logic. Larionov's primary concern was not with the dismantling of the illusory forms of perceived objects in order to visualise the forces within and between, but with the necessary conditions that must precede even our awareness of the existence of objects. These may include a source of illumination, a reflective surface, and a medium which allows the transmission of light to the eye.

> We do not sense the object with our eye, as it is depicted conventionally in pictures...in fact we do not sense the *object* as such. We perceive a sum of rays proceeding from a source of light; these are reflected from the object and enter our field of vision.
> Consequently if we wish to paint literally what we see then we must paint the sum of rays reflected from the object. But in order to receive the total sum of rays from the desired object, we must select them deliberately – because together with the rays of the object being perceived, there also fall into our range of vision reflected reflex rays belonging to other nearby objects. Now if we wish to depict an object exactly as we see it, then we must depict also those reflex rays belonging to other objects – and then we will depict literally what we see.
>
> Larionov (1913: 98)

We are reminded of Gibson's insistence that pictures are not copies of some kind of patchwork of coloured shapes projected upon the retinae, but rather they display the active picking up of formless invariants; that is information available in the structured array of light. Invariants are noticed over changes in the ambient array brought about by directions of movement of observer and/or movement.

The above discussion of the practice of Malevich and Larionov in terms of Jakobson's study of communication and Gibson's theory of perception, indicates the potential of a methodology for the teaching and practice of drawing which integrates aspects of those theoretical bases. This potential will be strengthened in Section 4 and realised in Section 5.

As one of the leading Formalists, Jakobson's main aim was to theorise the poetic function of language which defamiliarises the familiar. He was able to do this by developing Saussure's categorisation of the syntagmatic and the associative (or paradigmatic) relations between linguistic terms.

Writing about this later, Jakobson (1956) observed that the two major speech disorders 'similarity disorder' and 'contiguity disorder' refer to two inabilities: an inability to recognise paradigmatic relations between words, and an inability to construct syntagms. Under normal circumstances these two abilities function through the dialectically-linked processes of *selection* and *combination.*

Jakobson theorised the two poetic devices of *metaphor* and *metonymy* as characteristic realisations of these two fundamental processes. Metaphor refers to the device whereby one sign is selected or substituted for another from the same paradigm, thus imbuing the familiar with a refreshing strangeness.

Metonymy refers to the device whereby one sign becomes contiguously associated with another.

Thus the poetic function foregrounds the equivalences between the elements of a composition, producing rhythms, patterns, symmetries and harmonies which draw attention to the composition itself, or in Jakobson's words,

> The poetic function projects the principle of equivalence from the axis of selection into the axis of combination.
>
> Jakobson (1958: 358)

Jakobson left Moscow for Prague in 1920 and was involved in developing links between the work of the Russian Formalists and the Structuralists at the Prague Linguistic Circle founded in 1926.[11]

As we have seen, the Formalists had theorised forms of literature as examples of the *aesthetic function* of language. Jakobson integrated this function into the wider concerns of the Prague

Circle with structural linguistics in general, and also their commitment to the study of the *functions* of language in particular.

Karl Bühler (1934: 48) had influenced the Prague school with a triadic model of the functions of language:

Addresser	Message	Addressee
Expressive Function	Representational Function	Appellative Function

The addresser uses language to express an emotive slant upon the representational content of the message, which influences the way in which it is received by the addressee.

Of course, there are further functions for which language may be used. These include: to describe, to explain, to manipulate; to simply keep in contact as with Bronislav Malinovski's (1923) *phatic* function; or to refer to the code of communication itself. By the time Jakobson came to address the *Conference on style in language*, in 1958, he was able to present a model (Jakobson 1958: 357) which theorised six functions of language: the *referential* function, used to transmit information about the world; an *emotive* function which expresses the mood or attitude of the message-maker; and a *conative* (Bühler's appellative) function which is used to influence the receiver of the message. He also posited the *phatic* function of communication which operates to lubricate contact between sender and receiver ("Hello! How are you?" "Fine, thanks. How are you?") and the *metalingual* function, a means of using language to draw attention to the code itself. Finally, the one other function of communication on which the Russian Formalists focused and which serves to *foreground the form* of the expression:

> The function of poetic language consists in the maximum of foregrounding of the utterance...it is not used in the services of communication, but in order to place in the foreground the act of expression, the act of speech itself
>
> Mukarovsky (1932: 19)

That is to say there is a sixth, *poetic* or *aesthetic* function of language which draws attention to the form of the message:

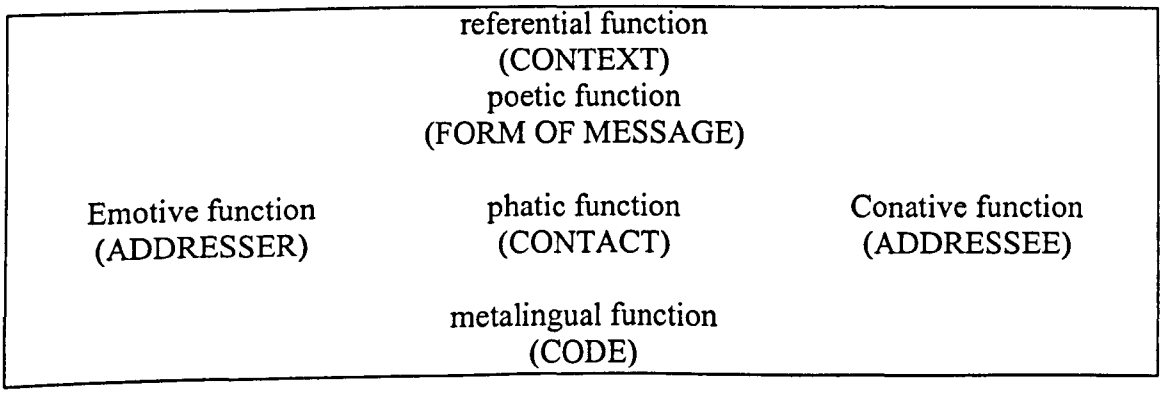


Figure 3.5

This is the culmination of Jakobson's contributions to the Prague Circle's concern with functions of communication. We shall see below how recent work by Australian-based researchers in communication has developed the seminal work produced in Moscow, Petrograd, and Prague between 1915 and 1939.

3.4 Language and reality

Saussure's (1916: 122) assertion that language is "a form and not a substance" has implications for the forthcoming discussion in Section 4 about the relationships between how we see, how we draw, and the type of social structure in which we exist. Those implications arise from the insight that since the form of language is our means of describing, classifying, and communicating our experience of the world outside ourselves, then it is possible to argue that it constitutes the structure of our social reality.

Kant (see Section 2.1) had proposed that what we know is not reality in any absolute sense, but a reality which our minds have already structured. From a deep study of native American languages, Edward Sapir (1921) concluded that languages operate through an inherent structuring principle. He and his pupil Benjamin Lee Whorf[12] (Carroll 1956) extended the

notion of linguistic structuring and formulated the hypothesis that social form, the culture, the way of life of a community, is itself structured in the same way as its language:

> Language is a guide to 'social reality'. Though language is not ordinarily thought of as of essential interest to the students of social science, it powerfully conditions all our thinking about social problems and processes. Human beings do not live in the objective world alone, nor alone in the world of social activity as ordinarily understood, but are very much at the mercy of the particular language which has become the medium of expression for their society. It is quite an illusion to imagine that one adjusts to reality essentially without the use of language and that language is merely an incidental means of solving specific problems of communication or reflection. The fact of the matter is that the 'real world' is to a large extent unconsciously built up on the language habits of the group. No two languages are ever sufficiently similar to be considered as representing the same social reality. The worlds in which different societies live are distinct worlds, not merely the same world with different labels attached.
> To understand a simple poem, for instance, involves not merely an understanding of the single words in their average significance, but a full comprehension of the whole life of the community as it is mirrored in the words, or as it is suggested by their overtones. Even comparatively simple acts of perception are very much more at the mercy of the social patterns called words than we might suppose. If one draws some dozen lines, for instance, of different shapes, one perceives them as divisible into such categories as 'straight', crooked', 'curved', 'zigzag' because of the classificatory suggestiveness of the linguistic terms themselves. We see and hear and otherwise experience very largely as we do because the language habits of our community predispose certain choices of interpretation.
>
> Sapir (1929: 162)

It is suggested here that language both divides and encodes the continuum of space-time according to the principles of its own structure.

Dorothy Lee (1950: 136) maintained that "...a member of a given society – who, of course, codifies experienced reality through the use of the specific language and other patterned behaviour characteristic of his culture – can actually grasp reality only as it is presented to him in this code. The assumption is not that reality is relative, but that it is differently punctuated and categorised by participants of different cultures, or that different aspects of it are noticed by, or presented to them."

Whorf (1939: 134) assumed general assent for his proposition "that an accepted pattern of using words is often prior to certain lines of thinking and forms of behaviour". He devoted

much time to the question of whether there are *affinities* between cultural conventions and linguistic patterns, whilst carefully denying "anything so definite as a *correlation* between culture and language" (1939: 139). Whorf suggested that language patterns and cultural norms developed together, influencing each other, and therefore he recognised the dialectic between language and culture.

However, his many demonstrations (1939: 135-137) of how people act within particular social situations according to the ways they talk about them led Whorf to believe that the systematic nature of language, and its inability to change rapidly, tends to *rigidify* (1939: 156) cultural responses. He claimed that language is affected by cultural events, but little and slowly.

Yet it is evident that changes in social structure affect the ways that people speak. A further study of semiotic systems at work within society may reveal the relationships between semiotic codes and social structures.

3.5 Communication in social context

The above discussion of Saussure (Section 3.1) referred to his argument for treating the structure of language itself as an object of study in its own right, as opposed to the nineteenth-century empiricist methodology through which language was assumed to be the means of categorising or labelling the objects and events of our world.

His success in theorising language as a closed system of signs to be studied in terms of their internal relations is not to be denied, and his seminal thinking has afforded linguists, and other researchers in a wide range of other disciplines, the opportunity for developing insights otherwise obscured.

It may be argued that the most important of those proto-post-structuralist insights is actually implicit in Saussure: He had identified key oppositions at work in the operations of the

language system, and had recognised the possibilities of a wider range of semiological applications, despite having emphasised *language* as opposed to other systems of making meaning. He had focused upon the study of *langue* as opposed to actual speech utterances, *parole*. He had advocated the use of a *synchronic* mode of analysis rather than *diachronic*. Saussure wished to emphasise *langue's* qualities of constancy even though he recognised the fact that signs within the system change diachronically:

> No society...has ever known language other than as a product inherited from previous generations, and one to be accepted as such...
> A particular language-state is always the product of historical forces, and these forces explain why the sign is unchangeable, i.e. why it resists any arbitrary substitution.
>
> Saussure (1916: 71-72)

He followed this by proposing that:

> Time, which insures the continuity of language, wields another influence apparently contradictory to the first: the more or less rapid change of linguistic signs. In a certain sense, therefore, we can speak of both the immutability and the mutability of the sign. Saussure (1916: 74)

The apparent paradox serves to emphasise that Saussure had recognised the reality of language in use: it changes even though no individual speaker may change it.

It has already been noted that the Russian Formalists had chosen to adopt Saussure's emphasis upon the study of the language system when they theorised literature and poetry as closed texts. It may be informative here to consider another Russian contribution:

In their criticism of Formalist techniques, Mikhail Bakhtin and Pavel Medvedev[13] (1928) identified the important insight inherent but suppressed in Saussure's and the Formalists' approach:

> How...is the direct material presence of the work...to be joined with the endless perspectives of its ideological meaning?... What, in fact, is the element which unites the material presence of the word with its meaning? We submit that *social evaluation* is the element. [My italics]
>
> Dentith (1995 : 145-6)

Essentially, Bakhtin and his circle were proposing a reassessment of Saussure using a Kantian methodology. Saussure had attempted to isolate the poles of the dichotomies *langue/parole*, synchronic/diachronic, etc. Bakhtin re-engaged them dialectically, as oppositions between terms which depend upon each other for their meaning, and by so doing facilitated the study of language within a *dialogical* context (Holquist, 1990).

Bakhtin recognised that for meaning to exist at all, there has to be a relation between two bodies participating from different situations. (The term 'bodies' may refer to individuals, political or social groups, or bodies of thought – ideologies). Consider two bodies facing one another: one can see things behind the other's back, and *vice versa*. Both are participating in the same event, but the experience of the event – and therefore its meaning – will be different for each.

Such a dialectical methodology may be employed to resolve the opposition between the Saussurean emphasis upon *langue* which Valentin Voloshinov[14] (1929: 126) termed "abstract objectivism", and a position that foregrounds the importance of the study of the psychology of the speaker, or "individualistic subjectivism".

> Abstract objectivism, by taking the system of language and regarding it as the entire crux of linguistic phenomena, rejected the speech act – the utterance – as something individual...
> For individualistic subjectivism, the entire crux of the matter is just exactly the speech act – the utterance. However, individualistic subjectivism likewise defines this act as something individual and therefore endeavours to explain it in terms of the individual psychic life of the speaker...In point of fact...the utterance cannot under any circumstances be considered an individual phenomenon in the precise meaning of the word and cannot be explained in terms of the individual psychological or psychophysiological conditions of the speaker. *The utterance is a social phenomenon.*

Since the purpose of language is to function as a means of communication, it could be argued that anyone attempting to theorise the functions of language would be wise to take into account the relevance of what Bronislav Malinowski (1923) termed the 'context of situation'.[15] We do not experience any communication in isolation, it always occurs within

specific contextual parameters which in turn affect the process of communication itself. These parameters include not only those of the physical surroundings, but the ideological culture and importantly, the types of relationships that may exist between those present during the process of communication.

Social semiotics

Bakhtin and his circle resolved the antinomy that Saussure's separation of *langue* and *parole* had presented, and thus laid the foundations upon which a *social semiotics* may be constructed. Social semiotics theorises the relationship between codes of communication and the contexts of situation in which they are used.

Simple messages, or alternatively messages woven together to form *texts*, all operate within a social process, or *discourse*. The form of the text is determined by the nature of its discourse. That is to say, the way we speak is determined by where and to whom we speak. It therefore becomes necessary to codify those parameters of the social context mentioned above in order to theorise the relationship between text and context.

Michael Halliday[16] (et al 1964) proposed three parameters of social context which may be summarised:

> *Field* refers to the institutional setting in which a piece of language occurs, and embraces not only the subject-matter in hand but the whole activity of the speaker or participants in a setting (we might add 'and of the other participants')...
>
> *Tenor*...refers to the relationship between participants...not merely variation in formality...but such questions as the permanence or otherwise of the relationship and the degree of emotional charge in it...
>
> *Mode* refers to the channel of communication adopted: not only the choice between spoken and written medium, but much more detailed choices (we might add: 'and other choices relating to the role of language in the situation'.)
>
> Doughty (1972: 185-6)

Within the context of any situation, we are able to relate to the social reality encoded in language in two fundamental ways: we may comment upon it, and we may act within it. Language enables us to *comment upon aspects of our experience of our social reality,* and language functions to facilitate action *within* the social reality by *motivating inter-personal relations*, thus bringing about change in position, attitude and mood of participants. These two functions of language may be termed the *experiential* and the *interpersonal.* Jakobson's model of the communication process is actually an elaboration upon these two prime functions. The *interpersonal* may be understood as a combination of Jakobson's expressive (emotive) and conative functions; his phatic function, the use of language to lubricate and maintain contact between addresser and addressee, may be achieved through either the *experiential* or the *interpersonal* functions. Jakobson's metalingual function is subsumed by the *experiential*, since language may be used to represent aspects of itself (as in this sentence.)

The poetic function, that *cause celebré* of the Russian Formalists and the Prague school of linguists, may of course be *experiential* in terms of the subject matter of any particular text. Nevertheless, in order to refresh our understanding of that subject matter, and in order to make the expected unexpected, a poetic text employs devices of composition which draw attention to its own formal qualities. Indeed, *any* process of communication, if it is to function at all, needs to be realised in some perceptible form - sounds, written words, pictures, three-dimensional form.

Halliday (1973 & 1985) recognised three primary functions of language: the *ideational* which corresponds very closely to Bühler's *representational,* or what has been referred to above as the *experiential*; the *interpersonal* (the sum of Bühler's original terms *appellative (conative)* and *expressive*), and, unique to Halliday, the *textual*, which refers to the function of producing the text itself in relation to its context. As Halliday put it:

> So we have the *observer* function [experiential], the *intruder* function [interpersonal], and the *relevance* function [textual]...
> To me the significance of a functional system of this kind is that you can use it to explain the nature of language, because you find that language is in fact structured along these three dimensions. So the system is...both extrinsic and intrinsic at the same time. *It is designed to explain the internal nature of language in such a way as to relate it to its external environment.* [My italics].
> Halliday (1978: 48)

Halliday's textual function operates to integrate coherently his ideational and the interpersonal functions in the form of speech or written texts relevant to the social situation. To achieve this, choices are made from the vocabulary and the syntactical and grammatical options available to the addresser. These linguistic resources are the *systems* through which the functions of language are realised. Their visual equivalents are discussed in Section 4. Language may now be understood as a resource "in terms of the choices that are available, the interconnection of those choices, and the conditions affecting their access." (Halliday 1978: 192)

A social semiotics studies the relationship between specific choices and specific social contexts. We are thus able to imbue the relationship between language and social structure with the dialectical resonances which Whorf chose to minimise in his work.

Summary

It has been argued in this Section that the structure of the language we use determines the way in which we perceive our environment and how we understand it. Such a connection is constantly affected by the social context within which it operates:

Language encodes Nature into Culture; and transformations of cultural attitudes generate further encoding devices in language.

Bakhtin's dialogical approach makes the justified assumption that no-one or no thing can be perceived except in relation to their surroundings. In terms of drawing this may be expressed: there is no perception of a figure without a ground (background.)

We may note the similarity here with Gibson's position (discussed in Section 2). He claimed "there is...no such thing as a perception of space without the perception of a continuous background surface." (Gibson 1950 : 6) Figures within space are perceived and their positions determined by the information afforded by the tonal and textural contrasts between the surface of the figure and the surfaces of the background. It is this information which specifies *edge*, and for which our eyes have evolved to pick up. Here is an important connection between the ecological approach to visual perception discussed in Section 2, and a social semiotic approach to human communication discussed here in Section 3.

Section 4 explores the synthesis of these two theoretical positions among others, with the aim of establishing an original basis for the teaching and practice of drawing.

SECTION 4: PERCEPTION AND COMMUNICATION

Introduction

4.1 Geometries of vision

4.1.1 Perception and geometry 1: Transformations and invariants

4.1.2 Perception and geometry 2: Drawing conventions

4.1.3 Primary geometry and secondary geometry

4.1.4 Viewer-centred and object-centred representations

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SECTION 4: PERCEPTION AND COMMUNICATION

> *A way of picturing involves the appropriation of a way of seeing. That appropriation is governed by the demand characteristics of the social order in which values must be thought*
>
> Robert Witkin (1995 : 62).

Introduction

This Section presents an original synthesis of aspects of the perception and communication theories reviewed in Sections 2 and 3. From this synthesis, a new instrument is developed and tested on the analysis of drawings. It is argued that the new instrument, summarised in Figure 4.32, offers a means of significantly broadening students' understanding of their own and others' ontological constructions through the practice of drawing. A variety of case studies ~~in Appendix D~~ illustrates the efficacy of the new instrument. Its application within a teaching programme of drawing is discussed in Section 5.

The Section opens with a review of the variety of ways in which information about the world available in the structure of light may be transformed into semiotic codes such as systems of geometry. The relationship between such drawing conventions, different ways of seeing, and types of social structure is then theorised.

4.1 Geometries of vision

The radical nature of James Gibson's (1979) ecological approach to visual perception was pointed out in Section 2.5. Whilst much of that theory is highly contentious, there is certain ground relevant to the practice of drawing upon which consensus of opinion has been reached.

It is perhaps fundamental that energy in the form of light of differing wavelengths emanating from the Sun (or other Earth-bound devices) is a necessity for seeing. The fact that the various physical and chemical properties of surfaces and media (e.g. air, water) making up our material world affect incident light in various ways is also generally accepted. When light falls upon surfaces, some wavelengths are absorbed and others are reflected. The disposition of the surface relative to the light source will also affect the way that light is reflected. Moreover, any array of light reflected from those surfaces will have been restructured in some way. Therefore there is some correlation between the properties of the surfaces, and the restructured array of light reflected from those surfaces. It can be claimed that the restructured array of light contains *information* about the nature and disposition of those surfaces. Who is capable of making use of this information? Any organism which has evolved physiological apparatus sensitive to light energy.

Further common ground: the essential principle of Ecology emphasises the dialectical relationship between an organism and its environment. It asserts there is no organism that survives on Earth without adapting to its environment, and, by definition, no earthly environment without an organism within. The relationship between humans and the constituent materials, media, and forces of our environment is one such dialectic.[1]

Beyond this common ground, visual psychologists take up opposing theoretical positions, as discussed in Section 2, but this analysis depends not upon their validity or otherwise, rather upon the correlations which are demonstrated here to exist between the nature of the

structural transformations of light arrays and the systems of geometry which human cultures have constructed in order to represent the layout of objects, spaces and observers' positions within the perceived visual field. It can be argued that we have evolved so as to *resonate* with the energy fields of our surroundings. Perception may be described as an *active* process, an invitation to act upon and within our environment. Attention may be drawn to what happens when the invitation to act upon this information is diverted into *the uniquely-human desire to share the experience of the invitation itself* by representing aspects of it through drawings.

4.1.1 Perception and Geometry 1. Transformations and Invariants

In our natural world, both the surfaces of our environment and our own bodies move in relation to each other and in relation to the source of illumination. A direct theory of perception such as Gibson's incorporates this fact and proposes that within the subsequent transformations of the structure of the array of light available at any given point (i.e. the eye positions) there are particular aspects of those transformations that remain *invariant.*

In an attempt to clarify the relationship between transformations and invariants, Gibson (1966a: 141) wrote:

> Continuous optical transformations can yield two kinds of perception at the same time, one of change and one of non-change. The (rotational) transformation of a rectangle, for example, was always perceived as both something rotating and something rectangular. This suggests that the transformation, as such, is one kind of stimulus information for motion, and that the invariants under transformation are another kind of stimulus information, for the constant properties of the object...There is almost always some permanence imbedded in any change...The primacy of form or pattern comes into question. There is no 'form' left in a continuous transformation. It has vanished and all that remains is the invariants.

Classes of invariants

Invariants enable us to perceive the continuity of objects across the variations of shape projections, lighting, colour, distance, etc., and may be classified:

1. relationships in the transformations of light arrays that remain constant even as the observer moves.
2. relationships that remain constant even as the intensity and direction of illumination varies.
3. relationships that remain constant even as the surfaces under observation move in relation to one another.

Let us imagine a walk around the drawing studio. Why is it we may understand the consistency of form of a rectangular drawing board seen against other surfaces that bound the space of the studio, when all we receive on the retinae are constantly-changing trapezoid-shaped patterns within a constantly-changing pattern of illumination brought about by our movements?

Although the four internal angles between the edges of the set of trapezoidal shapes projected into the eyes appear to undergo constant change, as do the lengths of the sides of the trapezoids, there are underlying relationships which remain invariant throughout: The relationship *between* the angles is constant (their sum is invariably 360°), the relationship of *parallelity* between opposite edges remains constant, and so does the *straightness* of the edges. Although the tonal and textural contrasts at the edge between the board and the surfaces it occludes (or is occluded by) undergo constant change as we move in relation to the sources(s) of illumination, the information specifying *occluding edge* is invariant.

Gradients, too, are sources of specific information. A gradient is the rate of change of one dimension or value in relation to another. Gradient structure is information about the world that is directly accessible from the light. For example, the size of the angle subtended by an object, related to the distance of the object from the observer; Figure 4.1

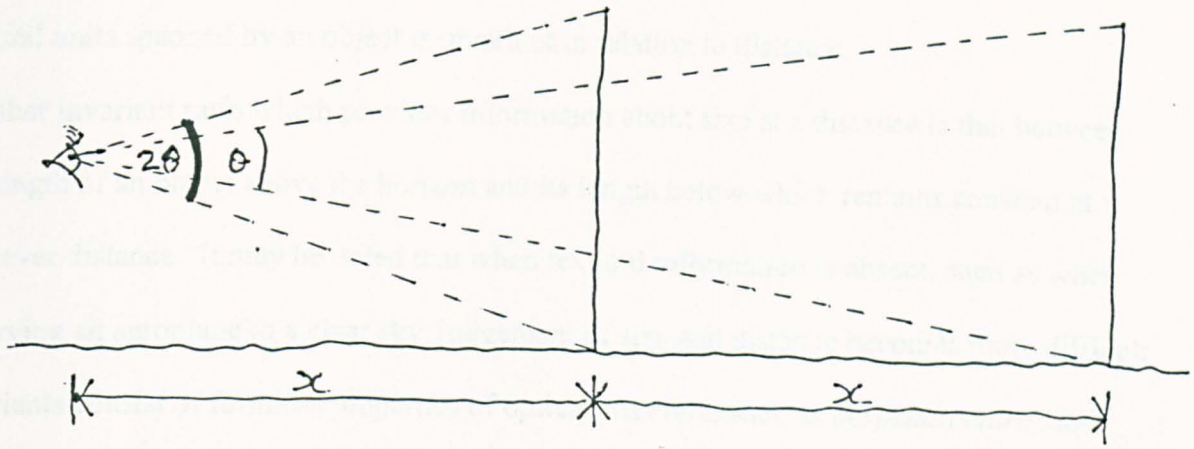


Figure 4.1

As distance is doubled, the angle subtended is halved. This relationship is invariant.

As a ground plane undulates, the rate of change of its observed textural or tonal density may specify the angle of slope relative to the viewer; as in Figure 4.2.

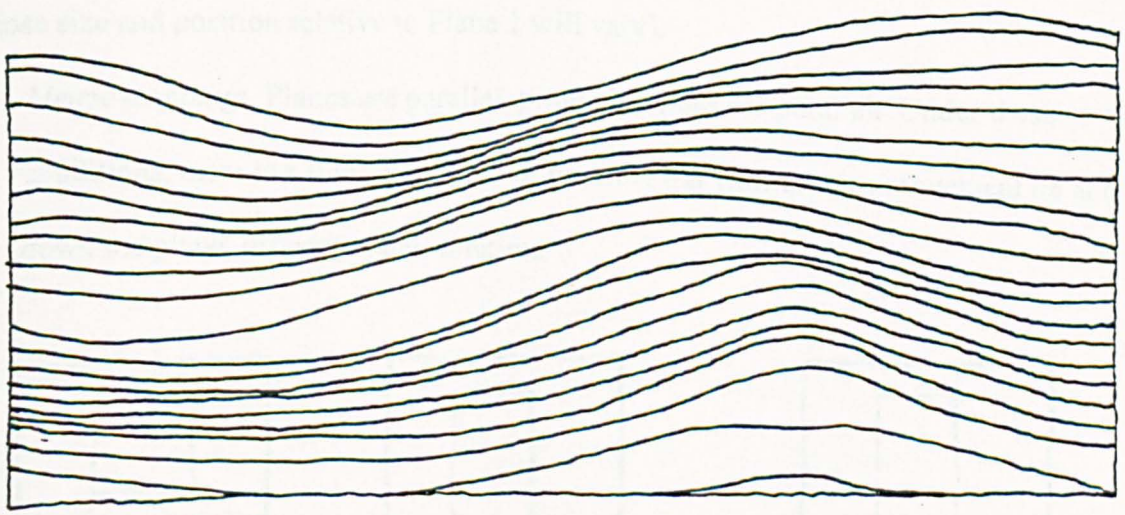


Figure 4.2

The relative size of objects is directly accessible from structured light, since the number of textural units spanned by an object is invariant in relation to distance.

Another invariant ratio which provides information about size at a distance is that between the length of an object above the horizon and its length below which remains constant at whatever distance. It may be noted that when textural information is absent, such as when observing an aeroplane in a clear sky, judgement of size and distance becomes more difficult. Invariants consist of formless properties of optical structure, such as *perpendicularity* and *rectangularity*, *straightness* and *parallelity*. Occluding edges specify the continuity of solid objects even as they rotate in space or as we move through space. Space itself may be understood only in terms of the changing relationships over time between the surfaces that bound it.

Classes of transformations

The geometrical concept of *transformation* may be illustrated by what occurs to a shape when it is mapped or projected from a Plane 1 (whose properties remain constant) to another Plane 2 (whose size and position relative to Plane 1 will vary).

1. *Metric mapping*: Planes are parallel, projection lines are parallel. Under these conditions, there is a limited number of possible transformations: movement up and down the plane, reflection, and rotation.

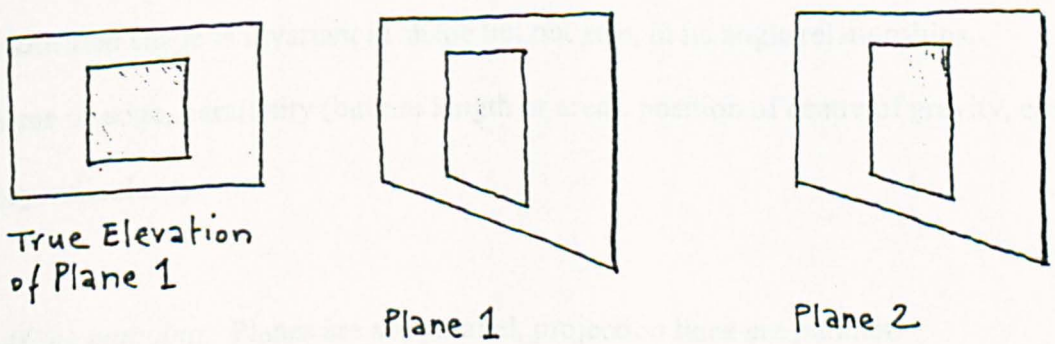


Figure 4.3a

The transformed shape is invariant in size, shape, angle relationships, straightness of edge, parallelity, length, ratio of length, area, position of centre of gravity, cross-ratio, and perpendicularity.(2)

2. *Similarity mapping*: Planes are parallel, projection lines diverge from projection point P. In this case, the range of transformations is increased by the additional radial transformation, but the number of invariant features is diminished.

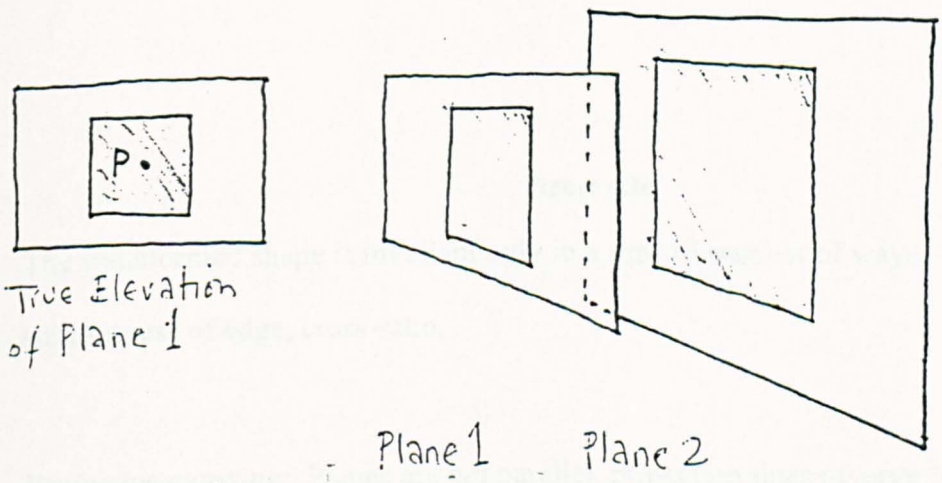


Figure 4.3b

The transformed shape is invariant in shape but not size, in its angle relationships, straightness of edge, parallelity (but not length or area), position of centre of gravity, cross-ratio, perpendicularity.

3. *Affine mapping*: Planes are *not* parallel, projection lines *are* parallel.

The range of possible transformations is again increased by the addition of:

skew reflection, skew compression, hyperbolic rotation, elliptic rotation, and shear transformation.[2]

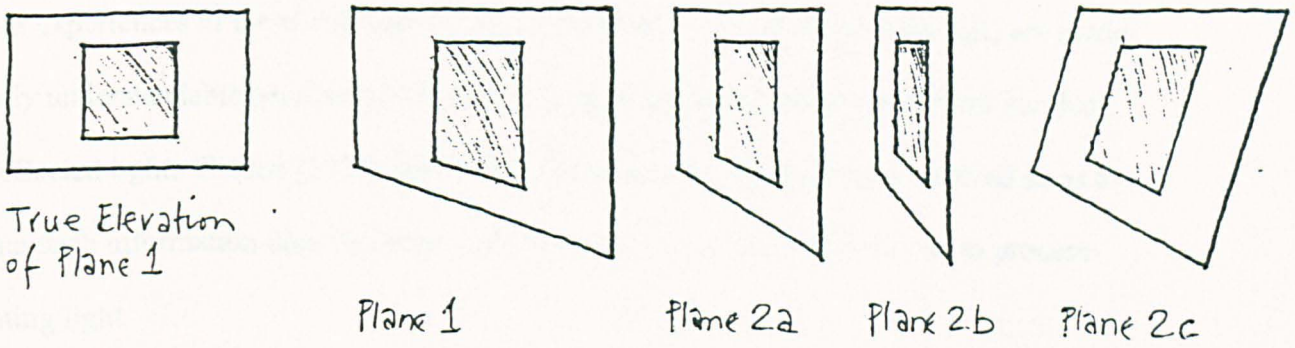


Figure 4.3c

The transformed shape is invariant only in a limited number of ways – parallelity, straightness of edge, cross-ratio.

4. *Projective mapping*: Planes are *not* parallel, projection lines diverge from projection point P.

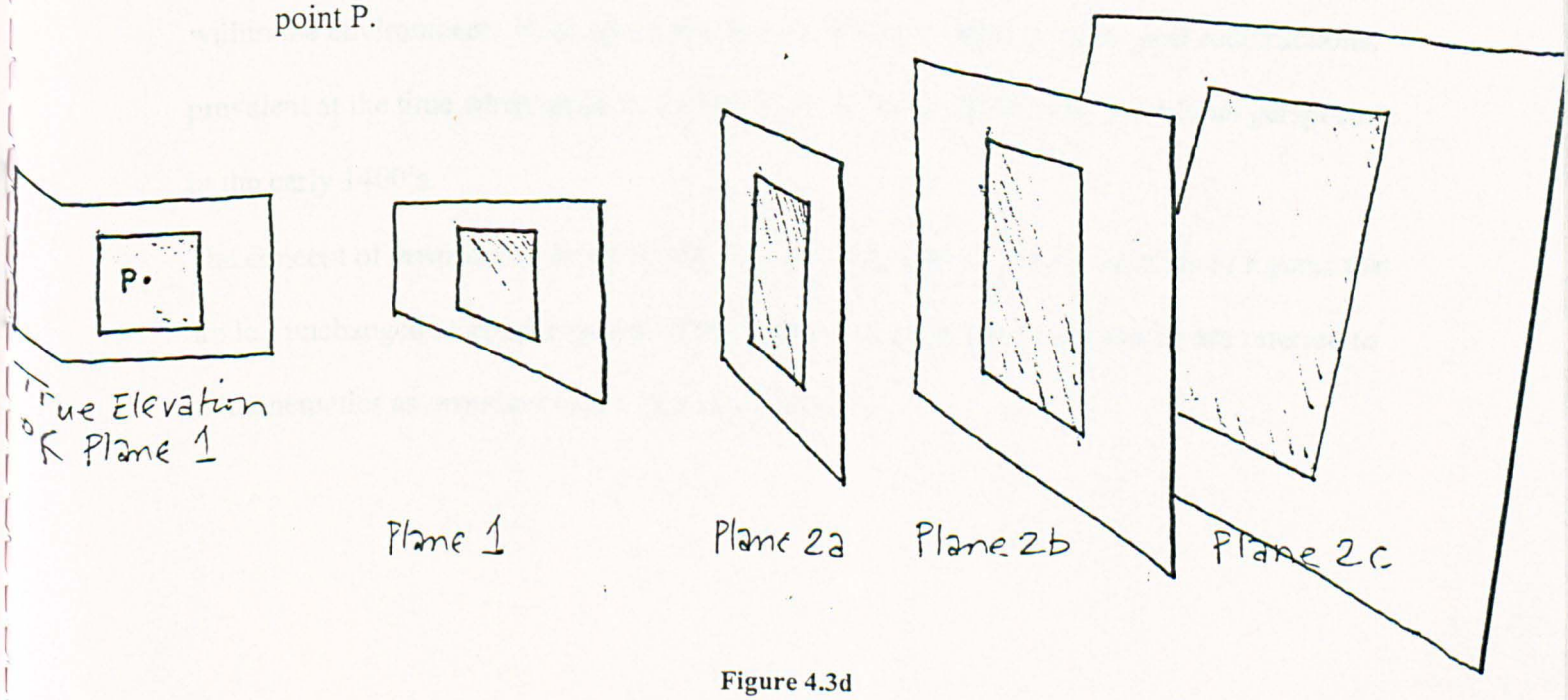


Figure 4.3d

All the transformations available in the other three mapping systems are retained in this projective transformation, but the transformed shape has even fewer invariant aspects: cross-ratio, and straightness.

All our experiences of the world (including the experience of looking at drawings) are made visually understandable because of our ability to glean invariant information from incident and reflected light. Gibson (1979) asserts that our perceptual systems have evolved so as to pick up such information directly, Marr (1982) argues vision has evolved so as to process incoming light.

It may be noted here that the drawings most familiar to Western post-Renaissance observers, such as those of projective mapping, are those containing the fewest invariants. However, the invariants that such drawings contain are exactly the same as those that remain throughout transformations brought about by the movements of the observer. These are the cross-ratios of points and lines and the gradients of size, linear perspective, and texture perspective. It appears that what has been termed 'realistic representation' within Western European culture is pictorial information invariant under changes brought about by the observer's movement within the environment. Such egocentricity is consistent with the ontological constructions, prevalent at the time when projective geometry was being codified as an artificial perspective in the early 1400's.

The concept of *invariant* is the complement of *transformation*. The properties of figures that are left unchanged after undergoing transformation by geometrical projection are referred to in mathematics as *invariant under that transformation*.

To perceive invariants is, in many ways, the same thing as to perceive transformations. As illustration of this, we may consider a textured surface which is moving away from an observer. Information about the rate of change of texture density is carried by the light reflected from that surface and provides a continuous and direct system of measurement of the visual world. If the observer happens to be in motion at the same time, then information about their position relative to the moving surface is contained in the invariant features that remain as the motions combine to produce transformations of the optic array brought about by the occlusion of one surface by another.

It is important to understand that the invariant features of a structured array of light do not exist except in relation to variants. When an observer moves, the entire optic array is transformed and such transformations contain information about both the layout and the shapes of objects and surfaces in the environment, and about the observer's movement relative to the environment. As Gibson (1975) puts it,

"perception of the world and of the self go together and only occur over time"

4.1.2 Perception and geometry 2: Drawing conventions

Following the criteria of Marr's (1982 : 20) definition of a representation as a "formal system for making explicit certain entities or types of information, together with a specification of how the system does this", it may be argued that *projective geometry* is such a means of representation, because it provides a formal systematic procedure for making explicit information about the three-dimensional attributes of objects and spaces upon a two-dimensional surface. There are other formal geometric systems which have been devised to represent such information. The various sets of rules which specify how the procedure may operate are termed *drawing conventions.* British Standard 1192 (1969 : 31-34) categorises these conventions:

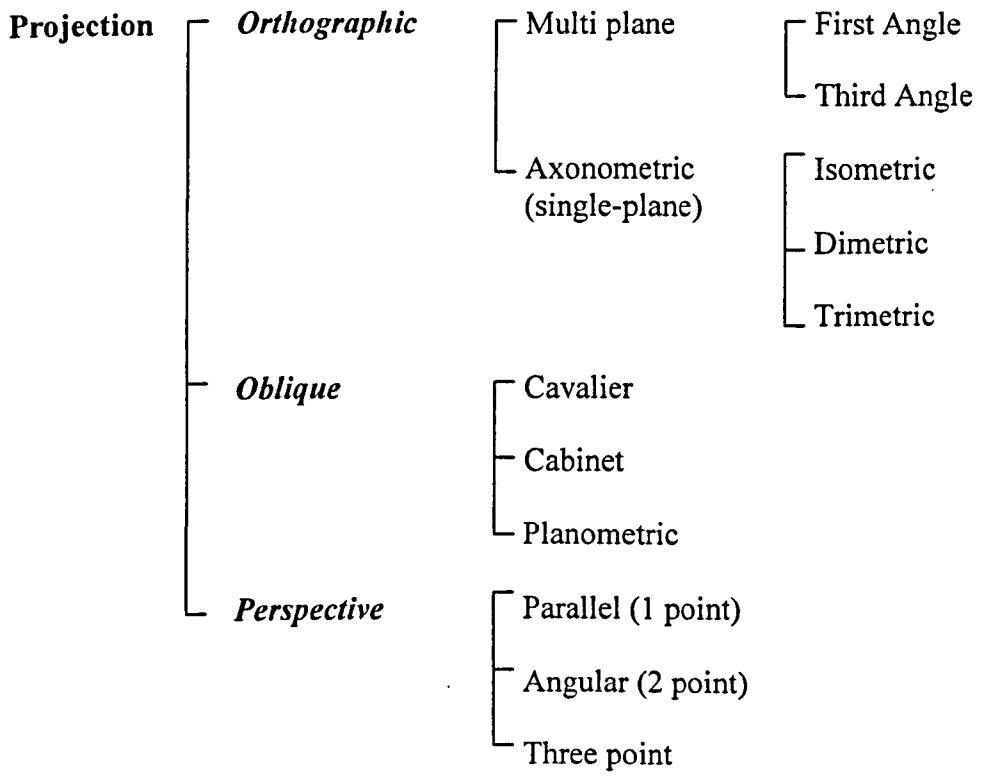


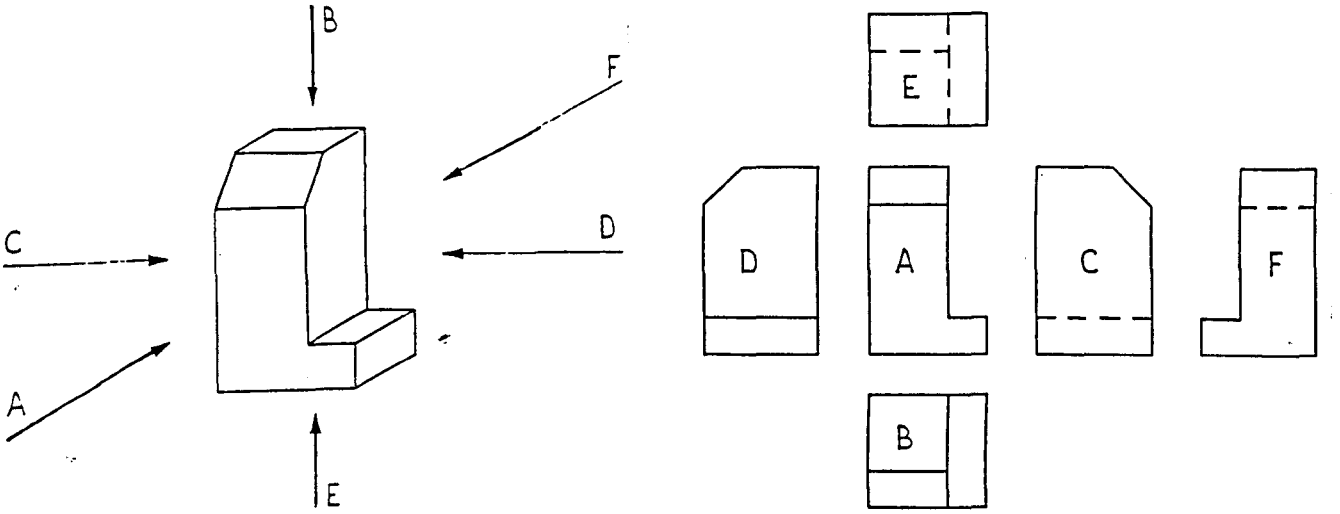
Fig. 4.4 B.S. 1192 categories of projection types

In this classification, all orthographic and oblique projections may be specified as *parallel projection* systems, since their *projectors,* [3] those lines of projection that link salient features of the object to points on the plane of projection, are parallel. Perspective projections may be classified as *convergent* since their projectors converge on a point in front of the plane of projection, assumed to be a viewer's eye.

Orthographic projection systems [4]

1. *Multi-plane orthographic projection*

   This allows several views of an object to be projected upon several planes, assumed to be at right angles to each other: Projectors are parallel and are perpendicular to the planes of projection. Each object face is parallel with its plane of projection.



View in direction A = View from the front
View in direction B = View from above
View in direction C = View from the left
View in direction D = View from the right
View in direction E = View from below
View in direction F = View from the rear.

The view from above is placed underneath
The view from below is placed above
The view from the left is placed on the right
The view from the right is placed on the left
The view from the rear may normally be placed on the left or on the right, as may be found convenient.

Figure 4.5

2. *Axonometric, or single-plane orthographic projection*

Projectors are parallel and perpendicular to the plane of projection, and all object faces are inclined to the plane of projection.

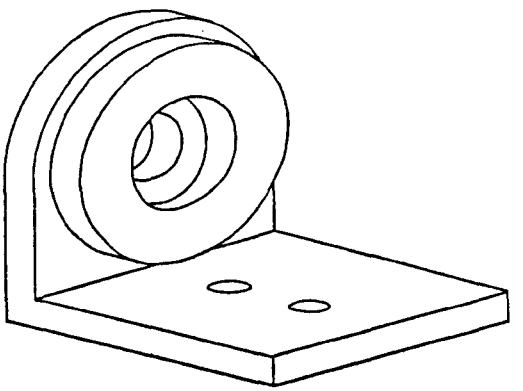


Figure 4.6

Isometric Projection is a unique case of axonometric in which foreshortening on all three axes is the same.

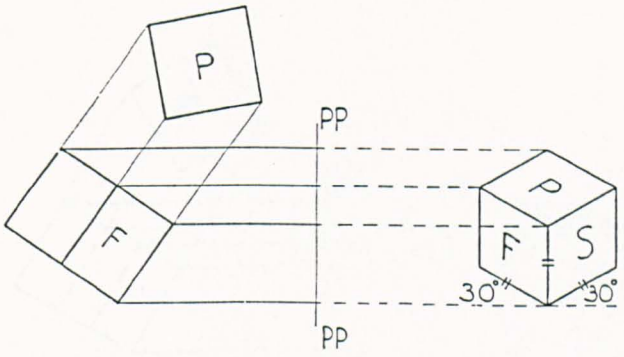


Figure 4.6a

Dimetric projection is a special case of axonometric in which scales along two axes are equal, the third axis being different.

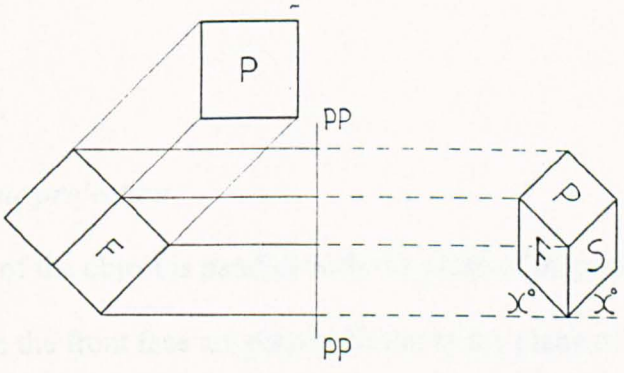


Figure 4.6b

Trimeric projection is the general case of axonometric and occurs when all three axes are randomly orientated and are each of different scales.

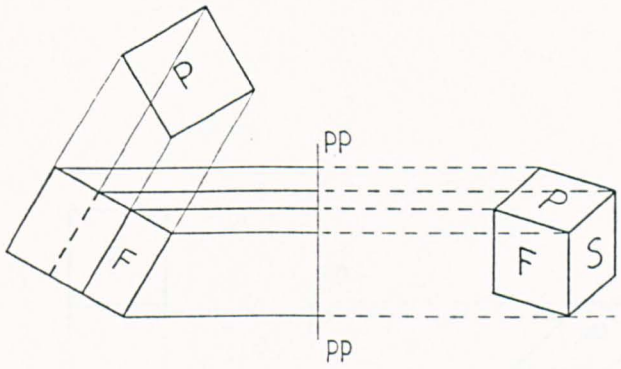


Figure 4.6c

Oblique projection systems

Oblique projections all have one face of the object parallel to the plane of projection, and the projectors, although parallel to each other, are inclined to the plane of projection in various ways.

1. *Cavalier oblique projection*

   The front face of the object is parallel with the plane of projection, while the projectors from the front face are perpendicular to the plane of projection. The projectors from the other two visible faces, although parallel, are inclined to the plane of projection so that the receding edges are represented at the same true scale as the front face.

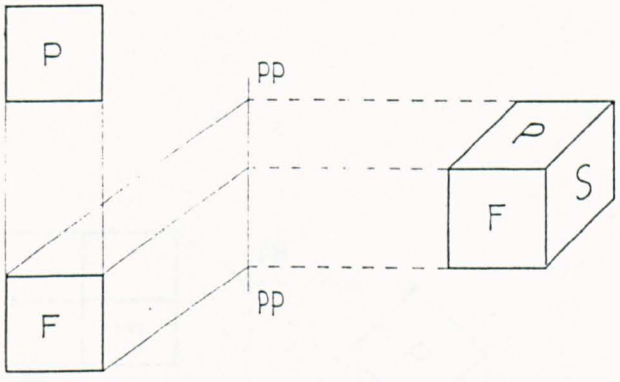


Figure 4.7a

2. *Cabinet oblique projection* is similar to Cavalier, except receding edges are drawn to half the scale of the true front face projection.

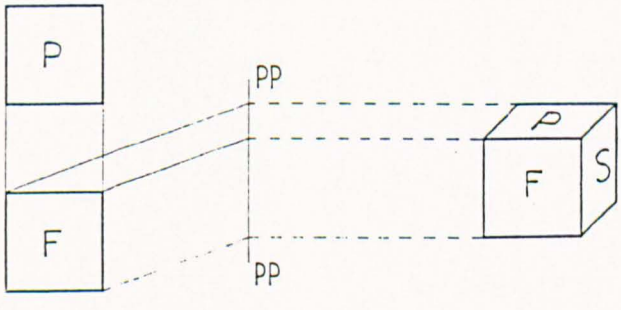


Figure 4.7b

3. *Planometric oblique projection* is a special case of oblique projection, often inaccurately called 'axonometric', where the plan face of the object is parallel to the plane of projection (and usually rotated through 45°) and projectors are inclined obliquely to the plane of projection.

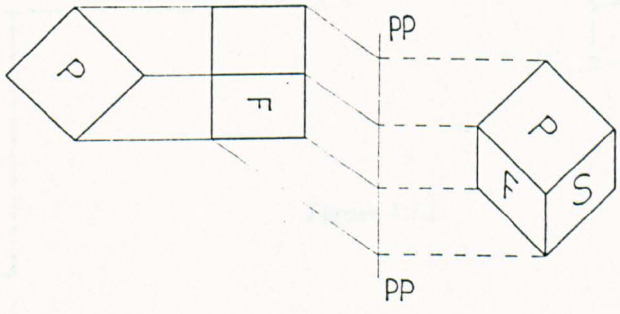


Figure 4.7c

Two other forms of oblique projection, not identified in the British Standard (1969 : 31-34), have been codified by Fred Dubery and John Willatts (1983 : 22,26):

4. *Horizontal oblique projection.* One face of the object remains parallel to the plane of projection and projectors are parallel, but are inclined to the plane of projection *in the horizontal direction only.*

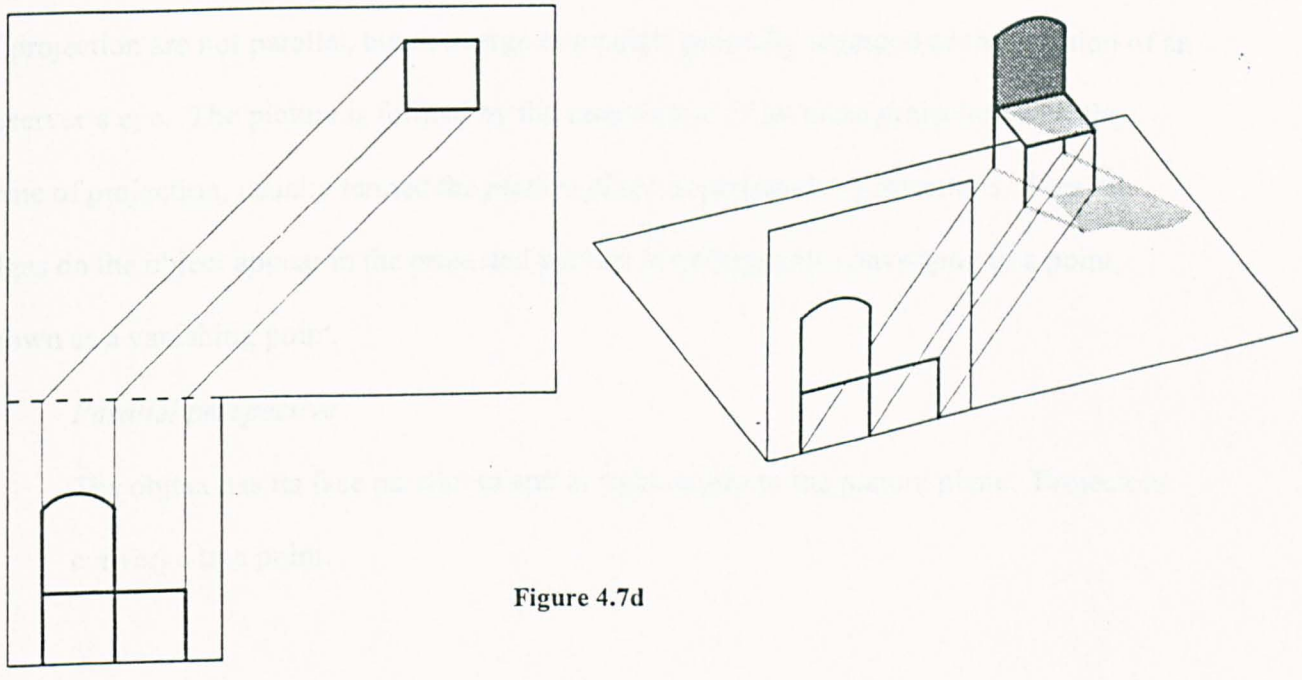


Figure 4.7d

5. *Vertical oblique projection.* One face of the object is parallel to the plane of projection, the projectors are parallel but inclined to the plane of projection in the *vertical direction only.*

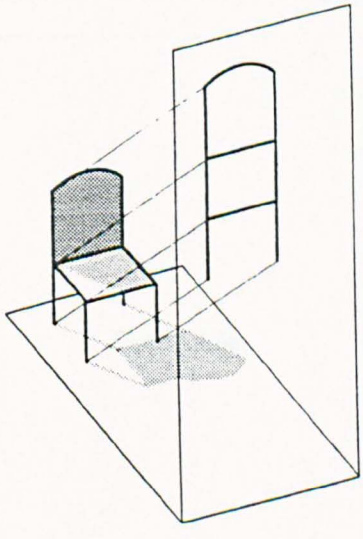


Figure 4.7e

Perspective Projection

This family of projection conventions as defined by BS 1192 (1969 : 34) differs from orthographic and oblique projections because the projected lines from the object to the plane of projection are not parallel, but converge to a point, generally regarded as the position of an observer's eye. The picture is formed by the intersection of all these projectors with the plane of projection, usually termed the *picture plane* in perspective projections. Parallel edges on the object appear in the projected picture as orthogonals converging to a point, known as a vanishing point.

1. *Parallel perspective*

   The object has its face parallel to and at right angles to the picture plane. Projectors converge to a point.

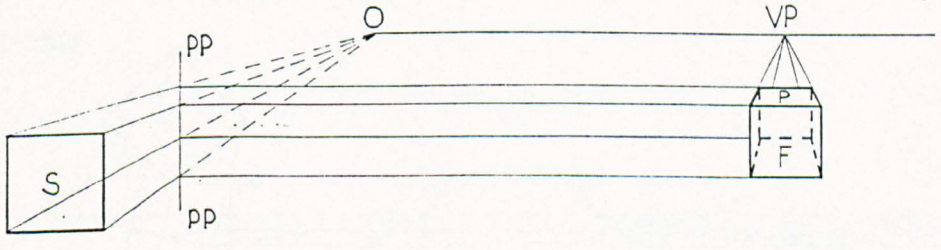


Figure 4.8a

2. *Angular (2-point) perspective*

Vertical faces of the object are inclined to picture-plane, horizontal faces remain normal to the picture-plane:

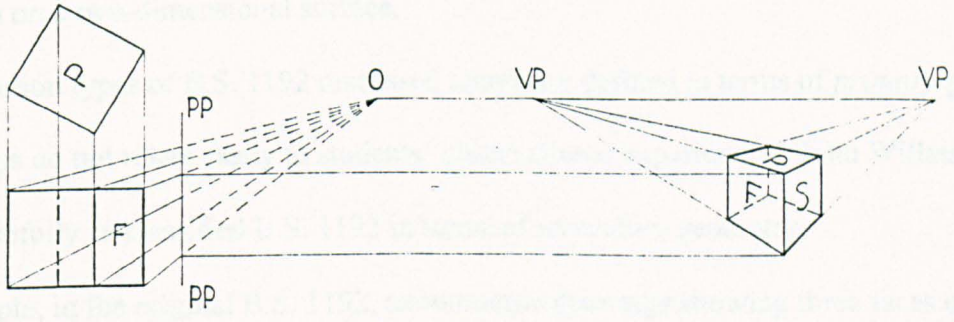


Figure 4.8b

3. *Three-point perspective*

All the object's faces are inclined to the picture-plane. There are three vanishing points.

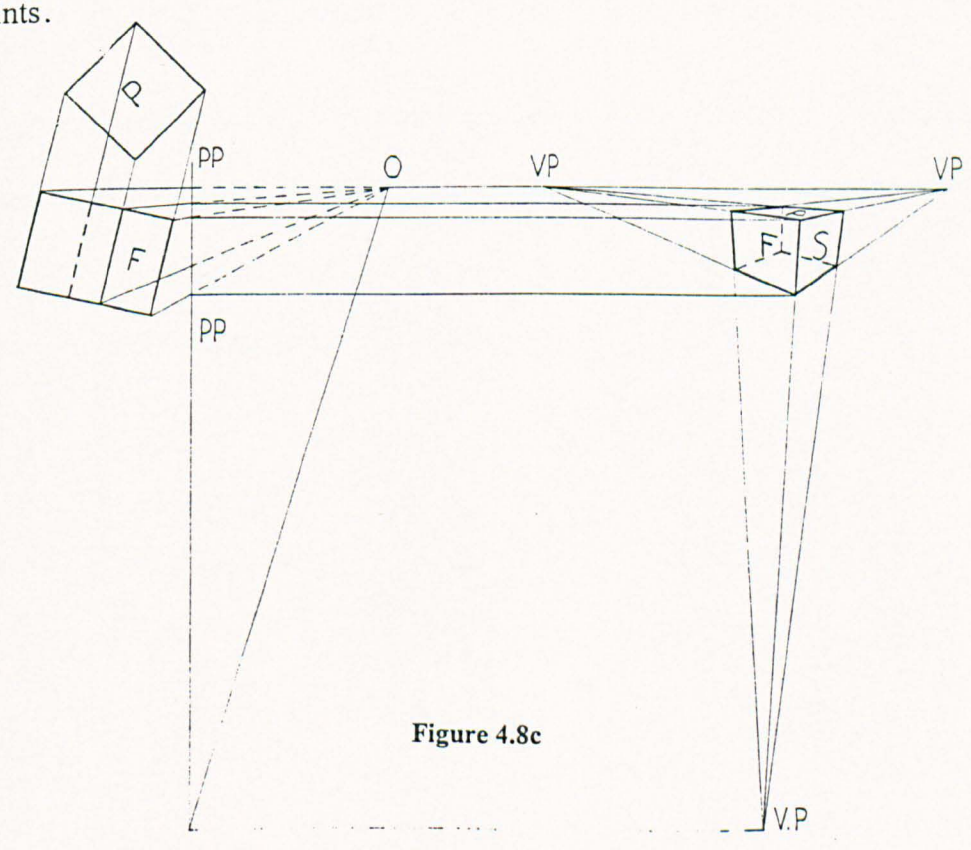


Figure 4.8c

4.1.3 Primary geometry and secondary geometry

Peter Jeffrey Booker (1963) made the distinction between *primary* geometry, the arrangement in space of lines of projection from the three-dimensional object to the plane of projection, and *secondary* geometry, the relationships between the points, lines and shapes of the drawn projection on a two-dimensional surface.

The projection types of B.S. 1192 discussed above are defined in terms of *primary* geometry, but perhaps do not relate easily to students' observational experiences. John Willats (1997 : 42) has usefully re-classified B.S. 1192 in terms of *secondary* geometry.

For example, in the original B.S. 1192, axonometric drawings showing three faces of an object have to be classified with orthographic projections which show only one face, because their primary geometries have parallel, perpendicular projectors in common. Willats suggests it would be beneficial to re-classify the axonometrics under oblique projections, thus recognising their obvious similarities of secondary geometry, which are the number of faces shown in the drawings, and, the directions of their orthogonals.

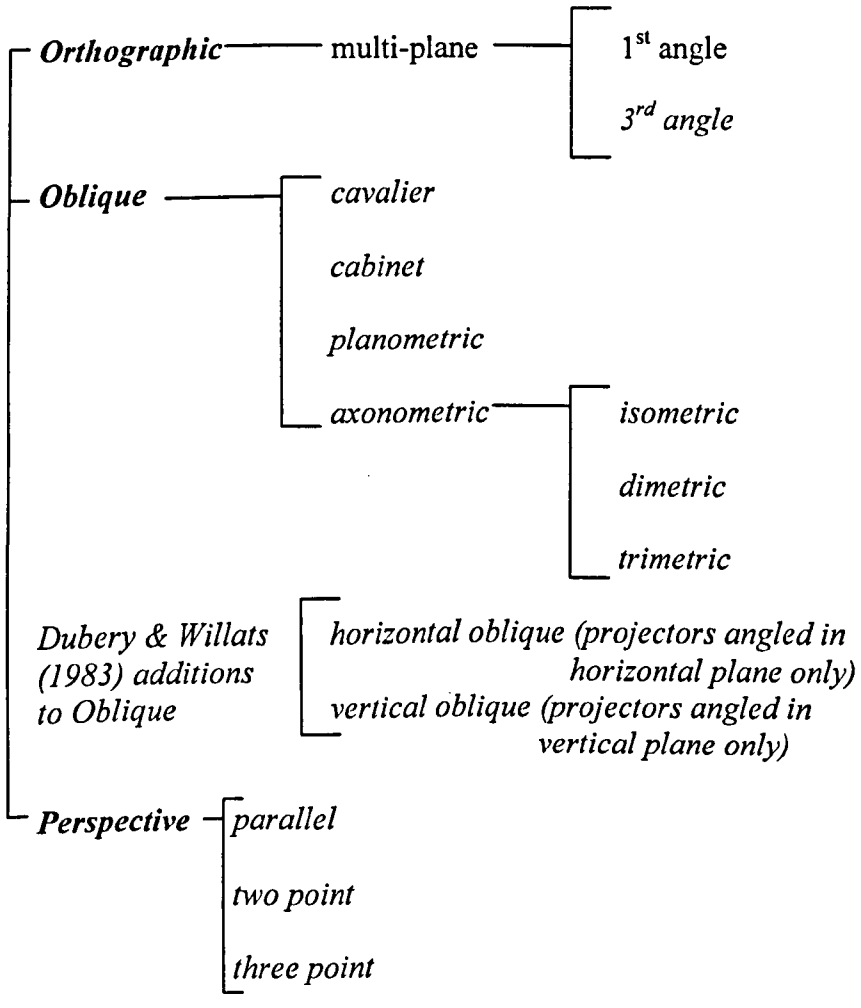


Figure 4.9 Re-classification of B.S. 1192 in terms of secondary geometry

This re-classification of drawings in terms of their secondary geometry provides a way of understanding those drawings which do not depend upon the Drawer's position defined by primary geometry but which, in their secondary geometry, explicate features of the object that are known, but not necessarily visible to the Drawer.

4.1.4 Viewer-centred and object-centred representations

These terms derive from the investigations of Marr and Nishihara (1978) into the representation and recognition of the spatial orientation of objects which was discussed in Section 2.6. The two categories are implicit in the classification of projection types. Therefore it may be useful to review those again, this time relating primary and secondary geometries to viewer - and object-centred representations.

According to Marr and Nishihara, vision is the processing of information derived from two-dimensional retinal images (viewer-centred) so as to produce information that allows us to recognise three-dimensional objects (object-centred descriptions).

The organic visual system receives at the retinae a constantly changing array of light reflected from surfaces and objects in the world from which we derive representations of those surfaces and objects that are consistent, as well as unchanging across varying viewpoints and lighting conditions.

Such representations may take the visible form of drawings not readily classifiable under the rules of primary geometry which are based upon specific assumed viewing positions. As will be explored in detail in Section 4.3, Willats' (1977a, 1977b, 1985, 1987, 1992a, 1992b, 1995) work over a period of time has synthesised aspects of Marr's theory into a unique approach to the understanding of children's drawings and others whose drawings cannot be defined in terms of primary geometry, but may be understood as examples of the following three categories:

Divergent perspective

This term describes drawings in which the orthogonals diverge. Although strange to

Western eyes, Willats (1997 : 12-13) points out that this system, together with horizontal oblique projection, was the most commonly used in Byzantine art and Russian icon painting during a period of over a thousand years. An example is illustrated in Figure 4.10.

Topological geometry

drawings which map spatial relations such as connections, separation, and enclosure, rather than resemblance and accurate scale, make use of topological geometry. Such drawings may be more easily understood in terms of an object-centred secondary geometry. An example is Figure 4.11.

"Fold-out" drawings and multiple-view drawings

These drawings display information about various aspects of objects and spaces simultaneously. This is not possible in drawings dependent on single-plane projections based on primary geometry. In Figure 4.12, the ground plane has been folded down in orthographic projection in order to convey information otherwise not available from a viewer's position perpendicular to the picture-plane. In the same Drawing, the canopy has been rendered in axonometric projection, affording the viewer a top-view which, whilst inconsistent with the obliquely-projected footstool, affords the viewer extra information about the scene.

To continue with the review of projection types in relation to viewer-centred or object-centred representations:

Multi-plane orthographic projection

These drawings are independent of any single viewing position, and are useful for describing the true proportions and relationships between faces of a three-dimensional object. This projection has become the standard for engineers and architects.

Oblique projections

These may be constructed to describe properties of either an object or interior spaces which would not be visible from certain viewer-centred positions. Figure 4.13 shows interiors of rooms left and right, which would not be possible in a viewer-centred description.

Types of oblique projection are evident in drawings from various cultures and periods. In the West, an early description of oblique projection was given by Cennino Cennini (c1390 : 57) who advised the artist to

> ...put in the buildings by this uniform system: that the mouldings which you make at the top of the building should slant downward from the edge next to the roof; the moulding in the middle of the building, halfway up the face, must be quite level and even; the moulding at the base of the building underneath must slope upward, in the opposite sense to the upper moulding, which slants downward.

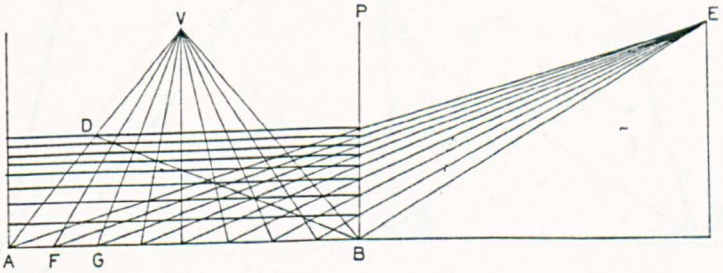
That this advice had already been understood by painters is apparent from Figure 4.14 painted by Giotto in the *Capella degli Scrovegni* at Padua between 1304 and 1308.

One-point, Artificial Perspective

This is a projection system whose primary geometry is based upon what Gibson (1979: 283) termed the *natural perspective* of an array of light reflected from surfaces and converging on the eye. It assumes the viewing position is singular, and static. In terms of secondary geometry , all orthogonals converge on a point known as the vanishing point. Its invention was the culmination of a long-standing desire to produce what Martin Kemp described as

"the imitation of measurable space on a flat surface" (Kemp 1990 : 9). As such, it may be understood as a more rational codification of the former, loose method practised by Giotto and described by Cennini.

Most authorities agree that linear, one-point perspective was invented by Filippo Brunelleschi in Florence. Kemp (1990 : 9) cites a source which suggests the date of 1413. It is certain that the system was codified and published in Latin by Leon Battista Alberti in 1435. The Italian version of 1436 had a prologue addressed to Brunelleschi and explained the primary geometry of light rays reflected from surfaces regarded as the base of a pyramid and converging to an apex at the painter's fixed eye.



Basic perspective construction as demonstrated by Leonardo da Vinci (based on MS A 41r).

E—observer
V—point of covergence for orthogonals from A, F, G, etc.
E is joined to A, F, G etc. Where AE, FE, GE etc. intersect PB, horizontals are drawn.
The diagonal BD is the 'proof' of the resulting projection.

Figure 4.15

Pictorial cues for the perception of depth.

These are usually described as relative size, relative position (on the picture plane) overlap or occlusion of one shape by another, contrast of texture and contrast of tone.

They may be deduced from the geometric construction of Figure 4.16.

They are all the consequences of natural perspective, that is the geometry of the light rays which are reflected from surfaces and edges in the world, projected through the picture plane and on into the eye: The trace left by these projections upon the picture plane is the secondary geometry.

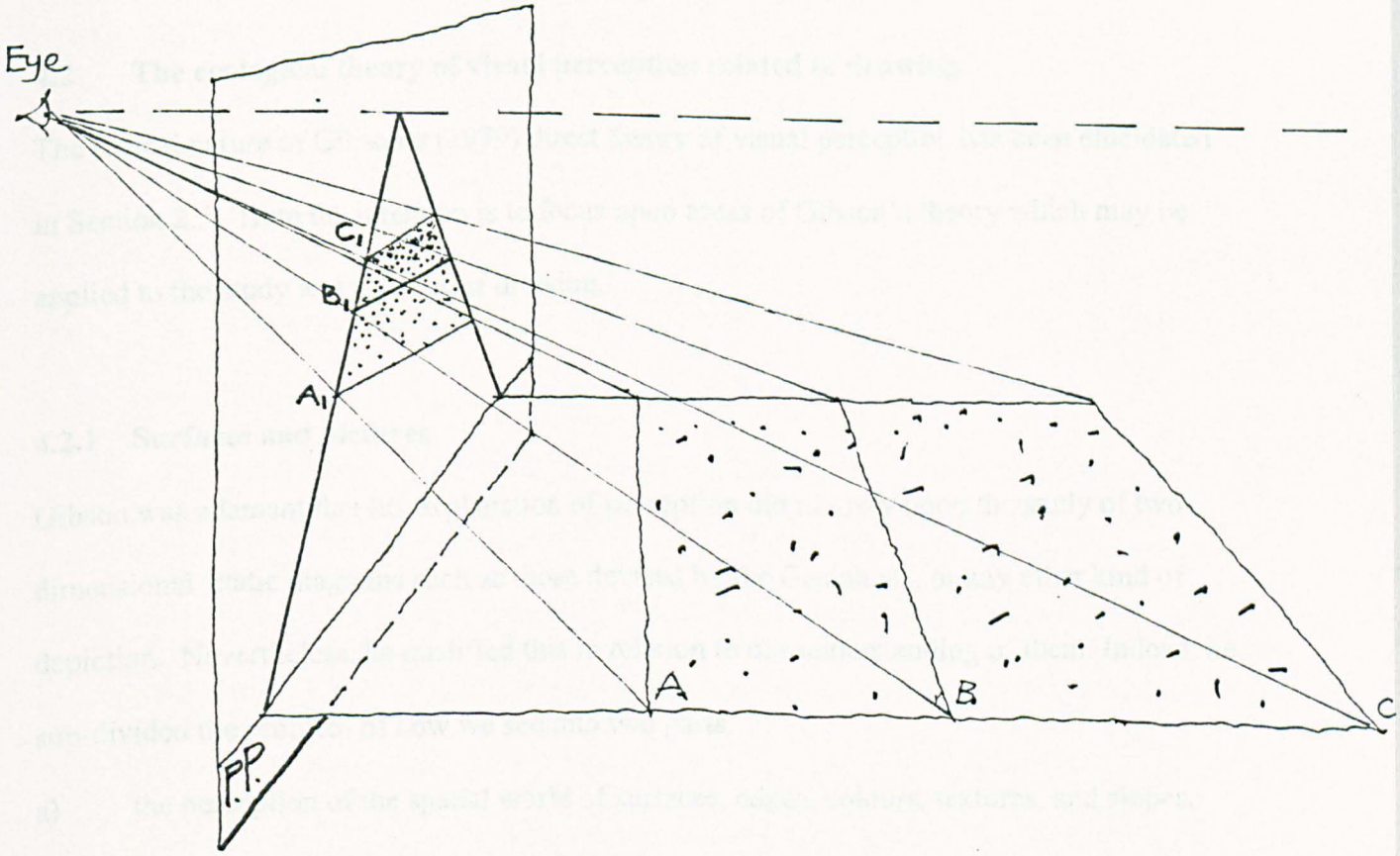


Figure 4.16

Each one of the ways of drawing discussed above makes certain information about three-dimensional objects and spaces explicit, but at the expense of other information that is obscured.

Therefore the choice of a particular way of drawing will depend upon what specific information about the scene, as well as the viewer's position relative to the scene, is deemed important enough to be represented in the Drawing. Moreover, such decisions will vary

according to the intended purpose of the Drawing, for whom it is intended, and according to the socially-conditioned ways that people construe the relationship between themselves and their environment at different ages and in different periods of history.

It is these relationships between drawing and social context that are addressed in Sections 4.5 and 4.6 after an analysis of Gibson's and Marr's influence upon thinking about drawing.

4.2 The ecological theory of visual perception related to drawing.

The radical nature of Gibson's (1979) direct theory of visual perception has been elucidated in Section 2.5. Here the intention is to focus upon areas of Gibson's theory which may be applied to the study and practice of drawing.

4.2.1 Surfaces and pictures

Gibson was adamant that his explanation of perception did not rely upon the study of two-dimensional static diagrams such as those devised by the Gestaltists, or any other kind of depiction. Nevertheless, he qualified this in relation to our understanding of them. Indeed, he sub-divided the problem of how we see into two parts:

a) the perception of the spatial world of surfaces, edges, colours, textures, and slopes. This is the world with which Gibson was pre-occupied.

b) the perception of the world of signification – objects, people, places, signs and symbols. This is the realm of perceiving cultural meanings, namely: the realm of semiotics.

> The perception of surfaces is radically different from the perception of markings on a surface. The former kind of perception is essential to the life of animals, but the latter is not. The former is presupposed when we talk about the latter, and we cannot understand the latter unless we understand the former. But we have been trying to do it the other way around. For many centuries we have assumed that the perception of forms is basic to the perception of the environment, as forms are all that the eye can deliver to the brain, and depth has to be somehow added to the forms. The perception

of forms, however, must be the perception of marks on a surface, if it is any kind of perception at all.

Gibson (1980) p.xi

Clearly, Gibson used the term "form" to mean two-dimensional shape.

The properties *of* surfaces and the properties of the shapes and figures produced *on* a surface are different. Nevertheless, Gibson argued that philosophers and psychologists have long confused them. He listed the differences in some detail (Gibson 1980 : xii) which may be described as follows:

a). All animals perceive surfaces, but only humans make and perceive pictures and symbols upon surfaces in order to communicate.

b) A surface has a texture but it does not either represent or symbolise another surface. The pattern *of* a surface and the pattern *made on* a surface are different.

c) Surfaces have the kinds of meanings that Gibson termed *affordances*, whereas marks on a surface can have referential meanings; that is the marks refer to something other than the surface itself.

d) The various affordances of surfaces, substances and events may be perceived in the course of development of any young animal by maturation and learning taken together, by encountering the surfaces in the habitat, without schooling. On the other hand, the referential meanings of marks on a surface are apprehended by children in ways that differ from the preceding, and also differ from one another. For example, they are different for pictures, and letters of the alphabet. drawings and diagrams can be iconic or indexical; alphabetic writing is wholly symbolic. But however different the learning of pictorial reference may be from the learning of linguistic reference, they are even more radically different from the learning of what surfaces afford.

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d) The various affordances of surfaces, substances and events may be perceived in the course of development of any young animal by maturation and learning taken together, by encountering the surfaces in the habitat, without schooling. On the other hand, the referential meanings of marks on a surface are apprehended by children in ways that differ from the preceding, and also differ from one another. For example, they are different for pictures, and letters of the alphabet. drawings and diagrams can be iconic or indexical; alphabetic writing is wholly symbolic. But however different the learning of pictorial reference may be from the learning of linguistic reference, they are even more radically different from the learning of what surfaces afford.

shape there exists an infinite set of possible objects in space, and for any given solid object that moves there exists an infinite set of possible shape-projections. A frozen shape does not specify the solid form of an object, but only some of the invariant features of that object. Furthermore, Gibson (1979 : 269) claimed we never see just a shape in isolation; we see a sample of the ambient optic array.

If Gibson is right, most of the experiments by psychologists of perception, including the Gestaltists, have been irrelevant to the study of seeing for survival (although Gestalt theory is perhaps applicable to the perception of pictures). Vision is at its simplest when it fulfils its primary function, not when it is adapted to confirm theories based on projective geometry. And the primary function of vision is to enable the organism to survive within its environment.

From the position of the cognitivists, drawing is always one of three activities: drawing from 'life', from 'memory', or from 'imagination'.

For them, drawing is always copying: the copying of a perceptual image is drawing from life. The copying of a stored image is drawing from memory; while the copying of an image constructed from other memory images is drawing from imagination. This theory of drawing is consistent with what Gibson (1979 : 278) called the mentalistic doctrine which assumes an optical image on the retina, a physiological image in the receptors, a transmitted image in the nerve, a cerebral image in the brain, and finally a mental image in the mind which is subject to transformation. The projecting of a mental image (*schema*) outwards upon an existing drawing is supposed to explain one's perception of that drawing, as Gombrich (1960) maintained in *Art and Illusion*.

Gibson insisted that the drawer does not replicate or copy, but marks the drawing surface in such a way as to display invariants and record signs of an awareness of being in a certain place at a certain time.

Put very simply, a drawing is surface that always specifies something other than what it is. A drawing preserves what its maker has noticed, and considers worth noticing (Gibson 1979 : 274). What is noticed are invariants underlying the variant structure of light rays at a point (fixed or moving) of observation. The invariants are not abstractions or concepts. They are not knowledge. They are simply invariants.

For Gibson (1979 : 279), drawing is never copying. He claimed it is impossible to copy a piece of the environment. "Only another drawing can be copied. We have been misled for too long by the fallacy that a picture is *similar* to what is depicts, a *likeness* or an *imitation* of it". He claimed that the term 'representation' used in this context is misleading. "There is no such thing as a literal re-presentation of an earlier optic array...Some of its invariants can be noticed and preserved, but that is all...Efforts by philosophers and psychologists to clarify what is meant by *representation* have failed...because the concept is wrong. A picture is not an imitation of past seeing". (Gibson 1979 : 279-280)

And of course a picture is a surface in its own right as well as being a display of information about something else. The viewer cannot help but see both, yet this is a paradox, since the two kinds of awareness are discrepant. Gibson resolved the paradox by explaining that a picture always requires two kinds of apprehension that go on at the same time: one is direct, and the other indirect. There is a direct perceiving of the picture surface, along with an indirect awareness which is equivalent to an indirect knowing or imagining of 'virtual' surfaces.

4.2.3 Putting Perspective into perspective

The term 'perspective' is a problematic one. It is a generic term, the specific sub-meanings of which may be qualified. The theory of geometric projection of flat shape profiles from solid objects onto a transparent picture plane and through to a stationary single eye position is

a Renaissance discovery that may be termed *artificial perspective*. The development of this projection system was discussed in Section 4.1.4. In contrast, Gibson's concept of the ambient optic array, that is, light rays reflected from surfaces and edges in the environment to all points, one of which may be a point of observation not necessarily fixed, reveals a *natural perspective*, (Gibson 1979 : 283) which is not the same thing as artificial perspective.

Artificial perspective leads to a set of geometric prescriptions for producing 'virtual space' on a flat surface, and is based on the assumption of a single, fixed eye position.

Natural perspective leads to ecological optics and the concept of the invariant structure in a changing optic array. Gibson (1979 : 238) lamented that many picture makers are inclined to ignore the reality of natural perspective when rejecting the constraints of artificial perspective. It is equally disturbing that many people, convinced by the logic of classical optics and projective geometry, reject the efforts of those drawers who wish to communicate the essences of visual experience using systems other than artificial perspective.

These difficulties arise from a lack of understanding about how invariant structure may be separated from perspective structure. The invariants display a world with nobody in it, and the perspective displays where the observer is positioned. Using invariant information in the structure of light, it is possible to depict without a fixed point of observation, just as it is possible to visualise without a fixed point of observation. Most drawing systems, apart from artificial perspective, do this. But it is depiction that assumes a fixed point of view which is the most familiar kind in the West. Moreover, since the ubiquitous photographic image is necessarily of this sort, the illusion of reality generated by fixed point artificial perspective has been reinforced.

Gibson's (1979 : 284) approach encourages us to recognise that it is not an illusion of reality that is induced in these pictures, but simply an awareness of being positioned in the world.

The argument that artificial perspective is no more than a Western convention appears to be supported by Erwin Panofsky (1927) who observed that perspective is "symbolic". Both he and Gyorgy Kepes (1944) who wrote of the "language of vision", implied that the arbitrary relationship between word-symbols and their referents could be applied to pictures. Nelson Goodman (1968) argued that depiction is fundamentally description, that we learn to read a picture as we learn to read a language, and that linear perspective could just as well be reversed from the way members of a particular cultural group have become accustomed to interpreting it. His point is borne out by pictures produced in India and Japan, as well as examples of Italian pictures produced pre-1413, and more recently, as in Figure 4.10.

Gibson (1979 : 285) argued that the notion that awareness of the visual world can be reduced by steady introspection to a flat patchwork of coloured shapes - the recovery of 'innocent vision' - has developed from the sensation-based perception theories of Hume, Helmholtz and others. This development runs closely in parallel with the rise of artificial perspective painting from the early Renaissance to the nineteenth century. A picture was deemed to be a patchwork of projected flat shapes on a surface. By analogy, the picture in the eye was assumed as a patchwork of projected coloured light on the surface of the retina. This was believed to be the basis of visual perception, and all major psychologists during this period - as well as influential drawing teachers such as Ruskin (1857) - accepted this doctrine of two-dimensional sensations. As we have seen in Section 2, they disagreed only in that some believed the cues for depth perception to be wholly learned, and others believed that concepts of space were innate.

However, Gibson proposed that the notion of perception beginning with a flat patchwork of colours is derived from the experience of practising drawing, not from an unbiased description of one's visual field. [5] Actually, what we become aware of by observing a static scene with one stationary eye is not visual sensations but only the surfaces of the world that

are revealed at that moment at that place. We notice the occlusion of surfaces - the overlapping of one opaque substance by another - and we notice the texture gradient but we do not notice the third dimension. The attitude adopted to notice this may be called introspective, but it is really a reciprocal, two-way attitude, one that has been described as a 'quality event', (Riley, 1984)

Drawing in perspective requires the observer to learn how to separate the hidden from the unhidden surfaces viewed from a static observation point by noticing the occluding edges that separate them. N*atural perspective* is at work here – the array of nested solid angles of light rays with their bases the surfaces of the world and their common apex at the eye – rather than the patchwork perspective of drawn shapes and tones.

4.2.4 Principles of line drawing

Gibson (1979 : 287) was quite clear about the limitations of line. For him, a line drawing (in its purest sense) can only specify the following invariants of surface layout:

a corner

an edge

an occluding edge

a wire

a fissure or crack in a surface

a skyline, the division between earth and sky

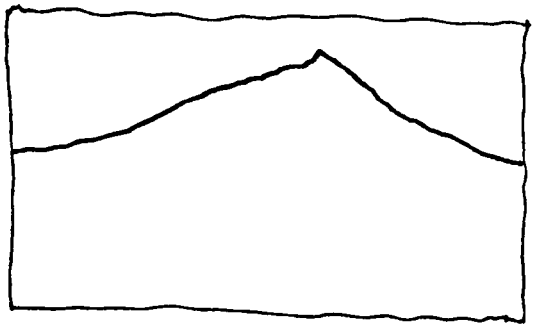


Figure 4.17

A line drawing cannot specify the following invariants: gradation of tone on a curved surface; a cast shadow; surface texture; surface reflectance.

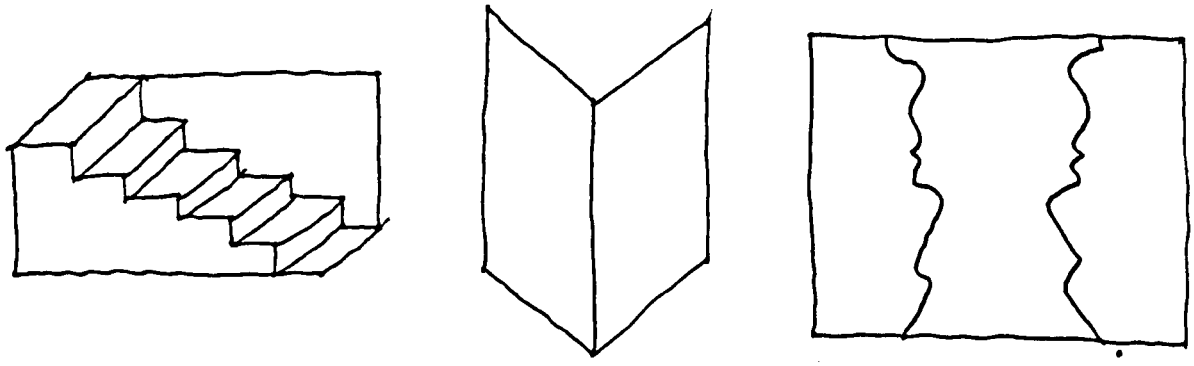
Furthermore, Gibson argued, the lines of a drawing must connect with one another if they are to specify superordinate and subordinate areas in an ecologically sensible way. He insisted that the lines which separate different areas on the picture plane should therefore not be called 'outlines' since this term implies detached objects in empty space and the fallacy that figure-on-ground is the prototype of natural perception. He argued that the term 'outline' refers mainly to the occluding edge of a detached object, but not that of an aperture. A line in a drawing can occlude either inward or outward depending on its connection with other lines. (See discussion of ambiguous drawings below). And the angled junction of two plane surfaces is given by a line, but this is not an 'outline'. Gibson confined the term 'outline drawing' to the unusual and misleading case of a line with closure, one that returns upon itself, an enclosed shape, and this kind of display contains only the weakest sort of information about anything. As pointed out earlier, it does not even specify the solid form of a detached object.

The information in a line drawing is embedded in the *connections* of the lines, not in the lines themselves. To put it another way, information is found in the relationships between lines, and the ways that the enclosed shapes are nested together, but not in the shapes themselves.

4.2.5 Ambiguous drawings and reversible figures

drawings which are ambiguous or reversible with respect to what is seen have been interpreted by Gestalt theorists as proving that perceiving depends more on the perceiver than it does on the external stimulus. But if such drawings are analysed as sources of *information* rather than *stimulation*, the puzzle becomes intelligible. The information in the array of light from these drawings is equivocal. There are two incompatible kinds of pictorial information in the light to the eye, and the percept changes when the observer shifts from one kind to the

other. In the following diagrams, information for depth at an edge has been arranged to specify two different and opposite directions of depth.



a b c

Figure 4.18a,b,c

The classical puzzles that arise with the cognitivist theory of vision (where the mind is believed to be in the brain, rather than distributed about the body in musculatory responses to movement and change) are resolved by recognising that the invariants are weaker and the ambiguities stronger when the point of observation is motionless.

It is worth noting that these puzzles are always human-made, static, 2-D drawings.[6] Such puzzles rarely occur in the natural environment.

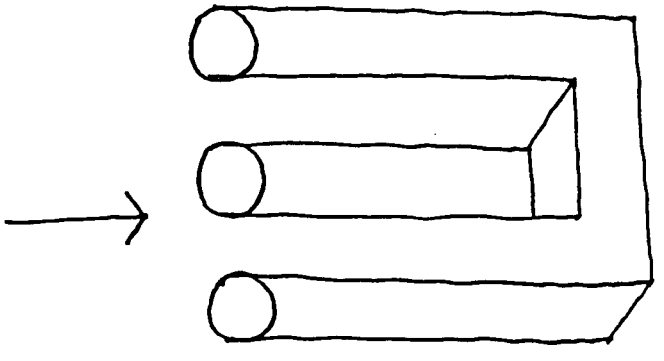


Figure 4.18d

In the figure above the key line arrowed appears to occlude the background on its lower side at the left-hand end, but appears to occlude the background on its *upper* side at the right-hand end. This is an ecological contradiction made possible by the omission of normally-occurring information of surface textures and tone contrasts.

The figures below show four different types of occlusion specified by the different modes of intersection of the same line elements:

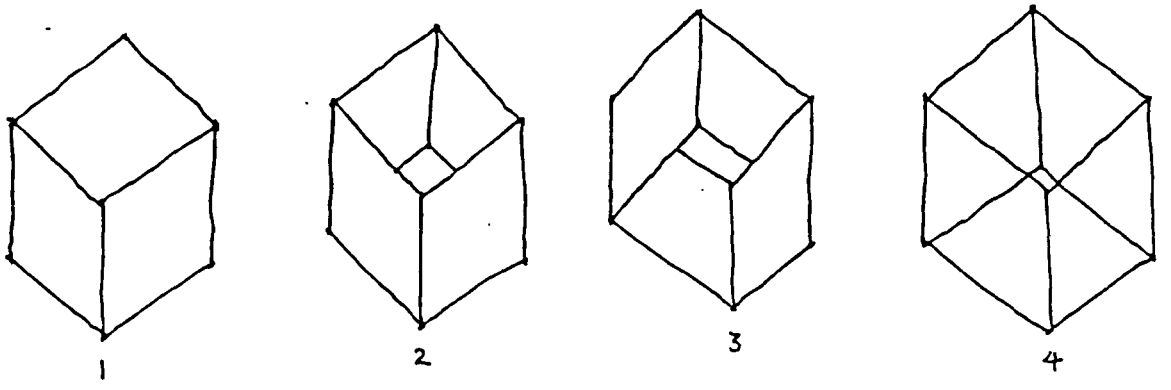


Figure 4.18e

It is the *connections* of the lines in these drawings that convey information - not the lines as such. What differs in the above drawings, Figure 4.18e, is the information for perceiving occlusion, not for perceiving depth. All of these diagrams may be perceptually reversed, although the first and fourth are easier to fluctuate than the other two, which require the perceptual construction of an upside-down truncated pyramid.

Clearly, the lines of line drawings and the edges of material surfaces are entirely different. The depicting of surfaces should not be confused with the layouts of projective geometry. Although line drawing can be a fascinating exercise, it is not fundamental to discovering better ways of specifying the information present in the structure of light. Much of the information in a natural optic array is lost in line drawing inasmuch as the array cannot be reduced to nested solid angles. The invariants present under changing illumination and under

changing direction of illumination are lost, as are the invariant relations that specify textures and surface colours.

Some of these of course, may be captured by painters using non-linemaking implements, but what is lost in any picture, drawing or photograph, is the information that can only be extracted from the *changing perspective structure of the ambient optic array of a moving observer.*

4.2.6 Gibson and semiotics

One conclusion that may be drawn from this discussion of Gibson's work is that the function of drawing is not to record a perception. It may be argued that drawing is not an imitation of past seeing. *"What it records, registers or consolidates is information, not sense data."* Gibson (1979 : 80).

Drawing is a semiotic process. It could be argued that m*aking a drawing is a human activity that transforms perception of the materials of the world into cultural meanings.*

Looking at a drawing is a dual activity. It is the looking at a surface in order to pick up information about what it naturally affords the viewer, and it is also the transformation of the marks upon that surface into cultural meaning. Such transformations are on-going, as perpetual as the constantly - changing relationship between observer and environment. The viewer of a drawing may be understood as an interpreter of signs. Gibson's approach allows us to substitute semiotic elements for optical invariants. We are then able to interpret the culturally determined and historically-variable conventions of drawing in terms of the underlying ecological regularities which are common to all cultural groups.

The activity of drawing is a manifestation of some aspect of the relationship between the drawer and their environment.

Material substances, media such as air and water, and the surfaces which separate them condition the behaviour of each individual being: the individual conditions environment. That each constantly exerts forces upon the other is a fundamental principle of ecological theory. Any resultant drawing is a sign of that relationship. It signifies not the drawer's perception of environment, but the meaning made between the environment and the individual.

4.2.7 Gibson and children's drawing development

Gibson (1979 : 276) claimed that the young child learning to draw will depict the invariants within the ambient array of light that they have noticed up to the particular stage of development they have reached. Children do not draw in what Gibson (1979 : 286) termed "patchwork" perspective, meaning the flattening out of objects and scenes, because they have never seen the world as a flat patchwork of coloured shapes. Neither do they first draw in "edge" perspective (Gibson 1979 : 286), which means the layout of the occluding edges of the surfaces of the world, and which Gibson insisted was a fact of perception as opposed to the Ruskinian myth of patchwork perspective, simply because they may not yet have noticed them. Young children begin to notice more invariant features of the array of light as they continue to exercise their drawing practice. Gibson (1979 : 276) listed some of these features.

> The quality called *straight* looks different from that called *curved*, and there are opposite curves. The trace can begin and end, or it can be continuous. A continuous trace can change direction with a jerk, and zigzag (although terms such as angle and apex will not be learned for years). A line can be made between existing marks to connect them, and marks can be lined up. A continuous trace can come back to where it began, whereupon a peculiar feature emerges that we call *closure*. A continuous trace is apt to produce an invariant called *intersection*. It makes *connections*. Traces that do not interact are very peculiar and some have the quality of being *parallel*. It will become evident that a new trace that exactly follows an old one adds nothing to the display (although the term *coincide* has yet to be learned).

> It may be noticed that a trace on one sheet of paper can be fitted over a trace on another sheet...This is preparation for the axiom of *congruence* in Euclidian geometry.
>
> All of these features in the scribbles of childhood are invariants. While they are being noticed in the child's own trace-making, they are surely also being noticed in the pictures that are shown in the nursery, and eventually some of the natural invariants that appeared in the ambient array from the outset will begin to be identified with the graphic invariants.

Gibson argued that, although the child may not draw in edge perspective yet, they may draw a table using a rectangle for the top and four thinner marks connected to its corners *because those are the invariant features of the table they have noticed.*

Gibson claimed that this is a better explanation than the traditional one saying the child draws what they *know* about the table (concept), instead of what they *see* of the table (sensation). The fatal flaw of that argument for Gibson is that it ought to be the other way around: the child should begin by drawing sensations and progress to drawing concepts. This argument will be addressed thoroughly in Section 4.3.

4.3 The computational theory of vision related to drawing

In Section 2.6 some of the terminology of machine vision research which Marr (1982) utilised and developed was defined and discussed.

Here it is necessary to introduce some other terms from that discipline in order to specify the differences between discussion of the visual world, or *scene*, and two-dimensional material representations of it, or *pictures*. The simplest elements making up the material world, *scene primitives* such as edges, boundaries, corners, texture units and surface segments, are transformed through drawing into *picture primitives* such as lines, line-junctions, points and *regions* (Willats 1997 : 290)

Marr argued that vision consists in the algorithmic transformation of the retinal images in order to produce *viewer-centred* internal representations and ultimately *object-centred* internal representations which enable us to negotiate the physical world. Using such terminology, drawing itself may be considered as a process of transformation; from those object-centred, internal 3-D model descriptions of a scene, to a two-dimensional external representation, or picture. A picture too, may be either viewer - or object-centred, depending on the algorithm which specifies its particular system of geometric projection. Some of these algorithms may describe the way light is transmitted through space - for example, the algorithm that specifies an artificial perspective projection. Some of them most certainly do not - transformation rules that specify the reversal of optical rules are evident in drawings - for example reverse perspective, or pictures based on topological transformations, as discussed in Section 4.1.2.

One purpose of such pictures is to communicate the experiences of seeing, and drawing may enable contemplation of the very process of transformation from viewer-centred to object-centred representations, as we shall see in Section 5.

Apart from informing the activity of drawing itself, Marr's methodology adapted to the study of children's drawings has been able to provide insights into how they develop through a series of stages identified with children's developing awareness of themselves and their relationship with the world of objects and events.

4.3.1 John Willats' adaptation of Marr's theory

Willats (1987, 1995, 1997) has been able to advance a consistent theory of children's drawing development by treating them as "information-processing devices for producing pictures". (Willats 1995 : 28) He proposes that the ways people convey their experiences of the world

through drawings may be described in terms of two systems that afford the drawer access to compositional choices: the *drawing system*, and the *denotation system*. In terms of the social semiotic model introduced in Section 3.5 (and elaborated in Section 4.6) Willats' systems may be understood to be two systems of many compositional devices affording choices from the geometries and vocabulary of marks available to the drawer in order to realise in material form their experiential and interpersonal intentions. Although Willats does not refer to Halliday (1985) or Michael O'Toole (1994)[7] and makes no reference to systemic-functional semiotics in his writings, his intention appears remarkably similar to those exponents of social semiotics:

> ...I shall try to show that analysing pictures in terms of these two representational systems (the drawing system and the denotation system) can be *useful*...I shall argue that differences in the representational systems found in different periods and cultures, and the changes that have taken place in these representational systems during the course of art history and that take place during the course of children's drawing development, are mainly determined by the different functions that representational systems are called on to serve.
>
> Willats (1997 : 1-2)

In fact Willats' proposal is derived from Marr's and Nishihara's work on what they termed the representation of "three-dimensional shapes" or form. [8]

They identified three aspects of a representation's design:

> (i) the representation's co-ordinate system (ii) its primitives, which are the primary units of shape information used in the representation, and (iii) the organisation the representation imposes on the information in its descriptions.
>
> Marr & Nishihara (1978 : 269)

Viewer - and object-centred co-ordinate systems used in drawing, and Willats' contributions to their classification were discussed in Section 4.1.2 under the term *Drawing conventions*. Their function is to transform three-dimensional spatial relationships in the scene into two-dimensional geometrical relationships on the picture surface. The function of Willats' denotation systems, however, is to transform scene primitives into picture primitives. The term 'denotation' implies not *how* something is represented, but *what* is represented. In

practice of course, every selection of picture primitive will function interpersonally to produce connotative meanings.

The distinction between the geometric relationships on the picture-plane and what they denote is crucial, because otherwise the two are easily conflated. For example, in our everyday use of language, lines on a drawing surface are referred to as edges of objects; depicted two-dimensional shapes are described as three-dimensional forms; two-dimensional patterns are spoken of as three-dimensional texture. Gibson (see Section 4.2) identified this problem when he wrote of the duality of seeing; the perception of the spatial world of undulating surfaces, edges, colour and texture as opposed to the perception of the world of signification, which of course includes drawings. René Magritte's *Treason of images* (1927) *Figure 4.19* is perhaps the best-known warning of this pitfall.

4.3.2 Denotation systems, scene primitives and picture primitives

Scene primitives are such things as edges, corners, surfaces or 'generalised cones.' Marr (1977 : 442-3) defined a generalised cone as "the surface swept out by moving a cross-section of fixed shape but smoothly-varying size, along an axis". Willats prefers the term *extendedness* in one, two and three directions to describe such volumes. Scene primitives may be zero-, one-, two-, or three-dimensional. A zero-dimensional scene primitive may be a corner-point of an object; an edge may be a one-dimensional primitive; a surface may be a two-dimensional primitive, and a volume or generalised cone may be a three-dimensional primitive. The activity of drawing transforms these scene primitives into picture primitives, and Willats (1997 : 93) classifies denotation systems as being based upon such picture primitives as points, lines or regions.

Picture primitives may be zero-, one-, or two-dimensional. A zero-dimensional picture primitive representing a corner, may be the point of a junction between two lines. A one-dimensional picture primitive representing an edge, may be a line. Two-dimensional picture primitives, representing surfaces, are regions, or faces. (A *region* in a drawing is Willats' term for the projected shape of a three-dimensional object in a viewer-centred drawing system. A *face* is his term for a projected shape in an object-centred drawing system). Such a concise terminology deriving from Marr's approach and differentiating between viewer - and object-centred drawings, scene and picture primitives, has allowed Willats to offer critiques of other theories of children's drawing development, and to propose an alternative.

4.3.3 Marr, Willats, and children's drawing

The most generally accepted explanation of children's drawing development until Willats' was that young children draw what they know, and older children draw what they see. This argument, put forward as early as A. B. Clark (1897) was developed by G. H. Luquet (1913, 1927) into a theory of intellectual realism versus visual realism. The change from intellectual to visual realism was deemed to occur between the ages of seven and nine years. Willats (1997 : 288) has suggested that the distinction between intellectual and visual realism may be interpreted as that between object-centred and viewer-centred internal descriptions as theorised by Marr. Jean Piaget and B. Inhelder (1956) inherited Luquet's theory, but added their insight about the child's development of space conception based upon invariant geometry, in which certain spatial relations remain invariant over transformations from one coordinate system to another.

The classes of invariant geometry form a hierarchy in which each one is a special case of the one before (above) it:

Stage 1	Topology
Stage 2	Projective geometry (perspective)
Stage 3	Affine geometry (oblique projections)
Stage 4	Metric geometry (orthographic projections)

Apart from Topology, these classes and their invariants were discussed in detail in Section 4.1.1. The number of invariant features increases from stage 1 to stage 4, so that features remaining invariant under transformation in Metric geometry include: size, shape, angle relationships, straightness, parallelism, length, ratio of length, area, and others.

Piaget and Inhelder suggested that progression from stage 1 to 4 could account for the child's development of a conception of space, and therefore the development of drawing ability. However, Willats (1977a) showed that in practice the developmental sequence was the reverse:

Children aged between 5 and 17 were asked to draw a table with various objects on it from a fixed viewpoint. Figure 4.20 illustrates typical results.

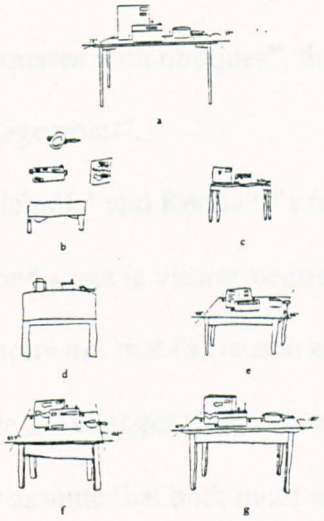


Figure 4.20

The drawings and the children's ages were classified as follows:

b No projection system (Topological); average age 7.4 years

c Orthographic projection (Metric geometry); average age 9.7 years

d Vertical oblique projection (Affine geometry); average age 11.9 years

e Oblique projection (Affine geometry); average age 13.6 years

f Naïve perspective (Projective geometry); average age 14.3 years

g Perspective (Projective geometry); average age 13.7 years

This experiment demonstrated that there seems to be a clear sequence of development from orthographic, through oblique, to perspective drawing as the child grows older.

In Marr's terminology, Willats' experiment shows that children begin drawing their surroundings using object-centred descriptions, and progress to viewer-centred descriptions.

Rather more recently, A. L. Nicholls and John M. Kennedy (1992 : 240) identified two distinct stages in children's drawings of a cube. At the "one-square" stage children drew with "parts of the object being geometrically similar to arrangements of lines on the drawing

surface". At the second stage, "squares with obliques", their drawings were based on "matching directions from a vantage point".

Willats (1995 : 29) argues that Nicholls' and Kennedy's first stage is based on an object-centred description and their second stage is viewer-centred.

His important contribution is to point out that the reason other theories of development of children's drawing seem to ignore the changes from object-centred drawings to viewer-centred drawings is because they assume that both input and output are *view-based,* regardless of age. The weakness of these arguments is that they do not recognise the possibilities of any algorithms that would allow the transformation of view-based input to object-centred drawings as output, and subsequently from object-centred drawings to viewer-centred drawings.

Algorithms – the rules governing the transformations from one kind of drawing to another – are culture-specific, and indicate the drawer's ideological positioning, as well as their mental positioning in relation to the scene depicted.

Willats' insights are important to the teaching of drawing, since they allow the opportunity to explore how the variety of ways in which selections from the range of drawing systems and denotation systems may be combined to produce the cultural variety of drawing styles. This opportunity is fully explored in Section 4.6, with discussion about how such selections and combinations operate semiotically to make visible the ideologies and belief-systems of the culture in which they are produced.

Margaret Hagen (1986) presented an interesting conundrum when she argued firstly against any notion of a hierarchy of drawing styles: "...development in art does not take place historically or culturally, no specifiable pattern or set of characteristics distinguishes earlier styles from later ones". (Hagen 1986 : 271) She went on to say "In younger children,

Orthogonality is commonplace;...In older children Affine and Projective systems also make an appearance..." (Hagen 1986 : 279 – 280) In the first instance, her statement comes after, and in support of her argument that the way people draw is a function of their particular cultural experiences. Such a position seems to correlate with the argument set out in Section 3.5, in which it was proposed that changes in social circumstances affect the ways that people use language. This argument is further elaborated in Sections 4.5 and 4.6 where it is applied to drawing.

Could it be that the process of development that both Hagen and Willats observed in the drawings of children is simply evidence of a growing awareness of the child's position as an individual within the culture? Such self-awareness may be indicated by the development from object-centred drawings to viewer-centred drawings. Only after children have achieved this state of awareness do their drawings become subject to the wider demands of social conventions and cultural constraints, and the wider range of functions that drawings are called upon to serve.

4.3.4 Marr and Gibson: common ground

Hagen's work was heavily influenced by Gibsonian theory. In Section 4.2.7, Gibson's explanation of the development of children's drawing challenged the traditional argument that children first draw what they know and then develop to draw what they see, by pointing out that if the argument is to be couched in those terms, then they should be the other way around. Gibson attempted to by-pass this constructed antithesis of seeing *versus* knowing by claiming that children initially draw those invariant features of objects they notice first, and that their drawings alter as their awareness of what they notice expands. In doing so, Gibson appears to be explaining what in Marr's terms would be the transformation process from raw

primary sketch through the 2½-D sketch to a 3-D model description, and finally to pictures. It may be that as children's awareness of their positioning in the world develops along with hand-eye co-ordination, so does their ability to display their object-centred internal descriptions through the making of object-centred pictures, and later viewer-centred pictures.

It was suggested in Section 2.6 that Marr's and Gibson's positions share common ground. For example, here are several principles laid down by Gibson (1950 : 6) which appear to be consistent with Marr's theory. The main principles follow from the hypothesis that there is no perception of space without the perception of a continuous background surface:

1. The elementary impressions of a visual world are those of surface and edge.

2. There is always some variable in stimulation which corresponds to a property of the physical environment (for example, the variable stimulus corresponding to 'surface' is probably a textured retinal image; stimulus for distance or depth over a continuous surface may be an increase or decrease in the density of the texture of the retinal image. The variable stimulus for 'edge' is probably the contrast boundary between two different light-intensities upon the surface of the retina).

3. The stimulus-variable within the retinal image to which a property of the environment corresponds need only be a correlate of that property, not a copy of it *(Gibson explains that solidarity and depth in reality cannot have any replica in the two-dimensional retinal image, but they may have correlates there).*

4. The inhomogeneities of the retinal image are analogous to the variables of physical energy and this means that the pattern of retinal image can be considered a stimulus.

Such principles indicate a closer correlation between Gibson and Marr than is generally acknowledged, and it is these correlations that afford the opportunity to adapt both theorists within a model that relates perception theory and visual communication theory. This will be discussed in Sections 4.5 and 4.6.

4.4 Visual perception and cultural communication: A discussion of Rudolph Arnheim's position

To study perception in relation to drawing is to recognise the relationship between how we construe the information received in the light at our eyes and how we construct ways of visually communicating such information and our responses to it. In this section, aspects of Gestalt theory and other visual perception theory are connected through discussion of Rudolph Arnheim's (1974) work on the psychology of the creative eye. Arnheim reconsidered the Gestaltist thesis that innate physiological forces in the brain somehow correlate with the nature of the stimulus upon the retinae. He proposed that visual form is not the result of innate forces but is manifest in the tensions, balance and dynamics inherent in the activity of seeing. It is these dynamic structural relationships that are described by the Gestaltists' principles of organisation.

> *Visual perception consists in the experiencing of visual forces.*
> Arnheim (1974 : 412)

However, Arnheim went further than this. He explored more than tension and dynamic structure in the visual forces we perceive. He recognised that we make sense of perceptual dynamics within a culturally-determined context of meanings and values. Indeed, his main task has been to theorise how visual form and cultural meaning are related.

4.4.1 Visual form and cultural meaning

For Arnheim the act of perception and the act of artistic creation are similar, in the sense that both involve the discerning of structural features or pattern through the principles of organisation. Semir Zeki, Professor of Neurobiology at the University of London, has recently brought to bear neurological research to support this proposition (Zeki 1999)

Arnheim's approach studied the connections between pictorial elements such as line, shape, tone, texture and colour, and how resulting compositions of those elements come to have meaning and value for the observer. He saw formal composition as a visual code for communicating the relationships between dynamic perceptual forces.

This approach to the perception of pictures draws parallels between the Gestalt principles of organisation, the bio-physical principles that every human observer experiences by moving around in the world (experiences dictated by natural forces such as the ways that combinations of materials react to gravity and motion relative to a light source, for example), and cultural principles by which the observer attributes meanings and values to those combinations. Arnheim suggests that the perception of pictures seeks out those parallels, which takes him further towards a coherent explanation of how pictures convey meaning than any other theorist relying on Gestalt principles alone.

4.4.2 Objective meanings and culturally-realistic meanings

Assuming perceptual dynamics to be a universal human experience, Arnheim (1980 : 169) argued we then invent "metaphorical devices of symbolism" to represent that bio-physical experience, and these are devices which enable the articulation of a visual language.

Thus, the meaning of a drawing is symbolised by the compositional relationships between shapes, tones, textures, and colours.

By adopting this stance, Arnheim suggests that meaning becomes "objectified" (Arnheim 1980 : 175) and the variability of observers' responses can be neglected.

This does not appear to accommodate the possibility that meaning may be negotiated through an individual viewer's own cultural experience and personality, even though Arnheim himself states:

> ...perception is not the mechanical recording of optical projections but an active grasping and creating of structure. Perception organises stimulus

> material by integrating a two-fold input. On the one hand, it structures the optical projections, received by the retinae of the eyes, in keeping with the configurations inherent in those projections. On the other hand, it applies the form patterns to which the recipient person is geared by his cultural training and individual disposition...A changed disposition will make for a different response to the same stimulus.
>
> Arnheim (1980 : 176)

Notwithstanding this admission of a relativity of meaning, Arnheim (1980 : 177) utilises the Gestalt principles of organisation to assert: "Even so an observer's mind cannot manipulate visual patterns in just any way it pleases".

How then, does he resolve this apparent contradiction between "objective" meaning and culturally relativistic meanings? By implementing a model of the hierarchy of levels of perception reminiscent of Marr's (1982) model discussed in Section 2.6, and applying it to the recognition of levels of compositional organisation and iconography:

> Remember here that works of art come in layers. Even in the purely perceptual sense a visual object is organised in a hierarchy that leads from the broadest overall shapes to the smallest details. Although a viewer may begin his exploration perversely by concentrating on an attractive detail, he cannot hope to do justice to what he is shown unless he succeeds in seeing the top layer of the compositional organisation as the overall theme that refines and specifies itself from level to level.
>
> Arnheim (1980 : 179)

Michelangelo's Sistine Chapel painting of God separating the earth from the waters (Figure 4.21) illustrates this model. At its most general level of composition, this painting may be read as an image of a container's (the oval shape) content (the figure) breaking out of its boundary. Metaphorically, such a compositional device may function at various levels; biological, political, psychological, philosophical. At the next level of reading, a male figure stretches outside the boundary of his cloak; further levels of iconographical detail specify the precise Biblical meaning intended by Michelangelo's patrons. Arnheim argues that the general level reading would fit the experience of every human viewer, whatever their cultural backgrounds. Each further level of reading, down to the narrowest iconographical references, reduces the number of viewers able to interpret the cultural-specific meaning of the image.

Note that at each level, a coherent reading is available, so that anyone viewing a drawing from an exotic culture may be able to make a common sense of it *at the level of reading accessible to that viewer*, augmenting this common understanding with individualistically determined connotations

Arnheim may be seen as a pioneer of the attempt to apply principles of visual perception theory – particularly Gestalt Theory – to the reading of pictures, so as to provide a practically-useful semiotics of pictorial composition. However, his approach can be adapted and refined in the light of more recent developments in visual perception theories and theories of social semiotics.

This will be attempted in Sections 4.5 and 4.6.

4.5 Perceptual modes - semiotic codes - social *mores*

Section 4.1 discussed how visual information about the world and the observer's position within it is negotiated during the activity of perception.

Subsequently, it was demonstrated how such information may be transformed into systems of geometry (semiotic codes) in order to visually communicate the experience of perceiving.

The nature of the relationship between how we see and how we draw has thus been established in general terms.

This Section considers how the structures of drawing conventions correlate to the social context in which they are deployed, and how our construing of such context affects the way we see the world. It has already been discussed in Section 3 how Sapir and Whorf suggested that our understanding of the concept of *reality* is socially constructed through language. The work of Pierre Bourdieu (1984) has established that *taste* is also culturally determined.[9]

Raymond Williams (1954 : 21, 1979 : 158-9) referred to "structures of feeling"[10], those culturally-inherited ways of making sense of, and responding aesthetically to the social realities in which we live.

It may be argued that the aesthetic sensibility which art schools aim to develop in students is also culturally-determined; such sensibility is *the product of correlations between semiotic codes and the social structures in which those codes have become conventionalised.*

Visual semiotic codes, those systems of signs we invent to represent and express our attitudes towards aspects of the world, are conditioned by our perceptual experiences of the world. They are the means through which we express the perceptual relations which exist between us as bodies, and our physical environment.

Therefore it becomes feasible to suggest a triadic structure linking perceptual modes, ways of drawing, and types of social structure:

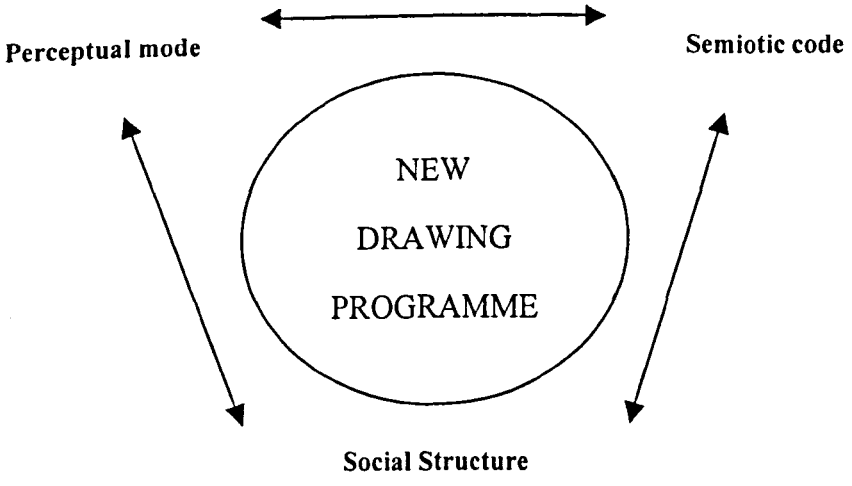


Figure 4.22

From this triad, an original, systemic model may be elaborated to provide a systematic theoretical underpinning for the teaching and practice of drawing based on perception and communication theories, with the aim of expanding awareness of the range of aesthetic sensibilities available to students.

4.5.1. Organic perceptual systems and modes of perception

Awareness of our bodies' relationships with the world is made possible by the organic systems evolved for seeing, hearing, touching, tasting and smelling. These afford the totality of our perceptual relations with our environment.

Interestingly the concept of an *organic perceptual system* challenges the traditional notion of a *sense*. Gibson (1966) was the first to point out the difference between a passive receptor of visual stimulation (e.g. a retina) and an active complex of organs comprising the eyes, themselves mobile, set in a head equally mobile, attached to a body capable of locomotion. Instead of a passive receptor stimulated by light energy being the basis for visual perception, Gibson argued that the organic perceptual system as a whole actively acquired information by virtue of eye/head/body movements affecting the structure of the array of light arriving at the eye. The acquiring of such information is performed at different degrees of attentiveness. The difference in degree may be understood as the difference in that which is abstracted from the array. That information which is disengaged from among the totality of information available in the array at the eye. These degrees of abstraction may be termed *modes of perception*, or simply different ways of seeing.

For example, we may notice some of the invariant features of the constantly-changing arrays of light that arrive at the eyes which afford us information about the nature of surfaces in the world - their degree of softness, hardness, rigidity or plasticity. This is what Robert Witkin (1995:63) termed *contact-values.*

At another degree of abstraction, invariants which afford information about our spatial position relative to those surfaces may be noticed. Information about degrees of nearness and farness, and angles of surface disposition. In general, information based upon *distance-values.*

Some other invariants relate to the interplay of shape, tone, texture and colour at the level of pattern and rhythm divorced from three-dimensional form - a way of seeing that is revealed through what Witkin (1995:64) terms *proximal-values.* [11]

(Of course in everyday life, the organic perceptual systems operate simultaneously, for example, seeing, touching, hearing, tasting and smelling. They confirm each other's information).

This raises the question: what determines any particular way of seeing? Karl Marx and Freidrich Engels suggested that:

> It is not the consciousness of men that determines their being, but, on the contrary, their social being that determines their consciousness.
> Marx & Engels (1859)

The echoes of Vico's earlier proposal (discussed in Section 3) may be heard in their statement, along with the Sapir/Whorf hypothesis of the relationship between language and social reality. The dialectic within Halliday's social semiotics appears to develop those earlier concepts by acknowledging the interdependence between language and its social contexts. This insight applied to perception and drawing, may be formulated thus:

What we notice, and how we draw, is conditioned by the kinds of language-determined realities that form us as social beings. Those socially-constructed realities, and language itself, are subject to transformation through innovations in the ways we see and draw.

What a Drawing presents to the viewer is a frozen version of those invariants that were noticed in the array of light, and subsequently selected by the Drawer from the totality of available information at their eyes. Whichever particular invariants are noticed and selected for transformation into drawn marks are determined by the parameters of the Drawer's social being.

The greater degree to which the drawer understands reality as the product of perceptual experience filtered through language, the greater the possibility of producing innovative drawings.[12]

4.5.2 Types of socio-economic relations

In his book *Art and Social Structure*, Witkin (1995) identified distinct types of social structure, and proposed corresponding art forms which neatly fit his categories:

A *co-actional* structure describes social relations in which each member plays a pre-determined rôle. Each separate rôle cues the others, rather like orchestral players. Such societies, low on the scale of individualism, with social roles integrated in a collective are described as co-actional.

An *inter-actional* structure is characterised by the kind of social relationship found in an urban, industrialised society. Complex division of social labour leads to development of social differentiation and individualism, as well as interdependence with others.

In an *intra-actional* social structure, subjects construct their social being directly in and through the process of relating to others. The disintegration of established social systems and the subsequent fracturing of a sense of identity is symptomatic of a society such as that in nineteenth century Western Europe.

These categories outline three ways of representing the levels of abstraction at which socio-economic relations may be ordered. The distinct characteristics of each set of socio-economic relations are realised through semiotic choices which may culminate in artefacts such as drawings.

4.5.3 Types of artforms

Witkin (1995:55-56) suggested three categories of artform which correspond to his three social structures: They were termed *invocational, evocational* and *provocational.*

(This categorisation draws attention to the essentially vocative nature of all images. They address the viewer, and the viewer is positioned. This interpersonal function of visual communication is discussed at greater length in Section 4.6).

Invocational art is motivated by a theology of a primitive kind. In a co-actional social structure typified by the Nascans in southern Peru for example, there is no attempt to portray individuality in their carvings of humans, animals and gods, either on their pottery or on the huge designs marked out upon the Pampa in the Nazca desert from c 400BC. Nevertheless, these linear patterns are representational. The geoglyphs (Figure 4.23) model the Nascan religious belief system in which gods send rain essential for human survival in return for appeasement. Walking along the lines in procession was a way of 'seeing' the world by being in dynamic contact with it. As the feet of the processors and their shaman massaged the groundlines, so the gods themselves were energised into action.[13]

In such belief systems, a model invokes the real. The aura associated with the image is directly attributable to the referent: sign and referent are one.

In an inter-actional social structure typified by Renaissance Italy, image-making was motivated by a spiritual theology. The attributes of individuals, their features and their personalities, were depicted as lifelike as possible because the function of these pictures was to *evoke* the spirit residing in, and animating, every individual. This was the religious spirit that permeated all society. Here the image was understood to be separate from the spirituality it evoked; the sign is distinct from its referent.

To examine Leonardo's anatomical drawing (Figure 4.24) today is also to recognise the power of *evocational art.* It may be argued that the materials – the ink and chalk marks, the surface upon which they are made, the protective frames and subdued lighting – themselves constitute a signifier of fragility, age, preciousness, the mark of the individual. At a deeper level of connotation, those drawings in contemporary context evoke nothing less than the myth of Leonardo as the epitome of Western values – Man the scientist-discoverer. We learn to value such drawings because they confirm the dominant ideology that holds empiricist science to be the means of cultural progress. These drawings stand for ourselves; they allow us to look inside ourselves. We are in awe of the delicate intricacies of our organisms, and this awe is evoked through the drawings. We feel the fear of death in the directness of these drawings, yet as anyone witnessing a public exhibition of them will affirm, they are hypnotic to members of a culture in which the reality of death is cloaked in religious ritual. Moreover, ironically we are filled with admiration for Leonardo's daring to breach the *taboos* we ourselves have inherited. Today, Leonardo the enigmatic master of evocational art is metonymic of a general unease and ambivalence towards the power of Art, symbolising its potential for challenging society's most revered conventions at the same time as revealing to us the inevitability of death.

As categorised by Witkin, both invocational and evocational art are realistically representational. However, if we now consider the early twentieth century as a period typical of an intra-actional social structure in Europe, the highly-significant break with the tradition of realistic representation may be explained.

Provocational art is motivated, not by any religious or spiritual source, but by the humanism that evolved from the Enlightenment and socio-technic revolutions of the eighteenth and nineteenth centuries. These Modernists shifted the emphasis from the relationship between

the sign and its referent altogether - and drew attention instead to the *process of signification* itself. The primary function of art was no longer to do with representing anything, but a means of provoking the viewer into a state of awareness of their own responsibilities for making sense of images. Marcel Duchamp was a typical *agent-provocateur.*[14] His treatment of the Mona Lisa (Figure 4.25) debunked not Leonardo or his sitter, but the aura of pious pseudo-religiosity which had enveloped such icons and had virtually obscured the historical reality of Leonardo's practice grounded in a specific social context.

> As was the case with other avant-garde movements of modern art, the Dadaists shifted attention from the artist as a creator to situate the creative process in the praxis of everyday life.
>
> Witkin (1995:56)

It is tempting to extrapolate from Witkin's model and propose a fourth type of social structure: a *multi-actional* one.

Such a *multi-actional* structure is typified by a Post-Modern[15] period in which have been seen the development of a plurality of approaches to art practice and an eclecticism of styles. This is a period in which the construction of an individual identity is complicated not only by the fluctuating states of possibilities of relationships between individuals, but also by an expanding range of available social positions made possible through an expanded awareness of the multiplicity of ideological positions. What kind of art form is the realisation of such a society? A *revocational* one, at once motivated and unmotivated by a plethora of influences, including the historical and the contemporary as well as the spiritual and the material. Such art revokes all previous laws and restrictions so that contradictions and contravisuals abound, words become images and *vice versa*, realities may be virtual. Attention is drawn to the very membranes themselves that separate internal from external, signifier from signified. In a post-modern period, the sign itself has been split, and signifiers float free as we that observe float between them. For example, we may float through Damien Hirst's cows in his 1996 installation *Some comfort gained from the acceptance of the inherent lies in everything,*

(Figure 4.26) where the boundaries between inside and outside, front and rear are broken. But we are denied entry to Rachel Whiteread's *House* constructed in1993, (Figure 4.27) whilst, paradoxically, having access to the interior surfaces of the rooms which form the exterior of the sculpture.[16]

Figure 4.28 tabulates the relationships between the various types of social structure and their corresponding art forms discussed here.

4.5.4. Relations between the Social, the Perceptual, and the Semiotic

Type of social structure	**Ways of seeing based upon**	**Semiotic form**	**Historical Example**
co-actional	haptic contact-relations	invocational art	Nascan c400BC
inter-actional	optic distance-relations	evocational art	Renaissance 1450
intra-actional	somatic proximal-relations	provocational art	Modernist 1919
multi-actional	pluralist eclectic mix of above	revocational art	Post-Modernist 1996

Figure 4.28

4.6 The visual aesthetic process of production

Such mapping of the relations between the social, the perceptual and the semiotic as laid out in general terms in Figure 4.28 becomes a useful way of understanding those "structures of feeling" with which Raymond Williams was so taken:

Let us consider the relationship between an individual piece of work and the state of the culture within which it is located. The individual piece may be expressed through identifiable conventions which may be taken to constitute the 'hallmark' of the period, or alternatively may challenge those conventions. In order to explore such relationships between individual expressions and cultural conventions, Raymond Williams invented the term 'structure of feeling', A structure of feeling describes the ideological aesthetic construction through which we make sense of the unique within the generalities of a period's social conventions. The concept becomes useful here as a way of understanding the visual aesthetic process:

The making visible of any idea requires an *inception* stage, in which social concepts and individual percepts are codified in material form. What is termed here the *visual aesthetic process* is an ordering of visual perceptual relations deemed appropriate by the producer for transforming into visible form some aspect of the socio-cultural values of the particular social and cultural context.

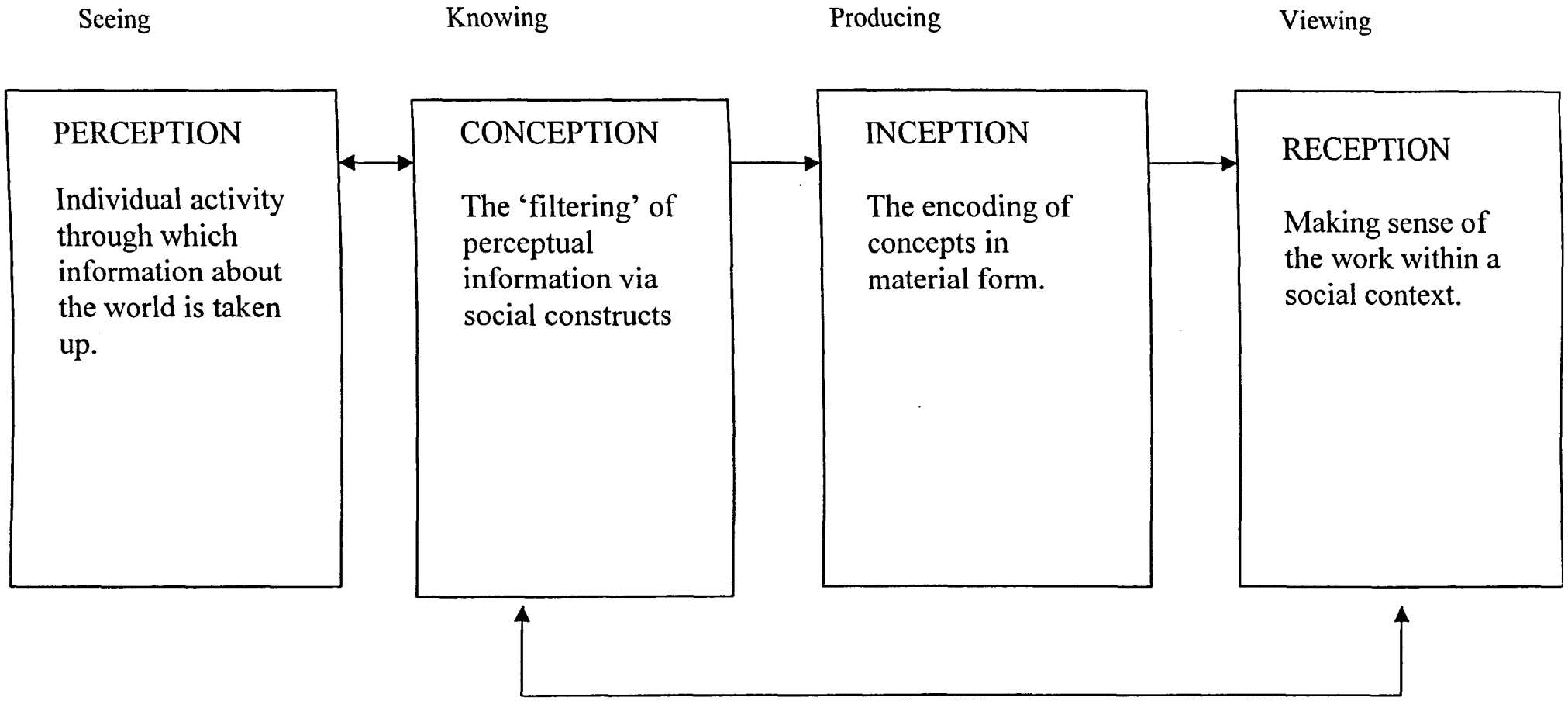


Figure 4.29 The visual aesthetic production process

At the *inception* stage, the semiotic requirements for visualising social ideology will determine the selection and combination of drawing elements:

SELECT Elements of drawing:	COMBINE Combinations of elements produce:	COMMUNICATE Combinations stand for physical and emotional experiences of the world:
point	contrast	spatial depth
line	proportion	force
shape (2D)	scale	direction
texture	pattern	movement
tone	rhythm	volume, mass, weight
colour		balance
plane		symmetry
		structure
		form (3D)
		surface properties
		observer's position(s)/mood, attitude

The combinations in the above chart are of course universal. They can be seen at work in all visual imagery in every culture. But how these combinations come to represent experiences of the world is very much culture-specific.

What is noticed about *distance-relations,* for example, may be represented using *proportion* and *scale* encoded in a system of geometry deemed appropriate to that society's world-view. A society with no concept of egocentricity (Figure 4.30) would have little need to develop an artificial perspective which represents distance relations from a static, one-eyed central viewpoint (Figure 4.31). Australian Aborigines, for example, have used combinations of visual elements in order to represent their ideological positioning, which is one of total integration with all aspects of the natural world.[17]

4.6.1 The social semiotics of drawing

In the materialist sense, drawings are produced through the selection and combination of particular surfaces, drawing tools, and the marks resulting from their interaction. However, *semiotically speaking,* both producers and viewers of drawings take up positions, adopt attitudes and points of view which are influenced by their positions within their sets of social relations. Such an ideological positioning involves a specific way of using signs (a semiotic), and a structured sensibility (an aesthetic) both grounded in a particular system of social relations. The way the producer selects and combines the compositional elements of the Drawing, and how the viewer relates to that Drawing, are both functions of the social contexts in which the work is (re) produced. But to say that drawings simply reflect social structure is too passive. *Drawing not only expresses the social context but is part of a more complex dialectic in which drawings actively symbolise the social system, thus producing, as well as being produced by, the ideological framework of a society.*

Variation in ways of drawing is the visual expression of variation in society. Drawing systems are produced within society and help to produce social form in their turn. This dialectical relationship is what Michael Halliday (1978 : 183) discusses in the phrase "social semiotic".

4.6.2 Varieties of drawing

Of the two types of variation in language discussed by Halliday (et.al. 1964), *dialect* expresses the diversity of social structure, and *register* expresses the diversity of social process. Whilst the meaning of dialect may be commonly understood, *register* may require further discussion. It refers to the fact that language usage varies according to the situation in which it is used. In terms of drawing, *register* refers to the variation in selecting and combining visual elements according to the purpose for which the Drawing was produced,

and according to the situation of its display. A social system (a culture) can be represented as a construction of meanings – as a semiotic system. The meanings that constitute the social system are exchanged through the rich variety of semiotic codes developed by humans, of which drawing is one.

From this social semiotic perspective, any social context may be understood as a temporary construct which may be mapped in terms of the three variables discussed in Section 3.5 which Halliday called *field, tenor,* and *mode.*

Field of social process – what is going on at the time of production of the Drawing.

Tenor of social relationships – the type of Drawing we produce varies according to the level of formality, of technicality, of need for clarity of communication, etc. It is the rôle relationships – the Drawer, the subject matter, the viewer and their inter-relationships – that affect the variations.

Mode of symbolic interaction – in the sense that how we draw varies with our attitude: An attitude of objective observation may produce drawings in a realistic mode; emotional disturbance may be realised in an expressionist mode; absentmindedness in doodling mode. An attitude attuned to the necessity of clear communication may produce drawings in a highly conventional mode, for example, as specified by British Standards or professional bodies.

4.6.3 The functions of drawing

It may be proposed that any code of communication has three main functions. Firstly, to convey some aspect of our experience of the world. Secondly, to express our attitude or mood regarding our experience, and also to position the receiver in terms of mood and attitude. Thirdly, to structure these two into a coherent, perceptible form. The first two

functions were labelled the *experiential* and the *interpersonal* in Section 3.5. The third may be termed the *compositional* function.

The parameters of social context – field, tenor, and mode – are systematically related to the functions of the semiotic system. In fact, those meanings that constitute our understanding of any particular social situation are made visible through the selection and combination of elements within the semiotic system.

Parameter of social context	Function of drawing through which a social situation is realised
Field (what is happening)	Experiential function
Tenor (who is taking part)	Interpersonal function
Mode (what part the semiotic code plays)	Compositional function

This may be adopted as the basis of a model which may theorise how drawings operate within a social context.

Halliday (1973) elaborated upon this basis to provide a model which identified the systems of choices from which specific selections may be related to the functions of language in specific social contexts.

Michael O'Toole[18] (1990) was the first to demonstrate the power of Halliday's insights when they are applied to the analysis of painting. He offered a systemic-functional model of painting in which he substituted the labels Representational, Modal, and Compositional for Halliday's original terms Ideational, Interpersonal, and Textual describing the three functions of language. Subsequently, O'Toole (1994) demonstrated the versatility of Halliday's model by adapting it to theorise how sculpture and architecture may be understood in relation to their social contexts. Gunther Kress and Theo van Leeuwen (1990, 1996) have also used Halliday's insight to illuminate the study of graphic design and other forms of visual

communication. They have argued that in a literate culture, the visual means of communication may be construed as rational expressions of cultural meanings, amenable to rational accounts and analysis. The problem, they claimed, has been that literate cultures have "systematically suppressed means of analysis of the visual forms of representation, so that there is not, at the moment, an established theoretical framework within which visual forms of representation can be discussed". (Kress & van Leeuwin, 1996 : 20-21). Alongside these pioneers of a systemic-functional semiotics of the visual, this thesis proposes just such a theoretical framework within which visual forms of representation may be discussed. Specifically, it is proposed that the theoretical framework may inform the production of drawings, and that it may also function as an instrument for evaluating qualitative shifts in students' attitudes evident in their drawings.

4.6.4 A systemic-functional semiotic model for drawing

Such a model is presented in Figure 4.32 where the *Experiential* function of drawing relates to a Drawing's ability to represent some aspect of our experience of the world. The *Interpersonal* function deals with how drawings may express the maker's attitude to their experiences, and may position the viewer in terms of attitude and mood. The *Compositional* function deals with the systems of available choices of media, surfaces and marks that combine to make visible, to realise, the other two functions. The heading *Levels of Engagement* in the chart refers to the hierarchical layering within which engagement with the Drawing is possible. The *Matrix of Systems of Choices* emphasises the *systemic* nature of the model: these ranges of available choices do not simply allow meanings to be negotiated at any single functional level, but affect all functions as a whole.

Social meanings to do with the Drawer's and viewer's experience within the field of the real world, and also the tenor of the relationship between Drawer and viewer are all realised

simultaneously through the systems of *Theme, Modality, Geometry*, etc. Choices from these systems are realised as particular modes of drawing which are themselves realised as appropriate combinations of drawn marks upon a surface.

In this chart, the varieties of geometries (discussed in Section 4.1) derived from the variety of ways of seeing, become some of the systems available to the Compositional function in order to realise – make visible – the Interpersonal and the Experiential functions. Also, Willats' denotation systems (discussed in Section 4.3.1) made up from selections and combinations of picture primitives, may be integrated within the systems of choices available.

Combinations of selections from the available systems of compositional choices allow the Drawer to give visible material form to modulations of their physical, emotional and imaginative experiences of the world. Reciprocally, those combinations are modulated through and related to the viewer's own experiences of the world. Thus the proposed model may facilitate both a means of putting sense into drawings, and making sense out of drawings. Crucially, the inclusion of the variety of levels of perception within the systems of choices available in the Experiential function acknowledges the variable foci of perception of both Drawer and viewer.

The model is the organising principle which structures the proposed new teaching programme in drawing set out in Section 5.2. It enables the design of drawing exercises which focus students' attention upon specific problems of visual representation, as well as being a means of assessing the resultant drawings. For example, the student who is able to derive the world-view of another culture from the analysis of its drawings becomes increasingly aware of ontological possibilities other than their own. Such awareness allows the student to deconstruct their own, taken for granted, beliefs about time and space, and affords the possibility of elaborating more sophisticated ontological constructs through drawings.

Examples of such drawing exercises and student responses to them in the form of drawings are illustrated and evaluated in Section 5.4.

LEVELS OF ENGAGEMENT	MATRIX OF SYSTEMS OF CHOICES	FUNCTIONS OF DRAWING		
		COMPOSITIONAL	INTERPERSONAL	EXPERIENTIAL
The drawing as displayed in context		• Inter-textuality • Systems of Geometry: persp. orthographic, oblique, inverted persp., & topological • Size and format • Framing devices • Location options	• Systems of modality: Mood, attitude, positioning: viewer-centred, object-centred • Public/Private • Intimate/Monumental	• Systems of Theme: Physical, emotional, imaginative experiences. narrative, Historical genre • Realistic/Abstract • Interplay between objects, poses, events
Sub-divisions of the drawing's surface		• Secondary geometry • Gestalt relationships: horizontal, vertical, diagonal axes • Proportional relationships • Tonal passages (aerial persp.)	• Systems of gaze: Eye paths, focus points • Dynamic/Static • Calm/Excited • Balance/Unbalanced	• Primary geometry • Actions, poses, events, objects • Awareness of distal and proximal perceptual values
Combinations of drawn marks		• Relative size of marks • Relative orientation of marks • Relative position of marks • Colour, tone and texture contrast – boundaries • Pattern • Rhythm • False attachments	• Deep/shallow range of depth illusion • Foreground/Background range of positioning • Stability/Instability • Scale • Heavy/light	• Distance between surfaces • Edges: occlusion of one surface by another • Direction • Transparency/Opacity of surfaces • Atmospheric conditions • Quality of light • Time of day • Awareness of haptic perceptual values • Weight
A drawn mark		• Size relative to picture surface • Orientation relative to picture surface • Position relative to picture surface • Combination of surface texture and drawing medium • Picture-primitives	• Psychological orientation • Range of textural meanings: wet/dry; hard/soft; matt/gloss • Denotation level of meaning	• Spatial depth • Effects of gravity and other forces • Effects of light and water upon material surfaces • Scene primitives
	MATRIX OF SYSTEMS OF CHOICES			

Figure 4.32

To end this Section, various case-studies are presented, in order to demonstrate the flexibility and general efficacy of the new instrument illustrated in Figure 4.32 in revealing insights to the ways that pictures function, and affording viewers a means of negotiating meanings other than the conventional.

Firstly, a generalised re-evaluation of Modernism is presented, followed by a comparison between the work of two artists, Will Roberts and Robert Newell, dealing with the social and physical landscapes of Wales, respectively. Finally, a detailed evaluation of a series of the author's own drawings is undertaken.

The Figures may be found in Volume 2.

Modernism re-viewed

The conventional description of the roots of Modernism refers to the period in Europe spanning the socio-economic events known as the French Revolution, the Industrial Revolution and the Russian Revolution. This period saw the rise and consolidation of mass industrialisation and mass democratisation across Europe. The social upheavals symbolised by those labels also challenged many prevalent assumptions about the visual arts. Academic drawing, emphasising the importance of geometry and proportion, had idealised the timeless constancy of the human figure. However, the shifts in consciousness brought about by the social and economic changes of the late-eighteenth and early-nineteenth centuries began to form an alternative concept to Academic idealism: that of an individualised perceptual immediacy - the self-conscious eye – and the sensation of constant change. Artists, no longer patronised by a weakened aristocracy and Church, began to respond to their new-found freedom through ways of practice which have become known collectively as 'Modernist'. Realism, Impressionism, Expressionism, relativism (Cubism, Futurism) and so on, are the

terms adopted to describe the phases of Modernism. Another, more proactively analytical, rather than descriptive, way of discussing Modernism is proposed here.
One which is expedited by the use of the systemic-functional semiotic model illustrated in the Chart in Figure 4.32. Within the early field of Modernist painting and drawing, at a time when the concept of 'realism' was being explored, two fundamentally opposed strategies may be discerned. Firstly, one that serves to draw the viewer's attention through the picture's surface and into its illusory space. Secondly, the strategy of drawing attention to the 'picture-ness' of the picture itself by exaggerating the artifice of Geometry and other indications of the artist's presence in the surface treatment of the medium and its support. [19] In this second strategy, the viewer is forced to negotiate the picture surface itself, so that any subsequent reading of the pictorial content (the depicted theme) is mediated by this negotiation of surface.

In terms of the Chart, such manipulation of the Interpersonal function is realised through the Systems of Gaze: the artist's selection of specific eye-paths and focus points within the composition. The various ways that a viewer is invited to gaze 'through' the picture-place, or to focus upon the surface textures of the medium applied *to* the picture-plane are realised through the artist's selections from the compositional systems of Geometry at the level of engagement of the whole work, and through selections from the systems of relative size and texture at the level of engagement of the drawn (or painted) marks.

Out of the two strategies identified, the first, negating the picture surface, employs choices from the systems of composition normally associated with the Academy: these are artificial perspective, aerial perspective, and the positioning of figures and manipulation of Gestalt relationships so that a sense of stable balance ensues. In this strategy, the materiality of the

medium and its support is not emphasised. However, what makes this Academic-based compositional strategy explicitly Modern are the choices made from within the column labelled Experiential function. The traditional themes of Academic works were those of history, religion and literature. In Modernist work these themes are rejected in favour of those of a more democraticised, industrialised social context, with its implied leisure time and public social activities. William Powell Frith's *The railway station* 1862 (Figure 4.33) illustrates an example of such a Modernist work, utilising the Academic compositional devices of artificial perspective and aerial perspective to emphasise the distal and the proximal values in the scene, and treating the picture surface in such a way as to negate its haptic qualities thus reinforcing the illusion of transparency.

The Academic devices of symmetry and visual balance are evident in the positioning of the three salient lighting globes, each directly above, and leading to the viewer's gaze down to, three cameos depicting the modern world of the time: on the left, a family with their luggage push towards the carriage; in the centre, a scene of farewells forming a stable triangular shape beneath the lighting globe, itself the apex of a triangular pattern of lighting globes, and on the right, a thoroughly urban Modernist event, the arrest of a man by top-hatted 'peelers'.

The second strategy also specifies Modernity by addressing themes of social democratisation and mass industrialisation, but at the same time confronts the viewer with the physical materiality of the picture-plane. This is achieved through the use of compositional devices which emphasise the texture of the medium and its support, and which subvert the system of artificial perspective and the conventions of aerial perspective. In this way, the medium becomes the message, or at least the medium powerfully modulates the viewer's response to the depicted subject-matter. Claude-Oscar Monet's *The Gare St. Lazare*, 1877 (Figure 4.34) provides an illustration of this strategy of surface modulation. The haptic qualities of the

picture surface are emphasised, and the sub-dividing of the overall composition produces a dynamic, rather than static, balance. Passages of paint depicting the smoke from the engine on the left of the picture are distinctly glossier than their surroundings, a contrast of texture which serves to animate the overall surface, thus drawing attention to it. Brush marks are clearly evident, with little change in their size across the whole canvas. Where brush marks form contrast boundaries, for example between the girder of the triangular roof and the smoke-filled atmosphere, they are left rough and ragged, at various levels of impasto. One mark of red paint acts as a boundary between the roof structure and the arch depicted on the extreme right of the picture. This, too, draws attention to the painterly qualities of the surface. Figures in the foreground are represented by loosely-applied blobs and dabs of pigment, as is the central lamp-post. Blobs and dabs standing proud of the canvas surface, draw attention to their materiality.

It may be that it was the second strategy, in Richard Brettell's (1999 : 15) term "Mediated Realism", which led, ultimately, to abstraction in the early twentieth century. The strategy allowed artists to recognise that the product of their labours, its very materiality, could be the object of contemplation, rather than that which may be represented by such materials.

Will Roberts [20] *and the 'spirit of the masses'.*

Engineers have a term to describe structures whose stability is due to their own mass: *bulk-active.* It came to mind viewing Will Roberts' paintings and drawings, because this bulk-active work seems as much to do with the active relationships between people and their domestic and working contexts as it is to do with the painterly massive bulk of figures and landscape elements.

Across the genres of portraiture, landscape, still life, even religious themes that Roberts deals with, the viewer is invited to ponder the multiple meanings of *mass.*

A portrait that engages the viewer face to face, a domestic close-up of the artist's wife, has a stability that comes from combining massive blocks of tone and using the lines of the resultant contrast boundaries to firmly anchor the figure to the frame (Figure 4.35).

Landscapes of labour where anonymous figures appear with their backs to the viewer (a sure sign of romanticism!) in the *"Galv"*, in *Dowlais,* and in *Farmworkers, evening* for example have become symbols of hiraeth [21] for the lost days of mass solidarity and socially-stable communities in the region of South Wales where Roberts lived.

So perhaps there's a lesson to be learned from Will Roberts' work about how social meanings of art can be negotiated. His paintings and drawings show how pictorial mass may be integrated within the most delicate tensile structures of composition such as *Tyn y Waun* (Figure 4.36) to produce contrasting metaphors about the solidarity possible in inter-personal relationships and the fragility of our social structures.

Of course the old Expressionist trick of distorting pictorial elements (line, shape, tone, texture and colour) to elicit a disturbance in the viewer's emotional balance is turned to good effect – after all the painter studied theory and practice at the Swansea School of Art, and he worked at the char-coalface alongside Josef Herman, the Polish Expressionist who lived among the miners of Ystradgynlais.

But he also shares something of the vision of David Bomberg who famously sought the spirit in the mass.

Bomberg's search was always a frenzied affair (that of his pupils even more so – Frank Auerbach's and Leon Kossoff's painting resembles the demolished haystack after a particularly impatient search for the imagined needle) whilst Roberts generates and transmits the patience of his domestic sitters and anonymous labourers at one with their landscapes.

In these paintings he finds and communicates what may be termed *the spirit in the masses*, a spirit which, ultimately, is the driving force of a healthy caring society.

Robert Newell [22] *and the bones of the land.*

Rock structures, those bones of the land that appear reassuringly stable even over long periods of time, are ostensibly the subject matter of Robert Newell's exhibition work. Pencil and wash drawings such as the *Glaciated Rocks : Nant Ffrancon* series in particular (Figure 4.37) afford the viewer an opportunity to ponder the concept of *accuracy* in drawing whilst admiring meticulous technique.

However, such 'accurate' work disguises the fact that drawing is not simply a record of what is seen, but a process of finding equivalents for natural forms within the infinite vocabulary of drawn marks - cultural signs. And from this point of view, the drawings become much more valuable than mere records of perception : they allow us to make sense of the connections and differences between the act of seeing and the act of drawing, both of which occur over time.

An ecological approach to understanding visual perception is helpful since it emphasises our need to receive information about the state of our surroundings directly from the ever-changing structure of light-rays reflected from the surfaces and edges of our visual world, so that we can respond to changes in our environment as we move through it. Seeing for survival. But it is the uniquely-human desire to communicate the experience of that invitation to act within and upon our surroundings that stimulates the act of drawing. Robert Newell is translating visual information picked up from reflected light into marks on a flat surface; an activity older even than speaking and writing. When viewers of his drawings contemplate accuracy, it is the precision of meaning of those marks to which the term applies. Their accuracy in re-presenting aspects of vision which remain invariant across the constantly - varying array of structured light. This is drawing that depicts fundamental consistencies within the flux of change that is the everyday process of vision we take for granted.

The material process of drawing - the erosion of many pencil points over prolonged periods of mark-making and the textural degradation of the paper support - is akin to the slower process of landscape erosion caused by the interplay of physical forces over time. We may well look upon drawings like these with awe. Because they resonate with our own experiences of forces, both physical and visual.

Howard Riley: theory into practice

At first glance, Figure 4.38 appears to represent a scene from a fixed viewpoint familiar to most Western viewers' experience. At the first level of engagement, each drawn mark at the extremities of the drawing (the only opportunity to scrutinise a mark isolated from other marks) whilst representing a variety of experiences of leaves and shadows, serves a common compositional function: to guide the viewer's eyes in a direction which leads to the same focus point. However, this focus point, a sharp-edged, deep blue V-shape, approximately at the geometric centre of the drawing, turns out to represent a complexity of primary geometry. The contrast boundaries between the blue V and its surrounding colours in the drawing bring into sharp focus edges which, if viewed in the scene itself, would be separated by some distance, and therefore *out* of focus (bar one). Also, it may be noted that the scale and textural quality of the marks across the whole drawing have a similarity which denies the variety of scale of texture possessed by the actual vegetation to which these marks refer. Since the haptic values of the scene are thus suppressed, as are the distance values, (only the relative scale of shapes in the drawing, and the high-contrast boundaries between shapes provide cues for reading distance in depth), we may conclude that this drawing is designed to draw the viewer's attention to the proximal values of the scene. This drawing reveals the maker's interest in the *patterns* of natural form. At each level of engagement, the compositional selections from the systems of available choices function to foreground the

interpersonal rather than the experiential. In such a viewer-centred drawing, the viewer is certainly psychologically positioned in relation to the scene, the sub-divisions of the drawing's surface arranged so as to communicate balance (note the salient contrast boundaries emanating both vertically and horizontally from the central V focus point, forming the axes from which the drawing grows. Even the placement of the written title contributes to the reading of the vertical axis). The selections from within the yellow-green-blue colour range support the mood of calm balance. Only the rhythm of the undulating lines and contrast boundaries of the lower left quarter contrasting with the angular shapes of the palm crown provide the visual dynamism to prevent the stability of the drawing from becoming static. Here is a drawing that invites the viewer to share its maker's interest in the *proximal* values of the scene, (at the expense of the haptic and distal values), and his concern with how compositional selections may instil in the viewer an awareness of how the abstract may underpin any realistic representation.

In Figure 4.39, the abstraction of a simple denotation system from the complex concrete form of the urban environment is effected through compositional choices. Scene primitives, such as edges and corners of material surfaces and the tonal and textural contrasts visible when such surfaces occlude one another in the visual world, are reduced, in the secondary geometry of the drawing, to a denotation system consisting only of line, dot, and limited tone. The only allusion to the three-dimensionality of the primary geometry of the street-scene is made through the use of the triangular shape with its base at the bottom of the picture plane and its apex mimicking the vanishing point of a one-point perspective projection. This serves to position the viewer psychologically (floating above the middle of the road!), as well as a means of drawing the viewer's gaze into the centre of the composition. It may be argued that the variety of thicknesses and density of tone of the lines, and their positioning within the pictural plane, also provide some illusion of depth in the drawing. What is the viewer to make

of such a minimalist representation of a three-dimensional solidity? Here are the bare bones of the visual field in which connections - false attachments - are made between lines that are clearly not representative of the actual spatial relationships within the scene. Scene primitives such as corners and textured surfaces which combine to form an integrated, material world, are disintegrated into picture-primitives attached to nothing, appearing to float in the picture-plane alongside the viewer.

The viewer's experience of the familiar public streetscape is rendered in an unfamiliar, private language of spatial description. Private, except it consists of strangely-familiar linear profiles and recognisable shapes. The poetic device of *closure* is at work here, inviting the viewer to 'join the dots', to complete the puzzle by working out the false connections between lines on the drawing which actually represent material edges some distance apart in depth in the actual scene.

Our familiar, solid world has been transformed. Our ontological bi-polar construct of solid/void is challenged. In these drawings, solidity and void co-exist on either side of every line. Just as the molecular scientist challenges our common-sense, empirically-based assumption about the solidity of material things by suggesting that the illusion of solidity is an accident of our perceptual systems of vision and touch, so the drawer may gently nudge our complacency of seeing.

In the sequence of drawings, Figures 4.40, a, b and c, little of what we experience and recognise in the physical world appears to be represented. Of course the drawings themselves (and, incidentally, the reproductions presented here) are a part of our physical world: the very textures produced through the combination of oil pastel and paper, scratched and rubbed, indicating their maker's involvement, may evoke in the viewer similar previous experiences of texture, and perhaps volume. When the viewer engages with these drawings at the level of the combinations of drawn marks, then a pattern emerges which is common to all

the drawings. The central position of the square, resting in each drawing on a horizontal base line, symbolises physical stability and epitomises visual balance. Against this constant compositional structure, change is more easily recognised. Through the choice of high-contrast boundaries between shapes of saturated colour, and the selection of textural gradients and tonal gradients, illusions of depth are produced. As the sequence progresses, contrast is reduced and colours desaturated with the effect that depth illusion is diminished. Colour combinations progress from warm to cool, thus altering the mood.

The solid form in the centre of Figure 4.40 is set in ambiguous space produced by the combination of light and dark tones arranged contrary to normal visual experience of the world illuminated by a single light source. In Figure 4.40a, the central square is surrounded by angular linear elements with no apparent Gestalt relationship. A chaos of elements whose edges vary from sharp to blurry, indicating various distances in the illusory depth of the picture. The effect of such random placement of pictorial elements within the sub-divisions of the drawing's surface, together with the ambiguous readings of pictorial space, may well unsettle the viewer whose eye-paths are being jerked around, having no definite focus point. Simultaneously, the viewer is (no doubt?) attempting to decode the ambiguous signs forming the base of the pictures, rather as captions anchor images in more conventional codes of communication.

At this stage, viewers may pick up allusions to their visual experiences of the world – not least, allusions to illusions. This play between the drawer and the viewer is the essence of the Interpersonal function of drawing, made visible through the selection and combination of choices from the compositional systems.

In Figure 4.40b, through the use of tonal grading and contrasts, the tubular elements appear to penetrate a rather less-than-solid central square. With no more resolution of the quasi-alphabetic anchor-block (relay-block?) and no obvious representation of their physical

experiences, the viewer may resort to metaphoric interpretations. The sequence may be understood as the gradual transformation of the central square from solid volume in ~~8~~ Fig. 4.40a to tissue-like insubstantiality in Figure 4.40c, under the attack of the tubular elements. However, the tubular elements themselves become dissolved in the fabric of the picture plane in ~~8c~~ 4.40c, even as the 'caption' becomes, temptingly, almost meaningful.

Language itself has emerged from a world of visual ambiguity and has pierced and penetrated our observations of the material world to such an extent that the two have become one. Language is interwoven with our perception of the fabric of the material world, yet its visible form remains forever arbitrary, forever open to negotiation.

Summary

A review of the relationship between perception and communication has been undertaken. The relationship between ways of seeing, semiotic codes and types of social structure has been discussed and evaluated.

An instrument, labelled a systemic-functional semiotic model of the field of drawing, has been developed from the work of Halliday and O'Toole, and has been adapted so as to take into account the levels of perception available to a viewer/drawer.

The efficacy of this instrument when applied to the evaluation of students' drawings is discussed in Section 5.4.3.

SECTION 5 : DRAWING, TEACHING AND EVALUATION

Introduction

> *We cannot refer science to the object and art to the subject for the view of human activity we are seeking to grasp rejects this duality of subject and object: the consciousness is part of the reality, and the reality is part of the consciousness, in the whole process of our living organisation.*
>
> Raymond Williams (1961 : 39)

This final Section opens with discussion of theory relevant to the eliciting of students' attitudes to drawing before and after participating in the new teaching programme. George Kelly's (1955) psychology of personal constructs is introduced, along with recent examples of the application of his work. Theory relevant to the strategies of delivery of such a new teaching programme is introduced, in particular Robert Witkin's (1974, 1978) work which is relevant to pedagogical methodology.

The structure and detailed content of the proposed new teaching programme in drawing is then laid out. This experimental new programme is one module of five which constitute the first year of the BA in Fine Arts and Painting & drawing courses at the Faculty of Art and Design, Swansea Institute of Higher Education.

The methods of data collection are explained, including instruments such as the Nominal Group Technique, employed to elicit the emic views of the student groups. Questionnaires are designed to elicit students' personal ontological constructions, and their degree of awareness of the constructions of others.

Data are presented pertaining to students' personal constructs relevant to drawing. Such data were collected before and after delivery of the new teaching programme, from both the experimental groups who participated in the programme, and control groups of similar levels who did not. This procedure allows any changes in the experimental groups' ontological constructions to become apparent, and attributable to the new teaching programme. Positive shifts in these are taken to be an indication of the efficacy of the new programme.

The key data, consisting of the drawings produced in and around the new teaching programme, are evaluated using a novel instrument: the systemic-functional semiotic model for drawing which has been theorised and designed in Section 4, and illustrated in Figure 4.32. Evaluation of the resultant drawings aims to confirm evidence of any positive shifts in the range of students' personal constructs (the research assessment criterion of ontological authenticity), and of their broadened understanding of the ontological constructions of others (the criterion of educative authenticity).

It is argued that the drawings also provide evidence that the new teaching programme has stimulated students' inquiry into new patterns of studio practice, (the research assessment criterion of catalytic authenticity), and has empowered their practice in areas outside the confines of the drawing programme itself, (the criterion of tactical authenticity).

In conclusion, it is argued that there is evidence provided in the data to justify the hypothesis that a teaching programme based upon the synthesis of perception and communication theories presented in this thesis can expand students' awareness and understanding of a range of visual constructions of reality, and can increase their ability to produce more varied, more informed constructions of their experiences in the form of drawings.

5.1 Praxis

Part of the business of being human is to do with making sense of the world in which we live, so that we can act within it and upon it. Humans are constantly receiving information about their environment through their perceptual systems, constantly structuring and classifying that information, and responding to such information in a way that tends towards confirming or restoring the previously existing ontological construction, or mental map of reality. Each new experience will perturb this existing matrix of intellectually-ordered constructs until the novelty can be structured to fit the established pattern as closely as possible. Any experience

too far beyond the range of the individual's previous experience may cause feelings of mild insecurity, even anxiety and physical distress, until the perturbed matrix itself is re-structured so that the new experience may be comfortably accommodated, or understood.

5.1.1. The psychology of personal constructs

In George Kelly's (1955) psychology of personal constructs,[1] *anxiety*, for example, is construed as being the awareness that events with which one is confronted lie mostly outside the range of familiarity of one's construct system. *Fear* is understood as the awareness of an imminent change in one's core structures. These examples relating to transitions within the individual's existing matrix are derived from Kelly's theory whose fundamental hypothesis is that a person's behaviour patterns are psychologically affected by the ways in which they anticipate events. This notion leads to a series of corollaries, the value of which appears to be confirmed by our everyday experience of life: his theory is nothing if not reflexive. Kelly's *construction corollary* states that a person anticipates events by construing their replications. He uses a musical analogy as illustration of this. As the Gestaltists understood, we are able to recognise a melody as one heard previously, even when its pitch, key, rhythm, and orchestration are altered. [2]

Kelly's *individuality corollary*, states that people differ from each other in their construction of events. This is because we perceive the same event through our unique personal construct system. As Bakhtin had argued (Section 3.5), for meaning to exist at all, a relationship between at least two bodies participating from different situations is required. Meaning emanates from the potential of difference. We differ from each other in the positions from which we perceive events, what we consider important about those events, and the degree to which they are welcome or unwelcome, threatening or reassuring.

The *organisation corollary*, states that each person characteristically evolves, for their convenience in anticipating events, a construction system embracing ordinal relationships between constructs. Here, Kelly is stressing the way we organise constructs hierarchically. This hierarchical property of construct systems allows us to manage our world. For example, the means by which we may subordinate the differences between a handmade charcoal drawing on paper and a digitally-produced drawing on a computer screen under the construct 'drawing as opposed to painting', and oppose this superordinate, in turn, to 'sculpture', then further subordinate both these oppositional terms under the construct 'art as opposed to science', allows us to negotiate otherwise densely impenetrable complexities. This organisation corollary appears to have assumed what Kelly termed the *dichotomy corollary*: a person's construction system is composed of a finite number of dichotomous constructs. He argued that it is useful to think of constructs as bi-polar, one positive and one negative. The similarities with the fundamental premises of Structuralism may be obvious, even though Kelly himself did not use the term. Rather, he wrote of his philosophical position as "constructive alternativism" (Kelly 1995 : v) [(3)].

However, according to Bannister and Fransella (1980 : 22), Kelly did assert that even where no words or other signs are available to represent a given contrast, we do not align ourselves with one pole of the contrast without implicitly denying the other within a given context. [(4)] The *choice corollary* states that people choose for themselves that pole in a bi-polar, or dichotomised, construct through which they anticipate the greater possibility for the elaboration of their personal construct system. As Bannister and Fransella (1980 : 23) intimated, this corollary may appear tautologous. They argued that if a person operates to anticipate events, as Kelly asserted, and if they do this by developing personal construct systems, then they will move in that direction which appears to them to make most sense, that

is, the direction which appears to confirm the validity of their construct system. It has been argued (Holland, 1970) that this corollary is untestable and therefore unscientific. However, it may also be argued that if we know enough about a subject's construct system beforehand to predict their likely choices in a given future situation, then a qualitative, rather than a quantitative assessment of the corollary may be possible.

Kelly's *range corollary* states that a construct is convenient for the anticipation of a finite range of events only. It follows from his dichotomy corollary that constructs are bi-polar and finite in number.

Personal construct theory implies that we develop our construct systems continually. The *experience corollary* confirms this implication by stating that a person's construct system varies as they successively construe the replication of events. A personal construct system, rather like Helmholtz's empiricist model of perception (discussed in Section 2) is a theory of negotiating the world which is under continual testing. We change our constructs as our anticipations are rendered faulty. Predictions are sometimes proved correct; our construct system remains stable. In the event of predictions not being accurate, we are faced with the prospect of having to adjust our construct system. Depending upon how we construe the situation, this prospect may induce anxiety, fear, or perhaps hostility, which Kelly defined as the continued effort to extort evidence for the retention of the construct system from a situation already recognised as a failure.

The understanding that people may alter constructs, sometimes with reluctance, sometimes without, allows us to recognise the theory of personal constructs as essentially a dynamic one. It is proposed here that such understanding may be usefully deployed in drawing-teaching studios, particularly those in which students are invited and encouraged to develop more awareness of their own construct systems, and more understanding of the construct systems of others.

Kelly's personal construct theory may be usefully related to the experience of looking with students at pictures, especially pictures which do not rely on conventional compositional devices to trigger predictable responses. In such a situation it may be noticed that students do indeed differ from each other in their constructions of meanings from the same set of environmental stimulii. It may also be noticed that many students experience anxiety and frustration during this kind of experience. We may all assume that the act of approaching and looking at visual compositions, such as drawings, produces certain expectations. It may be argued that the viewer anticipates events by recalling similar events from the past, but also expectations may be generated by use of repeated visual elements and patterns within the composition itself. It could also be argued that if those expectations are frustrated by complications within the visual text, then tensions arise in the viewer. Confirmation of the viewer's expectations in work of a more familiar genre produces a relief from tension, experienced as pleasure.

Student expectations are commonly based on an assumption that meaning is somehow embedded behind the work, perhaps in the artist's intentions and therefore out of reach, or worse still, knowable only by the cognoscenti. Enabling the student to adjust this assumption and to become a more active reader of pictures would be a useful objective for any proposed new drawing programme. The simple objective of this approach is an increase in the degree of open-mindedness of the student, an indication of the individual's ability to restructure their own mental map of reality without fear or anxiety, and to recognise the validity of the ontological constructions of others.

Paradoxically, it may be noticed that most humans do enjoy mild anxiety-producing experiences. We may be 'thrill-seekers' but most of us seek safe thrills within a controllable or controlled context. In this way the disturbance, although risky, may be savoured against

the ever-present framework of control, in the secure knowledge that the framework itself is stable. In their book *Psychology of the Arts*, Hans and Shulamith Kreitler (1972 : 372) confirm that studies show the perception of novelty depends upon a prior familiarisation with the environment in which the novelty is introduced.

The notion that something like a drawing may induce tensions within the viewer, and that those tensions may be relieved by the viewer's construction of meaning from the visual text itself is discussed in detail by the Kreitlers. Their description of such a model of homeostasis has at its focal point the concept of *pleasure*:

> Psychologically and physiologically, any pleasurable experience is concomitant with a rise in tension followed by a reduction in tension. The homeostatic model is based on the assumption that there are optimal conditions for the existence and survival of humans, defined by a certain equilibrium between internal and external processes as well as among the various processes themselves. We strive to preserve these conditions and to reinstate them whenever a deviation occurs.
>
> Kreitler & Kreitler (1972 :13)

Our drive to reinstate balance does not preclude the possibility of development and evolution, since it implies not only a return to a previously-existing state of equilibrium but also the establishment of progressively new, perhaps wider ranging, more stable states of balance. In the context of a drawing programme, this model allows us to recognise that the initial stimulus – the object or event under observation and the way it is presented – is of the greatest significance if the student is to be expected to structure the experience in such a way that the relief from the initial tensions results in a wider-ranging state of understanding, a more clearly focused hierarchy of possibilities of meaning.

5.1.2 Nurturing an intelligence of seeing

The quality of the student's initial sensate experience enabling active elaboration of meaning is the most fundamental aspect of "subjective-reflexive action". This is the term used by

Witkin (1974 : 19) to explain an act of self-expression, where the initial sensate impulse is recalled and eventually incorporated within one's own being, as opposed to "subjective-reactive" behaviour which merely extends the sensate impulse with no satisfying resolution. For example, the wilful breaking in of a window in response to an impulse is in Witkin's view subjective-reactive behaviour, since the impulse is released and burned up in the action, but the behaviour does not reciprocate it. The behaviour is not a means of recalling the sensate impulse and thereby of assimilating it into being. When an individual makes a drawing, however, their use of such expressive media reciprocates the impulse since that expression has the power to evoke or recall it.

Witkin's work is about ways of strengthening subjective-reflexive behaviour patterns. He argues that many teachers rarely comprehend the creative process well enough to distinguish between the two types of behaviour outlined. He asserts that it is the student's direct sensing that both guides and controls the expressive act of drawing until it manifests itself in an expressive form, or in Witkins's term, a *feeling form*. This implies that the tutor must be involved in the student's creative process (since that is what any expansion of mental constructs means) from the outset. The argument that since the student's sensate experience is unique to them, so that the tutor *cannot* enter the creative process from the outset, simply fails to recognise the nature of the sensate problem.

Witkin offers clear confirmation of the value of the tutor's involvement with the initial stimulus, the subject-matter under observation in the drawing studio. He also appears to advocate a structuralist-materialist approach to the teaching of drawing.

Teaching drawing, rather than teaching Art. After all, drawing is one of the fundamental activities that enable us to visually represent aspects of the world, and express to others how we feel about the things we experience. To represent is to construct something that can usefully be substituted for some other thing, real object or event, in one or more respects.

And representing things is a fundamental pre-requisite for cultural production, including the production of art.

It has been argued that the split between mind and matter – Arthur Koestler (1964 : 148) has called it the "Cartesian catastrophe" – is responsible for the imbalance in our education system which favours the development of a scientific logic over an *intelligence of feeling*, to use Witkin's (1974) phrase.

As argued in the Introduction to this thesis, the mode of awareness employed when making visual work can be seen as analogous with the other two better-understood capacities for language and mathematics. But it is *holistic* in the sense that it is a way of envisaging objects and events *within their wider contexts* rather than in the isolation of word-symbols or algebraic substitution.

The capacity for visualising, developed from an intelligence of seeing, questions the assumptions and preconceptions which are the result of a rationalist classification of areas of human activity. Such a capacity, which disturbs convention by revealing the false boundaries and disjunctions between areas of thought, forces us to question prevailing language-structured realities. If we ignore this capacity for visualising, we are doomed to repeat the same thought patterns, making the same kinds of meaning from our constantly-changing environmental circumstances time after time.

A teaching strategy which develops in students an awareness of the breadth and depth of vision, together with an understanding of visual communication in a social context, could strengthen the validity of the art schools' curriculum.

How is it possible to develop perceptual awareness that is not too tightly constrained by habit and preconception? If we manage to by-pass that part of the intellect which insists upon naming, classifying and categorising visual input, then we will see that there is no thing set

apart from any other thing. All we would see is a dynamic web of relatedness rather akin to the Zen[5] attitude of 'suchness':

> ...Zen is seeing reality directly, in its 'suchness'. To see the world as it is concretely, undivided by categories and abstractions, one must certainly look at it with a mind which is not thinking – which is to say, forming symbols – about it.
>
> Alan Watts (1957 : 175)

Sources such as this serve to emphasise something of which all educators should be aware: creative vision is fundamental. It is inherent, but obscured by our rational minds, by our projections from memory through language. The direct-seeing mind is referred to by Zen teachers as the 'uncreate', since we create only when we are not conscious of our attempts to create.

The drawing programme proposed here is structured so that the student acquires an understanding of the relationship between individual percepts and social conditioning without the fear of losing the security of memory classification.

From the commencement of the programme, exercises which draw attention to the intriguing nature of everyday things are introduced. This is the first and most fundamental aspect of *subject-reflexive* action, leading to creative expression.

A careful manipulation and presentation of the original stimulus (the subject-matter for observation) can lead both to a questioning of preconceptions without fear of losing all sense of boundaries, and a development of subject-reflexive behaviour, a response wherein the use of an expressive medium - expressive both of ideas and itself - reciprocates the initial impulse in the sense of being that which extends it and recalls it.

The sensate impulse is in fact the first stage of Witkin's three-stage creative process:

1. Setting the sensate problem
2. Making a *holding form*
3. Movement through successive approximations to a resolution

The sensate impulse is the origin of self-expression, the stimulus upon which the individual acts, but which is often neglected within the teacher's praxis. Witkin argues that teachers more often become engaged only with what emerges as *reaction* to the stimulus. It appears imperative for the teacher to arrange high quality sensate problems if they are to expect a reflexive response rather than a subjective reaction from the student.

Witkin's second stage, making a *holding form*, refers to the way in which the fleeting sensate experience can be encapsulated (since the sensate impulse does not stand still and will quickly dissolve in other sensate disturbances).

For the problem of expression of the original sensate impulse to be resolved, it needs to be held for the duration of the process of resolving it. So as soon as the sensate problem is recognised, the individual must establish a holding form for it. In reality this often follows so closely upon the awareness of the sensate problem that it is usually indistinguishable from its consciousness. Nevertheless it is a vital part of the drawing process, and without it the sensate problem itself would change out of all recognition and defy resolution.

> One cannot resolve so volatile and protean an event as a sensate disturbance unless one encapsulates it in a holding form.
>
> Witkin (1974 : 181)

Witkin explains that because the holding form is often instantaneously produced and contains the vitality, the inspiration of the full expression, so creativity itself is often spoken of as instantaneous, a flash of inspiration.

The third stage of the process may be likened to the *creativity cycle*, (Riley 1981) a succession of divergent and convergent modes of thinking that focus in on the range of acceptable resolutions.

In this three-stage proposal, the teacher's praxis is involved from the outset, nurturing the sensate input, encouraging awareness of the variety of perceptual values. The teacher becomes involved within the student's expressive act by heightening awareness of the

importance and aptness of the expressive medium. This may be achieved by discussing and demonstrating conventional aspects of visual language as well as the legitimate use of unconventional combinations of visual elements, so that the student's inquisitiveness is actively encouraged from a base of security rather than from an unsound position of subjective scepticism with no clear criteria for deciding between one strategy or another. In this way, the teacher's praxis becomes involved in the student's development of the intelligence of seeing.

5.2 The teaching programme: structure and content

From the outset, studio projects were designed to encourage students to notice natural phenomena at the various levels of perception: the haptic values within the scene, the distance values, the proximal values. Phenomena such as reflections and refractions may be arranged so as to dissolve the conventional boundaries between objects, and thus stimulate questions about what is directly perceived and what is known intellectually. The possibility of looking without language is explored through drawing exercises.

Life drawing, long out of the bastion of the Academy, and, it may be argued, often out of fashion since, is here revalidated as a vehicle for the development of an intelligence of seeing for several reasons. Firstly, good life models emanate an aura of presence which can sustain the concentration of the drawer. [6] Secondly, as the Russian Formalists understood, making the familiar strange refreshes our perception: the human form, that most familiar form, appears to be almost unlimited in its capacity to intrigue. There is another reason. One may regard the human form as the most easily accessible, flexible, durable, compact and portable subject-matter with which to demonstrate the concept of fractal geometry. At every level of scale, from the macro to the micro, similar structures are apparent. For example, the way one surface occludes another, and those two occlude a third to produce tri-tonal edge patterns of 'T' or 'Y'. Noticing such things encourages students to understand the importance of *edges*,

both to perception and drawing, and may increase their capacities of expression beyond the limitations of the drawn line, and outline in particular.

As these exercises begin to nurture an intelligence of seeing, the fundamentals of visual communication are addressed. Compositional relationships between figure and field, for example, may be discussed in terms of their effects upon the viewer; dynamic and static, stable and unstable compositions may be totally altered in mood by the selection of the mark-making medium and how it is physically applied to the support.

The ambiguities within the notion of 'accuracy' are addressed through studies of proportion. Whilst traditional methods such as the 'Coldstream measuring method', the 'invisible grid method', and the 'observation of negative spaces' method [7] are applied, they are discussed in terms of the assumptions implicit in their use: assumptions to do with the relationship between the primary geometry of the scene and the secondary geometry of the drawing; assumptions to do with the relationship between viewer-centred representations and object-centred representations.

Students are encouraged to consider the social functions of drawing when making selections from the range of projection systems. Of course this only becomes possible when the student is aware of the functions of drawing and the variety of geometries at their disposal. As well as the activity of drawing, slide talks held in studio allow these issues to be elaborated through examples of work from a variety of periods and cultures. However, it is emphasised here that the students' own practice is paramount in the learning process.

Ultimately, drawing is presented as a means of transformation. Transformation from scene to picture via systems of geometry; transformation of individual perceptions into social communication; transformation of cultural values into material form; and finally, the transformation of the student's personal ontological and epistemological constructs so as to inform and empower future practice in the visual arts.

The following pages indicate the structure of the new programme. The detailed content of the project briefs handed to students may be found in Appendix A.

Structure of proposed new drawing programme

Semester 1

Week No.

1-3 *Visual studies workshop.* An introduction to the vocabulary of the drawing class for those students with no previous experience.

4-6 *Looking through the prism-house*[8] *of language.* Exercises to explore how language affects the way we see the world. Introduction to the three levels of perception; haptic values, distances values and proximal values. Stereograms illustrate how further information may be discovered through changing our way of seeing.

7-10 *Welcome to Plantasia.* A project conducted among the exotic flora and fauna enclosed in the large glazed structure known as Plantasia. The three levels of perception are explored, as are the three functions of drawing. These functions are introduced and illustrated in a studio slide-talk prior to the visit.

11-15 *Seeing and believing.* An exercise designed to increase student awareness of ontological constructions, and how these may be made visible in drawings.

Semester 2

Week No.

1-5 *Geometries of vision.* The variety of drawing systems, including projection types, is introduced in a slide talk. Primary geometry and secondary geometry are explored, as are viewer-centred and object-centred representations.

6-9 *Gesture and empathy.* A closer look at the Interpersonal function of drawing.

10-15 *Transformation from scene to picture.* An introduction to scene primitives and picture primitives, denotation systems. T-junctions and Y-junctions are explored in relation to the concept of fractal geometry.

5.3 A discussion of the methods of data collection

Guba & Lincoln (1989 : 189-190) identify four purposes of research evaluation, based upon the nature of judgement to be made, whether *merit* or *worth*, and the intent of the evaluation, whether *formative* or *summative*. For example, an existing programme for teaching drawing could be assessed in terms of its intrinsic value, a *formative merit* evaluation, with the intention of discovering ways of improving its characteristics of up-to-date-ness, or sequencing of projects, or relevance to practice. A *formative worth* evaluation of a teaching programme would be concerned with assessing its extrinsic value with the intent of improving it in terms of the extent to which desired outcomes are produced in an actual context of application – for example, the drawing studio. A *summative merit* evaluation is concerned with assessing the intrinsic value of a proposed new teaching programme in terms of whether it meets an optional standard for up-to-date-ness, or the sequencing of projects. In this third case, a positive evaluation would result in the new programme being warranted as

meeting its internal design specifications. The fourth, a *summative worth* evaluation, is concerned with assessing the extrinsic value of a proposed new programme in an actual context of application. A positive evaluation would result in the proposed programme being warranted for use in that specific context.

Since these four purposes of evaluation are all different, Guba & Lincoln (1989 : 190) deem it unlikely that any single evaluation could serve more than one purpose. And since, in the case of the research presented in this thesis, the aim is to evaluate a proposed new teaching programme in a specific context of application – namely, the drawing classes of a fine art degree course – a *summative worth* evaluation strategy has been selected as most suitable.

Constructionist evaluation rests on two elements:

a) responsive focusing: determining what questions are to be asked and what data are to be collected on the basis of student input.

b) constructionist methodology: carrying out the inquiry process within the ontological and epistemological presuppositions of the constructionist paradigm of research which was specified in the Introduction to this thesis.

Guba & Lincoln (1989 : 174-177) also outline necessary conditions for the conducting of a successful constructionist research inquiry:

a) the study should take place in the natural setting of the activity to be studied. This is a direct consequence of the relativist ontology which underpins constructionism, and which assumes that various constructions of reality, and in particular various attitudes towards drawing, are held within the groups of participating students.

b) the need to base research upon students' emic constructions rather than the researcher's etic constructions.

There is a history of controversy about the merits of studying data from one individual, over the merits of studying data from a group. The research described in this thesis draws upon both strategies. An approach utilising data elicited from the student groups, is regarded as suitable for finding out about general attitudes concerning drawing. The chosen instruments were the Nominal Group Technique, or NGT (Done & Lonsdale 1979), and Semantic Differential Scales, based upon the research of Charles Osgood and colleagues (Osgood et al 1967). These were applied in two pilot studies (1981 in Australia and 1996-7, 1997-8 in Wales) to establish general psychological dimensions of word meaning which would hold true for a range of people of differing backgrounds. Data from the two pilot studies are presented in Appendices B and C. For the final phase of research, Likert scales [9] designed to elicit responses to the specific content of the drawing classes were administered. (Likert, 1932)

For the analysis of individual students' drawings the systemic-functional semiotic model is employed as the instrument of analysis. Kelly himself designed a diagnostic instrument he called the "*Rôle Construct Repertory Test* (Rep Test)" (Kelly 1955 Vol. 1 : 219) which functioned to elicit the psychological constructs of individuals. Whilst the instrument applied here to analyse individuals' drawings (the systemic-functional semiotic model) is in no way as quantitative in its method, it could be argued that it operates in similar ways. For example, the semiotic model allows the researcher/inquirer to understand each drawing in terms of its maker's specific selections from the systems of choices which enable the drawer to construct a visual representation of some aspect (perceptual, emotional, or imaginary) of their experiences, thus revealing their ontological construction.

In a similar way, Kelly's Rep Test allows the psychologist to build a model of their subject's mental map of reality. The main difference lies in their ultimate objectives: the systemic-

functional semiotic model is applied with the intention of assessing any change in the student's ontological awareness – their own, and of others. Kelly's Rep Test is intended as a means to resolving patients' psychological problems.

The Nominal Group Technique (NGT)

Data gathered by this technique were used in the two pilot studies and the research programme to design the other instruments of data collection, Semantic Differential Scales, and Likert Scales. (Both of these instruments were applied to reveal any broadening of the students' ontological constructions, and their awareness and understanding of the constructions of others in the context of drawing conventions).

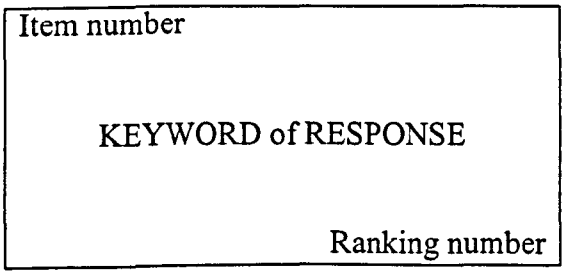
The method of the NGT is now described in detail:

Step 1: In the drawing studio before the commencement of the drawing programme, members of the student group write down as many responses as possible to a question, for example: "What do you consider important to gain from a teaching programme in drawing?" The wording of the question is critical, carefully constructed to be general, which allows students to reply in a wide variety of ways. However it must also be answerable in very specific terms.

Step 2: Each student is asked in turn for one response from their list. These are displayed and numbered in front of the whole group. This procedure continues until all responses generated by students have been recorded in full view for all to see. Duplicate responses are listed once only. During this stage, no discussion or reaction concerning the displayed responses is encouraged, so as not to inhibit any idiosyncratic responses.

Step 3: At this stage, full discussion and questioning of the displayed responses takes place. The purpose of this is to ensure that each student understands every listed response sufficiently well enough to make a decision about their relative importance.

Step 4: Students privately rank the five listed responses they consider the most important. This is done on five small sheets of paper:



Sheets are collected and analysed, allocating a point for each occurrence of a particular listed response. In this way a ranked list of the responses may be obtained for each participating student group. The ranked lists so obtained may be termed NGT pre-programme results. Similar lists were obtained at the end of the drawing programme. These are termed NGT post-programme results. Results are discussed in Section 5.4.1.

Semantic Differential Scales

As well as indicating students' emic views about drawing, the NGT pre-programme data facilitated the selection of bi-polar constructs in the design of the Semantic Differential Scales. These were applied in pilot studies assessing the effects of a drawing programme upon students' attitudes to the act of drawing itself and attitudes concerning the discussion and assessment of drawings.

Such scales are derived from the work of Osgood (et al 1967) and his notion of the "semantic space" in which individuals develop ontological and epistemological constructs.

Results of the first pilot study, conducted in the School of Art and Design at the Western Australian Institute of Technology in 1981, were positive and are presented in Appendix B. After a prolonged period of study investigating the application of communication theory to the teaching and practice of drawing, a second pilot study was undertaken in the Foundation course of the Faculty of Art and Design, Swansea Institute of Higher Education.

Responses to the Semantic Differential Scales were elicited from the groups before and after delivery of the second pilot teaching programme, (1996-7, 1997-8) so that data could be acquired from which any shifts in students' attitudes may be discerned. [10]

The results of this second pilot study appeared positive. They are presented in Appendix C.

Likert method of attitude measurement

This is the instrument employed to gather data about shifts in students' attitudes which may indicate the degree of ontological authenticity, and the degree of educative authenticity of the research, attributable to the new teaching programme over the two year period 1998-2000.

The sets of attitude statements, administered both to the experimental groups and control groups before and after the delivery of the new teaching programme, consisted of statements relating to the specific content of the new programme.

Each of the seven available boxes for registering students' responses to each statement on the Likert scale was allocated a number from 1 to 7. The number of student responses for each box was counted, and multiplied by the box's allocated number. The product was then divided by the total number of students in the group to arrive at a value representing the average response of the student group to each statement on the Likert scale.

This procedure was applied both to control groups and experimental groups for the *pre-programme*, the scale administered prior to the delivery of the new teaching programme, and for the *post-programme*, the same scale administered after the programme had been delivered.

The degree of positive shift in each group's attitude to each statement on the Likert scale may then be calculated simply by subtracting the pre-programme values from the post-programme values. A negative result indicates a negative shift in attitude. The results are presented in Section 5.4.2.

Systemic-functional semiotic model for drawing

The model (Figure 4.32) is the key instrument applied to the interpretation and evaluation of the key data, students' drawings produced in and around the new teaching programme. As well as confirming shifts in attitudes discerned by the Likert Scales, analysis of the drawings afforded the assessment of catalytic authenticity (to what extent has the new programme stimulated students to action, demonstrating their elaborated ontological constructions in their own practice?), and tactical authenticity (to what extent has the new programme empowered students' action in their major studio practice?)

Evaluations of students' drawings are presented in Section 5.4.3.

5.4 Evaluation of data

This sub-section presents and evaluates the data obtained by the Nominal Group Technique (NGT) and the Likert Scales over the period of two academic years, 1998-99 and 1999-2000. The key data, students' drawings produced in and around the new teaching programme over the same period, are discussed and evaluated.

5.4.1 Evaluation of data obtained by the Nominal Group Technique

The top six items in the ranked lists of student-generated responses to the question 'What do you consider important to gain from the drawing class?' are presented below in Figure 5.1 (Numbers in brackets indicate Pre-Programme rankings).

1998-99 Experimental Group

NGT Pre-Programme		NGT Post-Programme	
1.	Ability to record what I see	1(6).	Improvement in my ability to think visually
2.	Confidence in my drawing ability	2(3).	Improved understanding of composition
3.	Improved understanding of composition	3(2).	Confidence in my drawing ability
4.	More ability for personal expression	4(1).	Ability to record what I see
5.	Improvement in skills and techniques	5(4).	More ability for personal expression
6.	Improvement in my ability to think visually	6.	Improvement in skills and techniques

1999-2000 Experimental Group

NGT Pre-Programme		NGT Post-Programme	
1.	More skill in handling media	1(5).	To understand how we see
2.	To improve personal expression	2(3).	To communicate ideas visually
3.	To communicate ideas visually	3(6).	To use drawing as research for major projects
4.	To record observations accurately	4(4).	To record observations accurately
5.	To understand how we see	5(2).	To improve personal expression
6.	To use drawing as research for major projects	6(1).	More skill in handling media

1998-99 Control Group

NGT Pre-Programme	NGT Post-Programme
1. To learn skills	1(2). Fluency of expression
2. Fluency of expression	2(1). To learn skills
3. To illustrate things	3(5). To develop my personal style
4. To understand what we see	4(4). To understand what we see
5. To develop personal style	5(3). To illustrate things
6. Ability to share ideas	6(6). Ability to share ideas

1999-2000 Control Group

NGT Pre-Programme	NGT Post-Programme
1. The ability to record accurately what I see	1(2). A variety of stylistic approaches
2. A variety of stylistic approaches	2(3). Skilful techniques
3. Skilful techniques	3(1). The ability to record accurately what I see
4. To communicate visually	4(4). To communicate visually
5. How to express personal mood	5(5). How to express personal mood
6. Ways of visual exploration	6(6). Ways of visual exploration

Figure 5.1

It may be discerned that three responses, those concerned with the acquisition of skills, the ability to record, and the ability to express oneself, emerge consistently in all four groups over the two year period. (This observation is borne out in the pilot test results presented as Appendices B and C).

But unlike the Control Groups, the NGT Post-Programme results for the two Experimental Groups indicate a clearly-defined shift in students' attitudes to importance, away from skills, recording, and expressing, towards an awareness of how one sees, and the ability to communicate.

Within the parameters of a constructionist research paradigm, such an indication may be interpreted as evidence of the ontological authenticity and the educative authenticity of the research project. This is the first indication that the new drawing teaching programme has effectively broadened the student groups' ontological constructs.

5.4.2 Evaluation of data obtained from the Likert sets of attitude statements.

Semester 1 1998-99

The Likert set administered both to Experimental and Control groups before and after delivery of the Semester 1, 1998-99, new teaching programme is presented in Figure 5.2. Each statement is derived from student responses in the NGT, and is designed to elicit the students' emic views on issues covered in the new programme.

Each statement is linked to specific criteria by which the new teaching programme may be authenticated for its efficacy in broadening student awareness of their own ontological constructs, and also those of others. The direction of a positive shift in attitude to each statement is indicated by an arrow. For example, in the first statement, 'I believe that understanding how we see is important', for which may be expected a high pre-programme value in the range 1-7, a positive shift would be indicated by an even higher post-programme value. In contrast, since the construct 'I believe the meaning of a drawing is controlled by its maker' is challenged during the delivery of the new teaching programme, a positive shift in student attitude would be indicated by a lower value in the range 1-7 on the post-programme scale.

In Semester 1 1998-99, the pre-programme Likert set was administered to the whole first year group of 35 students of fine art, and painting and drawing. This group was then divided in two, one half designated as the Experimental Group, the other as Control Group.

Figure 5.2d summarises the shifts in attitude for both Experimental and Control groups in the first Semester of the delivery and evaluation of the new teaching programme.

Whilst there is encouraging evidence of positive shifts in the attitude of the Experimental group in all but one of the items, which may be used to argue a degree of the ontological and educative authenticity of the research, there are similar positive shifts evident in the Control group which serve to undermine any such argument.

An explanation is offered for the apparently inconclusive results: both Experimental and Control groups were formed from the first-year intake to the Fine Art/Painting and drawing courses. Both groups shared a studio in which they were integrated throughout the semester. Naturally, students were free to discuss their drawing classes and compare drawings. Inevitably, some knowledge of the new drawing programme could be available to the students who formed the Control group. There was another factor, which may explain the first semester's inconclusivity as far as research conclusions are concerned. The Control group was taught by a student teacher, a fine arts graduate, who was qualifying for a post-graduate teaching diploma. She was supervised informally by myself. Inevitably, we discussed the content of my research programme, both in private tutorials and within her drawing classes with the Control group.

These two factors may have 'contaminated' the data, and so, for the ensuing three semesters of the data-gathering period, Control groups were nominated from outside the Fine Art/Painting and drawing student cohort, and were taught independently by a full-time experienced teacher and practitioner of drawing.

Semester 1 1998-99

PRE-PROGRAMME [n=35]

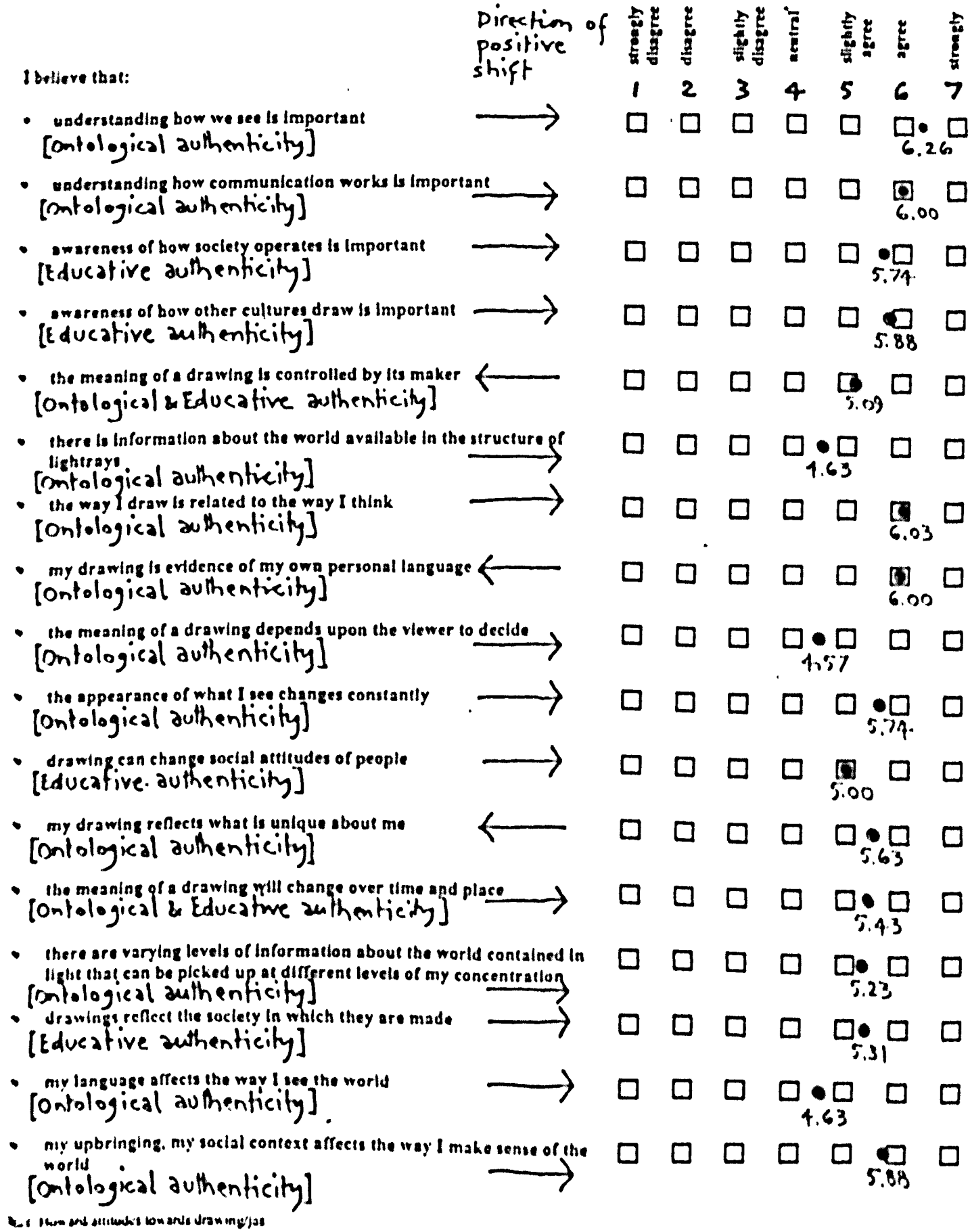
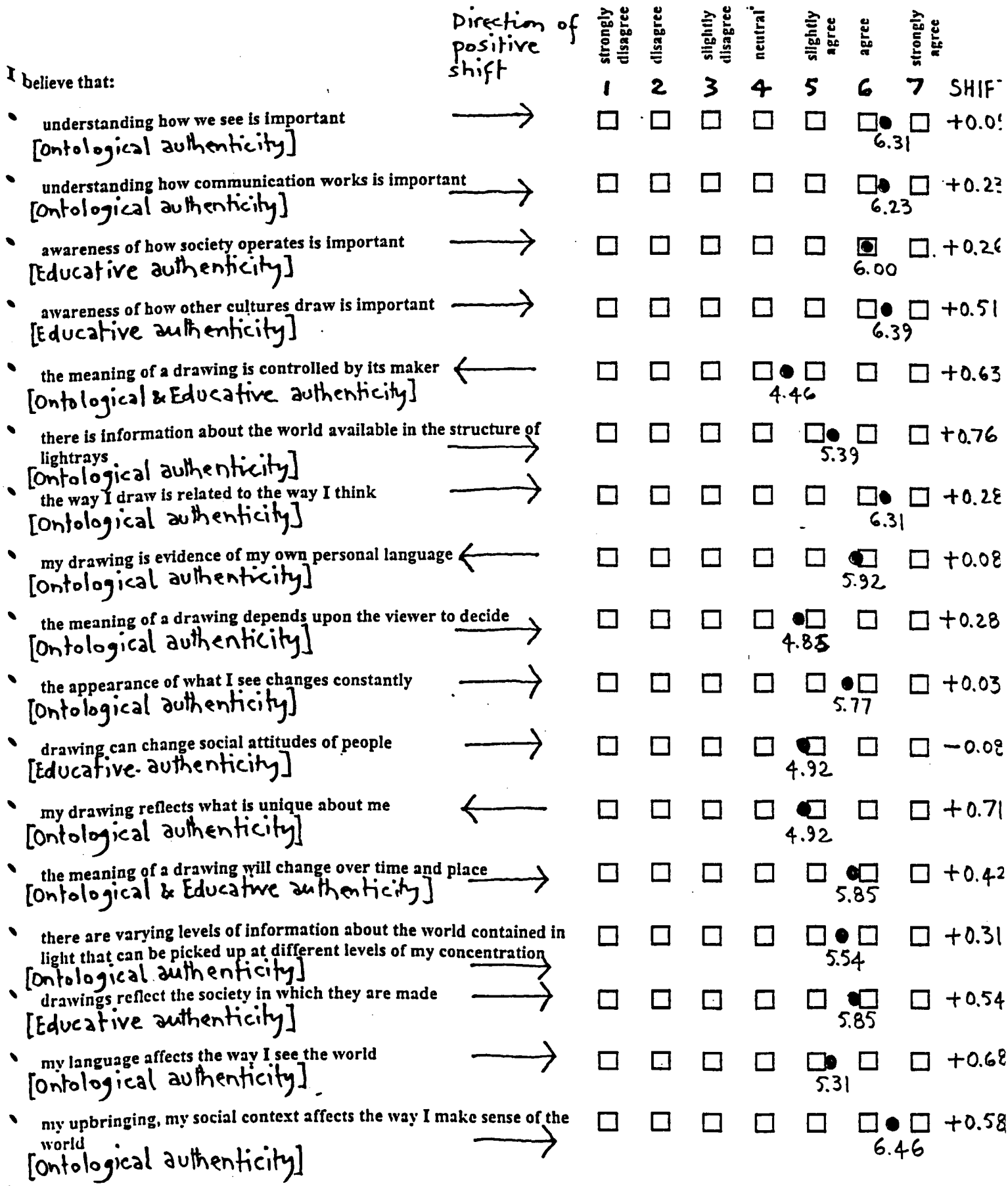


Figure 5.2a

Semester 1 1998-99

POST-PROGRAMME EXPERIMENTAL GROUP [n=15]

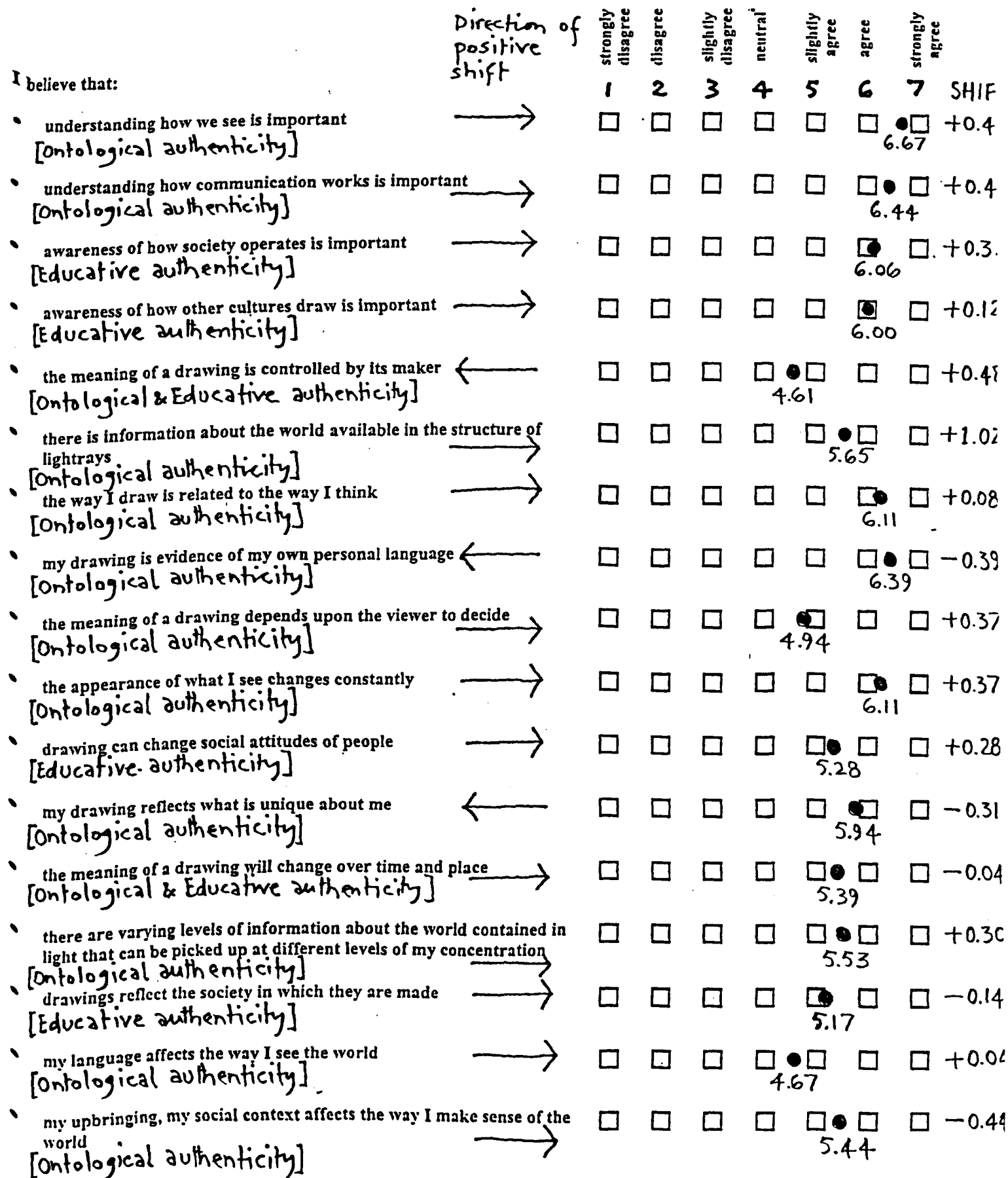


Ref: Howard/attitudes towards drawing/jas

Figure 5.2b

Semester 1 1998-99

POST-PROGRAMME CONTROL GROUP [n = 18]



Ref: Howard/attitudes towards drawing/jas

Figure 5.2c

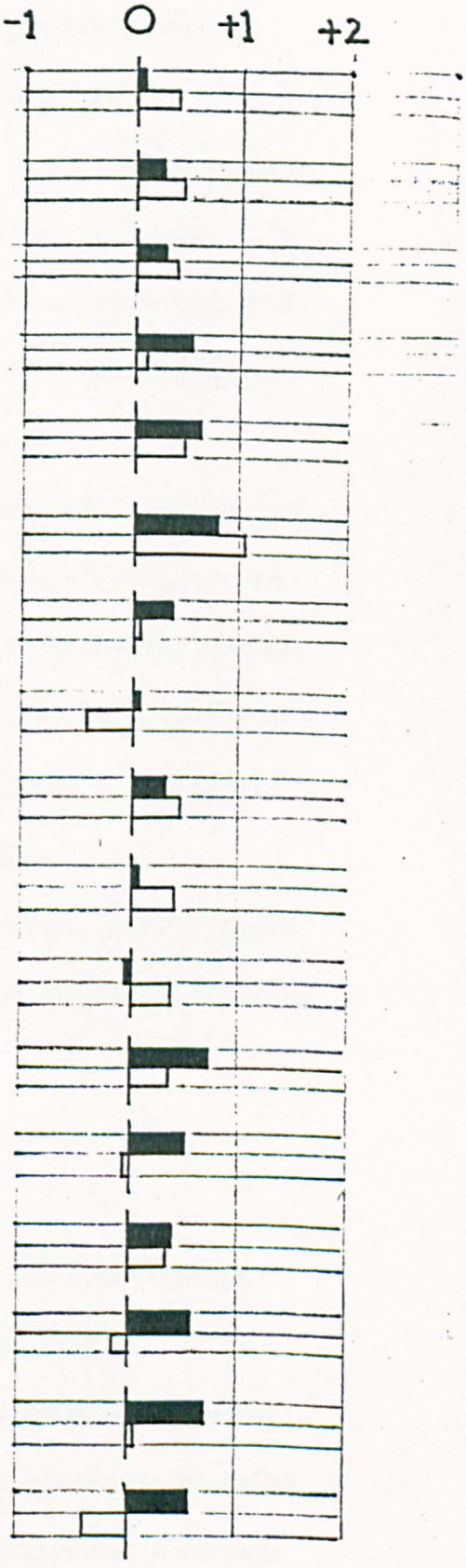
Semester 1 1998-99

SHIFTS IN ATTITUDES

Experimental group
Control group

I believe that:

- understanding how we see is important
- understanding how communication works is important
- awareness of how society operates is important
- awareness of how other cultures draw is important
- the meaning of a drawing is controlled by its maker
- there is information about the world available in the structure of lightrays
- the way I draw is related to the way I think
- my drawing is evidence of my own personal language
- the meaning of a drawing depends upon the viewer to decide
- the appearance of what I see changes constantly
- drawing can change social attitudes of people
- my drawing reflects what is unique about me
- the meaning of a drawing will change over time and place
- there are varying levels of information about the world contained in light that can be picked up at different levels of my concentration
- drawings reflect the society in which they are made
- my language affects the way I see the world
- my upbringing, my social context affects the way I make sense of the world



Ref: Howard/attitudes towards drawing/jas

Figure 5.2d

Semester 2 1998-99

Figure 5.3 presents data gathered from the Likert set of attitude statements administered to both Experimental and Control groups before and after delivery of the new teaching programme in Semester 1, 1998-99. Each statement is designed to elicit students' emic views on specific content of the teaching programme. As in Semester 1 set of attitude statements, and throughout the four semesters of the data-gathering period, for each statement in the sets there is indicated specific criteria (ontological authenticity or educative authenticity) which authenticates the new teaching programme in terms of its efficacy in broadening students' awareness of their own ontological constructs, and also those of others.

It may be noted that the pre-programme results for both the Experimental (Figure 5.3a) and Control (Figure 5.3c) groups are clustered around the neutral response, valued as 4 on the scale 1-7. This is to be expected, since none of the students has experience of the technical language used in the Likert set at this stage. However, the post-programme results for the Experimental group (Figure 5.3b) indicate a consistent positive shift, whilst those of the Control group still remain closer to the neutral response (Figure 5.3d)

Here is further evidence that the new teaching programme has broadened the Experimental Group's awareness of their own ontological constructions and the possibilities of alternative constructions held by others.

Semester 1 1999-2000

Data from the Likert sets administered to the Second Experimental and Control groups, students who enrolled in Semester 1 1999-2000, are presented in Figures 5.4.

The response to the statement 'I believe that my drawing is evidence of my own personal language' indicates a determination within the Experimental group to hold on to this belief. The high pre-programme value of 6.06 (Figure 5.4a) and the even higher post-programme

Semester2 1998-99

PRE-PROGRAMME EXPERIMENTAL GROUP [n=15]

When I am drawing:	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	
• An awareness of primary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐● 5.05	☐	☐	
• An awareness of secondary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.69	☐	☐	☐	
• I am aware that a viewer-centred drawing reflects my position in the world [Ontological authenticity]	☐	☐	☐	☐● 4.68	☐	☐	☐	
• An awareness of the possibilities of object-centred drawings is important [Ontological authenticity]	☐	☐	☐	☐● 4.79	☐	☐	☐	
• An awareness of scene-primitives is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.5	☐	☐	☐	
• An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important [Ontological & Educative authenticity]	☐	☐	☐● 3.65	☐	☐	☐	☐	
• An awareness of the three levels of perception (haptic, distance, and proximal) is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐	☐● 6.35	☐	
• These classes have improved my drawing	☐	☐	☐	☐	☐	☐	☐	N/A

Figure 5.3a

Ref: howard/attitudes towards drawing2/jas

Semester 2 1998-99

POST-PROGRAMME EXPERIMENTAL GROUP [n=15]

When I am drawing:	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	SHIFT
• An awareness of primary geometry is important [ontological & Educative authenticity]	☐	☐	☐	☐	☐	● 5.6	☐	+0.55
• An awareness of secondary geometry is important [ontological & Educative authenticity]	☐	☐	☐	☐	☐	● 5.84	☐	+1.15
• I am aware that a viewer-centred drawing reflects my position in the world [ontological authenticity]	☐	☐	☐	☐	☐	● 5.87	☐	+1.19
• An awareness of the possibilities of object-centred drawings is important [ontological authenticity]	☐	☐	☐	☐	☐	● 6.14	☐	+1.35
• An awareness of scene-primitives is important [ontological & Educative authenticity]	☐	☐	☐	☐	● 5.25	☐	☐	+0.75
• An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important [ontological & Educative authenticity]	☐	☐	☐	☐	● 5.20	☐	☐	+1.55
• An awareness of the three levels of perception (haptic, distance, and proximal) is important [ontological & Educative authenticity]	☐	☐	☐	☐	☐	☐	● 6.74	+0.39
• These classes have improved my drawing	☐	☐	☐	☐	☐	☐	● 6.54	

Figure 5.3b

Ref: howard/attitudes towards drawing2/jas

Semester 1 1998-99

PRE-PROGRAMME CONTROL GROUP [n=15]

When I am drawing:	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	
• An awareness of primary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.28	☐	☐	☐	
• An awareness of secondary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.47	☐	☐	☐	
• I am aware that a viewer-centred drawing reflects my position in the world [Ontological authenticity]	☐	☐	☐	☐● 4.05	☐	☐	☐	
• An awareness of the possibilities of object-centred drawings is important [Ontological authenticity]	☐	☐	☐	●☐ 3.74	☐	☐	☐	
• An awareness of scene-primitives is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 3.96	☐	☐	☐	
• An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.01	☐	☐	☐	
• An awareness of the three levels of perception (haptic, distance, and proximal) is important [Ontological & Educative authenticity]	☐	☐	☐	●☐ 3.75	☐	☐	☐	
• These classes have improved my drawing	☐	☐	☐	☐	☐	☐	☐	N/A

Figure 5.3c

Ref: howard/attitudes towards drawing2/jas

Semester 2 1998-99

POST-PROGRAMME CONTROL GROUP [n=15]

When I am drawing:	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	SHIFT
• An awareness of primary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.19	☐	☐	☐	−0.09
• An awareness of secondary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐	●☐ 4.72	☐	☐	+0.25
• I am aware that a viewer-centred drawing reflects my position in the world [Ontological authenticity]	☐	☐	☐	●☐ 3.83	☐	☐	☐	−0.22
• An awareness of the possibilities of object-centred drawings is important [Ontological authenticity]	☐	☐	☐	●☐ 3.76	☐	☐	☐	+0.02
• An awareness of scene-primitives is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.07	☐	☐	☐	+0.11
• An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.11	☐	☐	☐	+0.10
• An awareness of the three levels of perception (haptic, distance, and proximal) is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.32	☐	☐	☐	+0.57
• These classes have improved my drawing	☐	☐	☐	■ 4.06	☐	☐	☐	

Figure 5.3d

Ref: howard/attitudes towards drawing2/jas

Semester 2 1998-99

SHIFTS IN ATTITUDES

Experimental group
Control group

When I am drawing:

- An awareness of primary geometry is important
- An awareness of secondary geometry is important
- I am aware that a viewer-centred drawing reflects my position in the world
- An awareness of the possibilities of object-centred drawings is important
- An awareness of scene-primitives is important
- An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important
- An awareness of the three levels of perception (haptic, distance, and proximal) is important
- These classes have improved my drawing

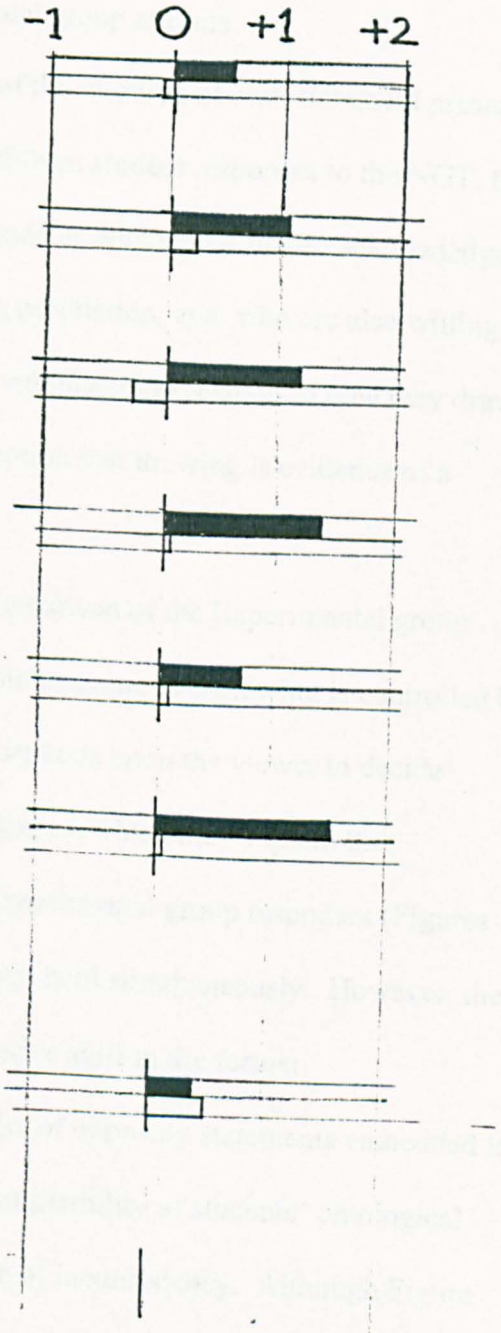


Figure 5.3e

value of 6.28, (Figure 5.4b) indicates the strength of this belief, despite the contradictory nature of the response to the statements 'I believe my drawing reflects what is unique about me' and 'I believe drawings reflect the society in which they are made'. Both of these statements elicited positive shifts in the Experimental group attitude.

It may be worth emphasising here the importance of the wording of each statement presented to the students. Although each statement is derived from student responses to the NGT, the wording of each has been refined. It appears that students who are willing to acknowledge the influence of social context upon individual drawing production, and who are also willing to relinquish a degree of importance of their personal uniqueness in relation to how they draw, are still able to reconcile with these constructs the notion that drawing is evidence of a personal language.

Another apparent contradiction is revealed in the comparison of the Experimental group responses to the two opposed statements 'I believe the meaning of a drawing is controlled by its maker', and 'I believe the meaning of a drawing depends upon the viewer to decide'. Perhaps the wording of both these statement is ambiguous, which may explain the contradictory responses. From the evidence of the Experimental group responses (Figures 5.4a,b) it appears that both these opposing positions are held simultaneously. However, the positive shift in the latter item is greater than the negative shift in the former.

The Semester 1 Likert set was designed with such pairs of opposing statements embedded in random order so as to evaluate the consistency and compatibility of students' ontological constructs. Evidence presented here suggests a degree of inconsistency. Although Figure 5.4e indicates a more consistent pattern of positive shifts within the second Experimental group than that of the first Experimental group (Figure 5.2d), it is recognised that the Semester 1 results from both years of data collection are inconclusive. One reason for this may be to do with the design of the data-gathering instrument, the Likert set itself.

Semester 1 1999-2000

PRE-PROGRAMME EXPERIMENTAL GROUP [n = 18]

I believe that:	Direction of positive shift	strongly disagree 1	disagree 2	slightly disagree 3	neutral 4	slightly agree 5	agree 6	strongly agree 7
• understanding how we see is important [Ontological authenticity]	→						6.17	
• understanding how communication works is important [Ontological authenticity]	→						6.00	
• awareness of how society operates is important [Educative authenticity]	→						6.00	
• awareness of how other cultures draw is important [Educative authenticity]	→						6.11	
• the meaning of a drawing is controlled by its maker [Ontological & Educative authenticity]	←					5.28		
• there is information about the world available in the structure of lightrays [Ontological authenticity]	→				4.22			
• the way I draw is related to the way I think [Ontological authenticity]	→						5.94	
• my drawing is evidence of my own personal language [Ontological authenticity]	←						6.06	
• the meaning of a drawing depends upon the viewer to decide [Ontological authenticity]	→				4.44			
• the appearance of what I see changes constantly [Ontological authenticity]	→					5.56		
• drawing can change social attitudes of people [Educative authenticity]	→					5.28		
• my drawing reflects what is unique about me [Ontological authenticity]	←						6.06	
• the meaning of a drawing will change over time and place [Ontological & Educative authenticity]	→					5.17		
• there are varying levels of information about the world contained in light that can be picked up at different levels of my concentration [Ontological authenticity]	→				4.67			
• drawings reflect the society in which they are made [Educative authenticity]	→					5.17		
• my language affects the way I see the world [Ontological authenticity]	→					5.17		
• my upbringing, my social context affects the way I make sense of the world [Ontological authenticity]	→						5.89	

Figure 5.4a

Semester 1 1999-2000

POST-PROGRAMME EXPERIMENTAL GROUP [n=18]

I believe that:	Direction of positive shift	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	SHIFT
understanding how we see is important [Ontological authenticity]	→						6.44		+0.2
understanding how communication works is important [Ontological authenticity]	→						6.33		+0.3
awareness of how society operates is important [Educative authenticity]	→					5.83			−0.1
awareness of how other cultures draw is important [Educative authenticity]	→						6.17		+0.0
the meaning of a drawing is controlled by its maker [Ontological & Educative authenticity]	←					5.39			−0.1
there is information about the world available in the structure of lightrays [Ontological authenticity]	→					5.61			+1.3
the way I draw is related to the way I think [Ontological authenticity]	→						6.28		+0.3
my drawing is evidence of my own personal language [Ontological authenticity]	←						6.28		−0.2
the meaning of a drawing depends upon the viewer to decide [Ontological authenticity]	→				4.61				+0.17
the appearance of what I see changes constantly [Ontological authenticity]	→						6.22		+0.66
drawing can change social attitudes of people [Educative authenticity]	→					5.72			+0.44
my drawing reflects what is unique about me [Ontological authenticity]	←						5.89		+0.17
the meaning of a drawing will change over time and place [Ontological & Educative authenticity]	→					5.83			+0.66
there are varying levels of information about the world contained in light that can be picked up at different levels of my concentration [Ontological authenticity]	→					5.39			+0.72
drawings reflect the society in which they are made [Educative authenticity]	→						6.17		+1.00
my language affects the way I see the world [Ontological authenticity]	→						6.28		+1.11
my upbringing, my social context affects the way I make sense of the world [Ontological authenticity]	→						6.44		+0.55

Ref: Howard/attitudes towards drawing/jas

Figure 5.4b

Semester 1 1999-2000

PRE-PROGRAMME CONTROL GROUP [n = 25]

I believe that:	Direction of positive shift	strongly disagree 1	disagree 2	slightly disagree 3	neutral 4	slightly agree 5	agree 6	strongly agree 7
understanding how we see is important [Ontological authenticity]	→						6.48	
understanding how communication works is important [Ontological authenticity]	→						6.08	
awareness of how society operates is important [Educative authenticity]	→					5.44		
awareness of how other cultures draw is important [Educative authenticity]	→					5.40		
the meaning of a drawing is controlled by its maker [Ontological & Educative authenticity]	←					5.20		
there is information about the world available in the structure of lightrays [Ontological authenticity]	→				4.36			
the way I draw is related to the way I think [Ontological authenticity]	→						6.04	
my drawing is evidence of my own personal language [Ontological authenticity]	←						5.92	
the meaning of a drawing depends upon the viewer to decide [Ontological authenticity]	→				4.44			
the appearance of what I see changes constantly [Ontological authenticity]	→					5.16		
drawing can change social attitudes of people [Educative authenticity]	→				4.68			
my drawing reflects what is unique about me [Ontological authenticity]	←						5.52	
the meaning of a drawing will change over time and place [Ontological & Educative authenticity]	→				4.44			
there are varying levels of information about the world contained in light that can be picked up at different levels of my concentration [Ontological authenticity]	→				4.56			
drawings reflect the society in which they are made [Educative authenticity]	→				4.48			
my language affects the way I see the world [Ontological authenticity]	→				4.44			
my upbringing, my social context affects the way I make sense of the world [Ontological authenticity]	→					5.40		

Ref: Howard/attitudes towards drawing/jas

Figure 5.4c

Semester 1 1999-2000

POST-PROGRAMME CONTROL GROUP [n = 25]

I believe that:	Direction of positive shift	strongly disagree 1	disagree 2	slightly disagree 3	neutral 4	slightly agree 5	agree 6	strongly agree 7	SHIFT
• understanding how we see is important [Ontological authenticity]	→						6.04		−0.4
• understanding how communication works is important [Ontological authenticity]	→					5.72			−0.3
• awareness of how society operates is important [Educative authenticity]	→					5.24			−0.2
• awareness of how other cultures draw is important [Educative authenticity]	→					5.12			−0.2
• the meaning of a drawing is controlled by its maker [Ontological & Educative authenticity]	←					5.44			−0.2
• there is information about the world available in the structure of lightrays [Ontological authenticity]	→				4.32				−0.0
• the way I draw is related to the way I think [Ontological authenticity]	→						5.80		−0.2
• my drawing is evidence of my own personal language [Ontological authenticity]	←						5.92		0
• the meaning of a drawing depends upon the viewer to decide [Ontological authenticity]	→					4.92			+0.4
• the appearance of what I see changes constantly [Ontological authenticity]	→				4.88				−0.28
• drawing can change social attitudes of people [Educative authenticity]	→					5.00			+0.32
• my drawing reflects what is unique about me [Ontological authenticity]	←						5.84		−0.3
• the meaning of a drawing will change over time and place [Ontological & Educative authenticity]	→					5.16			+0.72
• there are varying levels of information about the world contained in light that can be picked up at different levels of my concentration [Ontological authenticity]	→				4.40				−0.16
• drawings reflect the society in which they are made [Educative authenticity]	→					5.44			+0.96
• my language affects the way I see the world [Ontological authenticity]	→				4.80				+0.36
• my upbringing, my social context affects the way I make sense of the world [Ontological authenticity]	→						6.08		+0.68

Ref: Howard/attitudes towards drawing/jas

Figure 5.4 d

Semester 1 1999-2000

SHIFTS IN ATTITUDES

Experimental group
Control group

I believe that:

- understanding how we see is important
- understanding how communication works is important
- awareness of how society operates is important
- awareness of how other cultures draw is important
- the meaning of a drawing is controlled by its maker
- there is information about the world available in the structure of lightrays
- the way I draw is related to the way I think
- my drawing is evidence of my own personal language
- the meaning of a drawing depends upon the viewer to decide
- the appearance of what I see changes constantly
- drawing can change social attitudes of people
- my drawing reflects what is unique about me
- the meaning of a drawing will change over time and place
- there are varying levels of information about the world contained in light that can be picked up at different levels of my concentration
- drawings reflect the society in which they are made
- my language affects the way I see the world
- my upbringing, my social context affects the way I make sense of the world

Ref: Howardattitudes towards drawing/jas

Figure 5.4e

However, it may be argued that the inconsistencies in the pattern of shifts in students' attitudes are clear evidence of an accelerated process of re-adjustment common in the early stages of a new course, during which students are reconstructing their ontological constructs related to beliefs about how we see, and how we communicate through drawing. It is demonstrated that the Semester 2 results indicate a more consistent pattern.

Semester 2 1999-2000

Figure 5.5 presents data gathered from the set of attitude statements administered to both Experimental and Control groups, before and after delivery of the teaching programme for Semester 2, 1999-2000.

Data from the final semester of the testing period of the new teaching programme confirm the findings of Semester 2, 1998-99 (Figure 5.3e). Values in the post-programme Experimental group Likert set (Figure 5.5b) are consistently high, clustered between 5.81 and 6.56. Such a significant positive shift in the Experimental group's attitudes to the detailed content of the new programme is testimony to the group's increased awareness of the range of ontological constructions embedded within the programme.

Even the one negative shift, that relating to the students' attitudes to the importance of awareness of the various levels of perception, carries a high post-programme value of 6.25 on the scale 1-7, indicating the group's continued recognition of the importance of this item. The noticeably high value given to this item by the pre-programme Experimental group (Figure 5.5a) is explained by the fact that levels of perception were introduced, discussed and assimilated in the Semester 1 drawing programme.

The positive shift in the attitude of the Control group (Figure 5.5d) to the same item (levels of perception) appears consistent with the result from Semester 2 1998-99 (Figure 5.3d). However, in both cases the pre- and post-programme values for this item are clustered

Semester 2 1999-2000

PRE-PROGRAMME EXPERIMENTAL GROUP [n = 16]

When I am drawing:	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	
• An awareness of primary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐	● 5.56	☐	
• An awareness of secondary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐	● 5.94	☐	
• I am aware that a viewer-centred drawing reflects my position in the world [Ontological authenticity]	☐	☐	☐	● 4.56	☐	☐	☐	
• An awareness of the possibilities of object-centred drawings is important [Ontological authenticity]	☐	☐	☐	● 4.50	☐	☐	☐	
• An awareness of scene-primitives is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐	● 5.69	☐	
• An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important [Ontological & Educative authenticity]	☐	☐	☐	☐	● 5.06	☐	☐	
• An awareness of the three levels of perception (haptic, distance, and proximal) is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐	☐ ● 6.44	☐	
• These classes have improved my drawing	☐	☐	☐	☐	☐	☐	☐	N/A

Figure 5.5a

Semester 2 1999-2000

POST-PROGRAMME EXPERIMENTAL GROUP [n=16]

When I am drawing:	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	SHIFT
• An awareness of primary geometry is important [Ontological & Educative authenticity]						6.13		+0.57
• An awareness of secondary geometry is important [Ontological & Educative authenticity]						6.13		+0.19
• I am aware that a viewer-centred drawing reflects my position in the world [Ontological authenticity]					5.81			+1.25
• An awareness of the possibilities of object-centred drawings is important [Ontological authenticity]						6.00		+1.50
• An awareness of scene-primitives is important [Ontological & Educative authenticity]					5.81			+0.12
• An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important [Ontological & Educative authenticity]						6.13		+1.07
• An awareness of the three levels of perception (haptic, distance, and proximal) is important [Ontological & Educative authenticity]						6.25		−0.19
• These classes have improved my drawing						6.56		

Figure 5.5b

Ref: howard/attitudes towards drawing2/jas

Semester 2 1999-2000

PRE-PROGRAMME CONTROL GROUP [n=17]

When I am drawing:	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	
• An awareness of primary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐● 5.23	☐	☐	
• An awareness of secondary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐ ●☐ 5.70		☐	
• I am aware that a viewer-centred drawing reflects my position in the world [Ontological authenticity]	☐	☐	☐	●☐ 4.00	☐	☐	☐	
• An awareness of the possibilities of object-centred drawings is important [Ontological authenticity]	☐	☐	☐	●☐ 4.06	☐	☐	☐	
• An awareness of scene-primitives is important [Ontological & Educative authenticity]	☐	☐	☐	☐	●☐ 5.06	☐	☐	
• An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.47	☐	☐	☐	
• An awareness of the three levels of perception (haptic, distance, and proximal) is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.23	☐	☐	☐	
• These classes have improved my drawing	☐	☐	☐	☐	☐	☐	☐	N/A

Figure 5.5c

Ref: howard/attitudes towards drawing2/jas

Semester 2 1999-2000

POST-PROGRAMME CONTROL GROUP [n = 17]

When I am drawing:	1 strongly disagree	2 disagree	3 slightly disagree	4 neutral	5 slightly agree	6 agree	7 strongly agree	SHIFT
• An awareness of primary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐● 5.12	☐	☐	−0.11
• An awareness of secondary geometry is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐● 4.88	☐	☐	−0.82
• I am aware that a viewer-centred drawing reflects my position in the world [Ontological authenticity]	☐	☐	☐	☐● 4.06	☐	☐	☐	+0.06
• An awareness of the possibilities of object-centred drawings is important [Ontological authenticity]	☐	☐	☐	☐● 4.41	☐	☐	☐	+0.35
• An awareness of scene-primitives is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.53	☐	☐	☐	−0.53
• An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important [Ontological & Educative authenticity]	☐	☐	☐	☐● 4.53	☐	☐	☐	+0.06
• An awareness of the three levels of perception (haptic, distance, and proximal) is important [Ontological & Educative authenticity]	☐	☐	☐	☐	☐● 4.94	☐	☐	+0.71
• These classes have improved my drawing	☐	☐	☐● 3.53	☐	☐	☐	☐	

Figure 5.5d

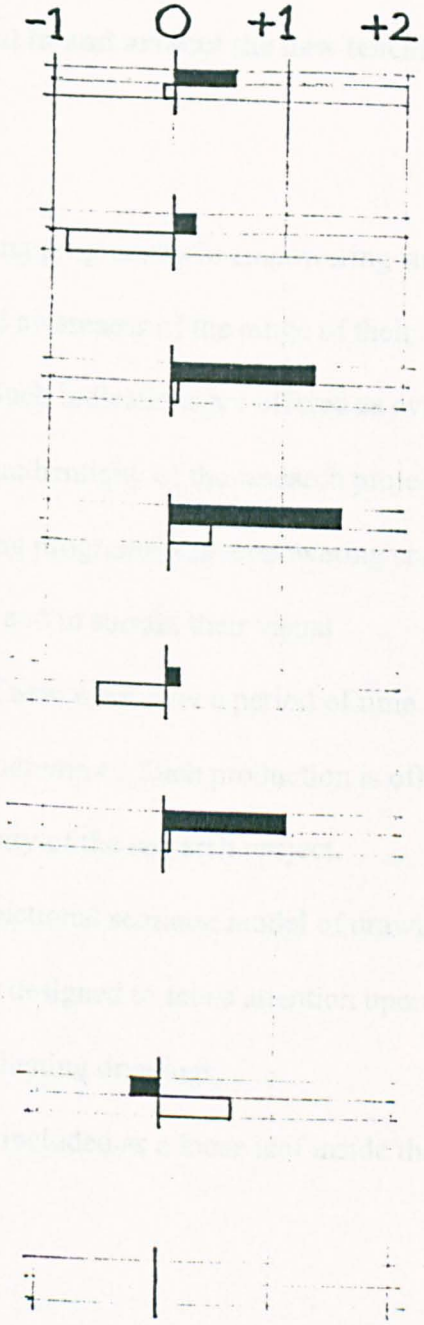
Ref: howard/attitudes towards drawing2/jas

Semester 2 1999-2000

SHIFTS IN ATTITUDES

When I am drawing:

Experimental group
Control group



- An awareness of primary geometry is important
- An awareness of secondary geometry is important
- I am aware that a viewer-centred drawing reflects my position in the world
- An awareness of the possibilities of object-centred drawings is important
- An awareness of scene-primitives is important
- An awareness of how scene-primitives may be translated into picture-primitives (lines, points, T & Y junctions, tone and texture contrasts) is important
- An awareness of the three levels of perception (haptic, distance, and proximal) is important
- These classes have improved my drawing

Figure 5.5e

between 3.75 and 4.94 on the 1-7 scale, indicating far less conviction than that within the Experimental group.

5.4.3 Evaluation of students' drawings produced in and around the new teaching programme

The purpose of evaluating students' drawings is:

1. to demonstrate the efficacy of the new teaching programme in empowering students to produce work which indicates an increased awareness of the range of their ontological constructs, and those of others. Such indications are offered as evidence of the ontological, educative, and catalytical authenticity of the research project.
2. to demonstrate the efficacy of the new teaching programme in empowering students to discover new directions of visual research, and to sustain their visual inquisitiveness and capacity for production of new work over a period of time following the delivery of the new teaching programme. Such production is offered as evidence of the catalytic and tactical authenticity of the research project.
3. to demonstrate the efficacy of the systemic-functional semiotic model of drawing (Figure 4.32) as a means of devising exercises designed to focus attention upon specific drawing issues, and as a means of evaluating drawings.

For easier reference the chart illustrating the model is included as a loose leaf inside the back cover.

Drawings from the 'Visual Studies Workshop'

In their first life-class, the majority of students drew an outline of the figure. Very few, if any, marks were made outside this figure-shape. Generally, tone was added within the figure shape after its completion, and was referred to as 'shading'.

With the Chart (Figure 4.32) as reference, exercises were devised at the level of engagement of *Combinations of drawn marks* in order to increase student awareness of the greater possibilities of *line*, how it may represent visual phenomena, and how the primary geometry of the figure in space may be transformed to drawing through an expanded range of combinations of drawn marks.

Students were encouraged to replace *line* with a concept of *contrast-boundary*. The terms *edge* and *occlusion of surfaces* were discussed.

Figure 5.6 illustrates the first indication of this expanded awareness. Edges in the primary geometry are beginning to be treated as boundaries between contrasting tones in the secondary geometry of the drawing, particularly at the shoulders, the right knee and left wrist. An indication that such an exercise may act catalytically to facilitate the production of work by the same student beyond the confines of the drawing programme is illustrated in Figure 5.6a. Note that the emerging awareness evident in Figure 5.6 is now fully articulated in this painting, most subtly at the shoulder, knee and thigh of the second figure from the left, at the small of the back of the central figure, and at the shoulder of the fourth figure from the left. This evidence is presented in support of the catalytic and tactical authenticity of the research project.

Figure 5.7 illustrates a full awareness of how tonal contrast may appear to fluctuate along an edge; dark figure/light background: light figure/dark background.

At the level of engagement *Sub-divisions of the drawing's surface*, exercises were devised to explore the primary geometry of the model's pose in terms of Gestalt relationships between axes and shapes of tone in the secondary geometry of the drawing.

Figures 5.8 and 5.9 indicate an awareness of how linear axes and the positioning of shapes of tones may afford the viewer eye-paths and focal points, a sense of depth and scale, and a sense of stability or dynamism.

Evidence of students' increased awareness of how these early exercises may be combined to produce drawings which engage the viewer is offered in Figures 5.10 and 5.11. These drawings allow meanings to be made about the position of the figure in space, its mass, the distance between surfaces, the quality and direction of the light, the balance and stability of the pose.

In contrast, Figure 5.12 provides evidence of an awareness that the figure in space may be construed simply as a pattern of salient edges. No information about mass or illumination, but an opportunity to focus upon the proximal values, the linear pattern of the scene. An ability to construe line as something other than outline is evidence of the student's expanding ontological constructions.

Other exercises in these early workshops were designed to encourage students to challenge and reformulate one of the deeply-held conventions of the life-class. The assumption of a static relationship between life-model and drawer. Exploring the possibilities of drawing the model from a moving pathway of observation resulted in drawings as illustrated in Figure 5.13 and 5.14. Here is evidence of a shift away from the students' earlier ontological construct towards one in which the everyday experience of moving within a world that also moves informs the practice of drawing. The student who recognises the logic of describing objects in space from a viewing position within and moving around that space, as in Figure 5.15 may also recognise the validity of the ontological constructions and the drawing conventions of other cultures. Student drawings, Figures 5.16 and 5.17, illustrate attempts at combining a variety of viewpoints within the one drawing.

These drawings from the Visual Studies Workshop are offered as further evidence of the ontological and educative authenticity of the new programme in teaching drawing.

Drawings from the 'Plantasia' project

The *Plantasia* project (see Appendix A for details of the project requirements) offered students an opportunity to increase their awareness of ontological constructs to do with ways of seeing. Three levels of perception were introduced:

1. the haptic level, or the noticing of textural variation and detail in the scene.
2. the distal level, or the noticing of information about spatial depth in the scene.
3. the proximal level, referring to the noticing of pattern across the visual field.

These three levels of visual information had been mentioned throughout the previous Visual Studies Workshop, so that students were familiar with the terms. However, during the Plantasia project these levels were discussed as potential means of organising visual information in compositions that may both communicate the experience of seeing and position the viewer in terms of attitude and mood. The three functions of drawing identified in Figure 4.32 were introduced in a talk illustrated with slides.

Notes and illustrations for the talk may be found in Appendix A.

In Figure 5.18 the student's experience of observing a lizard in static pose over a long period of time from a static position may be shared through compositional devices. Engaging with this drawing at the level of *Sub-divisions of the drawing's surface*, the viewer may notice how the stability and weight of the pose is emphasised by the central placement of the horizontal axis with dark tones above and light below. The lizard is held visually stable, as its front leg forms a part of the second major axis, running diagonally across the main horizontal. This diagonal is balanced by a parallel one at the right. The viewer is positioned close enough to engage with the drawing at the level of *Combinations of drawn marks*. Here,

the relative size and orientation of the marks representing the horizontal branch may be compared with those representing the lizard's skin. The viewer is invited to share the contrast in textural qualities that the drawer had noticed. Here is evidence of the student's ability to manipulate the viewer's attention through an understanding of compositional devices and an increased awareness of haptic perceptual values.

Figure 5.19 illustrates two stages in a sequence of studies which draw attention to the proximal values within the observed subject-matter of cacti, as well as indicating their textural contrast between smooth and spikey. The top drawing sets up a reversible figure, in which the viewer's reading of depth is teased by the S-shaped contrast-boundary separating light from dark, and also by the relative size of marks representing the bases of the spikes. Figures 5.20 and 5.21 illustrate two of a series of finished large-scale drawings in which the viewer is drawn into the frame by a series of eye-paths which run along the edges or spines of leaves, thus drawing attention to their differences. In particular, the viewer is invited to dwell on the textural smoothness and sharpness of edge, qualities which result from the student's engagement at the level of *drawn mark*, and experimentation with various combinations of paper texture and drawing medium. Here is evidence of the student's increasing ability to communicate the effects of light upon material surfaces. Such ability may be developed from a greater awareness of the three levels of perception and the three functions of communication.

Figure 5.22 illustrates a response to the stimuli at Plantasia which may be understood by first engaging at the level of *Sub-divisions of the drawing's surface*. The systems of Gaze, for example eye-paths and focal points (or the lack of them) are employed to emphasise a dynamism exemplified by the two orange and three black curves emanating in various

directions from a single source situated one third along the base of the drawing from the left. In contrast, and balanced vertically one-third from the right on the base, another, straight-lined grid emerges which may refer to the gridded architectural structure within which the plants exist. Even though the colours of high contrast are juxtapositioned, any illusion of depth is minimised by the application of thick black lines at these contrast-boundaries, rather like the leads of a stained glass panel.

Minimal too is any information of the textural qualities of the materials represented. However, the minimisation of information about the haptic and distal values serves to maximise the third way of seeing, the proximal. Here is evidence of the student's growing awareness of how viewer's attention may be drawn to the proximal quality of contrast between the organic and the architectural by appropriate selection and combinations of visual elements.

In contrast to Figure 5.22, Figure 5.23 affords the viewer an opportunity to contemplate all three levels of perceptual information in one drawing. At the level of engagement of *A drawn mark*, the bottom third of the drawing provides evidence of the variety of textures present in the subject-matter, and of how those textural qualities appear (or rather disappear) as viewing-distance increases. Further information about spatial depth in the scene is available at the level of engagement *Combination of drawn marks*. For example, depth is indicated by the use of contrast boundaries representing the play of light at occluding edges within the scene. Particularly useful as a means of indicating spatial depth is the gradual reduction of contrast from foreground (i.e. the bottom third of the drawing) to background (i.e. the top third of the drawing). A reduction in sharpness of contrast boundaries from foreground to background would have further emphasised the distal values of the scene.

However, the consistency of sharpness of contrast-boundaries does serve a purpose. The student's experience of the proximal values, or the overall patterns within the scene, is shared when the viewer engages with the drawing at the level of *Sub-divisions of the drawing's surface.*

Pattern is produced through the repetition of proportional relationships: The similarity of size and shape of the leaf fronds; the similarity in sharpness of the contrast-boundaries, generating a rhythmic, curved eye-path across the drawing's surface; and the repetition of the light/dark alternation between frond-shape and background space all contribute to the communication of pattern.

In Figure 5.24 colour is introduced as a means of sharing with the viewer the student's experience of the moment when a fine mist of water is sprayed into Plantasia's atmosphere in order to increase the level of humidity. The viewer, who is already positioned in the pictorial space by means of the (roughly) triangular shape at the base of the drawing, and whose eye-level is suggested by the height of the contrast-boundary representing the far edge of the path, is invited to adopt a mood evocative of such tropical experience.

The feel of the atmosphere is achieved by careful selection and combination of visual elements and drawing media. Few edges in the scene are represented by sharp contrast-boundaries, and the smudging of chalk pastel laid down initially, representing foliage in the far distance, further enhances the illusion of mistiness. Those contrast-boundaries which *are* rendered sharply, such as those representing edges of fronds in the top right quarter, serve to emphasise the illusion of depth.

Figure 5.25 is presented as evidence of the catalytic and tactical authenticity of the research project. Beyond the requirements of the drawing programme, this drawing is generated from

a series of studies carried out during the Plantasia project. It displays a high level of intelligence of seeing, affording the viewer ample information about textural qualities of the various plants represented, as well as a strong illusion of depth.

The Golden Section proportion of the vertical and horizontal axes which sub-divide the drawing's surface, and the smoothness of the eye-line from the focal point of the intersection of those axes, the Bird of Paradise flower at left foreground, through to the complexity of forms at right background, may be read by the viewer as metaphor for the complex harmonies to be found in the structures of natural forms.

Figure 5.26 is also presented as evidence of catalytic and tactical authenticity of the research project. This drawing was executed beyond the confines of the Plantasia project period, and was selected by independent curators for inclusion in the national touring show *Wales Drawing Biennale 2000.*

Drawings from the 'Seeing and Believing' project

The *Seeing and Believing* project (see Appendix A for details of how the project was introduced, and the project requirements) afforded students an opportunity to explore the essences of reality, those ontological constructions of space-time relationships. A variety of realisms was discussed, and the ways in which those realities have been expressed through the drawing conventions of different cultures in different periods were studied. Students were encouraged either to analyse and if necessary adapt an existing convention from the range, or invent from first-principles their own means of visually representing a belief system to do with the space-time relationship.

With hindsight, this project might have produced better results had it been introduced after the *Geometries of Vision* project which dealt with systems of geometry in general, and the

relationships between viewer-centred and object-centred representations and primary and secondary geometries in particular.

However, an example of a student exploring an existing convention of representing the positions of objects in space is illustrated in Figure 5.27. Here, the Australian Aborigine convention of representing the location of food and water sources, and the types of landscape likely to be encountered on a journey to such sources has been adapted to codify the pattern of land-use and location of eating-places within her locality. Through this exercise, the student gains insight into the ontological construction of another culture, and is therefore in a position to recognise her own cultural conventions as alternative constructions of reality.

Figure 5.28 illustrates a relationship between viewer and world in which both viewer and viewed are assumed to be static. It is noticeable in this drawing that the student is fully aware of the effect that contrast-boundaries have in producing illusions of depth, and also the drawing demonstrates appropriate use of tonal and textural grading in order to emphasise the solidity and opaqueness of the sculpture. However, the conventional assumption underpinning this drawing is challenged in its companion drawing, Figure 5.28a, which explores a construction of reality in which all that is solid melts, and all that is opaque becomes translucent.

Engaging with the drawing at the level of *A drawn mark* in the Chart (Figure 4.32), it may be noticed that the student has applied chalk pastel for its ability to blend easily, thus facilitating the simulation of effects of light falling upon, reflecting off, and refracting through surfaces that range from rough to polished. The size of those marks, relative to the size of the drawing paper, positions the viewer in close proximity. By emphasising the proximal values of the

surfaces and edges in the sculpture, a reality is constructed in which the viewer participates in a complex world of interpenetrating and contradictory surfaces.

A world in which *forces* are codified and made visible is displayed in Figure 5.29. At the level of engagement *The drawing as displayed in context*, a framing device has been invented, with a fragility susceptible to the slightest force of air movement. Here, the drawing (i.e. the combination of twenty eight parts) moves in response to the viewer's movement, emphasising the experience of interplay between viewer and viewed. At the level of engagement *Sub-divisions of the drawing's Surface*, the twenty eight sub-sections are arranged in a regular grid which flutters in response to air movement. In this way the viewer is confronted with a work that is both dynamic and static, both calm and excited, both balanced and unbalanced. At the level of engagement *A drawn mark*, each of the twenty eight components bears a mark, visible indications of a variety of forces which were applied to the paper: compression, tension, torsion and shear. Here is evidence of the student's ability to move away from conventional representations of the visible world, towards a fresh representation of the *forces which form* the visible world. Here too is evidence of the efficacy of the new teaching programme in empowering a student to discover new directions of visual research. It is presented here in support of the ontological, educative and catalytic authenticity of the research project.

In contrast to the fragility of the work illustrated in Figure 5.29 is the robust solidity of a large-scale (six feet square) heavy gauge drawing paper completely rendered with graphite stick. (Figure 5.30). Engaging with this work at the level of *A drawn mark*, each hand-made scribble of the graphite is standardised in terms of size and orientation, producing a grain structure across the surface. The rough surface texture of the paper is compressed by each

mark to produce a polished sheen of graphite. The viewer is able to interact visually with this surface, since any movement of viewing position sets off a shimmer of surface reflection and illusions of spatial depth.

Upon this shimmering, deep surface, four totemic columns have been stamped from a wooden plank routed with patterns of linear marks.

The printing ink mixed with sand produces a completely matt finish in stark contrast to the graphite's sheen, with the result that the irregular patterns of linear marks appear to dance upon the matt surface.

The liveliness of the light, small-scale irregular linear marks contrasts with the large-scale, heavy, regular rhythm of the four columns spaced evenly across the whole drawing.

Engaging with the drawing as a whole, the viewer may discern another contrast, that between the intimacy of each hand-cut mark and the (relative) monumentality of scale of the overall work. This drawing on display becomes a very public statement about a developing private code. A code which may not be fully systematised, but which recognises its need to articulate oppositions and one which invites viewers to ponder upon the arbitrariness of their own cultural conventions.

Such direction of visual research has sustained the student well beyond the period of the *Seeing and Believing* project (See Figures 5.30b,c). It is presented here as evidence of the catalytic and tactical authenticity of the research project.

Drawings from the 'Geometries of Vision' project.

The *Geometries of Vision* project afforded students the opportunity to relate the concepts of primary geometry and secondary geometry to those of viewer- and object-centred representations through their drawing practice. It may be pertinent to note here that few first-year undergraduates came to the programme with a firm grasp of any geometry ,[11] so that for

many, this project became an opportunity to explore such basics as orthographic, oblique and perspective projection systems of secondary geometry.

Figure 5.31 illustrates examples of such exploration, undertaken as part of a pilot study.

However, Figure 5.32 illustrates student inquiry into the assumption implicit in perspective projection, that of the fixed, single point of viewing. Here is an attempt to break out from such ontological constraints, and to invent a way of representing the information in the light received at both eyes. Focusing upon the wooden framework with each eye in turn, but paying attention to the primary geometry of the scene, the student shares the experience of both eyes in the one drawing. The primary geometry of the scene is transformed into a secondary geometry rarely explored. It may be noted here, in support of the argument for the catalytic and tactical authenticity of the research project, that this student went on to win the student prize in the Welsh Artist of the Year 2000 competition, and had work independently selected for the Glynn Vivian Gallery Open Exhibition 2000.

The drawing illustrated in Figure 5.33 evolved from the student's study of projective geometry systems in common usage. An awareness that all of those assumed a flat plane of projection stimulated inquiry into the possibility of projecting onto a non-flat plane. Discussion around the notion of a 'cone of vision' developed into the idea of inventing a system for geometrically projecting what was noticed in the cones of vision onto a cone of projection. A paper cone was duly constructed and arranged at eye level, apex pointing to eye. With one eye closed, so as to flatten the cone perceptually, the student proceeded to mark the cone at appropriate distances from the eye, the marks representing the salient scene primitives (corners and edges). When the paper cone (or pyramid, to be precise) was laid out as a surface development, an original projection system was revealed. Here is evidence of the ontological and educative authenticity of the research project.

This student's experiments in the life class became a catalyst for the sustained production of a series of drawings and paintings throughout the student's second year and into his third. (Figures 5.33 b & c). Work from the series has been selected by independent curators for inclusion in the national touring *Welsh Drawing Biennale 1999-2000* (Figure 5.33a) and in the regional annual *Glynn Vivian Gallery Open Exhibition 2000.*
Here is further evidence of the catalytic and tactical authenticity of the research project.

Figures 5.34 and 5.35 illustrate two students' efforts to explore the inter-relationships between primary geometry, secondary geometry, and viewer-centred and object-centred representations. At the level of engagement of *Sub-divisions of the drawing's surface*, under the column headed *Compositional function*, Figure 5.34 attempts to employ a secondary geometry constructed from the combination of a viewer-centred representation (that of the figure itself) and several views of the wooden frame which made up the subject-matter. Such multiple views of a single object have the effect of increasing our information of the object as if we were able to move towards and around it. Such object-centred representations combined with a viewer-centred representation of the figure produces a drawing in which the viewer's position is ambiguous.

Figure 5.35 attempts a further complication. Here the figure itself is represented as mirrored, and the wooden frame appears in front of the figure and behind the figure simultaneously, as well as forming the geometry of the space within which the figure exists. The effect upon the viewer is that of a shattered image, dynamic and excited. This exercise stimulated the student to further explore the possibilities of combining viewer- and object-centred representations in a drawing.

Figure 5.36 illustrates a *collage* of separate drawings, each a viewer-centred representation of elements within the scene (a set-up of rectangular wooden frames and boxes). The combination of these viewer-centred representations becomes an object-centred representation, providing information about the scene not available from any single viewing position. At the level of engagement *Sub-divisions of the drawing's surface*, it may be noticed that the whole *collage* has been sub-divided along folds which effectively transform the flat plane into a three-dimensional construction, drawing the viewer's attention to the discrepancy between the distal values represented on the drawings' surfaces and the distal values of the three-dimensional scene (i.e. the creased and folded surface). Further evidence of the catalytic tactical authenticity of the research is provided in Figure 5.36a. The painting illustrated was produced as a result of the student's sustained stimulus beyond the confines of the *Geometries of Vision* project period. At the level of engagement *The drawing as displayed in context* it represents a range of systems of geometry, including orthographic projection, oblique projection and vertical oblique projection (the bottle at the right-hand edge). The combination of high-contrasted tonal shapes in the centre of the painting at the lower end of the dark-toned, centrally-placed vertical axis, produces a variety of depth illusions ranging from shallow to deep. This focal point also offers the viewer an ambiguity of reading; which surface overlaps which?

The series of drawings, Figure 5.37, a, b, c and d illustrates a systematic approach to the exploration of a possible transition from a viewer-centred representation to an object-centred one. Figure 5.37 was drawn from a (relatively) fixed position and indicates the student's grasp of the transformation process from primary geometry to a viewer-centred secondary geometry. As the series progresses (5.37 a, b, c & d) lines and contrast-boundaries between tones representing the salient edges in the scene become interlocked, producing a

complex web of compositional axes. This pictorial device enables the viewer to see relationships between those edges defining the space which are not available from a fixed viewing position. As more information about spatial relationships is added, less is revealed of the viewer-centred representation of the figure within the space. Finally, in Figure 5.37d, the figure is transformed through geometry into pure organic form.

Drawings from the 'Gesture and Empathy' project

The second semester *Gesture and Empathy* project afforded an opportunity for students to consolidate their understanding of the three functions of drawing explored in the first semester's *Plantasia* project. In particular, attention was drawn to the possibilities of positioning the viewer in terms of a particular mood, attitude, or sensibility which students may wish to convey about their experiences of the subject matter under observation. Such positioning may be facilitated by the drawer's selection and combination of appropriate marks and compositional devices within the drawing.

For example, Figure 5.38 illustrates an attempt to share with the viewer a sensibility regarding the inert mass of the figure at rest. Each drawn mark has a weight and density appropriate to the attempt, and the exaggerated smoothness of the curved lines representing the contours of the model's back, hip and breast emphasises the languidity of the pose.

In contrast, Figure 5.39 illustrates an appropriate selection of marks to convey an empathy with the energy within the pose. The charcoal marks representing muscle formations of the model's back, right forearm, left thigh and calf all indicate the twisting of the drawer's wrist and arm through the variation of thickness and depth of tone along their lengths. The gestural spontaneity of these marks communicate the empathy of the drawer with the model's

movements. The composition as a whole is constructed around a central vertical axis formed by the figure's right profile from shoulder, through hip, to ankle. To the left of this axis lie the heavy marks representing the bulk of the figure, the pose indicating movement to the left. This compositional instability may evoke the experience of seeing a figure in motion, a dynamism balanced, as in the viewer's own experience of moving about, by the positioning of the right arm. Here is the experience of dynamic equilibrium expressed through a composition of dynamic equilibrium.

In Figure 5.40, marks have been selected and combined to represent an experience rather more than the free motion of a figure in isolation. Firstly, the addition of areas of tone in the centre-left of the composition serve to tie the figure-shape to the field, and in particular, the tone represents the chthonicity of the pose. The sense of restricted movement of a torso from such a floor-bound pose is conveyed to the viewer through the superimposition of curved lines. Several sweep along the top profile of the figure from knee, through shoulder to a focal point at the head. One such curved line allows the viewer an eye-path from floor (lower centre) through the torso and to the head. The variety of stresses experienced in such movement of the torso is also expressed by an appropriate selection of marks. The stretching of the figure's right-hand rib-cage is expressed through a stretching of linear marks (these are partly negated in the drawing by a cross-hatching pattern), the compression of flesh around the figure's left-hand rib-cage expressed by a thickening of the marks representing compression folds on the figure.

The composition as a whole is constructed around two main axes; a horizontal, one-third from the lower edge, and a diagonal from lower left to upper right. The conflict between the experiential functions of these axes, the former fixing the figure to the floor and the latter

allowing movement, appears an appropriate compositional device for evoking in the viewer an empathy with the sense of conflict within the pose.

One of the considerations suggested to students in the brief accompanying this project (see Appendix A) concerned the vulnerability of the unclothed life-model within the potentially harmful environment of the drawing studio.

Figure 5.41 illustrates one student's attempt to communicate his empathy with such vulnerability. At the level of engagement of the whole drawing, the viewer is positioned close to the foot of the drawing-donkey which supports the life-model, within reach of the slippers acting both as a focal point and an entry point into the compositional space. At the next level of engagement, *Sub-divisions of the drawing's surface*, the slippers act as a full stop to the diagonal axis formed by the upper leg of the drawing-donkey, and the dash-lines which pierce the model's head and connect to the top edge of the drawing. Another diagonal axis, an even stronger one, emanates from the same top connection point, grazes the model's back, and pierces the floor close to the slippers. The angle of this second axis is repeated across the surface of the whole drawing, at different scales of length and tonal density, representing one leg of the tripods supporting the easels. This combination of sharp, angular elements appears cutting across the thighs of the model, and cutting into the model's right elbow, shoulder, and back.

At the level of each drawn mark, the consistency of sharp-edged linearity throughout every single mark not referring to the model pointedly contrasts with those marks that do refer to human flesh; indeterminate soft smudges of tone.

At each level of engagement, compositional decisions make visible the empathetic experience of the drawer, and invite the viewer to share the feeling of such experience.

The drawing is presented here as evidence of the catalytic authenticity of the research project, since it may be argued that the stimulus of the drawing programme enabled the student to articulate an empathetic response.

Drawings from the 'Transformations from scene-primitives to picture-primitives' project

This exercise offered an opportunity for students to consider the process of drawing as a transformatory one. Having already been introduced to the concepts of primary geometry and secondary geometry, and having explored the possibilities of transforming the former into the latter through their own studio practice, students were receptive to the study of the scene-primitives that generate a primary geometry and the picture-primitives that constitute drawings.

Observing the life-model at every level of scale from the whole figure to the study of a finger reveals a commonality in the appearance between surfaces, somewhat akin to fractals. Students were encouraged to notice T and Y connections at all scales. These terms refer to the pattern of the contrast boundaries at the place where two surfaces occlude one another, and both occlude a third. The transformation of such scene-primitives as corner, edge and surface into the picture-primitives dot, line and tone was explored in this exercise.

Figure 5.42 illustrates a conventional, full-toned, viewer-centred representation of the life-model within a defined space. Figure 5.43 illustrates a first attempt to transform the scene-primitives of corner, edge, surface, and volume to the picture-primitives of dot, line, tone and graded areas of tone.

Figure 5.44 emphasises the T and Y connections which have been noticed by the student, both on the surfaces of the figure and between the figure and its surroundings. If this approach were taken at a smaller scale, observing surface connections apparent on an individual limb, for example, then a drawing may be produced which is entirely constructed

of T and Y junctions at a variety of scales and tonal weights. The student who produced the drawing illustrated in Figure 5.45 decided on her own approach, which entailed divorcing the T and Y connections from the figure and its surroundings, and re-arranging them in a composition which allows the viewer to contemplate the ambiguities of surface connections and occlusions which are often present in a scene, but are overlooked by the familiarisation of everyday seeing. An intelligence of seeing may be stimulated by such work, and in Figure 5.46, the same student draws our attention to the similarity between her own inquiry and that of Liubov Popova who was herself attempting to make the familiar strange.

Summary

The evaluation of the data presented in Sections 5.4.1 and 5.4.2 collected from the Nominal Group Technique and Likert scales has provided evidence of the Experimental groups' increased awareness of their own ontological constructions related to drawing, and also evidence of an increased awareness of the possibilities of alternative constructions when compared with the Control-groups. Within the parameters of a constructionist paradigm of research, assessed using criteria of authenticity, this evidence appears to validate the research in terms of ontological authenticity and educative authenticity.

The evaluation of drawings made by a wide range of students [12] within the Experimental groups presented in Section 5.4.3 has provided further evidence of those students' increased awareness of their ontological constructions related to drawing, and also an increased awareness of the possibilities of alternative ontological constructions. Within the parameters of a constructionist paradigm of research, assessed using criteria of authenticity, this evidence appears to validate the research in terms of ontological authenticity and educative authenticity.

The evaluation of student Experimental groups' drawings has also provided evidence of the new drawing programme's efficacy in stimulating production of drawings within the programme itself, and evidence of the new programme's efficacy in empowering students to develop ideas and produce work of quality in the period following the delivery of the new teaching programme. It has been noted that in several cases, the quality of such work has been acknowledged by its inclusion in independently-curated national and regional exhibitions.

Within the parameters of a constructionist paradigm of research, assessed using criteria of authenticity, such evidence appears to validate the research in terms of catalytic authenticity and tactical authenticity.

The evaluation of students' drawings presented in Section 5.4.3, using the systemic-functional semiotic model designed for the purpose, has provided evidence of the instrument's efficiency.

CONCLUSION

The research presented here is stimulated by the author's experiences in the practice and teaching of drawing over a period of twenty years at schools of art in Australia, Malaysia and Wales. It is undertaken in response to a perceived need for a theoretical mapping of the domain of drawing. Visual perception and visual communication (the latter driven by the uniquely human desire to share our experiences of the world) are two activities fundamental to the existence of this domain, and are here construed as dialectically-entwined. The synthesis of their theoretical bases is shown to be effective in the development of a new pedagogy of drawing.

This alters the state of the background theory in the discipline of drawing pedagogy.

Following a general review of attitudes to drawing in the history of the art school in Europe, undertaken in Section 1, it becomes apparent that, although few of the teaching strategies reviewed have been articulated with explicit reference to their corresponding ontological and epistemological parameters, each may be categorised in a table of clearly-defined philosophical positions. This table is presented as Figure 1.36.

Whilst each of the teaching methods reviewed in Section 1 may have achieved, and may still be achieving commendable results in terms of the quality of drawings produced, many of those methods are based on a tacit acceptance of specific philosophical parameters and the exclusion of others. For example, the notions of 'accuracy', 'objectivity', 'subjectivity' and 'expressivity' have each been adopted in various schools at various times as central to a teaching method.

In contrast, the central aim of the new teaching programme presented in this thesis is to *empower* students by expanding their awareness of the whole domain of drawing: the inter-relationships between ways of seeing, ways of drawing and social belief-systems that are discussed in Section 4.5. This changes the state of background theory of drawing pedagogy.

To further this aim, it is argued that a constructionist philosophical attitude be adopted for the research, since such an attitude facilitates exploration of ontological relativism, including all the prescriptive stances mentioned above.

The choice of a constructionist paradigm of research also offers an opportunity to assess the efficacy of the *criteria of authenticity* developed by Lincoln and Guba specifically for the evaluation of qualitative constructionist research. Here they are deployed in an under-explored context: that of the drawing studio. These criteria are fully discussed in relation to alternatives in the Introduction. It appears that these criteria have not been applied to the evaluation of drawing pedagogy before. Their application here therefore changes the state of the focal theory.

Section 2 reviews developments in the field of perception theory. Particular emphasis is placed on James Gibson, of the *direct* theory school, and David Marr, of the *indirect* school, because these have emerged as the two prominent proponents of the two most salient schools of thought. Aspects of both schools are identified as useful in the design of the new drawing teaching programme. The introduction of such theories into the teaching programme effectively alters the focus theory of drawing pedagogy.

Section 3 focuses on the twentieth century emergence of communication theory founded on a semiotic approach to the study of language. Aspects of such theory suitable for application in a drawing programme are identified. In particular, the relationship between language and the perception of social contexts in which it operates is discussed. This study of social semiotics provides a basis for the theorising of the relationship between drawing, perception and social context which is a noticeable addition to the focus theory of drawing pedagogy. It is argued that

drawing conventions operate to transform the natural into the cultural: those cultural encodings may generate alternative drawing conventions.

In Section 4, a synthesis of those aspects of perception theory and communication theory which have been tested and found compatible within a drawing teaching programme is presented, with the intention of identifying an integrated theoretical basis upon which to design a series of experimental exercises suitable for the first year of an undergraduate course in drawing. The clarification of such a basis, identifying functions of drawing and the range of systems of choices through which those functions may be realised in drawings, is presented in the form of a matrix, Figure 4.32, adapted from Michael O'Toole's systemic-functional semiotic model for the analysis of paintings. O'Toole's model is chosen for adaptation because it maps the structural potential of visual language in general, thus affording drawers a fuller awareness of systemic choices from which selections and combinations may be synthesised according to their aims and the specific cultural contexts in which they operate. Such adaptation extends the background theory of drawing pedagogy. It is argued that providing students with the means to negotiate such a mapping of the domain of drawing empowers them more effectively than a pedagogy which prescribes conventions of seeing and of drawing construction, as in the case of many of the pedagogical methods reviewed in Section 1.

A crucial aspect of this adaptation, one which changes the focal theory, is the integration of systems of choices relating to the various levels of perception which are identified and discussed in Section 4.5.1. Awareness of the haptic, distal and proximal levels facilitates the design of drawing exercises which allow exploration of the relationship between those levels of perception

and the selection and combination of marks. The evidence of such exploration is the body of students' work produced in response to the exercises set out in Appendix A.

The drawings themselves are evaluated in Section 5.4.3, applying criteria of authenticity. It is demonstrated that such criteria allow a qualitative evaluation, free from emotive language, and one which may be repeated with consistency across a range of individual students' work. The evaluations presented in Section 5.4.3 are positive in terms of those criteria, and therefore uphold the hypothesis forwarded in the Introduction: that the new teaching programme of drawing based upon a synthesis of perception and communication theories expands students' awareness of their own ontological constructions and those of others. Moreover, it increases their capacity to produce more varied, more culturally-informed constructions of experience in the form of drawings, than those produced using traditional prescriptive methods.
The results of the nomothetic methods of data collection and their evaluation, presented in Section 5.4.1 and 5.4.2 also provide evidence of the student groups' increased awareness of their own ontological constructions related to perception, language and drawing. The hypothesis is supported by both sets of data.

Future testimony to the efficacy of the new teaching programme in terms of the increase in ontological awareness made visible in drawings by individual students may be provided by a wider application of ideographic methods of data collection and their evaluation. It remains to be seen whether Kelly's Rôle Construct Repertory Test, for example, could be operated successfully in a drawing studio. The design, development and testing of alternative data-gathering methods is in avenue ready for future exploration. hr.

NOTES

Introduction

1. The American psychologist George A. Kelly developed a theory of personal constructs which was first published in 1955 (Kelly 1955). The theory had begun to be developed over the previous twenty years as a handbook of clinical procedures designed to elicit patients' personal experiences and to make sense of those experiences in relation to patients' social contexts. The theory is elaborated and discussed in Section 5.

2. Archer and Petherbridge are but two prominent art and design educators who recognise the importance of *visualcy*. Archer was Director of Research at the Royal College of Art, Petherbridge directs the Centre for drawing Research there. Another example, this time from the antipodes, is the Australian educationalist Geoff Parr, who argued that "when artists are pre-occupied by the creation of purely visual statements, establishing relationships and deploying symbols and syntax that have to do primarily with processes of visualisation and the liveliness of our tactile imagination, they deal with modes of awareness and exploratory thinking that are no longer highly developed in the majority of people in our society, although it has long been understood that such capacities are highly active in children and subsequently lapse for want of stimulation after the onset of formal schooling dominated by the spoken and written word". (Parr, 1980 : 13)

   Petherbridge's statement about drawing predating writing is supported by archaeological research. Iain Davidson and William Noble (1989) have written about "the archaeology of perception", and they argued on the basis of James J. Gibson's (1979) ecological theory of perception, and G. H. Mead's (1934) distinction between communication and language, that depiction transforms communication into

language. Depiction, they argued, can only have emerged in communities with shared systems of meanings. Gibson's theory (discussed in detail in Section 2) appears "entirely adequate" to Davidson and Noble (1989 : 129) in explaining how all organisms perceive, in the sense of engaging with their environment on the basis of their sensitivity to invariant structures in the ambient array of light, electromagnetic or accoustic energy fluxes around them. However, only humans have developed reflective language, the capacity to talk about what we have seen. Mead argued that communication between organisms on the basis of signal and response does not constitute language, since there is no reference to what is being signalled, only a response to the signal. A referential language is a system of signs representing recognisable meanings, and its existence depends upon a capacity to recognise the sign as having meaning, as being referential. Simple responses to a gesture as a stimulus is not language. Davidson & Noble (1989 : 131) argue that "the achievement of meaningful (iconic) tracing is the essential first step" towards a referential language. The recognition that resemblance is produced by "tracing" (the routing of an animal's profile on a rock, for example) allows the possibility of experimenting with the act of routing itself. Drawn shapes, or traces, may be routed whose meaning becomes recognisable by social convention. "This is because in creating the trace of a bison another thing *eventually* comes into existence beside the trace itself, namely, the concept of depiction...

A further matter eventually arises from the recognition of depiction as depiction, namely, the possibility of a meaning's being given to something which is not depictive". Davidson & Noble (1989 : 131)

Thus, from iconic signs which resemble their referents in some aspect, the possibility of arbitrary symbols, such as the alphabet, standing for referents arises.

3. Dunne's research focussed upon the relationship between electronic products and the realms of poetry and aesthetics. The activity of product design is construed as "socio-aesthetic research towards the integration of aesthetic experience and everyday life through the development of conceptual products rather than working prototypes or models which attempt to simulate a final product designed for mass production." (Seago & Dunne 1999 : 14)

The aspect of methodology which distinguishes Dunne's from that of conventional applied research is the use of the design process as a mode of discourse. According to Seago, this offers a radical model of the action researcher as a critical interpreter of design processes and their relationship to culture and society.

Other sources of evidence of the current concern about arts practice and its status as research may be found in the proceedings of academic conferences and symposia held over the last few years. For example, Buchanan (1998), Korvenmaa (1999), the proceedings of the symposium *drawing across Boundaries*, held at the School of Art & Design, Loughborough University in September 1998 (Mottram, 2000), Biggs (2000), Friedman & Durling (2000), Scrivener (2000).

Section 1

1. Nikolaus Pevsner provides a detailed history of the academies in his 1973 *Academies of Art. Past and Present.* New York: Da Capo. A more recent appraisal is Carl Goldstein's 1996 *Teaching art. Academies and Schools from Vasari to Albers.* Cambridge: Cambridge U.P.

2. Detailed accounts of the establishment of the School of Design may be found in Quentin Bell 1963 *The Schools of Design*, London, and Stuart Macdonald 1970 *History and philosophy of art education.* University of London Press.

3. A detailed history of the RCA is provided by Christopher Frayling 1987 *The Royal College of Art: One Hundred and Fifty Years of Art and Design.* London: Royal College of Art and Frayling 2000 *Art and design: 100 years at the Royal College of Art*, London: Collins & Brown,

4. The psychologist and amateur painter Marion Milner realised Tonks' exhortation in an event of personal revelation. In her 1950 book *On Not Being Able to Paint*, she wrote "When really looked at in relation to each other, the outlines of objects were not clear and compact as I had always supposed them to be, they continually became lost in shadow. Two questions emerged here. First, how was it possible to have remained unaware of this fact for so long? [She was about thirty-five]. Second, why was such a great mental effort necessary in order to see the edges of objects as they actually show themselves, rather than as I had always thought them?" Her training in psychology suggested an answer: "The insistence upon the reality of outline is associated with a fear of losing all sense of separating boundaries; particularly the boundaries between

tangible realities of the external world and the imaginative realities of the inner world of feeling and idea; in fact a fear of being mad." This conclusion led her to surmise: "I wondered if perhaps this was one reason why new experiments in painting can arouse such fierce opposition and anger. People must surely be afraid without knowing it that their hold on reason and sanity is precarious, else they would not so resent being asked to look at visual experience in a new way, they would not be so afraid of not seeing the world as they have always seen it and in the general, publicly agreed way of seeing it." (Milner 1950 :15-17) Perhaps one of the fundamental objectives of a drawing teaching programme is to allay this fear through the development of inquisitiveness and observation of other people's, or cultures' ways of representation.

A confirmation that Tonks failed to articulate a philosophical basis for his teaching practice is evident in David Cast 2000 Representing reality: G. E. Moore, Tonks, Coldstream, Victor Pasmore and others, *Word and Image* 16:3 290-309.

5. *Vkhutemas* is the Russian acronym for what in translation becomes Higher State Art - Technical Studios. These were the second reincarnation of art education institutions in Soviet Russia, having been formed out of the *Svomas*, Free State Art Studios, in 1920. In 1926 the Vkhutemas were reorganised as *Vkhutein*, Higher State Art-Technical Institute.

A detailed history of this turbulent period is given by John E. Bowlt in his chapter 4, *Art and Architecture in Soviet Russia 1917-1972*, in Robert Auty and Dimitri Obolensky (editors) 1980 *An Introduction to Russian Art and Architecture.* Cambridge U.P., 145-181. John E. Bowlt also provides a comprehensive

bibliography on this period in his 1988 *Russian Art of the Avant-garde: Theory and Criticism 1902-1934*. Revised Edition London: Thames & Hudson 309-348.
For detailed discussion of the prominent individuals who are mentioned in this Section, see Charlotte Douglas 1991 *Malevich: Artist and Theoretician*. London: Thames & Hudson, Natalia Adaskina and Dimitri V. Sarabianov 1990 *Liubov Popova*, London: Thames & Hudson, Nina Gurianova 2000 *Exploring Colour, Olga Rozanova and the Early Russian Avant-garde 1910-1918*. London: G. & B. Arts International, Peter Noever (editor) 1991 *Aleksandr M. Rodchenko - Varvara F. Stepanova. The Future is Our Only Goal*. London: Prestel, Larrisa Alekseevha Zhadov (editor) 1989 *Tatlin*. London: Thames & Hudson.
General discussion of the 'Amazons', the prominent female members of the Russian Avant-garde such as Popova, Stepanova, Rozanova, Udaltsova, Goncharova and Exter, may be found in Myuda Yablonskaya 1990 *Women Artists of Russia's New Age 1900-1935*. London: Thames & Hudson. A more recent discussion which discusses the gender politics of their social context may be found in John E. Bowlt and Matthew Drutt (editors) 1999 *Amazons of the Avant-garde*. London & New York: Royal Academy/Guggenheim Museum publications,

6. Petrograd was so named between 1914 and 1924. Before 1914 it had been known as St Petersburg, and after the death of Lenin in 1924 it became Leningrad. Today, the city is once more named St Petersburg.

7. *Suprematism* is a term invented by Malevich to describe the hard-edge, geometric abstract drawings and paintings he first exhibited at *0.10 The Last Futurist Exhibition* organised by Ivan Puni at the Dobychina Gallery in Petrograd, December/January

1915-16. (See Figure 1.15). The precise meaning of the term is problematic. In Malevich's book *From Cubism to Suprematism. The New Painterly Realism*, published to coincide with the *0.10* exhibition, he explained "Only when the conscious habit disappears of seeing nature's little nooks, Madonnas and Venuses in pictures, will we witness a purely painterly work of art...I have transformed myself in the zero of form and have fished myself out of the rubbishy slough of Academic art...Objects have vanished like smoke: to attain the new artistic culture, art advances towards creation as an end in itself and towards domination over the forms of nature..." (Auty & Obolensky 1980 : 135).

Rainer Crone and David Moos in their 1991 *Kazimir Malevich. The climax of Disclosure*, London: Reaktion, suggest that Malevich's Suprematist objective was to terminate "the tradition of five long centuries in Western painting, departing from the triumvirate of fundamental tenets that had secured creative man in his world: a ceaselessly illusionistic representation of observable experience; realism as a measure of truth; and requisite accuracy proclaimed through perspectival systems". (Crone & Moos 1991: 3)

Charlotte Douglas traces the origins of Suprematism back to Malevich's stage designs for the 1913 opera *Victory Over the Sun* in her 1980 *Swans of the Other World. Kazimir Malevich and the Origins of Abstraction in Russia*, UMI Research press.

Robert C. Williams' chapter Theosophy and the fourth dimension (Williams 1977 : 102) proposes a spiritual basis to Suprematism, claiming "Malevich had absorbed second hand the ideas and writings of European and American theosophy, which enabled him to visualise on canvas the 'fourth dimensions' of life beyond death", an argument which is elaborated by John Milner in his 1996 *Kazimir Malevich and the Art of Geometry*, New Haven: Yale U.P.

Milner analyses Suprematist works in terms of geometric systems derived from theosophical premises. Suprematism is further discussed in Section 3. Lissitsky's development of a graphic syntax based upon Suprematist formal devices may be seen illustrated in Sophie Lissitsky-Küppers 1968 *El Lissitsky: Life, Letters, Texts*, London: Thames & Hudson. See also catalogue of the 1990 exhibition *El Lissitsky 1890-1941* held at the Municipal Van Abbemuseum, Eindhoven.

8. *Inkhuk* is the Russian acronym which in translation becomes the Institute for Artistic Culture. It was organised in Moscow in May 1920, with the later affiliations in Petrograd and Vitebsk. One of the main functions of Inkhuk was to rationalise avant-garde theoretical positions into a scientifically-based programme which could form the basis of education and research. In particular, opposition between the so-called 'laboratory art' and 'productivist art' was addressed at Inkhuk. Laboratory art was essentially easel-based studio work which explored formalist and plastic problems of composition with a view to resolving technological difficulties in three-dimensional construction. Productivist art was concerned directly with the manipulation of concrete materials and their application to social needs of a technological and architectural nature. The Productivists were the more influential, and contributed significantly to the development of Constructivism in the autumn of 1921.
The most prominent advocate of laboratory art within Inkhuk was Kandinsky. As his position weakened, he left Inkhuk and subsequently contributed to the Bauhaus teaching programme.
Members of the productivist faction are profiled in the following sources: S. O. Khan-Magomedov 1986 *Rodchenko: The Complete Work*, Cambridge, Mass: M.I.T., Alexandr Lavrentiev 1988 *Varvara Stepanova. A Constructivist Life*, Thames &

Hudson, London; S. O. Khan-Magomedov 1986 *Alexandr Vesnin and Russian Constructivism*, New York: Rizzoli,.

9. *Culture of materials* is the phrase used to describe an attitude to artistic production which assumed the goal of such production to be development of a utilitarian material culture within an industrial context. Vladimir Tatlin had been experimenting with relief-constructions of various materials including metal, wire and wood since 1913. By 1915 these had developed into free-hanging corner-constructions. Between 1920 and 1925 Tatlin lived in Petrograd, working on practical projects designing stoves and workers' clothing with particular attention to the economic use of materials. He called this design process 'culture of materials'. See John Milner 1983 *Tatlin and the Russian Avant-garde*, New Haven: Yale U.P.

10. Popova's terminology at the time of the *5 x 5 = 25* show, September 1921, indicates her determination to build the bridge of Constructivism between easel-painting and industrial production. Even the material for her painting supports was changed from canvas to plywood. Towards the end of 1921, in a paper *On the construction of new objective and non objective forms*, Popova proclaimed at Inkhuk: "The outstanding element in our creative consciousness in this era of great organisations is the replacement of the principle of art as painting as a means of representation by the principle of organisation or *construction*". The language of physics employed in titles such as *Spatial force constructions* served to reinforce the determination to construct, rather than to represent.

11. David Elliott in his 1986 *New Worlds, Russian Art and Society 1900-1937*, London: Thames & Hudson, claims that Nikolai Suetin "was working as an artist at the Leningrad Lomonosov Porcelain Factory" (Elliot 1986 : 24) and there designed a number of Suprematist motifs for ceramic ware.

12. Collaboration through rivalry appears to sum up the turbulent relationship between Malevich and Tatlin. The other three Departments of the Petrograd Institute of Artistic Culture (*G Inkhuk*) were the Department of Organic Culture headed by Malevich's friend and collaborator the composer, painter and writer Mikhail Vasilievich Matiushin who had composed the opera *Victory over the Sun* discussed in Section 3; an Experimental Department headed by Pavel Mansurov; and a Department for General Methodology headed first by Pavel Filonov and later by Nikolai Punin.

13. *Victory over the Sun* is discussed more fully in Section 3.

14. The terms *Rayism* and *Rayist* refer to Larionov's attempts to depict the interplay of light rays as they reflect and refract from and through surfaces and media. Variations in the English translation range between "rayonnist" (Gray 1962 : 115), "rayonist" (Elliot 1986 : 13) and the more recent "rayism" (Bowlt & Drutt 1999 : 159).
In his paper *Rayonist painting* published in Moscow, 1913, Larionov explained that "Rayonism is concerned with spatial forms that can arise from the intersection of the reflected rays of different objects, forms chosen by the artist's will." Larionov's paper is translated in John E. Bowlt (ed) 1988 *Russian Art of the Avant-garde. Theory and Criticism*, Revised ed., London: Thames & Hudson 91-100. His work is compared with that of Malevich in Section 3.

15. More reference to the Moscow and Petrograd linguistic circles may be found in Section 3. For a history of their origins and development, see Victor Erlich's 1969 *Russian Formalism. History – Doctrine.* 3rd edition (1st edition 1955) The Hague: Mouton.

Roman Jakobson, mentioned here for the first time, is generally regarded as one of the most influential linguists of the twentieth century. In 1914 the eighteen year old Jakobson enrolled in the Department of Slavic and Russian, Moscow University. A year later, he was instrumental in founding the Moscow Linguistic Circle. Within the circle, it was held that "the study of language would be the key to understanding literature and folklore as well as culture in general." (Lechte 1994 : 62). Jakobson brought to this study the insights of Edmund Husserl and Ferdinand de Saussure, thus laying the groundwork for a phenomenological structuralism which was to influence the development of literary theory throughout the last century. Jakobson's theoretical bases are discussed in Section 3.3. See also Note 8, Section 3.

16. Hermann Muthesius founded the *Werkbund* in 1907. He had been employed as a trade *attaché* at the German Embassy in London from 1896 to 1903, with a brief to report back on the state of English architecture and design, including teaching methods. Consequently, he was in a prime position to introduce the ideas of William Morris into Germany. By 1907 he was Superintendent of the Prussian Board of Trade for Schools of Art and Crafts, and was instrumental in bringing together manufacturers, architects, artists and writers in a new association called *Werkbund.* According to Nikolaus Pevsner (1936 : 35) the aim of the *Werkbund* was "selecting the best representations of art, industry, crafts, and trades, of combining all efforts

towards high quality in industrial work, and of forming a rallying-point for all those who are able and willing to work for high quality." Pevsner's doctoral student, Reyner Banham, has also discussed this period in his thesis, published in 1960 as *Theory and Design in the First Machine Age*, London: Architectural press.

17. The most detailed account of Gropius' personal relationships, and how they affected the Bauhaus, may be found in Elaine S. Hochman's 1997 *Bauhaus. Crucible of Modernism*, New York: Fromm International.

18. For a detailed discussion of Itten's preliminary course at the Bauhaus, see his 1967 *Design and Form*, London: Thames & Hudson. Moholy-Nagy's approach is discussed in *The new vision, from material to architecture*, first published in 1929, and Albers' in a paper presented to the *Sixth International Congress for drawing, Art Education and Applied Art*, Prague, 1928. A version of this paper was published in the journal *bauhaus* 2 (2 & 3) 1928.

19. Between 1952 and 1955, The Institute of Contemporary Arts, London, was the venue where the people who were to become known as the *Independent Group* met. Richard Hamilton was a major force in the group, along with the sculptor Eduardo Paolozzi, architects Alison and Peter Smithson, and theorists Reyner Banham and Lawrence Alloway. Alloway's writing in particular (See Alloway 1960, 1962) has constructed a history which positions the Independent Group as catalyst for the post-1945 artistic fermentation which exploded as Pop. Anne Massey and Penny Sparke have challenged Alloway's version in their article *The myth of the Independent Group* in the journal *Block* 10, 1985, and Massey has elaborated on this in her 1995 book *The*

Independent Group. Modernism and Mass Culture in Britain 1945-59, Manchester: Manchester U.P.

However, Hamilton's involvement in the development of an artistic practice which challenged the traditional boundaries in England between the so-called 'fine arts' and popular culture remains undisputed.

20. A retrospective show celebrating the work and pedagogy of Pasmore, Hamilton and Hudson was held at the ICA in March 1981. See David Thistlewood's 1981 catalogue *A Continuing Process. The New Creativity in British Art Education 1955-65* Institute of Contemporary Art, London. Victor Pasmore's 1959 article titled The developing process in *Art News and Review* Vol. XI No. 7 page 2 discusses his own particular approach. See also Richard Hamilton's interview with Victor Willing in *Studio International*, September 1966 page 132, Tom Hudson 1961 *The Visual Adventure*, Leicester College of Art, and Maurice de Sausmarez 1964 *Basic Design: the Dynamics of Visual Form*, London: Studio Vista. A collection of work by students of Hamilton, Pasmore, Thubron and Hudson is held at Bretton Hall. It may be accessed from the web site of the Visual Arts Data Service. http://vads.ahds.ac.uk

21. The Art & Language group had expanded as an international concern by 1970 when the American conceptual artist Joseph Kosuth became U.S. editor of the journal *Art-Language*. His work *Ten Investigations* reflected the influence of Ludwig Wittgenstein's linguistic and epistemological investigations. They were exhibited in a variety of forms, such as display panels, magazines, and neon tubing, but all included texts of linguistic philosophy and theory.

22. The more common term for describing this paradigm, 'constructivist', is problematic in the context of this thesis, since it has been employed to carry a different meaning by another of the disciplines discussed here: The Russian art and design movement of the revolutionary period is generally referred to as 'Constructivism'. In view of this, the pedagogical philosophy associated with a relativist conception of social constructions of reality, often termed 'constructivist', is here identified by the less common 'constructionist'.

Section 2

1. In his 1983 book *The Reflective Practitioner. How Professionals Think in Action*, New York: Basic Books, Donald Schön analyses the relationships between the epistemologies of academic institutions and those of professional practice. He argues that Academia is committed to a view of knowledge that "fosters selective inattention to practical competence and professional artistry." (Schön 1983 : vii) His aim is to present an epistemology of practice based on close observation and analysis of professionals (architects, engineers, planners) in action.

2. The American painter Ben Shahn has been credited with the observation that *intuition* is the result of prolonged *tuition*.

3. Gombrich delivered the A. W. Mellon Lectures in the Fine Arts at the National Gallery, Washington, in the Spring of 1956. These became the core of his book *Art and Illusion. A Study in the Psychology of Pictorial Representation*, first published by the Phaidon press, London, in 1960.

4. The phrase *record of perception* is Norman Bryson's. In his 1983 *Vision and Painting. The Logic of the Gaze*, London: Macmillan, Bryson used this phrase (page vii) to sum up Gombrich's emphasis upon perceptualism, and to highlight Gombrich's suppression of the social character of images. The critique of Gombrich's position elaborated in Section 2.4 is based upon Bryson's argument.

5. Empiricist theory argues that perception consists of adding meaning by association to a raw, unstructured visual stimulus through process of unconscious inference.

Nativist theory assumes the brain possesses innate capacity for interpreting the retinal images.

6. At least as far back as Pliny, who wrote of the painters Zeuxis and Parrhasius and their competition to ascertain which of the two could paint most realistically. "Zeuxis produced a picture of grapes so dextrously represented that birds began to fly down to eat from the painted vine. Whereupon Parrhasius designed so lifelike a picture of a curtain that Zeuxis, proud of the verdict of the birds, requested that the curtain should now be drawn back and the picture displayed. When he realised his mistake, with a modesty that did him honour, he yielded up the palm, saying that whereas he had managed to deceive only birds, Parrhasius had deceived an artist." This story is recorded in Pliny's *Natural History*, Book XXXV. 64-66.

7. James Jerome Gibson, the Cornell psychologist who died in 1979, was the first to propose a theory of visual perception which recognised the ecological relationship between a seeing organism and its environment. He claimed that humans have evolved perception systems which are capable of "picking up" information about the state of the world directly from the structure of the array of light arriving at the retinae. His argument is elaborated in Section 2.5.

8. Kepler and Descartes were both avoiding what William Epstein has termed "the inverse projection problem" (Epstein & Rogers 1995 : 1). Their concern to establish the retinal image as a direct projection of the three-dimensional world was a more straightforward task, since given any three-dimensional object in space and given a specific viewing point, it is possible to calculate its projection on a surface such as

the retina. To use terms more fully discussed in Section 4.5.1, the transformation of *distal* values to *proximal* values is a straightforward task of geometry. However, the inverse projection problem is not so straightforward. From any given two-dimensional projection, there may be constructed an infinite number of possible three-dimensional forms. As Epstein puts it... "going from the occurrent proximal state of affairs to the distal state of affairs constitutes an ill-posed problem." (Epstein & Rogers, 1995 : 2). The history of the development of visual perception theory may be structured as a survey of the diverse responses to the challenge of the inverse projection problem. A brief review of those responses is laid out in the Summary to Section 2.

9. According to Michael Ayers (Ayers 2000 : 493), Locke was the first of the empiricist opponents of Descartes to achieve comparable authority among his European contemporaries. His project was to make careful observation and systematic description the primary task of natural inquiry, thus replacing the Cartesian notion of nativist rationalism.

10. Berkeley, who became Bishop of Clone, relied upon the argument that God was responsible for producing ideas, or sensations in the mind.

11. Hume is generally regarded as embodying the culmination of the empiricist tradition of Locke and Berkeley. However, his writings on religion, which he regarded as an invention with which to quell anxiety about one's own fate, clash sharply with the beliefs of Bishop Berkeley.

12. Gottfried Wilhelm Leibnitz was one of the central figures in seventeenth century European philosophy. His rationalism was based upon philosophical optimism, the belief that the world is created by a rational God who always chooses the best for a good reason. (Garber 2000 : 480). He introduced a distinction between conscious and unconscious perceptions, and tried to understand how the latter determine the former.

13. Immanuel Kant's ability to resolve the apparent opposition between rationalism and empiricism laid the ground for much in the philosophy of the nineteenth and twentieth centuries. According to Paul Guyer (2000 : 432) he was the philosopher of human autonomy, arguing that through the application of our own reason, we can discover knowledge without outside assistance, particularly without divine intervention.

14. Hermann von Helmholtz contributed to our understanding of the physiology of perception through his work on the central nervous system, and experiments in optics which led to his invention of the opthalmoscope. He emphasised the importance of the connection between education and research, and to that extent his influence may be discerned throughout this thesis.

15. Richard L. Gregory has long been associated with the Brain and Perception Laboratory at the University of Bristol. His association with E.H. Gombrich on the exhibition *Illusion in nature and art*, held at the Institute of Contemporary Arts, London, in 1973, was based on their common belief that visual illusions were "tools for discovering processes of perception." (Gregory & Gombrich 1973 : 7)

16. J. B. Watson articulated two forms of behaviourist theory. Firstly, *methodological behaviourism* refers to the doctrine that data gathered for psychological scientific purposes must be publicly observable data, not the private data elicited through personal introspection. Such a doctrine is commonplace amongst contemporary experimental psychologists. the second form, *scientific*, or *radical behaviourism* is the form criticised in Section 2.2 It contends that psychology ought to be concerned only with the formulation of laws relating stimuli with responses, and is generally regarded as a doctrine in decline.

Clearly, understanding how people are likely to respond to any given visual stimulus, such as packaging design for example, would be beneficial to those concerned with manipulating people's behaviour towards the consumption of commodities. Subsequently, J. B. Watson became a director of the advertising agency J. Walter Thompson.

17. The term 'Gestalt' means 'shape' or 'structure'. According to Barry Smith (2000 : 313), it was introduced into psychology by the Austrian philosopher Christian von Ehrenfels in about 1890. He was able to demonstrate that there are certain inherently structural features of experience which transcended the then-dominant atomistic approach to understanding perception. From these features, Gestalt principles of perceptual organisation were developed.

18. Before his death in 1994, Karl Raimund Popper had contributed greatly to the philosophy of science, and also to political and social philosophy. His general epistemology, termed 'critical rationalism', follows the Socratic method of posing questions and critically discussing the answers. He considered knowledge, in the

sense of certainty or of justified true belief, to be unobtainable. For a general introduction to Popper's thought, see Brian Magee's 1973 *Popper*, London: Fontana. Gombrich himself acknowledged his debt to Popper: "I should be proud if Professor Popper's influence were to be felt everywhere in this book..." (Gombrich 1960 : ix)

19. In the words of Bertrand Russell (1946 : 647): "If this one principle – induction – is admitted, everything else can proceed in accordance with the theory that all our knowledge is based on experience".

20. John Ruskin, the centenary of whose death fell in the year 2000, has been the subject of recent re appraisal. For an account of his influence upon the painter J. M W. Turner as well as the Pre-Raphaelite Brotherhood, see the catalogue of the equally-recently re-named Tate Britain gallery exhibition held in 2000.
Notwithstanding such reconstruction of opinion, Ruskin's attitude to 'objective drawing', and in particular his notion of the 'innocent eye', fails to convince today as it failed to convince Gombrich in 1956.

21. The concept of *affordance* may be traced back to Koffka's notion of the 'demand character' of an object. "To primitive man, each thing says what it is and what he ought to do with it...a fruit says 'Eat me'; water says 'Drink me'; thunder says 'Fear me'." (Koffka 1935 : 7)

22. David Marr, the M.I.T. psychologist who died of leukaemia at the age of thirty five, in 1980, is mentioned here for the first time. His work is generally regarded as seminal in the field of computational theory of vision.

23. In their 1985 book *Visual Perception. Physiology, Psychology and Ecology*, London & Hillside, New Jersey: Lawrence Erlbaum Associates, Vicki Bruce and Patrick R. Green provide an analogy which illustrates this point: "We can picture this as applying a rectangular 'mask' divided into two regions of equal size systematically to each region of the image and computing the difference between the amounts of light falling in each half of the mask. Any value other than zero indicates that a gradient in intensity is present." They go on to note that "the field of a simple cell in the visual cortex is just such a mask". (Bruce & Green 1985 : 73)

24. The term 'constructivist', when used in the context of visual perception theory, refers to those thinkers who, like Helmholtz and Gregory, argue that vision is a process of mental construction upon the given retinal images.

Section 3

1. The "new way" referred to here, and invented by Picasso and Braque is, of course, Cubism. So-named after a "derisive" (Read 1974 : 67) remark by the critic Louis Vauxcelles, when referring to the cube-like representations in Braque's paintings.

The neurologist Semir Zeki, in his 1999 *Inner Vision. An Exploration of Art and the Brain*, Oxford U.P., proposes a refreshing argument that posits Cubism as an attempt to resolve "that deep paradox between the reality of perception and the single view appearance of painting that Plato had alluded to." (Zeki 1999 : 50).

Zeki, as did Gibson before him, argues that vision is an active process, requiring the brain "to discount continual change in the environment and extract from them only that which is necessary to categorise objects." (Zeki 1999 : 6) Art too, Zeki argues, is an active process, "a search for essentials; it is thus a creative process whose function constitutes an extension of the function of the visual brain." (Zeki 1999 : 7).

Thus, Zeki appears to argue for a biological basis for aesthetics, from within what sounds like a thoroughly structuralist paradigm.

The most recent publication dealing with the life of Picasso is by John Richardson, who to date has completed the first two of four proposed volumes *A Life of Picasso* Volume 1 1881-1906, and Volume 2, 1907-1917, published by Jonathan Cape, London. The same author has also written on Georges Braque.

Einstein's theory of relativity has been explicated by many, including Bertrand Russell's fourth revised edition (1985) of his 1925 *ABC of Relativity*, London: George Allen & Unwin.

The Swiss linguist Ferdinand de Saussure is generally regarded as one of the founders of structuralism and semiotics. His seminal work, translated as *Course in General Linguistics* and published in 1916, was compiled from three sets of students' lecture

notes taken during Saussure's teaching at the University of Geneva in 1907, 1908-09 and 1910-11. "That such an obscure specialist in Sanskrit and Indo-European languages should become the source of intellectual innovation in the social sciences and humanities...suggests that something quite unique had occurred in the historical epoch of the twentieth century, so that a new model of language based on Saussure's structural approach emerged to become the model for theorising social and cultural life." (Lechte 1994 : 148-9).

For a recent re-evaluation of Saussure's thought, see Paul J. Thibault 1996 *Re-reading Saussure. The Dynamics of Signs in Social Life*, London: Routledge.

2. Vico argued that myths are attempts to impose a graspable form upon the chaos of everyday experiences.

According to Terence Hawkes (1977 : 13), Vico emerges as one of the earliest to argue that such imposed forms spring from the human mind itself, and it becomes the form of the world that is perceived by the mind as 'natural' or 'true'. Here is the principle of *verum factum*: that which humans recognise as true (*verum*) and that which they themselves have made (*factum*), are one and the same. Humans construct myths and other social institutions, and in so doing, they construct themselves. "Vico sees this process as an inherent, permanent and definitive human characteristic..." (Hawkes 1977 : 14).

The Russian folklorist Vladimir Propp in his 1928 *Morphology of the Folk Tale* has shown how our facility for structuring experience in terms of binary oppositions has driven the construction of metaphors and myths in the form of folk tales. His argument proposed that there is an underlying common structuring principle at work in the folk tales from across a wide range of cultures.

Claude Lévi-Strauss, arguably the most distinguished anthropologist who utilised structuralist principles, recognised the importance of Propp's pioneering work, (Lévi-Strauss 1960), and also published in 1955 The structural study of myth, in *Journal of American Folklore* 68 (270).

3. *Structuralism* is generally understood to derive from Saussure's distinction between *langue*, or system of language, and *parole*, or speech. Structuralists set themselves the task of describing the organisation of the total sign-system itself. According to Frederic Jameson (1972 : 101), "We may...understand the Structuralist enterprise as a study of superstructures, or, in a more limited way, of ideology. Its privileged object is thus seen as the unconscious value system of system of representations which orders social life at any of its levels, and against which the individual, conscious social acts and events take place and become comprehensible."

4. The American philosopher Charles Sanders Peirce is generally regarded as one of the founding fathers of semiotics, along with Saussure. In a paper published as early as 1868, he wrote "The only thought...which can possibly be cognized is thought in signs. But thought which cannot be cognized does not exist. All thought, therefore, must necessarily be in signs." (Peirce 1931-58 : Vol. 5 para. 251).
Following Pierce, Donald Brook (1985) has proposed a finite range of three possible representational approaches which he labelled *exemplification, symbolisation,* and *simulation.*
Exemplification refers to the use of iconic signs to represent aspects of experience; symbolisation, the use of arbitrary symbols; and simulation, the use of indexical signs to represent aspects of experience.

However, in contrast to Peirce's icon, symbol and index, the three terms of Brook do not stand for categories of signs. Rather they describe three functions fulfilled by images. And as Arnheim (1969 : 135) says about his own classification of Picture, Symbol and Sign, a particular image may be used to fulfil each of these three functions and will often serve more than one at the same time:

 sign (of danger)	 picture (of mountain)	 symbol (of hierarchy)	**Arnheim**
 symbol (of danger)	 icon (of mountain)	 index (of hierarchy)	**Peirce**
 Symbolisation (of danger)	 Exemplification (of mountain)	 Simulation (of hierarchy)	**Brook**

Of course it is the context, the combination of other signs (in the Peircian sense) in the syntagm which allows us to select a preferred reading from the range of possible meanings.

Brook's categories of simulation and exemplification resemble each other in a similar way to that in which Peirce's icon and index may be overlapped, (or even confused). The difference in both cases is that whereas in exemplification (function of iconic signs) the signifier resembles the object which it represents, in cases of simulation (function of indexical signs) the object and its representation are distinguishable. The flat ellipse in a drawing that simulates the fitted circular plate does not *exemplify* circularity, even though the ellipse-shape and the real plate look alike under certain conditions. Clearly, the reading of simulations is not always easy and obvious:

> Sometimes we don't even know whether some element in a picture is a simulating element, and not an exemplification or a symbol. Suppose that we come across a prehistoric rock engraving from an exotic culture, in which we recognise two 'stick-figures' of different sizes. Do they represent similarly-sized people seen at different distances (by simulation)? Do they represent differently-sized people standing together (by exemplification of relative sizes)? Do they represent similarly-sized people of different importance standing in quite different places (by symbolisation)?
>
> Brook (1985 : 7)

It is often obvious what is intended by artists in our own culture when visual conventions are recognised by both parties. However, Brook argues, misunderstandings do occur because artists themselves are often unclear about which mode of representation they are using. He challenges commonly-accepted concepts of learning processes, particularly those based on binary contrasts such as 'percept and concept' or 'visual and haptic'. He complains that what is meant by 'percept' in such a context is unclear in most of the art-education literature. It seems to be a notion influenced by phenomenalism and sense-datum theory. To copy the image of the retina is to behave 'perceptually'. In contrast to this way of representation, the 'conceptual' approach confuses the different processes of exemplifying and symbolising. According to Brook, the construction of exemplifying representations is no less perceptually demanding than is the construction of simulations.
He concludes that 'perceptual and conceptual' analyses of picture-making and also other binary systems such as 'visual and haptic' must fail because a correct analysis has to take into account his three distinct representational devices.

> Pictorial development needs to be seen as some pattern (if there is a regular pattern) of triadic interaction between the quite different processes of exemplification, simulation and symbolisation. I commend such a programme of research to educationists whose cast of mind is more empirical than my own. And I warn enthusiasts that even with the improved conceptual apparatus the task will still be arduous. The

> distinction between exemplification and symbolism can be so elusive that the temptation to let go of it, and try to muddle through with notions like 'haptic' may be overwhelming.
>
> Brook (1985 : 7)

5. The Russian Formalists evolved a new poetics based upon a study of formal devices in the two years before the 1917 revolution. By the beginning of the twentieth century, a methodological crisis had been apparent. A widespread reaction to the then-dominant positivist determinism had triggered a resurgence of irrationalist movements. This may be illustrated by the *zaum,* or trans-rational poetry, of Velimir Khlebnikov, and the *alogical* paintings of Kazimir Malevich. Linguists such as Roman Jakobson, conversant with, and sympathetic to this new art, set about devising a methodology which would allow a study of the formal devices of poetry, literature and painting in terms of the functions they fulfil in a social context, rather than in terms of their historical antecedents.

According to Victor Erlich (1969 : 63), the two centres of this development, Moscow and Petrograd, began as small discussion groups outside the academic establishments. The Moscow Linguistic Circle was founded in 1915 by students of Moscow University, including G. O. Vinokur, Buslaev, and Jakobson. The latter's paper on *Khlebnikov's poetic language* presented at the Circle in the academic year 1918-19 analysed the poet's formal devices in the light of concepts derived from Husserl and Saussure. Published two years later as *Modern Russian Poetry*, it became the definitive statement of early Formalism.

In Petrograd, a coalition of students from Baudouin de Courtney's school and professional literary theorists began meeting in 1916. Students Lev Jakubinski and E. D. Polivanov, among others, met with the theorists Boris Eichenbaum, S. I. Bernstein, and Viktor Shklovsky to resolve problems of poetics by making use of modern

linguistics. Shklovsky had had an apprenticeship with a sculptor, and this experience, together with his close association with Futurist poets and painters, gave him an awareness of form and artistic construction. He claimed "With the aid of Futurism and sculpture one already could understand a great deal. It was then that I saw art as an independent system." (Erlich 1969 : 67- 8)

For a critical account of Structuralism and Russian Formalism, see Frederic Jameson 1972 *The Prison-house of Language*, New Jersey: Princeton U.P.

6. The term 'making strange' is a literal translation of the Russian *ostraneniye*. See Lee T. Lemon and Marian J. Reis (eds) 1965 *Russian Formalist Criticism. Four essays*, Lincoln & London: University of Nebraska 3-24.

7. According to Natalia Adaskina (1999 : 187) the *Supremus* group first met in Udaltsova's Moscow apartment during 1915-16. We may assume the group formed in support of Malevich's position statement made at the *0.10* show, Petrograd, December 1915, since that is where he first publicly announced Suprematism. Vasilii Rakitin (1999 : 273-4) states that Udaltsova and her colleagues first referred to themselves as 'Suprematists' in the winter of 1916-17. She had contributed work to the *0.10* show, but at that time appeared to align herself more with Tatlin, to the extent of writing the catalogue notes that he distributed at that event (Rakitin 1999 : 273).

However, her diary entry for 29 November 1916 states "I've suddenly become interested in decorative designs and in Malevich." (Bowlt & Drutt 1999 : 345). Clearly, the philosophical tension between Tatlin and Malevich which was illustrated in Section 1.1.2, (and which, rumour has it, led to blows between them in the *0.10*

show), polarised the artists in their vicinity. Udaltsova's inclination was towards the unification of these factions of the Russian avant-garde, and according to Rakitin (1999 : 274) she tried to unite with the Productivists Vesnin, Stepanova, and Rodchenko, within the Association of Extreme Innovators (*Askranov*). The attempt failed, but in 1920 she tried again within the debates held at Inkhuk. The extreme position of the proto-Constructivists declared that painting was not consistent with the goals of modernity, and should be abandoned. Inevitably, perhaps, this response led to the resignations of the Malevich faction, including Ivan Kliun and Udaltsova herself. Wassily Kandinsky left at the same time for similar reasons.

8. *Phenomenological structuralism* is a term used here to describe Jakobson's study of the formal structures of language informed by the recognition that such structures are themselves the products of human consciousness. The German philosopher Edmund Husserl had argued that subjectivity and objectivity are dialectically related, each existing only in relation to the other. He accepted neither the idealist position that mind creates the world, nor the empiricist position that the world produces impressions in the mind. The task of phenomenology was to explore consciousness from a neutral standpoint, from where the existential status or empirical facts about entities (including oneself) in the world are neither affirmed or denied. Only then, Husserl argued, can consciousness be explored without prejudice. In this way, Husserl hoped to reveal the truly 'eidetic' or universal structures of consciousness that could guarantee the certainty required for scientific research of all kinds, including that of language.

For recent discussion of Husserl's ideas, see Richard Kearney and Mara Rainwater (editors) 1996 *The Continental Philosophy Reader*, London: Routledge 3-22.

9. This opera had been devised at the *First All-Russian Congress of Poets of the Future* attended by Malevich and Kruchonykh in July 1913 at Matiushin's *dacha* in Uusikirkko, Finland.

10. John Milner provides a detailed analysis of the geometries involved in the construction of Malevich's compositions in his 1996 *Kazimir Malevich and the Art of Geometry*, New Haven: Yale U.P.

11. According to Victor Erlich (1969 : 154), Czechoslovakia had become a vigorous centre for linguistic and literary study by the mid-1920's. This had occurred because of the stimuli received from Moscow and Leningrad, and in particular because of the presence of Jakobson. The first meeting of the Prague Linguistic Circle was held on 6 October 1926. Vilem Mathesius, a leading Czech linguist, presided. As well as Jakobson, the literary theorist Jan Mukarovsky and the philologist N. S. Trubetzkoy joined the Circle. Boris Tomashevsky is known to have participated too. In Prague, the pure Formalism of the Russian Circles gave way to a more structuralist approach. The concern to locate the work (of literature, of poetry, or art) within a social context meant that ideological or emotional content became significant factors within the total aesthetic system, or structure, to be analysed. Karl Bühler contributed to the work of the Prague Linguistic Circle, although he was not a regular member. For detailed discussion of his contribution to the theorising of the functions of language, see Ladislav Matejka's paper *Postscript: Prague School Semiotics* in Matejka & Irwin R Titunik (eds) 1976 *Semiotics of Art. Prague School Contributions*, Cambridge Mass: M.I.T.

12. The 'Sapir-Whorf hypothesis' is a widely used term to describe their proposal that language shapes the way we think about the world. In contrast to earlier European scholarship centred upon Saussure's theoretical work, the two American anthropological linguists' approach was distinguished by first-hand experience with native American languages such as Hopi.

13. According to Simon Dentith (1995 : 4-5), Bakhtin had been active in intellectual discussion groups from c1918, when he met with Valentin Voloshinov, amongst others, in Nevel. In 1920 he was in Vitebsk and met Pavel Medvedev. These three formed the core of what has become known as Bakhtinian Circle.

14. In 1970 the Russian linguist Vyacheslav Ivanov caused a stir by attributing the book here cited to Bakhtin. Other books and articles previously attributed to Voloshinov and Medvedev were similarly re-accredited. Ivanov's motivation appears to have been to do with strengthening Bakhtin's relationship to Marxism: Voloshinov's and Medvedev's writings were explicitly Marxist in tone; if they could be attributed to the higher-profiled Bakhtin, then the Marxist genre of literary criticism would be strengthened accordingly. Academics are divided on the issue. For example, Simon Dentith (1995) rejects the reaccreditation; Katerina Clark and Michael Holquist (Clark & Holquist 1984) accept it. Whatever the truth may be, the fundamental insight of the Bakhtinian circle remains relevant to the argument being constructed here in Section 3: that communication is best theorised within a dialogical context, and evaluated within a social context.

15. According to Edmund Leach (1970) Bronislav Malinowski, the Polish anthropologist who was naturalised as English, "spent most of his academic life analysing the results of research which he himself had personally conducted over a period of four years in a small village in far off Melanesia. His aim was to show how this exotic community 'functioned' as a social system..."

As well as contributing to the theory of functions of language – he theorised the phatic function as the means by which contact is maintained within a communication process – Malinowski also recognised early on the importance of studying the parameters of social context within which communication takes place. His work influenced Michael Halliday's development of social semiotics. See Note 16.

16. Michael Alexander Kirkwood Halliday, mentioned here for the first time, is widely regarded as one of the leading exponents of social semiotics, and the leader of what is referred to as the Australian school of social semiotics. His work on the systems and functions of language at work in a social context underpins the systemic-functional model for drawing, Figure 4.32, which is proposed in Section 4 as a novel instrument for the analysis, synthesis, and assessment of drawings.

In the two possible approaches to study of language – the socially oriented and the psychologically orientated – Halliday is firmly located in the former. His antecedents in the development of a social semiotics include three prominent figures: Malinowski, referred to above in Note 15, Whorf, referred to in Note 12, and the English linguist J. R. Firth (1951, 1957a, 1957b). Malinowski and Whorf are important to Halliday's thought because they both insisted on the link between the cultural organisation and the reflection of this in the structure of language. Firth is responsible for Halliday's development of the notion of *system*. Firstly, the definition of meaning as *function in*

context was taken up by Halliday through Malinowski, *via* Firth. Secondly, Firth's development of a linguistic theory based upon the notion of function in context was enhanced by his conceiving of *system*: For Firth, a system is an enumerated, available set of choices in a specific context. As Gunther Kress (1976 : xiv) put it: "The importance of Firth for Halliday lies in the attempt which Firth made to provide the linguistic component to go with the sociolinguistic insights of Malinowski. The two important categories are: (1) *context of situation*, that is, a view of language as closely dependent on stateable general types of situation which influence language. From here Firth developed his theory of the multiplicity of 'languages' within the total language. This is an important insight which Halliday took over and developed in his work on *register*. (2) *system*, which...has become the major formal category in Halliday's theory."

Section 4

1. The concept of *ecology*, understood as the dialectical relationship between an organism and its environment, was first introduced in 1866 by the German biologist Ernst Haeckel. He based the word on the Greek *oikos*, which referred to the family household, its daily operations and maintenance.

"By ecology we mean the body of knowledge concerning the economy of nature – the investigation of the total relations of the animal both to its inorganic and its organic environment" (Brewer 1979 : 1)

Haeckel was a disciple of Charles Darwin, and in his 1869 inaugural lecture as professor at Jena, he placed an explicitly Darwinian emphasis upon this new concept: "...the study of all those complex interrelations referred to by Darwin as the condition of the struggle for existence". (Worcester 1977 : 192). See also Haeckel's book *Art Forms in Nature*, published by Dover in 1974.

2. Most of these invariant features are self-explanatory. *Cross-ratio* refers to a relationship that exists between a set of four lines *a, c, d,* and *b* converging on a point *p*. Let perpendiculars be dropped from a point on *c* to the lines *a* and *b*. The ratio of lengths of such perpendiculars is *r*1. Similarly, for the ratio of lengths, *r*2, of perpendiculars from an equivalent point on *d*. The cross-ratio, *r*1/*r*2 is invariant for all positions of *p*.

Margaret Hagen (1986 : 289-292) defined these terms as follows:

"Skew reflection is defined similarly to ordinary reflection, that is, the Metric transformation, in the context of two distinct lines, *x* and *y*, perpendicular to each other in the plane. But in skew reflection, the axes are not perpendicular to each other.

Skew compression is to compression as skew reflection is to ordinary reflection. The direction of the compression is no longer perpendicular to the axis of the compression. Hyperbolic rotation is a transformation resulting from two skew compressions in opposite directions.

Elliptic rotation is also the product of two compressions, but in this transformation both compressions have the same axis of compression and their product is combined with a rotation. A shear transformation may be defined as a one-dimensional stretch."

3. Note here the distinction between *projectors*, which are imaginary lines of projection from the object to the place of projection, and *orthogonals*, which are the drawn lines representing those edges of an object which are perpendicular to the plane of projection. In multi-plane orthographic projection, no orthogonals are visible since they are represented by points.

4. The author is indebted to Dr John Willats for his kind permission to reproduce diagrams here which were originally published in Fred Dubery and John Willats 1972 *drawing Systems*, London: Studio Vista.

5. In Gibson's 1950 *Perception of the Visual World*, he made the distinction between the *visual world*, that of objects and events, and the *visual field*, which appears to correspond to the idea of the flat patchwork of coloured shapes on the retinae rather like pictures. He suggested a way of becoming aware of such a visual field: "The attitude you should take is that of the perspective draughtsman. It may help if you close one eye. If you persist, the scene comes to approximate a picture". (Gibson 1950 : 27)

This is exactly the attitude adopted by William Coldstream and his followers in the practice of measured drawing. Their precision in keeping the head still, with one eye closed, allowing the open eye to swivel around and observe proportions in the visual world measured on a pencil held at arm's length (the arm allowed to move in an arc), revealed the fact that what they were actually measuring were ratios upon a *curved* visual field.

See Section 1 for further discussion of this method of drawing.

6. The Stanford psychologist Roger N Shepard has published intriguing variations of ambiguous figures in his 1990 *Mind Sights. Original Visual Illusions, Ambiguities, and Other Anomalies*, published by W H Freeman, New York.

7. Michael O'Toole, before recently retiring from the professorship of Human Communication at Murdoch University, Western Australia, was teaching and researching ways of adapting Halliday's systemic-functional analysis of language to the visual arts. In an unpublished paper written in response to a request from the Association of Gallery Guides of the Art Gallery of Western Australia, he stated: "Michael Halliday's system-functional linguistics offers a powerful and flexible model for the study of other semiotic codes besides natural language and its universality may be of particular value in evolving new discourses about art. I believe the adaptation of Halliday's model I am presenting here can significantly improve how we perceive art, how we talk about it and how we teach it."

The sentiment expressed above is strikingly similar to that of Willats.

8. Marr and Nishihara adopt the word *shape* to describe the geometry of an object's physical surface. Thus, they argue, two statues of a horse, cast from the same mould, have the same shape. In the terminology adopted elsewhere in this thesis, such three-dimensional shape is referred to as *form*.

9. Bourdieu's theory about the cultural construction of taste is generally accepted nowadays. It is cited here as another successful example from the constructionist paradigm of philosophy which employs a relativist ontological attitude in order to analyse social meanings.

10. Raymond Williams, the Welsh cultural theorist who died in 1988, first proposed the concept of a *structure of feeling* in a book jointly written with film-maker Michael Orrom, *Preface to Film* 1954.

At that time, according to John Higgins (1999 : 37), the concept was intended as an alternative way of understanding cultural constructions. Through development over many years, its importance came to lie in its potential to theorise cultural conventions (Williams was particularly interested in drama conventions of technique and staging) normally assumed to be 'natural' or 'given', in ways that revealed them as forms of social consciousness. For Williams, any change in artistic convention, (presumably this may include drawing conventions), reflects change in social consciousness.

For an account of Williams' life and work, see Fred Inglis 1995 *Raymond Williams*, London: Routledge.

11. The notion of different degrees of extracting information from the arrays of light at the eyes, termed by Witkin *contact, distal,* and *proximal*, may be traced back to Adolph von Hildebrand 1893 *The Problem of Form in the Visual Arts*, in which he

discussed the difference between art seen close up and at a distance. Alois Riegl argued that some styles and periods of art were tactile, or haptic, and others were optical. Riegl's ideas are discussed in Margaret Iverson's 1993 book *Alois Riegl: Art History and Theory.*

It may also be worth noting Donald M. Lowe's 1982 book *History of Bourgeois Perception* in which he argues that different social classes had different ways of perceiving the world. He tabulated European historical periods from the Middle Ages to the twentieth century, and correlated them to a history of the senses.

Witkin himself has published on the semiotics of aesthetic form (Witkin 1993, 1997). Currently Professor and Head of the Department of Sociology at the University of Exeter, Wilkin's research interests lie in the sociology of the arts and the aesthetic dimension of social life. His most recent publications have been on Theodor Adorno (Witkin 1998,2000). Previous research undertaken by Witkin in the fields of creative arts and teaching will be referred to in Section 5.

12. John Steer (1989) makes a case for analysing the styles of painting that constitute the canon of traditional art history in terms of the invariants selected by the artist in relation to the social realities of the period: "...the act of representation involves a kind of analysis not only of the visual world as such, but of the way we experience it." (Steer 1989 : 98)

13. In a 1997 BBC2 television programme, *Flightpaths to the Gods*, archaeologists constructed this theory from the evidence available. A transcript of the programme has been published in a booklet edited by Peter Millson 1997 *Flightpaths to the Gods. An Investigation into the Mystery of the Nazca Lines.*

14. Duchamp was an exponent of provocational art in the sense that he drew attention to the process of signification itself, and certainly managed to provoke social response. René Magritte's *Treason of images*, Figure 4.19, may also be cited as provocational, challenging as its does our complacency about communication.

15. The term *Post-modern* is problematic. Charles Jencks (1986) has offered a taxonomy of the various typographic alternatives: *Postmodern,* he informs us, was a term coined in the 1950's alluding to a perceived overcoming of the Modern. *Postmodern* was in use from the 1950's and 1970's to mean Modernism in decline. *Post-Modern*, as used here, indicates the development of pluralist approaches to art and design practices, and an eclecticism of style. *Postmodernity* is a term currently used to identify a position which criticises the values of consumer culture and the information age as being manipulative and neo-conservative. Jencks (1992) has also edited *The Post-modern reader. Elements of a New Cultural Synthesis.* For a historical review see Perry Anderson's 1998 *The Origins of Postmodernity.*

16. According to David Bussel (1997 : 199), Hirst's work is about "the ironies, falsehood and desires that we mobilise to negotiate our own alienation and mortality". Such an observation supports the suggestion that revocational art expresses the multiplicities and complications of a Post-Modern society. Hirst studied at Goldsmiths College, London and in his second year, 1988, curated *Freeze*, an exhibition which first brought to public awareness work of students like himself who had been influenced by an eclectic group of Goldsmiths tutors under the leadership of Jon Thompson. The teaching team included Yehuda Safran (who also taught at the RCA), Richard Wentworth and Michael Craig-Martin, to name but three contrasting but inspirational

members. Rachel Whiteread graduated from the Slade in 1987. She and Hirst were major contributors to the Royal Academy's exhibition of young British artists from the Saatchi collection, *Sensation*, in 1997.

17. The term *Australian Aborigines* is used here in a generic sense, to include the great diversity of tribal and regional differences. However, Eric Rowlinson (1981 : 9) points out, underlying such diversity is the common ideological standpoint which relates the Aborigine spiritual entity with geological features in their environment. For an attempt at explaining such an ontological belief system, see the Aborigine activist Mudrooroo's 1995 *Us mob*, Sydney: Angus & Robertson. For recent discussion and explanation of Aboriginal art, see Howard Morphy's 1998 *Aboriginal Art*, London: Phaidon.

18. O'Toole's adaptation of Halliday's systemic-functional grammar has been mentioned in Note 6 above. His most recent innovation in his project to empower people with a method for negotiating meanings in art is the 1999 CD-ROM *Engaging with Art. A New Way of Looking at Paintings.*

19. In his 1999 book *Modern art 1851-1929*, published by Oxford U.P., Richard R. Brettell has termed these two strategies "Transparent Realism" (Brettell 1999 : 14) and "Mediated Realism" (Brettell 1999 : 15)

20. Will Roberts, was a native of Neath in South Wales. He was a painter and drawer whose work has been exhibited widely. He died in 2000.

21. The term 'hiraeth' is a Welsh word whose meaning lies somewhere in the area between 'nostalgia' and 'longing'

22. Robert Newell is a painter and drawer who teaches in the School of Art and Design, Swansea Institute.

Section 5

1. Kelly's theory is generally recognised as a useful and effective means of analysis of people's personal ontological constructions, not only by psychologists but also by researchers in pedagogy (Rosie 1979), architecture (Mueller 1981, Stringer 1976), and art and design (Jerrard 1998, Talbot 1981).

2. Don Bannister and Fay Fransella (1980), in explicating Kelly's theory, took the opportunity to criticise behaviourist psychologists:

   Whilst pointing out that our capacity to recognise replicated themes is an "explicit assumption of the traditional idea of conditioning," they argue "behaviourist psychologists miss the essentially personal nature of...conditioning because they give the status of reality to the...replications on which they base their experiments...The fallacy of stimulus-response psychology...lies in the belief that a person responds to a stimulus. No one ever yet responded to a stimulus. They respond to *what they interpret the stimulus to be* and this in turn is a function of the kind of constructions the personal has imposed upon the universe." (Bannister & Fransella 1980 : 18-19).

   Bannister and Fransella quoted the research of Humphrey (1933) as evidence for their argument. He had found that a person can be conditioned by electric shock to withdraw their arm whenever the note G is played, but "when you play them 'Home Sweet Home' they will not twitch a muscle, although the tune contains the note G fourteen times – presumably because they construe it as a 'tune' and not as a series of notes". (Bannister & Fransella 1980 : 19).

3. Kelly contrasted the philosophical position he dubbed 'constructive alternativism' with *accumulative fragmentalism*, by which the truth is collected piece by piece.

Unlike a fragmentalist approach, constructive alternativism assumes that "whatever nature may be, or howsoever the quest for truth will turn out in the end, the events we face today are subject to as great a variety of constructions as our wits will enable us to contrive." (Kelly 1970 : 1)

4. Any detailed discussion of post-structuralist theory is beyond the scope of this thesis. However, the temptation to align Kelly with the French philosopher Jacques Derrida here is too great to resist. By doing so, a potentially fruitful field of research may be indicated for future cultivation. Had Kelly been aware of Saussure's *Cours* in the mid-1930's when he was developing his theory as a handbook of clinical procedures? Had Derrida been aware of Kelly's work (Kelly 1930, 1955, 1961) in the early 1960's when he was developing the theory of deconstruction (Derrida 1962, 1967, 1967a)? Certainly, Derrida's term *différence*, its sense suspended between the two French verbs 'to differ' and 'to defer', serves to reveal the same truth as Kelly intimated when he spoke of the psychological process of selecting one pole of a bi-polar construct as implicitly denying (suppressing?) the other. Derrida extended this insight by pointing out the process of selection of one term from a given paradigm implies the deferral of *all* the other available choices.

5. According to Alan Watts (1957 : 23), Zen Buddhism is "a way and a view of life which does not belong to any of the formal categories of modern Western thought." It is therefore rather difficult to define.

The activity (perhaps the inactivity) of looking and drawing with a calmness of mind which has no awareness of time, language, or self seems to come close. Readers

should note here the Zen saying: those who know do not speak; those who speak do not know.

6. This statement may be difficult to justify on scientific grounds. However, one only has to experience the rare occasion when a model fails to exude 'presence' to understand its power in maintaining concentration.

7. Coldstream's method of measuring proportion is described in detail in Section 1. The 'invisible grid' referred to here describes the network of imaginary lines which link salient points on the figure. For example, nose, nipple, navel, (k)nuckle and (k)nee, or combinations of these, may be aligned in various ways. These imaginary lines, once noticed, are deployed as a kind of scaffold upon which to construct the figure. Negative spaces are the picture equivalents of those areas within the scene which may not be labelled as discrete objects. The judgement of such shapes on the drawing surface is often more 'accurate' (more closely resembling the profile of an area bounded by discrete objects viewed with only one eye) than the judgement of shapes of objects that may be labelled with words. This is an example of looking without language.

8. The more familiar metaphor, adapted from Nietzsche by Frederick Jameson for the title of his 1972 book *The Prison-house of Language,* is not quite able to carry the sense of the multiplicity of reflected and refracted glances of meaning when applied to the notion of looking through language. The term 'prism-house' was invented by the author for a paper titled 'Style, taste and fashion in the prism-house of meaning',

presented at the international conference *Useful and Critical: The Position of Design Research*, University of Art and Design, Helsinki September 1999.

9. Rensis Likert (1932) proposed a method of attitude measurement which involves the researcher drawing up a set of attitude statements to which the research participants (in this case, students) are asked to indicate their agreement or disagreement along a seven-point scale, ranging from 'strongly disagree' to 'strongly agree'.
Robert R Burns (2000 : 560) claims that the advantages of the so-called 'Likert method' are:

a) the fact that the method is based entirely on empirical data regarding subjects' responses rather than subjective opinions of judges;

b) the fact that this method produces more homogeneous scales and increases the probability that a unitary attitude is being measured, and therefore that validity...and reliability are reasonably high.

Burns observes that most attitude researchers have relied on some version of Likert's scales because of their proven efficiency.

10. For both pilot studies, semantic differentials were designed with a scale of five available response boxes. However, Osgood (et al 1967 : 85) observed that "over a large number of different subjects in many different experiments it has been found that with seven alternatives all of them tend to be used, and with roughly, if not exactly, equal frequencies." For the research exercise following the pilot studies Likert sets with seven alternative response boxes were designed.

11. The call by Stephen Farthing (2000) at the D*rawing Across Boundaries* conference for a revision of the secondary education art curriculum has recently been echoed by the participants at the *drawing Symposium* organised by Wimbledon School of Art in November, 2000. There is a strong case to be made for the inclusion of systems of geometry in any revised curriculum.

12. A total of thirty-three students participated in the new drawing programme as members of the two Experimental groups, over the periods 1998-99, 1999-2000. The drawings of 25 students have been presented and evaluated.

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MATRIX OF SYSTEMS OF CHOICES

LEVELS OF ENGAGEMENT	FUNCTIONS OF DRAWING		
	COMPOSITIONAL	INTERPERSONAL	EXPERIENTIAL
The Drawing as displayed in context	• Inter-textuality • Systems of Geometry: persp. orthographic, oblique, inverted persp., & topological • Size and format • Framing devices • Location options	• Systems of modality: Mood, attitude, positioning: viewer-centred, object-centred • Public/Private • Intimate/Monumental	• Systems of Theme: Physical, emotional, imaginative experiences. narrative, Historical genre • Realistic/Abstract • Interplay between objects, poses, events.
Sub-divisions of the Drawing's surface	• Secondary geometry • Gestalt relationships: horizontal, vertical, diagonal axes • Proportional relationships • Tonal passages (aerial persp.)	• Systems of gaze: Eye paths, focus points • Dynamic/Static • Calm/Excited • Balance/Unbalanced	• Primary geometry • Actions, poses, events, objects • Awareness of distal and proximal perceptual values
Combinations of drawn marks	• Relative size of marks • Relative orientation of marks • Relative position of marks • Colour, tone and texture contrast – boundaries • Pattern • Rhythm • False attachments	• Deep/shallow range of depth illusion • Foreground/Background range of positioning • Stability/Instability • Scale • Heavy/light	• Distance between surfaces • Edges: occlusion of one surface by another • Direction • Transparency/Opacity of surfaces • Atmospheric conditions • Quality of light • Time of day • Awareness of haptic perceptual values • Weight
A drawn mark	• Size relative to picture surface • Orientation relative to picture surface • Position relative to picture surface • Combination of surface texture and drawing medium • Picture-primitives	• Psychological orientation • Range of textural meanings: wet/dry; hard/soft; matt/gloss • Denotation level of meaning	• Spatial depth • Effects of gravity and other forces • Effects of light and water upon material surfaces • Scene primitives

Figure 4.32