Environmentally Sensitive Printmaking: A Framework for Safe Practice

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This research has involved the generous help and collaboration of a number of people without who's help this thesis would not have been possible

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Abstract

This research is concerned with establishing a rationale which will link safe printmaking practices with artists' individual and sustainable creative practices, by investigating the preconception that printmaking practices may be limited by adopting such an environmentally sensitive approach. This has been investigated through a practice-led approach, which implicitly involves the researchers' professional practice as a visual artist printmaker.

The cross disciplinary nature of this practice-led research has established that diverse and non-text based sources be included in the literature review. The resulting contextual review established the evolutionary nature of printmaking practices, the role played by individual artists perceptions of risk, and the limited ability of available literature to adequately link evolving and didactic creative practices to emergent boundaries established by environmental and occupational health and safety legislative criteria. There was evidently no theoretical framework for linking these apparently divergent criteria.

The multi-disciplinary and practice-led context i.e. the research was generated by practice and carried out through practice, determined the range of methods employed: questionnaire, quantitative tests of materials; participation in, and initiation of collaborative case studies; documenting workshop practice and visual development of printed art works; and exhibition for peer review. These multiple methods and their complex interrelationships were visualised as a system of consequential actions, in order to externalise possible alternative actions and choices made by the researcher in response to this research.

Analysis of these methods revealed that: the collaborative case studies and the researcher's own visual and practical response, established that a systematic revaluation of practice could link the idiosyncratic and individual creative practices to the use and selection of nonhazardous practices, which did respond to objective occupational health and safety rationale. This revealed the extent to which a systematic re-evaluation of 'established practices' may be synthesised into the working practice of the researcher and lead to the diversification of that practice - visually and practically.

This process has resulted in the generation of a body of printed art works which implicitly embodied the hypothesis developed in this research; the development of a electronic database or 'morphological framework', which initiates a sequential examination of process at a structural level, collating, comparing and promoting previously un-considered alternatives based on a heterarchical model of risk. This process has offered tangible means of visualising the generative processes involved in making prints. The 'morphological framework' has implicitly linked the researcher's printmaking to a sustainable and environmentally sensitive creative practice, which is methodologically transparent and procedurally transferable.

"God is the artificer of man, man the god of artifacts"

Giambattista Vico (1710)

1.0 SECTION ONE: Introduction

1.1 Rationale for this Research

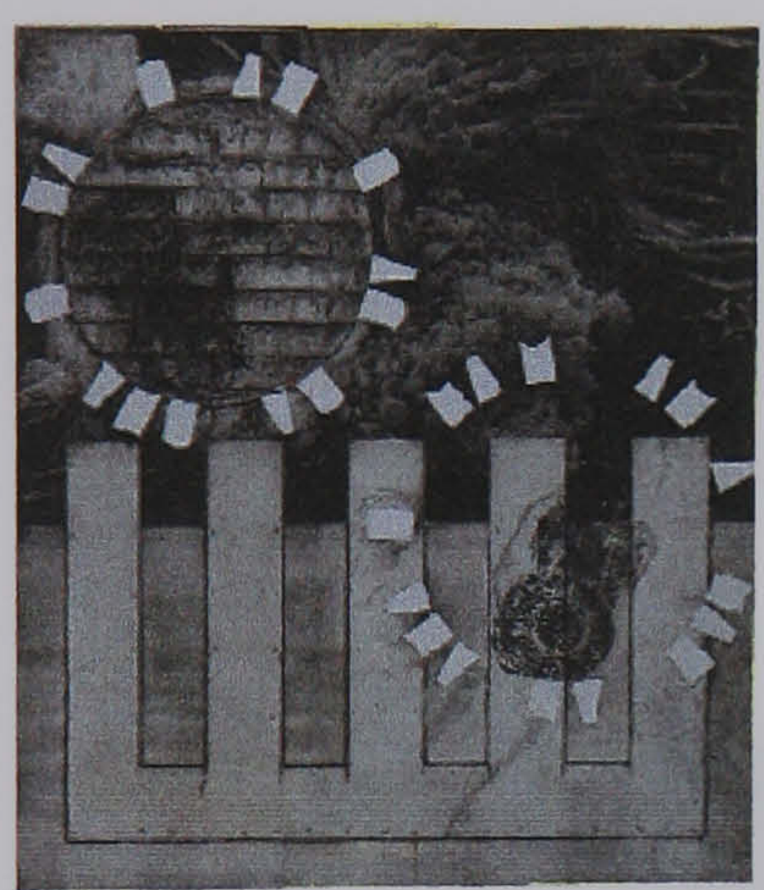
In recent years there has been an increasing awareness and concern with issues of safety relating to the working practices of artists. Perhaps the most urgent of these concerns is within the discipline of printmaking. Traditionally printmaking has used a wide range of substances, chemicals and techniques for the practical and creative purpose they offer the printmaker. But, the autonomous nature of the printmakers' creative practices and the unique workshop environment (educational and professional) within which those practice take place, are having to increasingly respond to both legislative and personal concerns voiced by artists. An increasing awareness of the health and safety issues has consequently called into question the appropriateness of many printmaking materials and methods currently used in practice. It will be these issues of sustainable practice that this research will endeavour to address.

1.1.1 Developing a Personal Printmaking Vocabulary

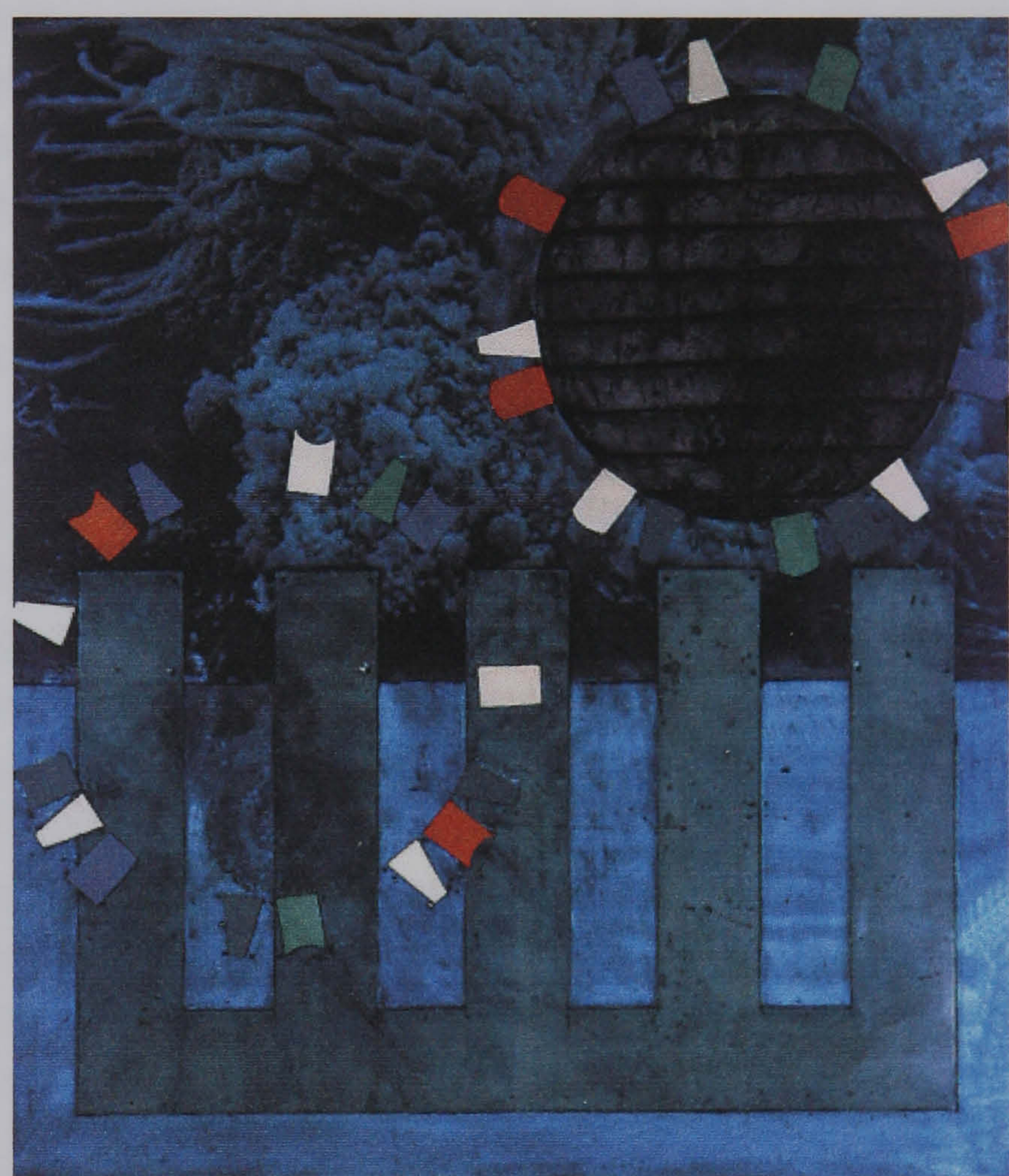
The researcher is a practising artist, who's main form of visual practice is printmaking. Over the last twelve years the artist / researcher has developed and evolved a personal visual vocabulary within printmaking, from undergraduate and postgraduate education, to editioning professionally for other artists, and then to setting up and running a professional printmaking studio. Throughout this period the artist / researcher has continued to expand his own printmaking practice through the process of making and exhibiting printed art works. The working methods used to a large extent have been defined by the visual and intellectual concepts which the work addresses. The subject matter has for a number of years been defined by the practical and ontological issues associated with the transcription of information (scientific [genetic] and artistic [aesthetic], see section 5) from theoretical concepts and symbols into personal visual forms. The diversity of topics pursued throughout this period, has changed, but a constant theme in the researchers professional practice has been a personal interest in the generic relationship between the physical manipulation of the materials and printing media used and their impact on the direction and content of the visual concept. This research however, will not address directly an investigation of the development of researcher's subject matter, although it will be discussed and recognised when it directly relates to the issues of interdependence between practical and aesthetic decisions. Further the notion of a visual morphology, resulting from the interdependence between practical and aesthetic decisions will also be seen to be central to the researcher's professional practice. The resulting work personifies an intuitive and evolutionary relationship between subject matter and the physical process adopted (*see section 6*) which the researchers visual practice has engaged over this period.

[1] "I.C.I." Woodcut (Pengelly, 1985, 1.4 x 1.2 m) printed by hand using a burin. The three-dimensional wood block surface, which could not be printed by a conventional relief press, resulted in the adoptionof a technique which 'moulded' the paper print to this surface.

For example, the wood block print **"ICI"** [1] (Pengelly, 1985), confronted the limitations of the relief cutting and printing processes in order to develop a particular 'mould' like quality in the final printed paper image. The three dimensional characteristics of the wood block itself became the underlying creative element around which the visual content and the manipulation of the image developed.



[2] "Human Disfigurement", Paper Proof above (Pengelly, 1989, 1.6 x 1.4 m). This proof was printed prior to a number of overlapping plates being welded onto the reverse of the main plates. The thickness of the final welded plate determined that it could not be printed in a conventional intaglio etching press.



The print "**Human Disfigurement**" (1989) evolved over a period of two months, involving a number of interlocking etched metal plates spot welded together. It was this configuration of physical elements which determined the final printing image [2]. This process resulted in a plate which could not be printed by any conventional intaglio printing process. In effect the final print/cast image developed 'independently' of the final realisation of this work, as a conventional intaglio printed image[3]. This process brought into question the

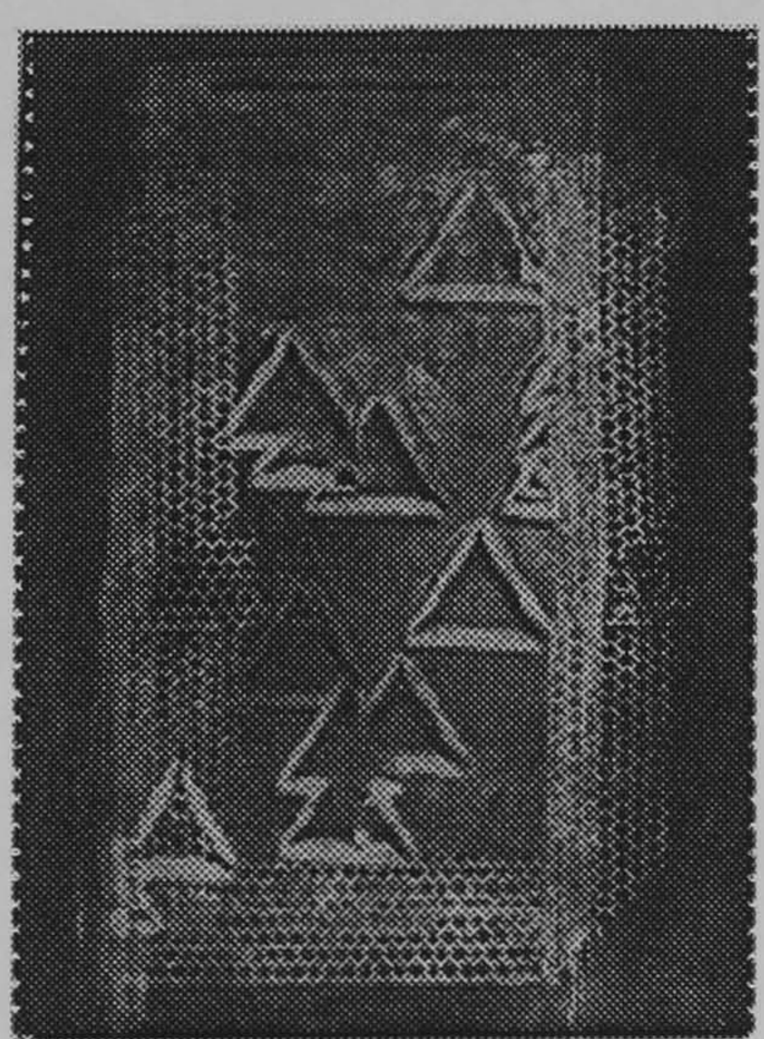
[3] "Human Disfigurement" opposite (Pengelly, 1989). This final printed copy used a silicon rubber casting process, developed for this particular print by the researcher whilst studying at the Royal College of Art (1987-89).

extent to which the intaglio printing process limited the aesthetic and visual development of the work. This physical and aesthetic dialogue ultimately lead to a complete break with all intaglio 'conventions' (using direct pressure as the means of taking an impression from the etching plate), and lead to the development of an innovative printing process using a silicon rubber compound which did not require a press or printing paper (*see section 2.8*). Throughout the author's professional creative practice, this developmental approach has resulted in a visual and practical printmaking vocabulary which is as a consequence of the interdependence between medium and idea.

Throughout this period the author had only vaguely been aware of the potential hazards associated with the materials and techniques used. The smells associated with that practice (wax, bitumen and solvent odours) and the often uncomfortable working environment that these printmaking processes often demanded, were considered an acceptable consequence of this creative process. However, increasingly personal concerns for the potential hazards associated with these working methods were developing, albeit in an unconscious and unstructured way.

1.1.2 A Personal Rationale for Change

A consistent theme, already referred to in the researcher's practice has been the manipulation and selection of materials, based solely on the visual advantage these may offer. This process the researcher suggests has been a significant influences in the development of a diverse and innovative body of work. However, this often expedient process, which had previously been determined only by the creative and aesthetic qualities it offers, has been increasingly called into question by the personal experiences of the researcher. A number of incidents throughout this period have culminated in the researcher questioning this approach and the basis on which the selection and use of materials is made.



[1] "Cell" (Pengelly, 1988, 0.6 x 0.9 m). This intaglio etching plate was produced used a combination of techniques one of which involved burning areas of bitumen powder onto the plate with a heated metal template.

The intaglio print **"Cell"** [1] (Pengelly, 1988) used a technique in which powdered bitumen aquatint was liberally scattered over the etching plate, this was then burned directly onto the plate using a perforated hot metal template, resulting an interesting and unpredictable 'printed mark', which acted as an acid resist. However, this technique also resulted in the bitumen powder overheating, which produced toxic fumes. Having accepted this 'unconventional' process based on the creative results it gave, the researcher was forced to strike a balance between the desired visual quality and the unpleasant and potentially hazardous results it produced (even though a face mask was used at all times).

Whilst working on the metal plates for "**Human Disfigurement**" (1989), which involved repeated etching by various techniques of a number of 'oversized' steel plates (larger than the available etching tanks). One of the techniques used was a 'spit biting'* method. As a consequence of these large plates and the use of concentrated solutions of nitric acid, the researcher was exposed to the toxic fumes this process produced. Even though precautions where taken; working in a ventilated area, and working with an approved respirator. These precautions evidently were not totally adequate for the extremely hazardous circumstances created by this unique situation (a process which resulted in the researcher being exposed, although mildly, to toxic fumes). The decision to use this technique was ultimately determined by personal criteria, which accepted the risks this hazardous technique may result in, when weighed against the creative advantages this technique gave: a decision the researcher was willing to make at the time, based on the 'desired' mark making quality of this process.

** Spit Biting - a process which involves using concentrated solutions of acid (nitric acid on steel); when applied directly onto a metal etching plate with a paint brush leaves 'painterly' etched marks on the surface.*

1.1.3 A Collective Responsibility for Change

Between 1990 and 1993 the researcher worked in a commercial fine art screen printing editioning studio, where the skills previously developed were utilized in a professional collaborative situation. In this working environment the circumstances were controlled by the working situation- the type of materials used, the periods of time one worked and the type of work undertaken [1]. A consequence of this working environment was the substitution of established personal control mechanisms and rationale, when working with known hazardous materials with external objective rationale. The circumstances were imposed by the working practices of this studio - long working periods, printing large scale work, solvent based inks, printing very large editions, working in close proximity to a combination of VOC* solvents. As a result of working in this environment the researcher became increasingly sensitised to the VOC based solvents and printing substances used. Throughout this period precautions and safe working practices were observed such as wearing rubber gloves, a respirator when cleaning a screen with solvents and not eating in the workshop. However, this did not adequately address the basic problem of working in this type of environment. Working with VOC solvent based materials and practices were accepted as the only viable method of producing the diversity and creative range of work.

[1] "Hybrids" (1992, Artist Michael Moon) this is an example of the sort of editioned prints the researcher was involved in printing (a screen print which has in excess of 40 over printings using solvent based screen printing inks).

** VOC, Volatile Organic Chemicals: a generic term to describe a large group of chemicals used as solvents - chlorinated hydrocarbons and aromatic hydrocarbons - which are used in various printmaking applications and are know to present health hazards.*

1.1.4 Summary

The experiences of the researcher's personal and circumstantial professional practice has illustrated the apparent difficulty in linking an evolving vocabulary of practice which is creatively independent, with the responsible and safe selection of materials and processes one uses. The researcher has become increasingly aware of the potential hazards associated with this practice, especially arising from the 'unconventional' application of materials in the pursuit of interesting and innovative visual qualities. As a result it has become apparent that personal subjective criteria, by which acceptable levels of risk had previously been established, are quite inappropriate for the circumstances in which one works. This research is seen as a personal response to these concerns.

1.2 Hypothesis

The hypothesis presented in this thesis is:

> The integration of environmental and occupational health and safety criteria implicitly into the researcher's creative practice, will result in expanding and diversifying the practical and visual vocabulary of that practice, and should result in a body of work which is creatively sustainable, visually exacting, and environmentally sensitive. This paradigm shift will form the basis for the development of a 'morphological framework of safe practice'.

1.3 Aims of the Research

This research aims to demonstrate, through the artist / researcher's evolving practice as a fine art printmaker, the creative advantage of working from an increasing environmentally sensitive position, supported by an increasing understanding of the occupational health hazards associated with certain printmaking practices. By systematically questioning of all aspects of the researcher's visual/creative vocabulary. This research investigates this hypothesis.

The notion of systematically questioning 'established' practice not only is a direct response to changes to occupational health & safety legislation (COSHH Regulations, 1988 *see section 2.4*), but also addresses personal concerns of the researcher relating to the physical consequences and possible physiological effects the selection of certain materials and practises on the researcher's health. As a result the researcher has been presented with the opportunity to reappraise his 'preferred' or 'established' working methods in respect to these concerns. The premise of this research is based on the proposition that the researcher had not previously implicitly linked safe working methods with his creative practice, and that there is currently no model which links artists working practices with 'safe' working methods, which might support sustainable creative practices.

The aims of this research will be to test this premise, based on a critical review of both literature and practice based sources, in order to determine:

- the extent to which printmaking has historically been influenced by the development of new techniques which determine the visual vocabulary and diversity of current printmaking practices;
- the extent to which the selection process is determined by creative expediency, whereby previously accepted working practices may increasingly be called into question by personal and legislative rational for safer working methods and printmaking practices.

The objectives of this research are to propose and evaluate a systematic restructuring of the artist/researcher's practice in relation to these aims, by means of evolving increasingly sensitive 'safe' practices:

- to propose a procedural 'framework of safe practice' that links all procedural decisions to the methodical selection and use of non-hazardous materials and practices;
- to test this 'framework of safe practice' in various workshop collaborations, in order to critically evaluate the relationship between printmakers' creative practices and the development of 'environmentally sensitive' working methods;
- to produce a body of printed art works embracing the development of a creatively sustainable visual vocabulary, which increasingly responds to safe working practices established in the course of this research.

The pursuit of these objectives has necessitated that this Ph.D submission comprises three related areas, represented by quite distinct media: first a written thesis (this text based document), second; a body of printed art works which form the basis of an exhibition and supporting catalogue (*refer to section 5*), and thirdly, the development of an electronic relational database - 'a framework of safe practice' (*refer to section 6 and accompanying CD ROM*). Each of these elements are fundamentally interconnected and integral to this research submission, given the objectives of the practice-led methods adopted, and the central role the researcher's practice plays in this (*refer to section 3.2.*).

1.4 Definitions of Key Terms

Throughout this written document key terms are used, many of which are specialist ones, requiring definition, or even redefinition as they are applied within the context of this thesis.

Practice: an artist's practical and visual experience gained within a given means of visual expression, based on that individual's interpretation and empathy for a given media. The resulting evolving visual vocabulary is accommodated within constantly shifting boundaries determined by individual aesthetic and practical understanding of that given media.

Safe Practice: the preferred use or selection of nonhazardous materials or substances in the pursuit of that practice.

Printmaker: an artist who's main form of visual creative expression is through the various techniques of printmaking.

Print: An impression taken from a matrix*, altered physically, chemically or electronically after the artist's own design, in order that an impression or record of that design may be transferred to another substrate or medium (usually paper). This definition includes transfer by physical pressure, electrostatic and thermal processes.

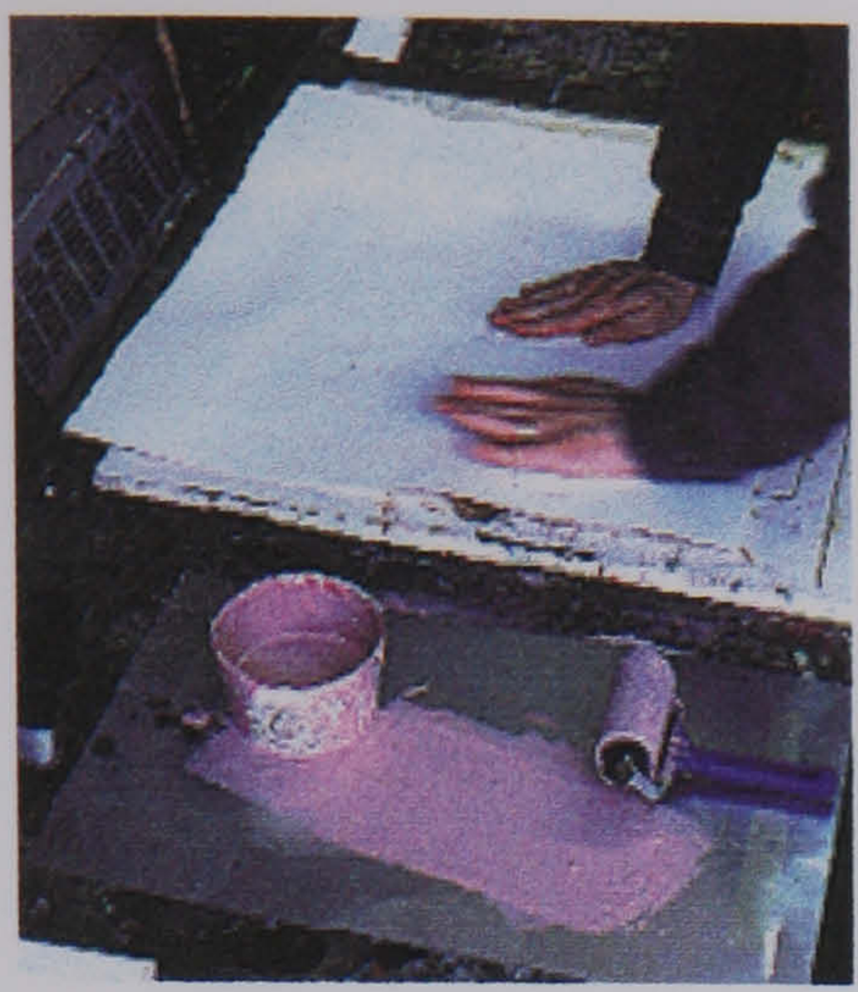
** Matrix - the physical medium or plate from which a print (image transfer) takes place. For example: woodblock, metal etching plate, lithographic stone or screen mesh and frame.*

Printmaking: the process of making multiple or single original works of art in which the artist directly engages single of multiple print processes: **relief -** lino-cut, woodcut, wood engraving; **intaglio** - etching, engraving, drypoint; **lithographic** - direct, offset; **stencil -** screen print, pochoir; **electronic -** photocopy, laser, inkjet, or **photographic** means. The artist alters or exploits any of these printing process or any combinations of these printing processes, in order to derive creative solutions from the physical, chemical or electronic manipulation of the printmaking process[1].

Environmentally Sensitive Printmaking: processes which do not involve hazardous or toxic substances in this process.

[1] This definition presented in this thesis, is derived from an understanding that the artist is implicitly involved in, or directs, the physical manipulation of the print medium. This definition consciously makes no reference to the notion of limited or original fine art prints. The debate concerning issues of originality in printmaking derived from the process of artificial 'limiting' editions is not felt to be relevant to the argument presented in this thesis (see for example the BSI draught classification of prints by Joseph Winkelman in Printmaking Today, Volume 4, Number 2, 1995, pp 5).

1.5 A Definition of Current Printmaking Practice



(i) An example of the artist making a relief print by hand. A process which does not need any complicated equipment or access to specialist workshop facilities.

In order to be able to describe the different practical circumstances in which printmaking takes place, and in order to establish boundaries which will define the researcher's printmaking practice, the following descriptions are proposed. Furthermore, in order to identify the possible impact of a proposed 'framework of safe practice' within this field of practice, it would be necessary to offer distinctions between these different, but related, levels at which printmaking takes place. This is not proposed as a professional hierarchy but rather an indication of the diversity of current printmaking practice, given the circumstances in which printmaking takes place and the imposition of practical limitations.

(i) Printmaking is presently offered at a curriculum level at over sixty undergraduate and postgraduate courses in the UK. The researcher was educated within this fine art printmaking environment, at undergraduate and postgraduate level. The emphasis of this training was always placed on developing an individual visual vocabulary within printmaking, based on the visual manipulation of the medium for one's own creative purpose (see *A Guide to UK First Degree Courses in Fine Art*, **National Association of Fine Art Education**, **1996**).

(ii) The extensive print making facilities at Peacock Printmakers in Aberdeen, Scotland have enabled the researcher to pursue large scale and ambitious work, which this open access workshop offers.

The researcher has been involved throughout this project in teaching and disseminating aspects of the research with students and staff at his sponsoring institution

(ii) The open access printmaking workshop environment includes small 'one man' operations to elaborate studios dealing with all printmaking media. Each workshop environment provides a range of physical resources e.g. presses, inks and rollers, as well as the technical expertise to support simple or the most sophisticated work (see **Turner** & **Innocent**, 1994).

The researcher has been able to pursue a range of specific printing projects in the course of this research only because of the facilities these various print workshops offer.

(iii) An example of a small independent commericial editioning printmaking workshop, which supports the work of its director/printmaker (Kathy Corachio Studio, New York).

(iii) This last category of workshops are specialist editioning and publishing workshops that produce fine art printmaking projects with professional artists usually initiated by galleries, the workshop, publishers or by the artists themselves. These also range from 'one man' operations that have a particular specialisation, to workshops employing a number of printers and specialising in a number of different printmaking media. The more established studios receive considerable attention, as the artists they work with often have international reputations. The work is usually well supported in terms of facilities, materials, staff and time, enabling artist and the collaborating printers to develop sophisticated and elaborate printed art works (see also **Turner** & **Innocent**, 1994).

The researcher's own experience in this area as a printer was with an eminent fine art screen printing editioned workshop in London. This experience has helped the researcher to develop specific skills and knowledge within this medium, it has also given the researcher an opportunity to work collaboratively with established international artists on a number of ambitious projects.

1.6 Summary of Section

Making prints need not require access to sophisticated presses or require the help of experienced printers, as the physical principles of each printing process (intaglio, relief, lithography, screen or the photocopier) are ubiquitous, with no fundamental difference existing between printmaking at art college or in a school situation with a simple roller press, to the editioned prints of well known artist produced in collaboration with a master printers. The materials used may be more refined and a technical sophistication may be evident in the resulting print, but the principles remain the same.

The researcher and the remit of this thesis identifies with none of these areas exclusively (having personal experience which draws on each of these areas), but rather this research will be concerned with the ubiquitous nature of the printmaking medium itself. The reference to Vico (on the opening page) the C16 Italian philosopher, with its inference that in order to know something we must engage a fundamental knowledge of how, and out of what, things are made, implies human knowledge is subjective and that our understanding is framed by personal and practical assumptions. This research is seen as an opportunity to fundamentally question the personal assumptions and experiences of the researcher, which had previously exclusively determined the processes and means by which that creative expression had developed. This process is now being called into question by the aims of this research, as previously 'established' means of visual and practical expression may no longer be adequate to encompass the whole boundary of that practice and given the objectives of this research - to establish sustainable printmaking practices which addresses occupational health and safety legislation as well as personal environmental criteria.

2.0 SECTION TWO: Contextual Review

2.1 Overview of Critical Contextual Review

A literature search dealing specifically with the environmentally sensitive printmaking revealed the limited nature of existing published literature, with less a 10 references relating directly to issues of safe practices in the arts [**Wilson Art Index** (version 3.2.1, **1995**), **Ariad Index of Research in Art & Design** (**1992**), and Fine Print References (**Ludman & Mason, 1982**). The latter contains over two thousand citations dealing specifically with fine art printmaking; of these, 330 references specifically deal with printmaking techniques, but none address the main issue of environmentally sensitive printmaking. The contemporary and esoteric nature of the subject area was considered to be the main reason for the limited number of literature based references.

A customary literature-based review as a result was thought to be limited given the objectives of this project. In order to encompass the possible diversity of the source material, which was not found to be accommodated in text based format, the researcher has extended the review process. For the purposes of this thesis this review will now be referred to as 'a contextual review', a term which it is proposed will reflect the contemporary, live and often transitory sources this research draws on for example; exhibition visits, artists' statements in relation to their visual practice, personal but informed conversations between practitioners, and practical workshop experiences. Such sources can be collectively considered as belonging to the 'love' public domain of professional fine art practice, and may be documented in visual forms.

The researcher has determined that the contextual review be grouped into three main areas in order to recognise the complexity of the field and the divergency of sources. (This process has also been helpful in establishing at an early stage the areas that this research does not address, an important consideration given the diversity of the subject area). This review focuses on three main areas:

- a *review of printing processes*: artists have continually manipulated printing techniques and appropriated 'non-artist' materials and techniques for creative advantage;
- *the diversity of printmaking practices*: the medium continues to evolve, based on individual printmaker's visual criteria and objectives;

- *a review of health and safety issues related to printmaking:* which recognises the influence legislation increasingly has in this area of practice.

A critical review of the relationship between these connected but potentiality distinct areas, will be the main objective of this contextual review section. It is recognised that these elements are not of the same 'kind', but originate from quite different sources: Artist - individual creative milieu, process - field of practice, and

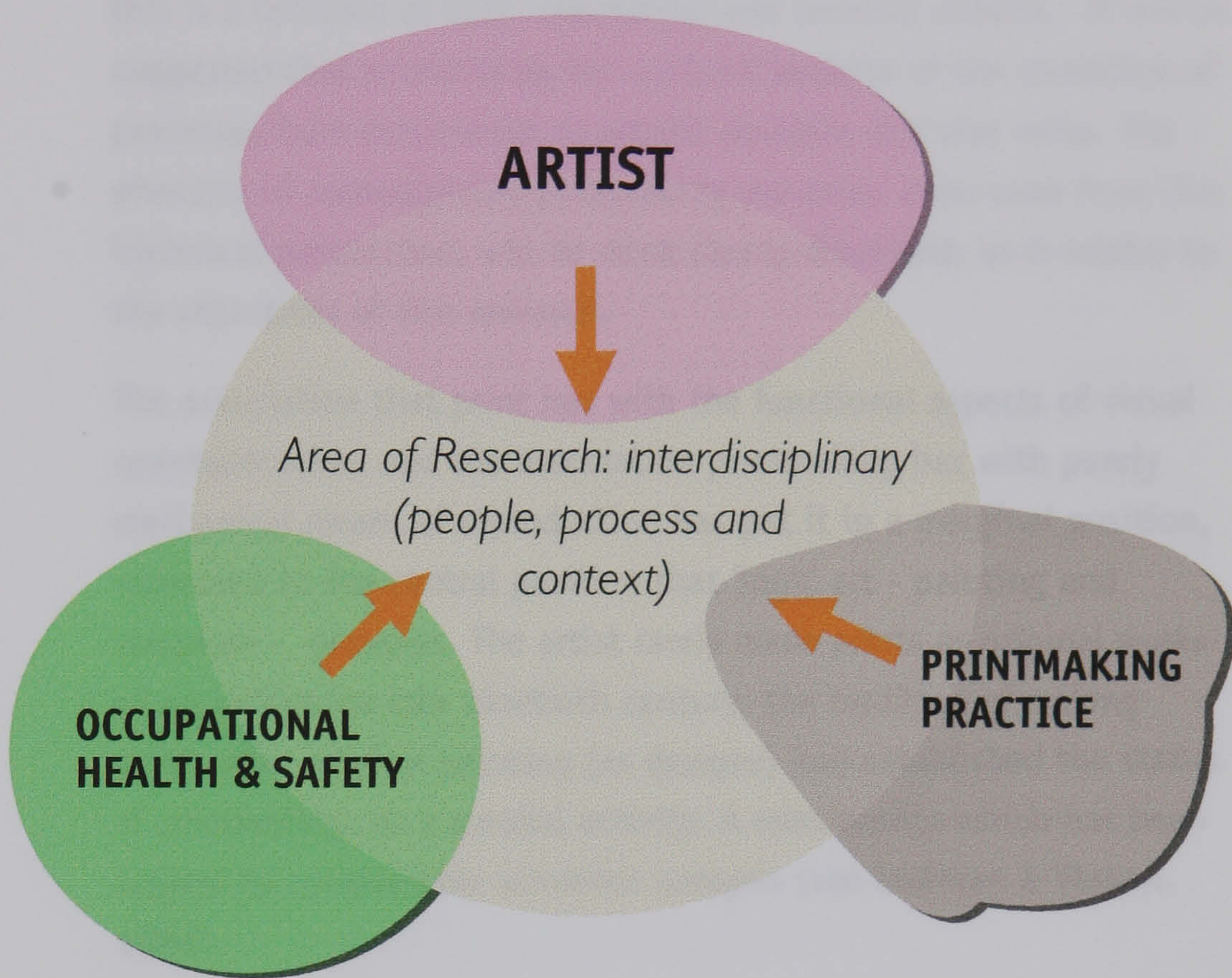


Fig 2.1 Graphic visualisation of the research area as a 'whole', the result of the interactions between specific areas: people - artists' creative milieu, process - diversity of printmaking practices and context - occupational health and safety legislation.

context - environmental and physiological legislative criteria, (these relationships are discussed in detail in section 3.3). However, what is important to this review are the interactions between these areas. The illustration (*see fig 2.1*) shows the relationships between these three areas, which forms the boundaries this contextual review, and establishes the themes investigated in the following sections. The interdisciplinary nature of this contextual review involving people, process and context is an attempt to describe and reflect the whole field of practice within which this research takes place and to which it responds.

2.1.1 The Printed Image: a Critical Review

This section is not an attempt to review the whole history of printmaking, or its associations with individual art movements (**Ludman** & **Mason**, **1982**, contains 182 chronological citations dealing with the history of print and art movements, and 322 citations relating specifically to printmaking techniques). This section however does aim to establish the premise, that change has taken place and continues to take place in this medium, and that this is a function of both commercial and creative criteria. It will be suggested that printmaking has evolved because of the transition of processes from commercial to artistic domains and vise versa. The diversity of contemporary printmaking practices when seen from this historical perspective, will be more clearly described, as it relates to the objectives of this research.

The association that print has with the functional aspects of visual communication, and the association printmaking has with purely mechanical means of reproduction has put it in a marginal position, compared to the central position that 'high' art - painting and sculpture - occupies. The artist rarely made prints as original works of art before the late ninetieth century; the tradition of making prints after original painting (as designs) had established the status of printmaking, as a parallel activity. A relationship which has been subject to considerable academic analysis (see **Ludman** & **Mason**, **1982**).

This notion that print fulfilled a limited or parallel artistic role is developed by **Irvins** (**1978**); who suggested the importance of the visual syntax developed in print was dependent on economic and cultural need. Any resulting visual syntax was a response to the need to communicate visual information and not reliant on developing an independent visual aesthetic *"a print was merely a picture made by a process which saved time and labour in quantity production"* (**Irvins**, pp 29).

The apparent limitations of the print medium were practical in origin: poor and inconsistent quality of printing paper, the simplicity of the printing presses, the inking methods used[1], and the need for longevity in the print matrix - all this defined the practical and manual syntax of print. However, the role played by the artist cannot be underestimated in the development of the medium as a commercial and artistic process, as research into early etching methods between 1400-1645, by **Bacon**, (**1985**) established. Bacon

[1] The development of regular rollers surfaces did not take place until the early 20th century

suggests the technical invention and refinement of the intaglio print medium cannot be seen solely in terms of economically or artistic need. The development of intaglio etching was a response not only to artists' pursuit of innovative visual forms, but also to the commercial demands placed on the medium for 'exactly repeatable pictorial statements', which Irvins concedes:

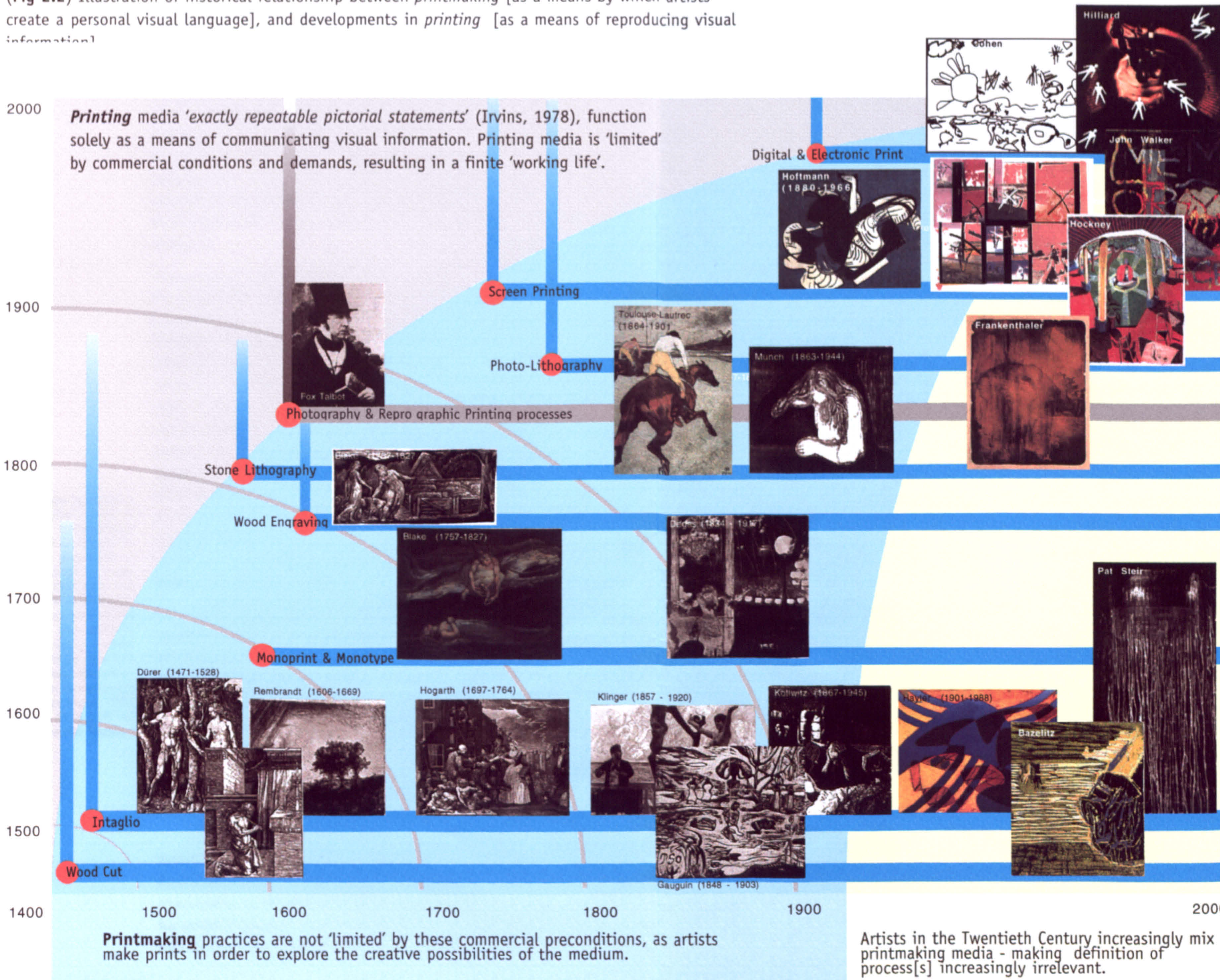
> *"what makes the medium artistically important is not any quality of the medium its self but the qualities of mind and hand that the user brings to it." (pp 114)*

This relationship between the development of the print medium for commercial purpose and artists' pursuit of unique visual statements cannot be distinguished in this early period, and reached its ascendancy in the work of **Rembrandt Van Rijn** (1606-1669) and **William Blake** (1757-1827). Rembrandt and Blake were artist who were completely engaged in this dialectic discourse, who made no intellectual distinction between their chosen medium and the evolved visual statement. Blake's understanding of the printmaking medium was not only limited to the practical results it gave, but for Blake the medium embodied a symbolic action:

> *"first the notion that man has body distinct from his soul is to be expunged; this I shall do by printing in the infernal method, by corrosives, which in Hell are salutary and medicinal, melting apparent surfaces away, and displaying the infinite which was hid."*
>
> *(**Blake**, quoted in **Lister**, 1975, pp 68)*

The concept that reciprocal but divergent cultures - commercial and artistic - have defined the development of the medium is illustrated in a historical context (see **fig 2.2**), which graphically represents this process of ascendancy and entropy. Artists' appropriate print media for creative advantage in an a ongoing creative process which is not 'limited' . Commercial printing processes, evidently have a 'finite' life span. This chronology is not an attempt to summarize the complex history of the printed image, but rather it offers an illustration of transitional processes which periodically take place; from an early interdependent relationship between artist and process, where the artist-printmaker has established the foundation of the print mediums visual syntax (1400 -1750), to a situation where the artist-printmaker 'borrows' and subsequently develops an independent visual syntax from commercially developed printing processes and technical innovations (1750 - present day).

(**Fig 2.2**) Illustration of historical relationship between *printmaking* [as a means by which artists create a personal visual language], and developments in *printing* [as a means of reproducing visual information]



For example, the print media of woodcut, metal engraving and etching in a commercial sense had developed a sophisticated visual syntax, given that these media were the only means of visually communicating 'exactly repeatable pictorial statements'. However, as these media became redundant commercially, artists would continued to evolved visual qualities which were no longer based on the need for 'exactly repeatable pictorial statements', but rather based on the capacity of the artist to continually elicit individual creative possibilities from these media. For example Kollwitz (1867-1945), Munch (1863-1944), Gauguin (1848-1903) and Klinger (1857-1920) *see fig 2.2.*

This process of invention and innovation follows a cyclical pattern, The *Journal of the Historical Printing Society,* has chronicled this process in detail, (see for example **Harris** 1968, 69 & 70, and **Woodward**, 1974 & 75). For example, the invention of stone lithography set an entirely new precedent as 'natural' tonal qualities inherent in the medium could easily replicate artists' 'usual' drawing media of charcoal, pencil and pen. Previously these qualities could only be alluded to by the manual or mechanical means of skilled artisans. Stone lithography quickly became the most versatile and 'economic' printing technique (**Twyman**, 1972, 74 & 75) which was itself replaced by more sophisticated reprographic (photographic) printing processes [1]. However the quite unique drawing characteristics that the lithographic stone offered, continued to be utilised by artists (notably by T**oulouse-Lautrec**, 1864 - 1901, **Redon,** 1840-1916 and **Munch** 1863-1944).

[1] The inevitable transition to more autographic means of printing as photography increasingly had an impact on these manual processes of printing, produced a large number of techniques and processes which incorporated both the manual skills of the artisan, and photographic means. Techniques which interestingly form the basis of a number of current 'alternative'' methods used in contemporary printmaking, (see Harris, 1968, 69 & 70, White, 1978 & 79, and Fildes, 1969, see also Section 2 .3)

The invention of photography, and the photochemical means of reproducing images it offered had a profound impact practically and philosophically on the way the printed image was perceived. This **Benjamin (1992)** suggests, removed any lingering notion that originality should be implicitly linked to representation, a dialogue by which printmaking had up until this point been totally restricted. In effect photography released the artist and printmaking from this role:

> *"The uniqueness of a work of art is inseparable from its being embedded in the fabric of tradition. This tradition itself is thoroughly alive and extremely changeable". (pp 217)*

Further, **Irvins** saw the invention of photography as an opportunity for the printmaking medium to re-evaluate the manual basis of its visual syntax, in order that the emphasis might be placed back on the aesthetic qualities inherent in the printing medium. A consequence of this transition, has been the notion that artists' prints might be printed in limited numbers in order that these processes and aesthetics qualities could be linked to connoisseurship. This practice can be traced back to **Hogarth** (1697-1764), but became common after **Whistler** (1834 - 1903) who introduced the idea that personally signing a limited number of prints would artificially create an art object for collection with possible increased critical recognition, without the medium having been altered visually. As previously stated this research will not be directly concerned with issues of originally arising from editioned and non-repeatable printed images (*see section 2.2.5*).

2.1.2 Summary of Overview

The evolution technically and perceptually of printing processes, has been supported by both artists' aesthetic demands and by commercial applications and inventions with this process being interdependent of each other. Artists have been involved in and been 'open' to the influences of such an evolutionary process. This process of innovation, development and acquisition has been influenced by cultural traditions of high and low art (criteria which have imposed artificial means of representing printed works in the form of limited signed editions), and technological advances; throughout this early period technology and artistic invention forced the pace of change for the print medium. The important issue established by this review has been the historical association printmaking has with these factors. Artists increasingly seized upon the opportunities technological means afforded to experiment with most adventurous print media. Printmaking in the 20th century took these precedents, and both built and distorted them in a number of ways, which further emphasises the dichotomy evident in an aesthetically driven visual medium that evolves its visual vocabulary by periodically engaging in technological innovation.

2.2 Diversity of Practice: a Twentieth Century Phenomenon

2.2.1 Introduction

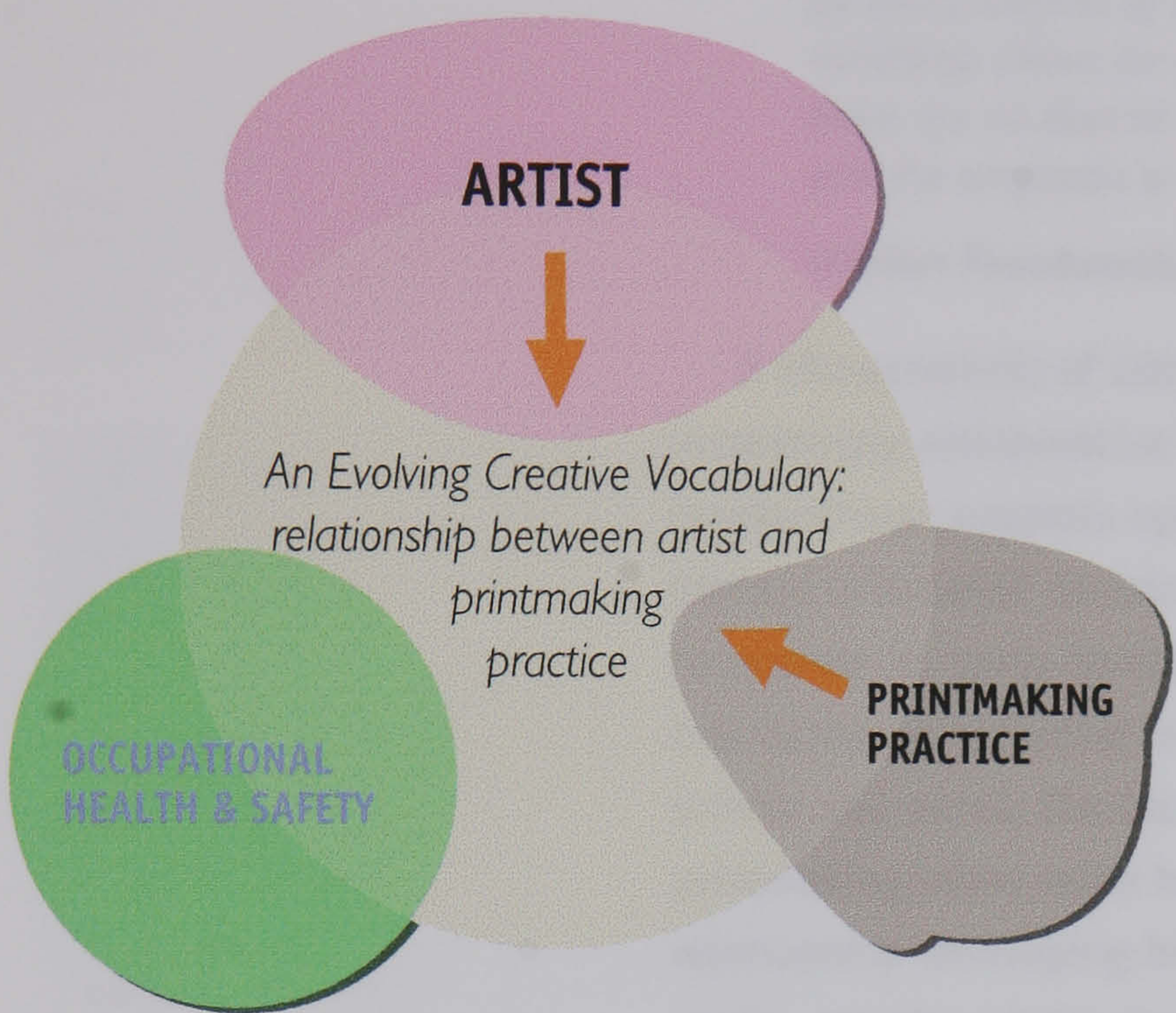


Fig 2.3 This section of the contextual review will deal with a critical review of issues specifically effecting the development of printmaking practice in the twentieth century.

The following review of 20th century printmaking will consciously not adopt a historical perspective, by making reference to major art movements, key artists' or the cultural contexts within which artists' work was developed, as a considerable number of references provide detailed discussion of all these aspects (Ludman & Mason contains over three thousand cross referenced citations: chronological, geographical, by medium, by art movements and monographs of leading artists; see also **Adhemer, 1971 -** Twentieth-Century Graphics, **Castleman, 1988** - *Prints of the Twentieth Century: A History,* **Gilmour, 1970** - *Modern Prints*). This section of the contextual review will consider the practical and creative means by which printmaking media has evolved in the twentieth century. It will also be suggested that a characteristic of twentieth century printmaking is a dialectic process, constantly evolving and increasingly idiosyncratic. This section will identify key areas in which twentieth century printmaking has evolved by visual and practical means, driven by these criteria.

2.2.2 Printmaking as a Collaborative Process

> *I am not interested in the techniques of printmaking. I am not interested in the patience it requires. I am not interested in chemistry. I want it done for me. But I have to be there for every hairline of the doing. Everything. And an expansive workshop allows for all of that. The shop has no judgment, there are no likes or dislikes. The enterprise is the artist's art, and the emphasis is on quality"*
>
> ***(Helen Frankenthaler**, 1980, pp 25-26)*

A characteristic of 20th century printmaking has been the increasingly collaborative nature of the medium, which Helen Frankenthaler suggests operates at a specific level for her, based on process orientated decisions. The collaborative process will be shown to operate on many levels, a process which is analogous to the translation of technical knowledge into artistic language between printer and artist. The technical aspects and innovations on which printmaking often relies have resulted in a particular unique relationship developing between the artist (as sole creator of the work), and the printer (as facilitator and technical director of the work) although these are not mutually exclusive roles. The impact that this relationship has on the artist is difficult to establish, but its effect on the medium is more evident, in the work produced by artists as a consequence of the collaborative process; this is quite often based on the introduction of new technology, new techniques and the facilitation of increasingly complexity printing projects (see for example **Castleman 1991, Gilmour 1978; Fine & Corlett, 199; Contemporary British Art in Print, 1995**; *see also section 2.2.3*).

But the philosophical foundation on which this collaborative process is based is not easy to identify when one considers the often lengthy negotiations between artist and printer, which may take place and influence the development of the image at each of the many stages involved in making a print. **Gilmour (1985)** has recorded interviews with many artists and printers over a number of years, in order to understand this relationship better. But surprisingly a recurring theme Gilmour notices is the denial by both artists and printers of the extent technical and procedural aspects affected the outcome of the work. This Gilmour suggests is more to do with contemporary notions of originality:

> *"one way of defining an original print is that it occurs when technique and the idea exist in a state of absolute necessity."*
>
> *(p 194)*

For **Hayter** (**1962**) the defining boundaries of this relationship where clear. His description of this collaborative printmaking practice identifies three levels: first, an idea or image (artists); second, the process by which it has been manifested (artists-printer, if these can be separated); finally, the action of printing from the matrix (printer, but originated by the artist). Evidently for Hayter the relationship between artist and printer is subordinate to any visual direction the medium may impose.

[1] *Aldo Crommelynck had a long standing collaborative relationship with Picasso and printed the artists work over a number of years.*

Picasso, "#105 Suite 347", (1968), etching, drypoint and soft ground. An illustration of the 'hand' of the artist, manipulating physically the plate in order to gain a desired 'etched' mark.

The master printer Crommelynck [1], offers an insightful description of Picasso's methods of drawing and painting onto etching plates in **Cohen** (**1995**). What is evident is how the technical language used by the printer is considered in terms of 'correct' and 'incorrect' application of the medium by Picasso. Picasso's increasing articulate manipulation of the techniques of printmaking blurred these boundaries for Crommelynck, the creative manipulation of these techniques (originally learnt from Crommelynck in this instance), evidently are the result of this collaborative relationship. But Picasso selectively applied or rejected technical advice in order to create. Crommelynck notes *"a printer understands completely the intention of the artist and proposes the technical means for him to express himself."* (Crommelynck in **Gilmour, 1989,** Exhibition catalogue, Waddington Gaphics). The printer's role here is most evidently facilitator.

Hamilton, "Picasso's Meninas" (1973), etching with aquatint, which borrows charactors from Picasso.

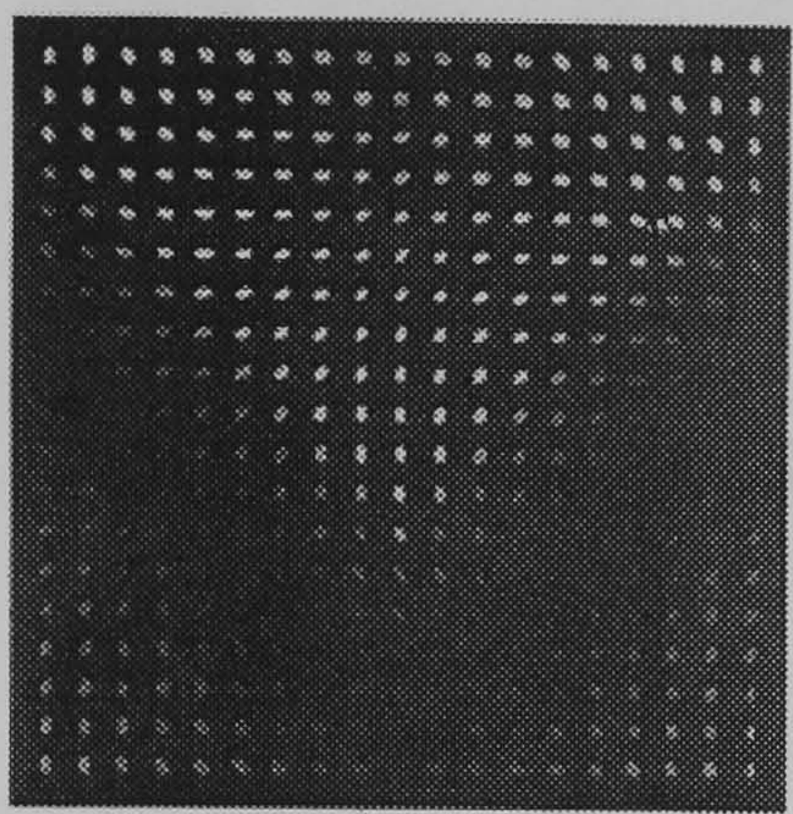
Richard Hamilton (**1922-**) has explored the philosophical implications of this collaborative relationship. In the print "Picasso's Meninas" (1973) Hamilton particularly sought the collaboration of Crommelynck, in order that Hamiltons' work might have visual, physical and metaphorical associations with Picasso's earlier work (one defining characteristic of Crommelynck's work is the fine tonal quality and variation of the aquatints he produces). Hamilton in effect was exploring previously ephemeral but residual associations between the printer and artist, an approach which recurrs in Hamiltons' work, based on an assertion by Hamilton that the printer is the tool - 'a machine the artist uses'. This is a statement which should be put into context, given that Hamilton's collaborations with printers is formed on the basis of a personal extensive understanding and empathy with the technical aspects of the printmaking processes. **Jim Dine's** (**1935 -**) collaboration with Crommelynck in contrast may be seen as a process of 'confrontation' between Crommelynck's 'tradition' versus Dine's 'non-traditional' approach. These collaborative process ultimately developed into a particular style or aesthetic[2].

[2] *The combination of Dine's extensive use of power tools/ drypoint mark making and the printers subtle use of aquatints.*

"He didn't do exactly the opposite of what one was supposed to do, but utilised all the means that we don't think of ourselves, by which I mean the technicians habits. So one is pushed around a bit"

(Commelynck in Gilmour, 1985, pp 196-97)

The skills and expertise the printer develops in response to artists' demands have greatly influenced the practical vocabulary of the process itself, a theme that the exhibition *'American Screenprints'*, at the Hunterian Gallery, Glasgow, (**Reba** & **Dave Williams**, 1987) clearly illustrated. The collaborative experiments of printers like Chris Prater in the UK who worked closely with artists over a number of years resulted in Prater evolving a distinct visual vocabulary within screen printing in the 1950's & 60's, which prior to this had no or very little artistic association with fine art practice. *"There is no given starting point. Once an approach is agreed on, the experimentation is aimed in that direction"* (**Prater** in **Gilmour, 1980**). Here the artist and printer are in a position to stamp their own identity on a medium which had little previous status within the fine arts, which is occasionally the case when technological changes take place (*see section 2.2.4*).



Bridget Riley "Nineteen Greys", (1968), printed at Kelpra Studio, London by Prater.

To try and define this collaborative relationship, or the influence it has had on the development of printmakings' vocabulary would possibly impose a static description on what is evidently the result of personal and evolving relationships between artist and printer. However with respect to this research what is important is that there exists a general process of translating technical knowledge into an artistic language by means of a mutual exchange or dialogue, resulting in a visual vocabulary neither party had considered previously resulting from this creative interaction.

2.2.3 An Industrial Aesthetic

A late 20th century phenomenon has been a general move towards increasingly complex and large scale printed art works. The network of professional printmaking workshops which developed in the 1950's & 60's has played a central role in expanding the technical possibilities of the printmaking medium, these studios - Gemini, Graphicstudio, Tamarind, Universal Limited Art Editions in the USA, and Kelpra, Coriander and Advanced Graphics in the UK - brought about a renaissance of the printmaking medium. This period effectively set about redefining the conventions of printmaking practice; these workshop environments increasingly offered

[1] Frank Stella "Pergusa Three", (1983) printed at Tyler Graphics using CAD cut woodblock. with screen printing.

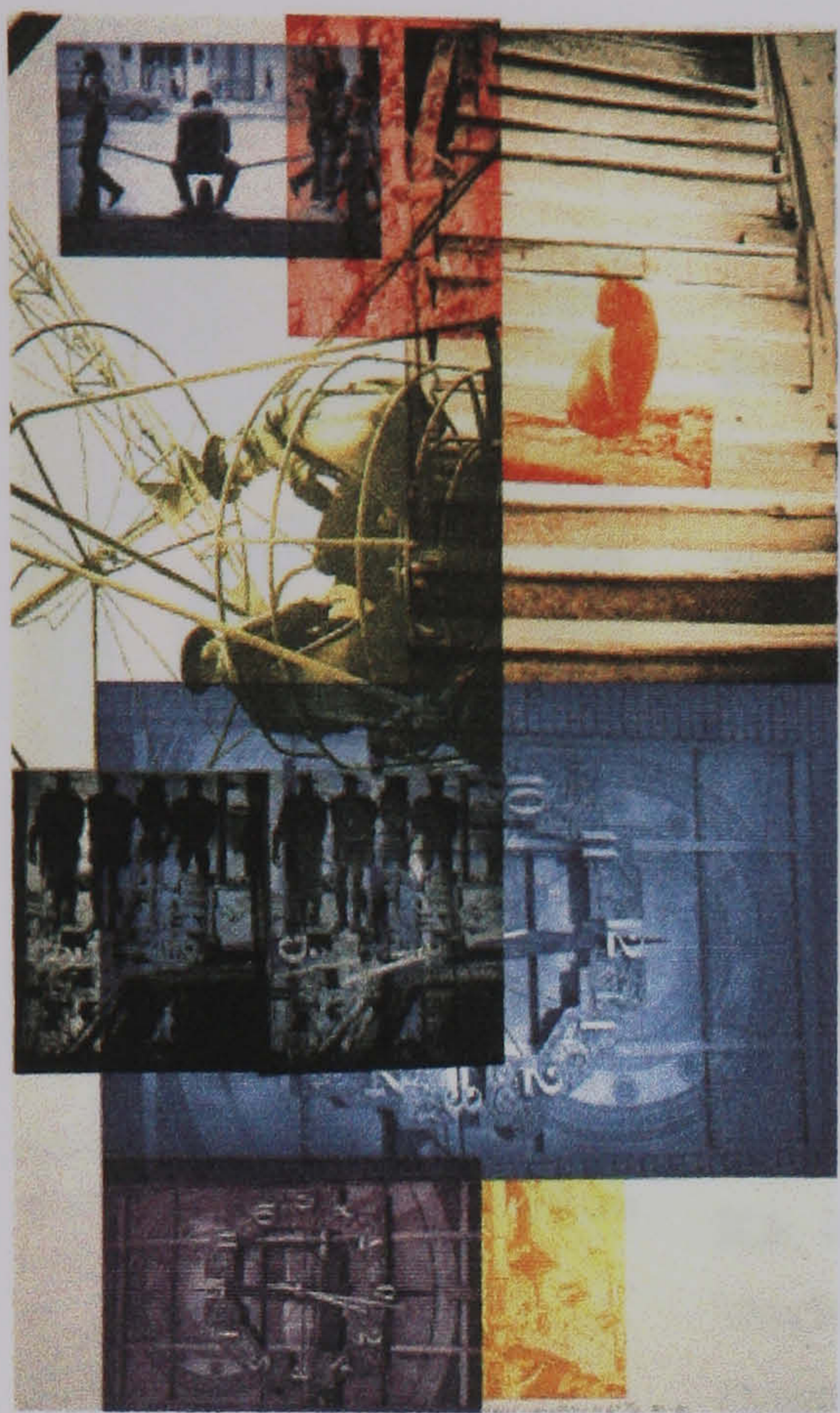
organisational and individual expertise across all printmaking media, for the sole purpose of facilitating innovative printmaking projects with internationally recognised artists, with the result that the contribution made by the printer in these professional environments was increasingly one of partnership. The organisational expertise and extensive practical workshop facilities enabled artists and the printers to pursue large scale prints which 'competed' in scale with painting (see for example - **Fine** & **Corlett, 1991,** Graphistudio; **Armstrong, 1987,** Tyler Graphics, *The Extended Image;* **Lieberman, 1969**, *Tamarind: Homage to Lithography;* **Gilmour, 1977**, *Artists at Curwin*).

The theme of parity between painting and printmaking **Castleman (1991)** developed in the *Innovation in the Eighties* exhibition at The Modern Art Gallery, New York. Castleman identified an 'Industrial Aesthetic' in the work emanating from these print studios, the characteristics being large scale work, multiple colour and multiple media prints which often borrowed their vocabulary from industrial processes [1]. The exhibition, **Castleman** suggests, marked a creative and technical watershed for printmaking[2].

Increasingly the complexity of these projects responded not only to the artists' aesthetic judgement, but engaged the workshop/master printers' assertion that *'it can be done, if only an artist could be interested in doing it'.* The greatest exponent of this industrial aesthetic is the master printer Ken Tyler who's contribution has been recognised in its own right (**Armstrong, 1987**) *'I always wanted to put all the mediums together and felt it was an absolute necessity to do so'* (Tyler quoted in **Cohen,** 1985 p 80). The industrial scale and organisational complexity which characterise Tyler's collaborative work increasingly set new technical precedents. For example; computer driven cutting of wood blocks and complex collage techniques developed for **Frank Stella (1936 -)** in *"Pergusa Three"*; **Rosenquist (1933 -)** sprayed paper pulp printing techniques used on *"Welcome to the Water Planet"*, series, 1989. An important characteristic of this 'industrial aesthetic' has been techniques and materials normally thought to be outside the vocabulary of the artist / printmaker which were introduced by the workshops through the ambitious projects they printed. The Graphicstudio (established in Tampa, Florida in 1968), was founded on a principle of 'actively engaging and initiating research in the field of graphics and

[2] *The development of an Industrial Aesthetic (the increased complexity and scale of printed work) in the 1980's cannot be separated from the financial climate at the time which was able to support such ambitious projects. A more cynical view has been proposed: given the assumption that artists' prints where a financial investment bigger invariable meant more profit (scale being distinct from aesthetic consideration); see Cohen, 1985, Princenthal, 1990 & Tallman 1987.*

multiples' (**Hassold, 1992**). The resulting program of collaborative print projects involved a 'no rules' philosophy which developed into anumber of new techniques. A project with **Rauschenburg (1925 -)** involved developing a casting process borrowed from industry:



Robert Rauschenberg "Soviet / American Array III", (1989-90), 7' 4" x 52" in. This lithograph used industrial pre-coated plates in order to 'free' the collage qualities.

"At each stage of "Made in Tampa", the Graphicstudio staff demonstrated its commitment to its objectives of 'opening up new directions for the artist', as well as the ability to translate the technical know-how gained through experimentation into the language of fine prints".

(Kelder, Art in America, pp 61 March-April 1973).

The researcher's own experience as a printer editioning artists prints (Advanced Graphics - 1990-92) included working on a number of very large and ambitious projects. These prints involved a number of innovations which directly responded to the 'industrial aesthetic' of the time; printing in sections and the use of a hydraulic relief press to print large scale relief work. The development of this 'industrial aesthetic' cannot be seen as simply a response to the technical demands of individual artists. Rather, it was a response to a philosophy projected by the studios which linked the creative vocabulary of the artists to the pursuit of innovative technical solutions.

2.2.4 New Technology: Digital Image Manipulation and Generation

This section will consider printmaking's philosophical association with the physical means of image transfer it has traditionally relied on, an association that artists' use of new technology[1] increasingly questions. This contemporary discourse has confronted notions that the physical processes of printing somehow intellectually define the boundaries of the printmaking medium. As a result the impact that new technology is having on expanding the perception and definition of print is not easy to determine, but the association printmakers have had with the technology of printing and photography, has already been shown to have profound philosophical implications on the way we perceive visual images (see **Ivins, 1974**, and **Benjamin 1992**, *and section 2.2.1 & 2.2.2*). A discussion of the philosophical implications and the practical impact that photography and digital image manipulation has on the manual processes of printmaking is therefore important to this research.

[1] For the purposes of this thesis 'new technology' refers to the generation, manipulating or subsequent rendering of images where the visual information is processed in a digital form. A characteristic of 'new technology' printing is the indirect [non-physical] processes by which it is carried out: inkjet, laserprint, thermal transfer and electrostatic printing.

A period often referred to as being a renaissance in printmaking (the late 1950's and early 1960's) marked a short time when there was a direct correlation between what was happening in main stream fine art (painting and sculpture) and developments artists pursued in printmaking. **Cattleman, 1988**, suggests that Pop Art with its interest in the cultural significance of the multiple image, acted as a catalyst, for a period it was no longer appropriate to make distinctions between painting or printmaking as the medium artists used straddled the boundaries between these.

Jasper Johns "Target", 1974, artists hand draw seperations rendered photographically, 88 cm x 69cm.

The exhibition *'The Mechanised Print'* at the Tate Gallery, London 1978 in critical terms marked the coming of age for photochemical and photomechanical processes in fine art printmaking (**Gilmour, 1978).** This progression from artists' familiar use of photographic methods can be traced to artists' experimental use of 'new technology' (computer generated images rendered by means of digital and electronic image processing hardware). This possibility was alluded to as early as 1968, with the *'Cybernetic Serendipity'*, exhibition at the ICA, in London in which it was speculated that artists would use 'machine-aided creative processes' in order to move outside conventional means of image rendering (necessarily limited by scale and dimensional integrity of the technologies at this time). However, in the first major survey of artists making computer assisted prints (*'Electronic Print'*, Arnolfini Gallery, 1989) the diversity of the media from which electronically generated images and printed art works could be produced, was totally incongruous when seen in relation to the visual content represented in the show, which was limited by the means of its reproduction: simple inkjet and dotmatrix printing techniques. In the *'Electrowork'* (1979) exhibition, artists' tentative experiments with the creative possibilities offered by the new technology of electrostatic copiers and xerography. What was interesting was not the technologies' reproductive abilities, but the creative possibility of developing a visual vocabulary which had no historical repertoire.

> *"..when I show it a hair curler it hands me back a space ship, and when I show it the inside of a straw hat it describes the eerie joys of a descent into a volcano."*
>
> *(McCray, 1979, pp 7)*

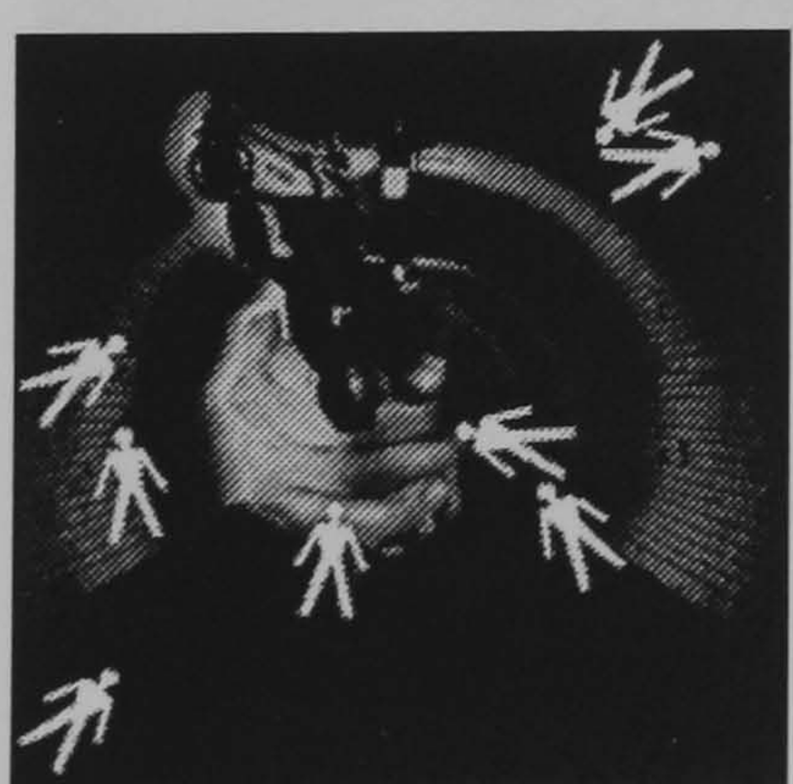
What is evident is that the creative results achieved are a direct outcome of an interplay between artist and machine, in this case, early experiments with xerography, where the machine's role is in offering physical/visual means of transformation, by process alone. The role of the artist therefore is a more subtle one, as instigator and manipulator of this creative process by accepting as a component part the role new technology plays in forming the art work. The copier's associations with purely 'utilitarian, information-transmitting functions' also plays an important role; a philosophical point raised by **David Hockney** (**1937** -), who submitting drawings electronically by fax to the São Paulo Print Bienniale in 1989, transformed them by the nature of this 'utilitarian, information-transmitting medium', into printed art works. The process of transmitting the images by fax, physically transformed the image, the resulting and prints were very large and had to be pieced together - the instructions were also faxed.

Artists interested in electronic technology as a means of printing or manipulating images have in the main been concerned with finding an appropriate visual vocabulary. The artist **Richard Hamilton's** (**1922-**) interest in the interface between new technology and his art practice, is based on an acceptance of the influence it may have on his working processes;

> *"I've always striven to use technology, to make sense of the ideas, but I'd always been in advance of the technology. I saw Paintbox as an ideal vehicle for collage. Before, collage was restricted by the size of the elements".*
>
> ***(Simpson, 1995)***

Hamilton's work has avoided getting caught in a prescriptive notion concerning the validity of one means of producing printed images over another. No distinction is made between computer, photographic, printing process or the hand of the artist. Hamilton sees it only as a tool, a tool which poses a different set of visual problems, and offers a number of different creative routes to the finished work. But the work still rest firmly within certain conventions for Hamilton.

> *"I'm old fashioned enough to still want to produce a print. If I have a skill it is selecting a single image and trying to give that a mythic, resonant quality. I could just leave the image on the computer screen and hang the computer up in the gallery but I want a print".*
>
> ***(Simpson, 1995 pp 45)***



[1] John Hilliard "Incident" 1990. Monoprint using electronically scanned images printed using Scanachrome ink-jet printing technique over individually masked areas.

The means of gathering information electronically - the hand held scanner connected to a computer, the photocopier, colour laser printer or inkjet printer - are increasingly finding their way into the every day vocabulary of artists[1]. Currently there are a number of research projects initiated by printmaking departments in the UK which are exploring the implications this technology potentially has for the printmaker. The development of digital media and image manipulation potentially influence two areas - it removes the association photographic imagery has with chemical reprographic procedures (which has a direct affect in reducing the number of chemicals used in the printmaking workshop), and secondly these media make no distinction in the dimensional or visual integrity of the original image potentially offering new means of manipulating imagery and conventions within which artists must establish their practice [1].

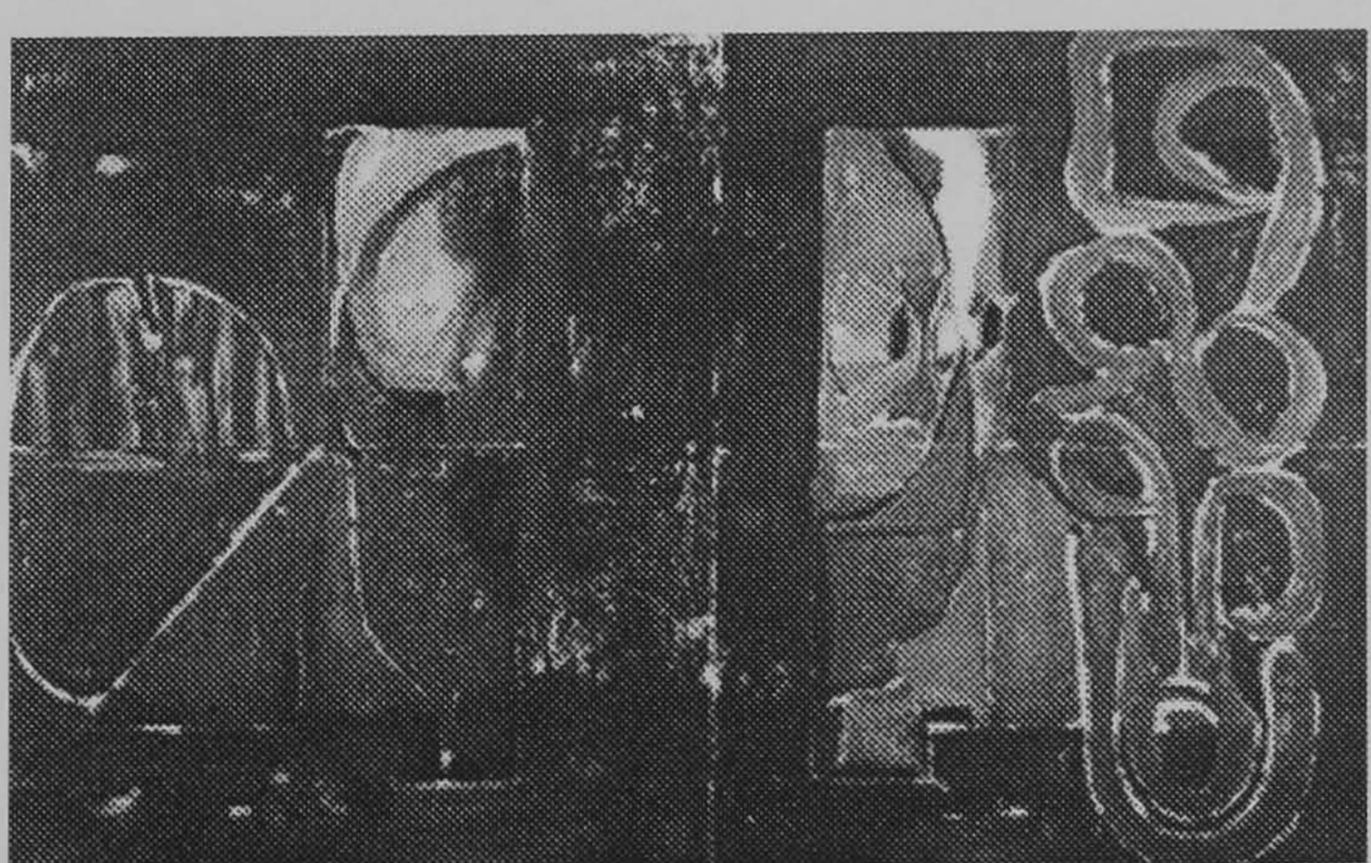
[1] *This notion of having to possibly develop new definitions for printmaking practice was addressed by the Royal College of Art Printmaking Symposium, 1995.*

2.2.5 Monoprint, Monotype and the Non-Editioned Print

William Blake "Pity" 1795. Colour monoprint: egg tempera was painted onto mill board which was them printed with an etching press.

The processes of making prints, involving the repeated physical or chemical transfer of an image from a static matrix onto a flat surface (usually paper) has always been concerned with producing 'exactly repeatable images' (**Ivins, 1978**). However this definition is a limited one when considering artists' manipulation of the medium for creative ends. Artists have historically actively engaged in altering the procedural and physical conventions of the print medium, in order to pursue unique creative ends.

The direct means by which artists manipulate the image on the printing matrix prior to printing characterises the monoprinting processes, where the boundaries between painting and print are not easy to define. Monoprinting has the most direct historical associations with the artist-printmaker, **Rembrandt** (1606-1669) continually selectively inked and proofed intaglio plates at different states, each printed image was seen by the artist as a finished artistic statement work in its own right. The 'colour printed drawing' or 'polytype' technique perfected by **Blake** (1757-1827) involved drawing onto mill board with water soluble paints from which a print was taken. The technique was a direct response by Blake to his dissatisfaction with the qualities of oil painting. **Degas** (1834-1917) made over 500 monoprints which demonstrated the artists' fluent transition between his painting and monoprinting, by taking advantage of the painterly qualities offered by the lithographic monoprinting medium.



John Walker "Form at Salsipuedes", 1987 Monotype, 216cm x 355cm.

Contemporary adaptations of monoprinting have raised some interesting issues in relation to this thesis. Does the physical transfer process itself have any inherent quality which extends the visual vocabulary of the artist, when the means of manipulating the image (painting directly onto a flat surface) and the materials used (artists oil and watercolours) are ubiquitous to painting and monoprinting processes, **Parry-Janis (1991)** suggests:

> *"Transferring thus becomes a sort of token, perhaps a kind of homage to the days before photography, when printmaking's principle importance was still to replicate ideas. Now with 'unique' prints, we are faced with a conscious restraint where multiplication is concerned."*
>
> *(pp 212)*

Monoprinting techniques increasingly dispelled distinctions (historical and physical) which differentiated printmaking and painting. The printer Garner Tullis in collaboration with artist's John Walker and Sean Scully (see *The Tate Gallery, Contemporary Prints Exhibition, 1993* catalogue) has introduced an 'industrial' scale and painterly complexity to this medium, which makes it increasingly irrelevant to make these distinctions. However, the vocabulary of the monoprinting medium continues to be grounded in the transfer process itself, from matrix to substrate.

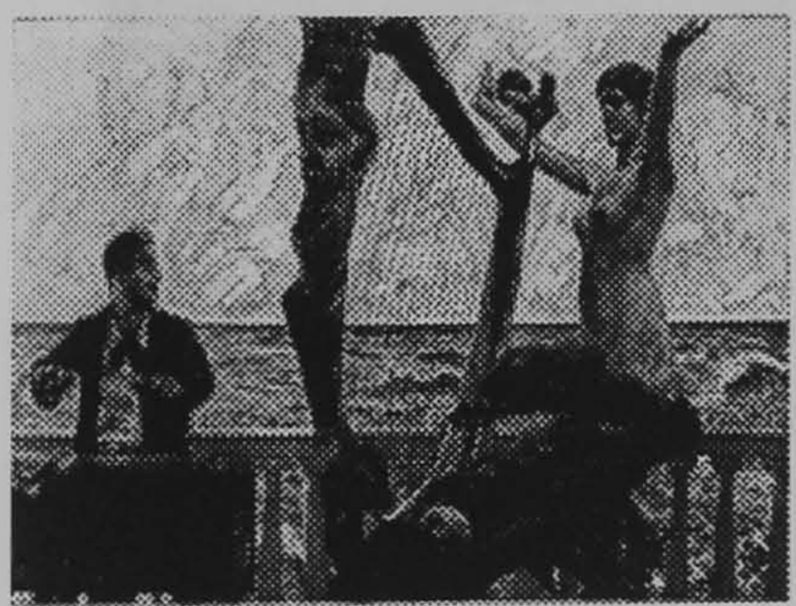
An issue monoprinting raises which is relevant to this research, concerns the materials used by the artist to paint the monoprint matrix; these have tended to reflect monoprint's association with painting, as the type of media used ranges from oil paint, printing ink, water colour, oil pastel, gouache, chalk pastel, acrylic paint and gel medium. The use of these materials in combination with the simple transfer principle by which monoprinting works (when used in combination with the pressure generated by an etching press) have made it possible for water-based media to be introduced at the printing stage. Having experimented with the particular qualities oil and water based media offer, **Brown (1992)** identifies the particular qualities that water based media offer as *"delicate quality which contrasts with the dense, somewhat shiny surface of monotypes done with oil-based inks."* (pp 48). Watercolour media and monoprinting take advantage of the painterly qualities in combination with the transparency these media offer. For the research this has important implications - introducing water-based pigments and painting media into the printmaking process might offer a diversity and quality which 'traditional' oil based media do not.

2.2.6 The Proof: a generative process

The proof in printmaking is a demonstration of the constant decision making processes made by the artist and is central to the printmaking medium; it is quite different to the proof in printing which determines production values in commercial printing (like consistency, accuracy and resolution). The artists proof illustrates and records the evolution of the idea: physically and visually, where the creative decisions made by the artist form a chronological visual record. It also records decisions which may not be evident in the final printed art work. The proofing process in effect is a tangible means by which the artist or printer (if these are separate activities) are able to engage in a process of visual reflection and discussion, based on the actual visual documentation of the printed proof.

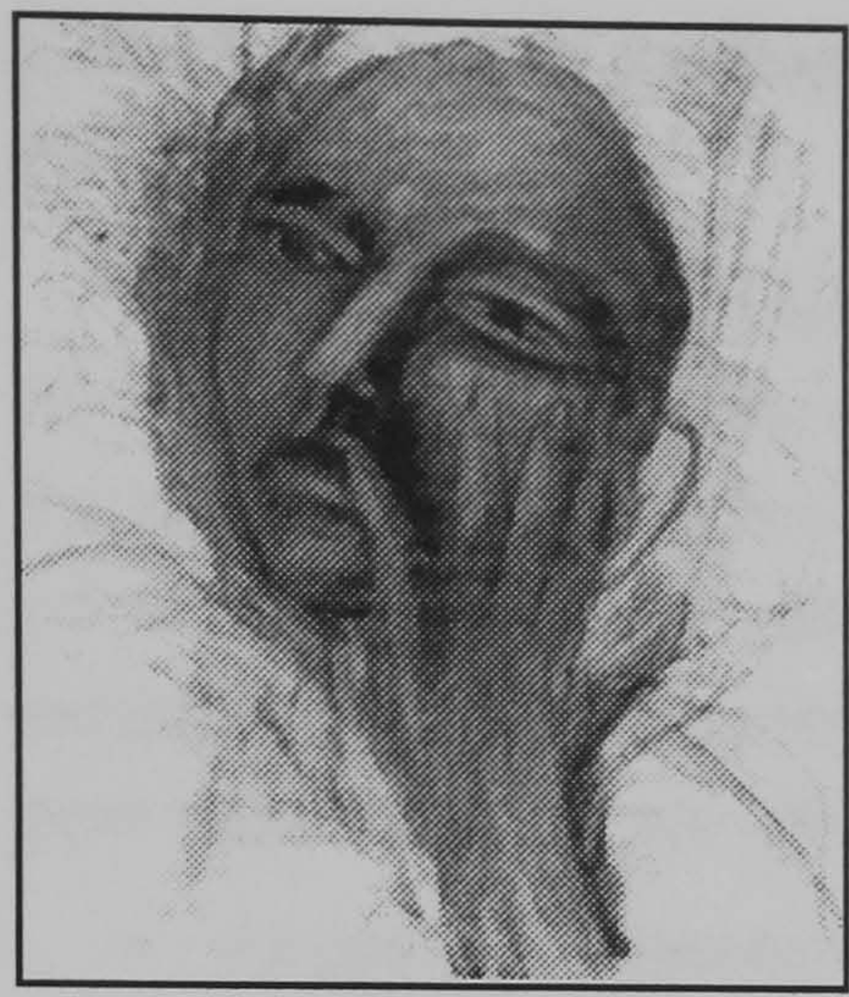
The artist **Max Klinger (1857 - 1920)** coined the term *Griffelkunst*[1] to describe the narrative qualities of this successive proofing process. This narrative characteristic is contextualised by **Goldman (1981)** in an exhibition *American Prints: Process & Proofs* at the Whitney Museum, New York in 1981. In this exhibition Goldman develops the argument, by suggesting the proof offers an annotation which alludes to the reciprocal influence artist and process exerted over each other *"artists-printmakers follow no set procedures, but discover images in the proofing process"* (pp 7). By associating the proofing process so strongly with the actual development of the idea, Goldman goes some way towards defining this blurred area between visual creativity and procedural invention on which the printmaking medium is so dependent. The proof acts as a visual commentary on this intimate relationship: in research terms the proof is also a methodological tool.

[1] The generative characteristic of the printmaking medium in the hands of the artist determines the vocabulary of the medium but not the visual outcome. This generative quality associated with the functional characteristics of the medium influences the development of the visual grammar. To separate these aspects [process and aesthetic], negates the underlying importance of the generative morphology of the proofing and mono printing processes (see also section 6.4).



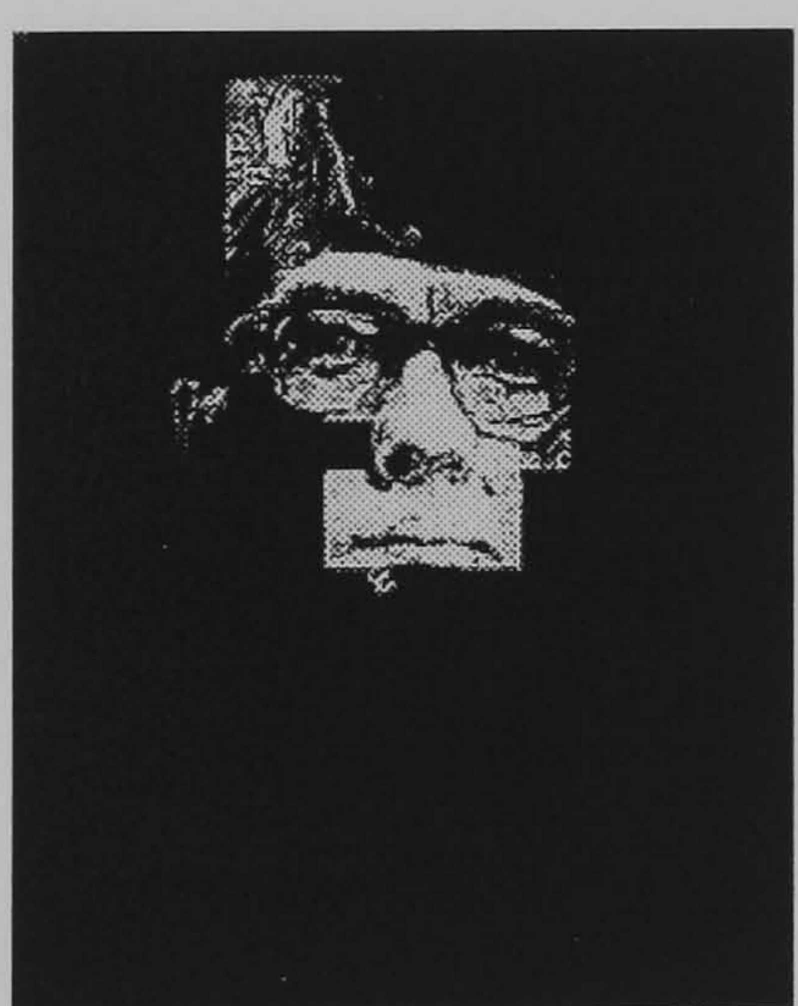
Max Klinger, "Brahms Fantasies: Evocation", intaglio etching.

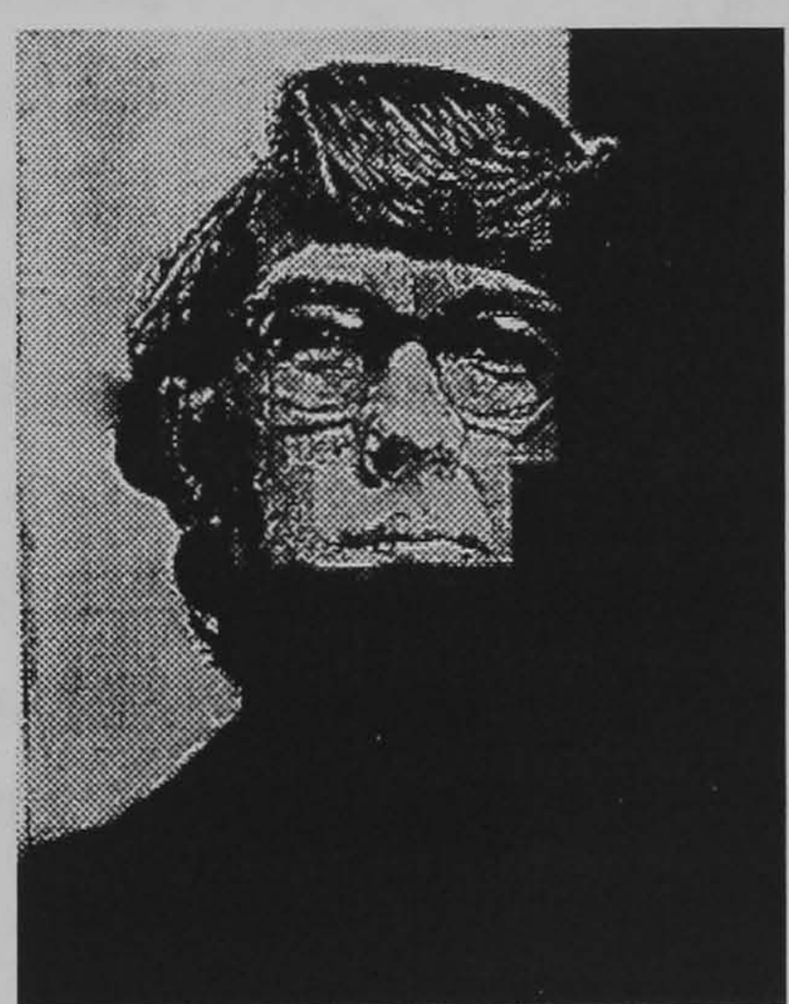
The artist Pat Steir arrives at a finished print through a delineation of the procedural stages by means of the proofing process. Steir combines and recombines many different physical layers. Steir's prints often use different printmaking processes: intaglio etching, lithography, wood block and screen; as a result the development of her prints evolve through this proofing process, which is difficult to distinguished from the creative process itself. Steir identifies this as a *"way of thinking"* (**Willi, 1988, pp 9**) in effect the proofing process is an integral part of the artist's intuitive and tacit visual senses, an assertion also expressed by Frankenthaler *(1980)*.

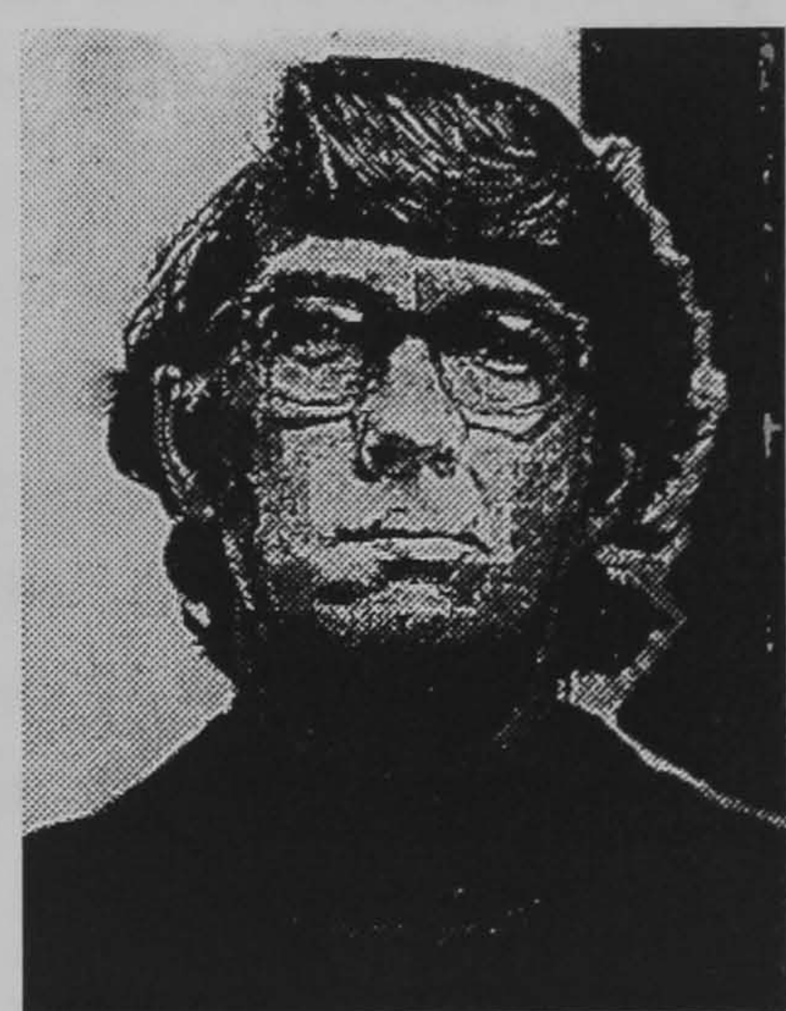


[2] Pat Steir, "Self as Picasso Seated Woman," & "As Dona Maria Isabel (Goya)." 1986. Two examples Illustrating two (of many) visual statements from the same monoprinting block (intaglio).

The physical action of taking a proof has also been used by artists to make a philosophical comment on this relationship between the physical action and the tacit responses of the artist. The print *'Keith'* by **Chuck Close (1940 -)** consciously points at the artist's philosophical engagement with process as a visual language in its own right [1]. The artist adopted a mezzotint medium (which has strong associations with Eighteenth century reproduction prints) in order to produce the work, but it was also a medium that required a particular procedural rigour as the mezzotint surface wears very quickly by the printing process. The image was developed from a grid structure (as many of Close's works are), each square meticulously worked up to a finished state before the next square was started. But it is in this proofing process that it becomes apparent the extent to







[1] "Keith", Chuck Close, 1972. Illustrating different proofed states where the process of proofing affected the final outcome.

which the artist has entered into a dialogue with the medium itself. Each successive proof wears earlier completed sections, until what we are presented with is a visual account of the artist struggle with the process and the influence the process has on the image. The importance of the proofing processes for this research therefore exists at a very basic level - as a means of articulating visual and practical decisions, but it also offers a means of recording those decisions in chronological order resulting from the alternative selections and decisions in made in the course of this research.

2.2.7 Summary of Section: Diversity of Printmaking Practice

The section has recognised the contribution artists and printers have made to expanding the visual vocabulary in printmaking. This has been based on, and often evolved from, technical innovations within printmaking, or an appropriation of printing media from industrial or commercial applications. A number of key areas have been identified which are influential to this research:

- the creative influence that the techniques and materials have had on the development of printmaking when manipulated by artists own demands;
- the influence that developments in commercial printing processes and materials continues to have on the evolution of printmaking practices;
- the shift in the perceived 'boundaries' of established printmaking practices, in order that a contemporary definition of printmaking terms can be evolved;
- the unique collaborative relationship between artist and printer, which has been central to the development of the diversity of the medium, a characteristic of 20th Century printmaking;
- the documented relationship printmaking has with technological innovation, which continues to expand artists' vocabularies within printmaking.

Printmaking's ability to accommodate, alter and expand the diversity of artists' personal visual vocabularies (in terms of drawing, mark making and creative means of expression) is a characteristic that defines the medium. The increasingly loose associations the medium has with rigid or 'established' definitions of practice (media or technique based) suggests that any description which does not acknowledge this 'rule-less' approach cannot adequately describe contemporary printmaking. The researcher's visual work will engage all these aspects, as a means of developing the work visually.

2.3 Occupational Health & Safety Legislation

2.3.1 Legislative Rationale for this Research

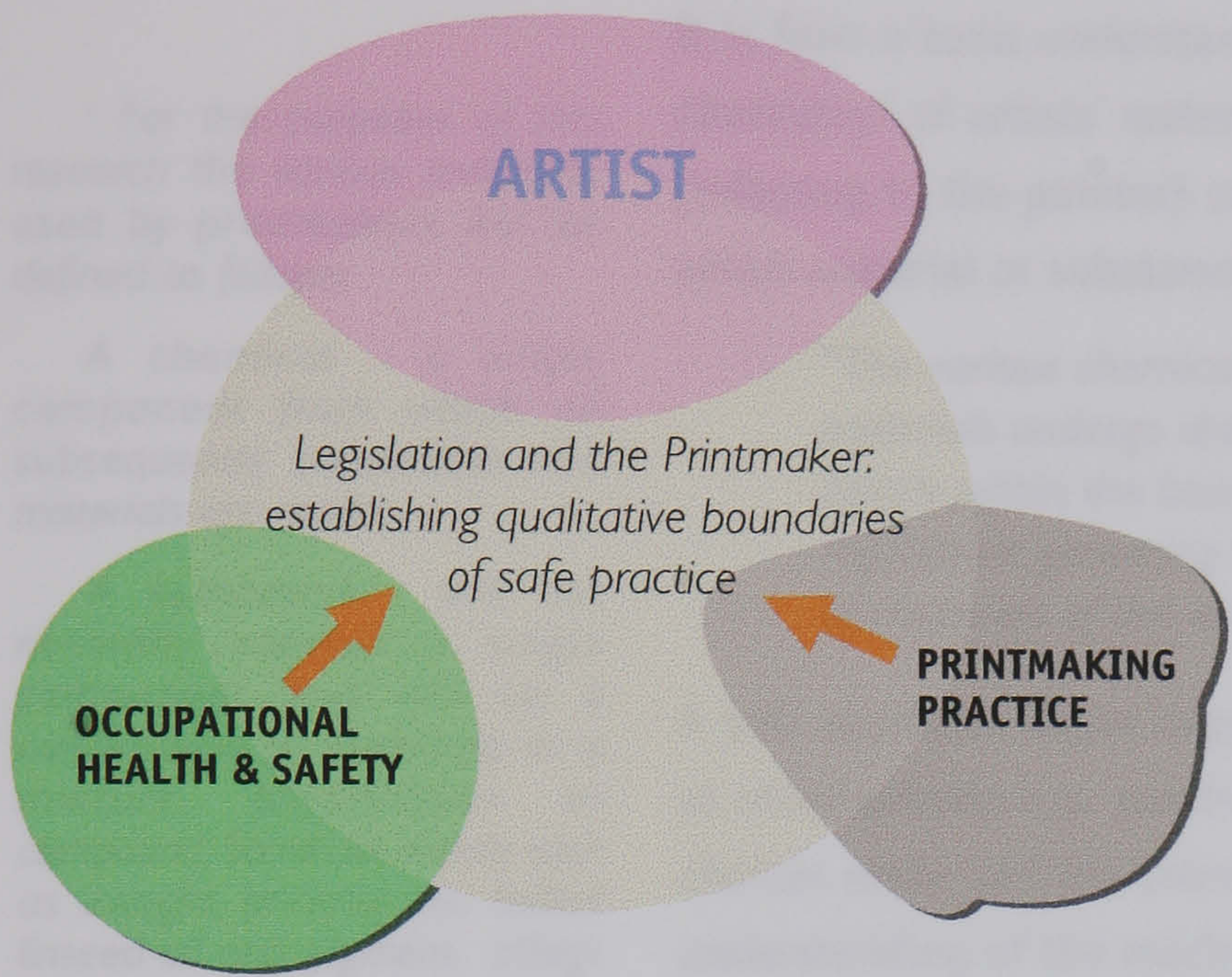


Fig 2.4 This section will review the protocol[s] established by occupational health and safety legislation which define objective definitions of 'acceptable practice' for the artist printmaker.

The autonomous nature of the researcher's printmaking practice referred to in section one, emphasised the importance of the relationship between the selection of materials and processes used by the artist / researcher, and the often 'expedient' interpretation of these, which is based on subjective and intuitive responses to the visual mark making potential they offer. The introduction of the **Control of Substances Hazardous to Health (COSHH) Regulations, 1988**, has had a significant effect on these subjective and personal interpretative practices which is the subject of this section.

The researcher had personally considered his own practice to be autonomous, to be outside the legislative procedures and occupational health and safety regulations, prior to undertaking this research. This is based on no other criterion than that of the researcher's practice being established solely on a visual creative basis. This creative 'freedom' was based on an expedient application of substances and products for creative advantage, hazardous materials or practices (if identified) were tolerated as part of this creative process.

The COSHH Regulations establishes the means of bringing all 'idiosyncratic' practices, small businesses (including printmaking workshop practices) within the remit of occupational health and safety legislative structure, which previous legislation was not able to achieve (Health and Safety at Work Act 1974, Environmental Protection Act, 1992). This section will review current legislation and occupational health and safety issues, as well as the physiological issues that relate to printmaking practices. This section will also review the wider cultural implications of developing an environmentally sensitive approach, and the environmental issues which affect artists politically and philosophically.

2.3.2 Physiological Affects of Cause and Effect

In order to be able to establish a definition of 'safe printmaking practice', an understanding of the means by which hazardous chemicals or substances effect the individual must first be identified. It is from a basic understanding of the physiological effects and chemistry [1] of artists' materials that **Mayer (1991)** suggests the artist (referring to the painter) can make better informed decisions about which material or substances to select:

> *"The various chemical and physical changes that artists materials undergo should be taken as a warning to abide strictly within the bounds of the accepted rules and regulations governing the methods, procedures, and choice of materials of the various painting techniques." (pp 446)*

A safe approach Mayer suggests is not always pursued by the artists, as other criteria e.g. practical, creative and experience, influence choices made and the selection procedures they adopt. An understanding of the mechanisms by which substances and chemicals interact with the body (pertinent to the printmaker), and an understanding of the means by which toxic substances affect the body, is therefore, central to this research. In order to determine the effect printmakers' chosen working practices may ultimately have on their short term safety and long term personal health it is essential that the artist works from an increasingly informed position.

Toxicology is the study of the mechanisms by which toxic substances natural or man-made effect living organisms. **Wheeler (1980)** identifies toxicity as a function of the 'invasive capability' of a substance, the finer the particles or its ability to be absorbed, the greater degree of interaction and solubility it has. These substances can enter the body by three means: through skin contact, by inhalation (gaseous or dust particles) and by ingestion.

> **Dermal Adsorption** - The skin (dermis and epidermis) is the first barrier against a toxin entering the body. The rate a toxin is absorbed is effected considerably by which area of the body is exposed to the substance (the hands offering more resistance than upper arms or abdomen for example).

For the printmaker: removing the skins protective 'greasy' layer by repeated cleaning of hands with solvents, dedicated hand cleaners or through abrasion of the skin by acids or alkalis will considerably increase adsorption, and all these can readily be attributed to 'normal' printmaking practices.

[1] For the purposes of this research the various materials used by printmakers will be defined as follows:

A chemical - a single component from which all subsequently substances and materials are made.

A substance - will not normally contain a single component, but will be a combination of chemicals, in a mixture, preparation or compound. Some are simple such as intaglio printing ink: boiled linseed oil and pigment, others will be complex like screen printing inks: resins, waxes, volatile organic chemical solvents, fillers and pigments.

Inhalation - airborne particles directly enter the body orally if the particle size is small enough or if the atmosphere is excessively laden; the body's defences - the mucus and fine hairs in the respiratory tract (nose and throat) - become overwhelmed.

For the printmaker the types of dusts and sprays found in printmaking - rosin, aspheltum, chalks, wood dust and the atomised stray (potentially solvent laden) produced by pressure washing of screens - are all potentially hazardous sources and can be readily inhaled.

Ingestion - the most direct means of a toxin being absorbed into the body.

For the printmaker poor housekeeping in a workshop environment, handling materials, mixing colours or printing can result in this type of exposure. Most common means of contamination is from bringing food or drinks into the workshop, this is relatively common in the experience of the researcher given the usually 'informal' environment of the printmaking workshop.

The control of exposure to toxic substances [1] by means of occupational health and safety legislation forms two distinct areas. Firstly, the type of hazard that may occur will be based on the means, and duration, of the exposure (within the print workshop and printmaking practices the exposure is usually to the skin and respiratory system as a consequence of the solvents used). Occupational health & safety legislation in this respect is concerned with controlling the means by which exposure takes place and by establishing safe working practices. Secondly, the degree of risk associated with a substance is dependent on the concentrations of that toxic substance: a function of the duration of an exposure, combinations of substances, and the means of its application (combinations of substances resulting in an effect known as 'synergism'). For the printmaker this is a real problem given the diversity of materials and substances used. In this instance occupational health and safety legislation is concerned with establishing safe working limits and working practices for a substance, based on notions of a 'typical' working environment.

[1] *Toxic effects are also subject to modifying factors; length and duration of exposure, body weight, gender, age, social habits (being a smoker), the actual working environment, all these can modify the toxicity of a substance. In order to arrive at a realistic measure Time Weigther Averages (TWA) and threshold values*

Establishing 'universally' safe limits evidently is a practical impossibility, as a degree of uncertainty will always be evident, (which **Frankel, 1978** suggest extends to the measuring process itself *"no experiment can ever prove a given concentration of a substance is 'safe; it can only show that certain ill-effects seem to be* *absent*", pp 3). Therefore, occupational health and safety legislation is based on establishing practical boundaries of exposure for given hazardous substances in normal use. Occupational health and safety legislation establishes a control mechanism by which individual working practices and working environments may be assessed within 'known' safe boundaries. Although a substance may present a hazard, it may still be used within the boundaries of 'acceptable risk' occupational health and safety legislation establishes, provided these hazards are identified and appropriate precautions are taken.

The concept of 'practical boundaries' established by health and safety legislation sets an important precedent in the following synopsis of health and safety legislation. Safe working limits are based on certain working conditions being met. The researcher's own experiences (*see section 1*) identified the extent that these 'boundaries' were pushed in pursuit of a desired creative result. Integration of legislation with individuals practices based on a more informed position must be a prerequisite for any proposed 'framework of safe practice', which will be pursued in the following sections (*see also sections 5 & 6*).

2.4 Occupational Health & Safety Legislation: a critical review

2.4.1 Introduction

This research is concerned with understanding the impact that a greater awareness of health and safety legislation may have on the artist / researcher's creative vocabulary in printmaking. However, evidently the printmaker's practice cannot be seen in isolation, as this has consequences outside the individuals working environment: work is often carried out in collaboration with other artists, the chemicals can effect those in close proximity and may have an impact on the environment as a whole. Understanding these cause and effect issues in terms of a 'chain of consequences', establishes the idea that every stage and every action carried out by the artist involves other individuals and the environment. This notion of responsibility is a theme legislation increasing promotes, with the diversity of health and safety legislation relevant to the artist printmaker reflecting this 'life cycle process' (*see fig 2.5*). The

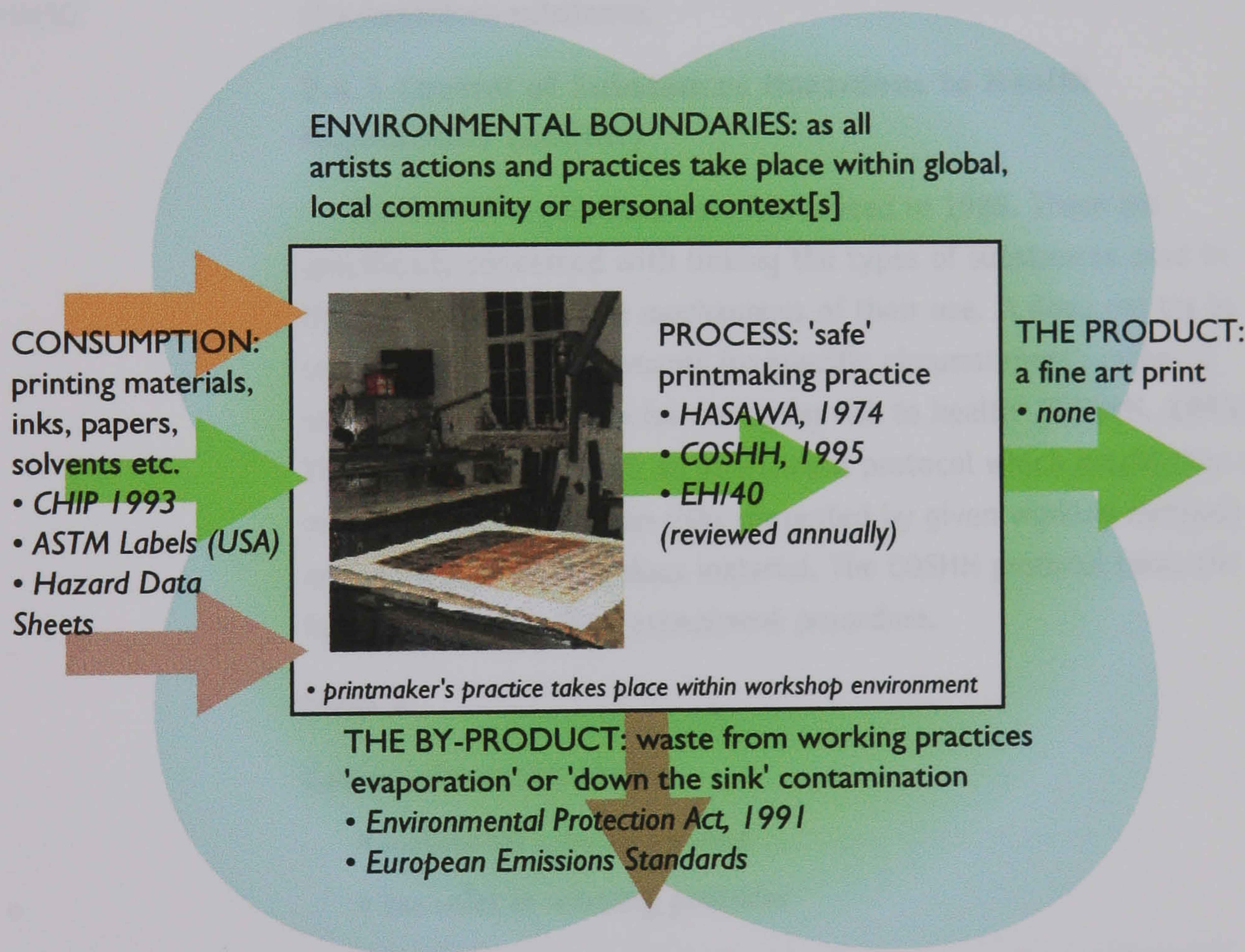


Fig 2.5 An illustration of the occupational health and safety legislation which relates to the 'life cycle' production process involved in making a fine art print (product).

following critical review of this legislation is a response to the diversity of printmakers practices and this context, acknowledges that their work takes place within the 'environment' as whole.

2.4.2 EH / 40, Occupational Exposure Limits

The Health and Safety Executive publish occupational exposure limits annually, which establishes specific levels within which substances are considered to present safe working limits; these are not universal standards but pragmatic limits based on the best available occupational health information [1] (**Frankel, 1974**). These quantitative measures respond to the need to reflect real working conditions, given that eradicating all hazards is impracticable:

> *"In assessing reasonable practicability the nature of the risk presented by the substance in question should be weighted against the cost and effort involved in taking measures to reduce risk."*
>
> *(pp 4 EH/40 HMSO, 1993)*

So working within the boundaries these measurements (OES & MEL) establish does not in itself remove all residual risk, as measured levels are qualified by practical considerations of cost and the difficulty of implementation, determined with respect to the severity of a hazardous substance.

[1] Occupational Exposure Standard (OES) - when working below these levels no 'known' risk to health has been identified.

Maximum Exposure Limit (MEL) - is the maximum level a worker should be exposed to, under any circumstances, of a given substance averaged over a given period, usually associated with carcinogens.

Each category is further qualified by means of Short Term (10 minute) and Long Term (8 hours) Reference periods., see EH40, Occupational Exposure Limits, Health and Safety Executiive, HMSO.

2.4.3 Control of Substances Hazardous to Health Regulations (COSHH)

The COSHH regulations were introduced in 1988. These are specifically concerned with linking the types of substances used in the work place with the mechanisms of their use. It does not try to set out 'specific requirements for specific circumstances'; rather it sets out 'a basic system for managing risk to health' (**COSHH, 1993**). This is achieved through an assessment protocol which establishes a method of evaluating the risks presented by given working methods and contact with hazardous material. The COSHH protocol takes the form of a Step-by-Step assessment procedure.

Step 1

Gather information about

- individual substances used
- the work & working practices

by observing and identifying where contact occurs in practice and which practices involve exposure.

Step 2

Evaluate the risks to health of individuals based on

- pattern and length of exposure
- measurement of these where appropriate.

Step 3

Decide what action needs to be taken relating to individual situation

- controlling
- preventing

by identifying exposure to potentially hazardous materials or situations.

Step 4

Decide if the assessment needs to be recorded to show why decisions about risk and precautions have been developed.

Step 5

Periodically carry out a review, based on this assessment protocol

- when changes to working practices or new materials have been introduced into the working environment.

The premise of the COSHH regulations relies on instigating a sense of informed judgement which is qualified by 'reasonable practicability' which is;

> *"balancing the degree of risk against the time, trouble, cost and physical difficulty of the measures necessary to avoid it." (pp 36, COSHH, 1993)*

The importance of these regulations has not only been in the assessment procedure itself, but in the sense of responsibility it places on organisations to recognise 'unique' working practices and potentially hazardous practices which may take place. The COSHH protocol makes a distinction between 'accepted good practice' and 'usual practice', which are quite often not the same thing in terms of health and safety. For the college, printmaking workshop or artist working on their own, who previously might have felt 'outside' occupational health and safety legislation (given the idiosyncratic nature of their working methods and materials used), COSHH more than any other legislation has addressed this. Within the printmaking workshop or the educational environment, individuals working practices and the materials used are subject to the responsibility of that organisation (employer) in instigating the COSHH regulations.

The effect that COSHH regulations have had on artists and printmakers' creative practices has not been evaluated, as no research has been carried out in this area to date. However, research has been carried out to access the effect COSHH has had on the printing industry. **Ginn (1992)** identified changes to practice which were a direct result of the assessment process (having directly lead to a reduction in the number of hazardous chemicals used) a point also made by **King (1990/1)**. The effect of COSHH on printmakers' working practices is more difficult to determine and is an underlying theme of this research will address (*see analysis of the questionnaire with research carried out, section 4.5.2.2*).

2.4.4 CHIP (Chemicals Hazard Information and Packaging) Regulations

The **CHIP** regulations (**1993**), offer a visual labelling system which identifies the possible hazardous consequences of chemicals (based on nontechnical graphic symbols). The regulations have supplemented previous legislation on the provision of information contained in the Health and Safety at Work Act, HASAWA 1974, and the Consumer Protection Act 1987. CHIP builds on these by requiring the supplier to:

- identify and classify any hazardous chemical they supply;
- provide hazard information;
- package that substance safety.

The responsibility rests with the supplier to carry out the classification and to identify a hazardous chemical **HMSO (1994)**, to which end CHIP establishes a protocol and system of *'Risk Phrases'* for the identification of substances. An area which CHIP extends previous legislation is in the provision of specific Hazard Data Sheets. The supplier now has a responsibility to make available hazard data information to the user, and for this information to be 'sufficient' for the purpose to which that substance is put. The information contained is limited to identifying hazardous substances, making it difficult to establish possible synergism resulting from unusual combinations of 'nonhazardous' substances. Interpreting Hazard Labels and Hazard Data Sheets for the printmaker highlights certain limitations. The system relies on the supplier to check that the information is:

> *"adequate for the intended applications of your customers and to check that the safety data sheet covers foreseeable eventualities"*
>
> *(**HMSO, 1994**) pp 38*

The limitations become evident when one considers that industrial products are often taken out of 'normal' usage by the printmaker for discriminate use. The hazard data information is based on 'foreseeable usage', where the product is used as intended. This quite often bears no relation to the intended end use or the circumstances in which artists apply these products.

2.4.5 Environmental Protection Act

It has been shown that printmakers' practices are not executed in isolation but form a 'chain of consequences' or life cycle of: consumption, application and disposal (*see fig 2.5*). This cycle necessitates that legislation encompasses the end use and by-products of this cycle. The **Environment Protection Act 1990 (EPA)** specifically deals with the environmental issues of disposal, possible contamination consequences - local and global of the manufacturing processes - by identifying manufacturing processes and substances which require emission levels to be set or monitored, as they have a polluting impact on the environment. The printing industry is one such industry; the scale of fine art printmaking practices in relation to the impact of industrial printing practices is insignificant by comparison. However, the EPA does offer principles and definitions which have a bearing on the issues this research addresses. Pollution of the environment is defined as:

> *"The introduction by man into the environment of substances or energy liable to cause hazards to human health, harm to living resources and ecological systems, damage to structures or amenity, or interference with legitimate use of the environment."*
>
> *(**Tromans, 1990**, pp 71)*

The **EPA** also introduces the concept of a 'Duty of Care' where the waste producer is increasingly accountable in the life cycle of the waste produced:

> *"The producer incurs a duty of care which is owed to society, and we would like to see this duty reflected in public attitudes and enshrined in legislation and codes of practices."*
>
> *(**Tromans, 1990**, pp 43-114)*

The **EPA** evidently is a response to wider 'green' issues, by encompassing a more tangible environmental conscience. The shortcoming however, of environmental legislation which engages a 'duty of care' from an industrial market-led economy is complicated (*see Ashby section 2.4.7*), and the disparity between international environmental standards is significant [1], when seen in relation to the apparent lack of rigour with which the environmental legislation has been enforced at a national level **Frankel (1978)** and **Rose (1991)**. This highlights the low priority environmental issues currently have politically and socially.

[1] A review of non UK 'environmental' and 'emissions' legislation illustrate the disparity between international legislation.

The USA has the Clean Air Act to control Volatile Organic Compounds (VOC) emissions, it has also introduced an 'emission tax' (first introduced in California) on the sale, import or manufacture of produces that contribute to the ozone problem (printing inks & solvents are highlighted as a problem area, see for example The EPA's Design for the Environment Programme).

Within Europe, Holland aims to reduce its emissions of VOC's by 50% by 2000. Denmark is pursuing a similar approach, both countries hope this approach will lead to 'cleaner technology'. Germany introduced the TA Luft system, in order to reduce pollution at source, and the French have set a 30% level reduction in VOC by the year 2000 (Rickmann, 1993)

2.5 The Concept of Risk

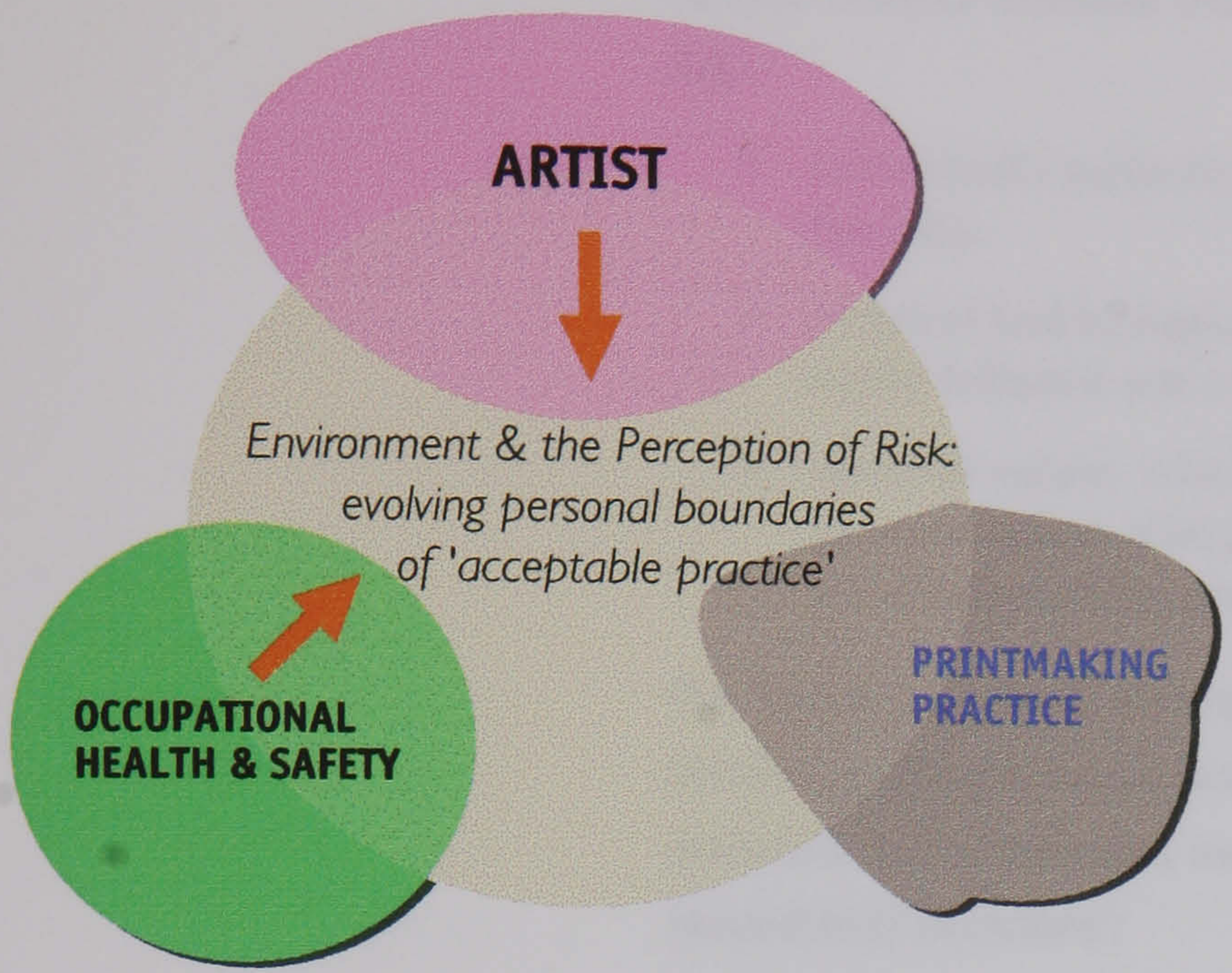


Fig 2.6 This section will investigate the influence that artists personal subjective perceptions of environment and risk and the objective protocol[s] established by occupational health and safety legislation have on defining notions of 'acceptable practice'.

The evaluative process by which all occupational health and safety legislation establish boundaries of 'acceptable levels' and 'reasonably practicable' working environments for known hazardous substances, is qualitative involving perceptions of risk. A discussion of this process will be important to the objectives of this research, as it may offer the means of establishing qualitative boundaries which describe the 'environment' within which artists practices take place. A detailed discussion of the psychology of risk is not within the remit of this thesis, however, an investigation of the concepts which define 'acceptable risk' does seem pertinent to the establishment and validity of any proposed *'Framework of Safe Practice'.*

Risk is a calculation based on the probability of a hazard occurring, were the frequency of occurrence, is multiplied by the severity of the contact (**Wharton, 1992**). This gives a basic model for calculating risk (*fig 2.7*). **Wynne** (**1992**) suggests the measurement of risk can only ever be a qualitative process, or a 'preventative paradigm', inevitably limited by the accuracy of evaluations which rely on anticipatory subjective processes.

Risk = Frequency *(contact)* x Consequences *(severity)*

Fig 2.7 A basic model for calculating a qualitative value of risk. This basic model will be developed in the proposed "Framework of Safe Practice' to include individual environmental conditions (see section 6).

What constitutes 'an acceptable level of risk' is therefore often determined by individuals attitudes to risk, even when working with known hazardous materials. These 'self-incurred' or 'voluntary risks' in effect "*judge what risks are considered acceptable, it is thus a normative, political procedure based on certain relevant information*" (Product Safety, 1983, pp 13). Artists' definitions of 'acceptable level of risk' the researcher suggests, is based on knowing or unwittingly accepting working with hazardous materials, when creative 'merits' result from that practice, at the time. This has been supported by artists' statements and descriptions of their working practices (**Mallary, 1963**). From the reviewed literature it was evident that certain criteria informed individuals definitions of 'acceptable level of risk':

- individual's subjective perceptions of well being (health);
- physical and biological environment, where individuals apply different sets of criteria and value judgements;
- material values, when the selection or use to which a produce is put, is largely informed by the 'tacit' knowledge of that products track record.

The working methods and tacit selection processes of printmakers (as previously stated) result from an expedient interpretation of the materials and substances used, based on 'visually creative [expedient] decisions':

> *"It would be difficult to imagine an issue so near the bottom of the artistic agenda. It would have been the kiss of death for any avent-garde movement to announce that the subversion of traditional categories was undertaken in the interests of safety."*
>
> *(**Cousin, 1994** pp 418)*

It would be reasonable to suggest that printmakers working methods are the result of accepting certain levels of risk, associated with their practice (decisions which may or may not be informed by safe practice). Cousin's develops this proposition suggesting that 'politics of safety' [culturally and constitutionally derived], confront and ultimately influence visual fine art culture: which traditionally experiment and test boundaries of taste [political and cultural] and personal [physical] danger, by visual art forms. *"I no longer think that an artistic strategy and a political strategy need in any sense reflect each other" (pp 421).* Cousin's is making specific reference here to performance art works, which he suggests has directly confronted the issue of the perception of risk.

But it is not unreasonable to suggest that on a personal level visual artists continually engage in this type of dialogue: physically, practically and politically, as highlighted in the introduction (*see section 1.1.2*). The moral and ethical implications resulting from apparent differences between acceptable personal risk and public perceptions of risk, are considered in detail by **Ashby (1978)** and **Wharton (1992)**. Wharton has suggested there is a 'personal hierarchy of risk', which determines what an individual is willing to accept, which is 'situation dependent':

"For the individual evaluation will be dependent on personal value systems whilst group decisions will reflect larger concerns based on political considerations." (pp 8)

The recognition of risk **Wharton** suggests, is based on that individual's personal terms of reference and propinquity, which Ashby has called the 'risk-satisfaction balance'. It has already been suggested that individual artists are willing to accept surprisingly high levels risk in relation to their creative practice (Mallary) which is supported in more general terms outside the visual arts, provided that risks are self-imposed and that the consequences lie many years ahead (**Wharton, 1992**; **Jackson, Norman** and **Carter, 1992**; and **Lave, 1987**). Comprehension of risk would seem therefore to be qualified by personal rationale and personal evaluations of its severity. The management of risk as a result is complicated by the individual nature of the perception of risk.

2.6 The Environment: Changing Perceptions and Attitudes

Adopting safer working methods has been linked to a general awareness and sympathy with environmental, ecological and green [1] issues. The following summary will identify certain definitions, in respect to the objectives of this research, in order to establish boundaries within which the researcher's practice takes place:

- by recognising that attitudes to the environment are in a state of development and change;
- by examining an apparent dichotomy which supports both, artists' passive [idiosyncratic] roles (see section 2.5), but also the artist's role in raising environmental and ecological issues through their visual work.

Given the pluralistic nature of society, attitudes towards the environment are not fixed, and are often defined by what one expects to gain in one's interaction with it. It is not possible therefore to identify in society a consistent disposition towards ecological issues. The relationship society has with the natural environment **Ashby (1978)** argues has been a usury one based on exploitation, which stems from a notion of man's superiority over nature (see also **Gare, 1995**). Ashby suggests, that this is slowly changing towards a position of increasing symbiosis with nature. The implication being that change is often seen as a consequence of negative environmental consequences, rarely as a proactive measure:

"It is one consequence of the astonishing adaptability of man that he has to be persuaded to be dissatisfied about abuses to the environment." (pp 21- 22)

The manifestation of this polar opposing position **Schnailberg (1980)** suggests is driven by economic, political and public

[1] For the purposes of this thesis "green" is taken to have a generic connotation, to mean a generally held, but nonspecific, interest in global, local and personal environmental consequences one accrues resulting from the actions or selections made by individuals, including artists.

attitudes. Therefore raising public concern for environmental issues is complicated by the distinct subjective value systems individuals and society (political and industrial) apply, resulting in constantly shifting boundaries within which environmental issues are considered important. The prospect of environmental crisis accentuated by an apparent cultural inertia **Gara (1995)** has suggested, has established a resolve in Western society which accepts its (apparent) inability to deal with such large global issues and responses:

> *"The new environmentalism of the economist and policy scientist has been enormously influential.The idea of 'sustainable development' and the measures called for by economists have been embraced by business organisations and governments with enthusiasm. But in practice, mainstream proposals to deal with the environmental crisis have failed." (pp 78)*

A value system proposed by Ashby has attempted to determine to what extent the concept of 'environment' (as an independent notion within such a dualistic society), impacts on individuals decision making processes.

These are:

- value-as-market,
- value-as-usefulness,
- value-as-intrinsic worth.

Ashby makes the point that quantitative scientific criteria, objective quantitative evidence traditionally used to account for changes in environmental legislation, and assumed to be 'value-free', is itself increasingly influenced by more subjective 'value-laden' and 'value-as-intrinsic worth' notions, as these increasingly determine public opinion. The implication is that what is acceptable environmentally is based on a form of negotiation between these value criteria. Therefore the notion of environmental autonomy just does not exist:

> *"Each political decision implants a choice into our system of social values, this imperceptibly changes the system of values, and this in turn affects the next choice."*
>
> *(**Ashby,** pp 78)*

Education therefore must play a central role in this negotiation process, if society's perception of environment as having "value-as-intrinsic worth" is to continue to evolve and develop. The Council for Environmental Education (**CEE**) is actively engaged in introducing 'green' issues at a curriculum level into higher education, by addressing two distinct areas:

- environmental education for personal and social responsibility;
- environmental education for occupational responsibility. (**Goulding, 1994**)

By establishing at an educational level an integral rationale informed by 'extraneous' environmental issues and consequences, the CEE has attempted to link, at curriculum level personal choices to more holistic ideas of environmental sustainability. This is a important precedent even if it has been framed by economic rhetoric.

Other environmental initiatives by CEE, have identified the lack of relevant environmental information by which materials may be recommended within education, as no reference source of proven safe materials was available (**James, 1992**). Designers and graphic artists are also being asked to more directly engage in considering the consequences and impact of selections they make on natural resources. **Chick**, (**1992**) and **Roberts**, (**1995**) each suggest designers and graphic artists might develop a personal value system in order to help guide the selection process, but no reference is made to the means by which this might be achieved.

2.6.1 The Environment: a Definition Proposed by Artists

The popular perception of the artist of having a natural empathy with the environment would seen to be a contradictory one. **Luke** (**1992**) suggests that the artists' role of social autonomy (a Postmodern concept) should be used in a proactive way, to challenge the basic nature of capitalism and the unquestioning acceptance of an aesthetically driven consumerism. [This notion of social and consumer autonomy the French philosopher Baudrillard expresses, as central function of Postmodern societies' malaise]. The resulting 'ephemera culture' has led (according to Luke), to many of the environmental and ecological problems society now face.

The possible role the visual arts might have in making connections between cultural roles and environmental awareness, without being prescriptive, is recognised by the CEE in a report *Taking Responsibility* (**Goulding, 1994**), which identifies art practices that may promote:

> *"public imagination into thinking about environmental themes that provoke questions about social and personal attitudes towards the environment." (pp 13)*

Examples given are publicly sited and site specific sculptures, and interventionist live art and performances. All are presented as art forms that may contribute to this debate.

Few artists have successfully proposed practices that practically contribute to this interface without being seen as propaganda or as dogmatic; the researcher suggests that both run counter to the aesthetic sensibilities so strongly associated with the modernist ideal of social independence in visual arts. The interventionist ecological art works of **Helen Mayer Harrison** and **Newton Harrison** makes a direct response to local and global ecological issues, by raising questions informed by a philosophy of 'guiding metaphors', which endeavours to link the community with environment (local and global). The Harrisons' propose a whole 'art system' that frames the way individuals, communities and cultures perceive the world, by questioning and integrating in order to create the art work:

> *"Specialisation itself seems to be a root of the crisis they address: specialized vocabularies that exclude citizens from their public processes, specialised professions that compartmentalise values, setting the long-term and the beautiful aside from the servicing of business interests, the specialised realm of art as a creation of marginal work for a marginal audience."*
>
> *(**Solnit**, 1990, pp 20)*

The artist **Joseph Beuys (1921-1991)**, co-founder and one time parliamentary candidate of the German Green Party, proposed a politicised art which was founded on a radical ecological paradigm, which actively confronted cultural attitudes and ecological issues. Beuys 'social sculpture', fundamentally anti-modernist, was rooted in a basic concept that only through art can *"a well ordered idea of ecology and professionalism"* develop (**Adams**, **1992**, pp 28).

For **Denes** (**1993**) the postmodern role of the artist as an independent social and cultural critic is limited when larger ecological issues are confronted. Denes suggests that a new altruistic role is needed for artists, which is synonymous with social responsibility and associated with a global environmental context. However, such an altruistic role would confront prevalent modernist art ideals, of artistic and social detachment based on independence and individualism. **Sanders** (**1992**) suggests that artists can no longer identify with these modernist ideals, that a new 'constructive post-modernism' be applied to their work:

> *"Methodologies of eco-artists may be examined not according to the medium but according to how they affect audiences." (pp 77)*

The implication is that artists' pluralistic art practices, based on designated boundaries of modern art 'traditions' (the artist working in the gallery system) will inadvertently contribute to the 'proliferation of aesthetic consumerism' (**Luke, 1992**). This view of modernism which suggests contemporary art opposes larger ecological and environmental awareness, is a view also put forward by **Gablik** (**1992**) and **Trussell** (**1989**), who go further to suggest that the artist can make nothing of value if larger ecological issues are not made implicit in the work.

There are few precedents for ardent and campaigning ecologically strident approaches within fine art (Beuys and the Harrison's are a notable exception), but indirect reference to the environmental impact of man (mass-production, consumerism and ecology) has occupied artists periodically (notably; the Boyle family, Richard Long, Goldsworthy, Hamish Fulton and Christo).

An important point these authors (**Trussell, Gablik, Denes** and **Luke**) do not address, which is pertinent to this research: that the artist's role may be seen in terms of a cultural barometer rather than campaigner. That by attacking head on the symbolic codes of consumption and production as they relate to ecology may only result in a didactic art which engages no one. There is no evidence to suggest that artists individually can be expected to be more aware or responsible for the environment. However as a group within society it may be the case that artists place greater emphasis on environmental sensibilities, but representing that environment visually in their work should not be confused with a concern for it.

2.7 Summary of Section: Occupational Health & Safety Legislation and Environmental Issues

Environmental and health and safety legislation seems to have moved away from 'react and cure', towards a more 'anticipate and prevent' approach. When seen together with the recognition environmental issues has gained in government legislation (Environmental Protection Act), working practices have consequently been increasingly forced to question 'best practice'. Artists working practices have generally been ambivalence towards occupational health and safety consequences of product selection so current legislation would seem to offer a structure to link these disparate elements, with environmental standards increasingly becoming stricter, and more numerous, [**Rickmann** (**1993**) suggests that regulatory parameters set to monitor waste materials and health and safety levels will inevitably increase to include additional criteria and tighter monitoring standards].

The onus of current health and safety and environmental legislation is not based on establishing universal standards, but is qualified by what is *'reasonably practicable'*. The need to balance the level at which any risk to health occurs, against the difficulty and cost of removing or reducing all hazards within legislative boundaries, is a fluid one based on individual circumstances and cost. For the individual printmaker, independent workshop, or educational institution teaching printmaking, this could mean that no definitive or comprehensive choice can be drawn from this legislation structure, given the individual nature of artists' practices. A propensity to change established practice and substitute safer alternatives may also be seen in these terms, if initially no obvious legislative incentive to adopt or develop safer alternative can be drawn from this legislation. The researcher would suggest that the onus for change must therefore ultimately rest with the individual, at a personal level but based on an increasingly informed understanding of the risks and hazards which link current legislation to their own creative process, in order to establish one's own *'reasonably practicable'* practice.

The importance of the COSHH regulations in particular has been enormous, in raising the safety debate within the fine art printmaking community - something that *The Health and Safety at Work Act* (HASAWA **1974**) never did (given the more direct connection HASAWA had with industrial factory practices and working situations). Artists, however, have always been subject to occupational health and safety legislation, but given the esoteric and personal nature of the artists work, these have often been considered 'outside' the regulatory controls of previous legislation. COSHH legislation therefore has introduced a mechanism or system within which all working practices may be readily assessed no matter what those may be. This has had the effect of making individual printmakers, workshops and teaching practices take a critical view of their work practices. It has been noted that legislation, specifically the COSHH regulations, have introduced the concept of risk assessment at every level within the work place. This pragmatic system of risk assessment is based on what is 'reasonably practicable'. The notion that personal risk was a function of the creative process has also been investigated, where risk can be seen as a strategy within the creative practices of artists. This contradiction has been extended to encompass artists dealing with ethical issues associated with environmental context[s] in their work. This review highlights certain questions in relation to establishing a possible 'Framework of Safe Printmaking Practice', namely:

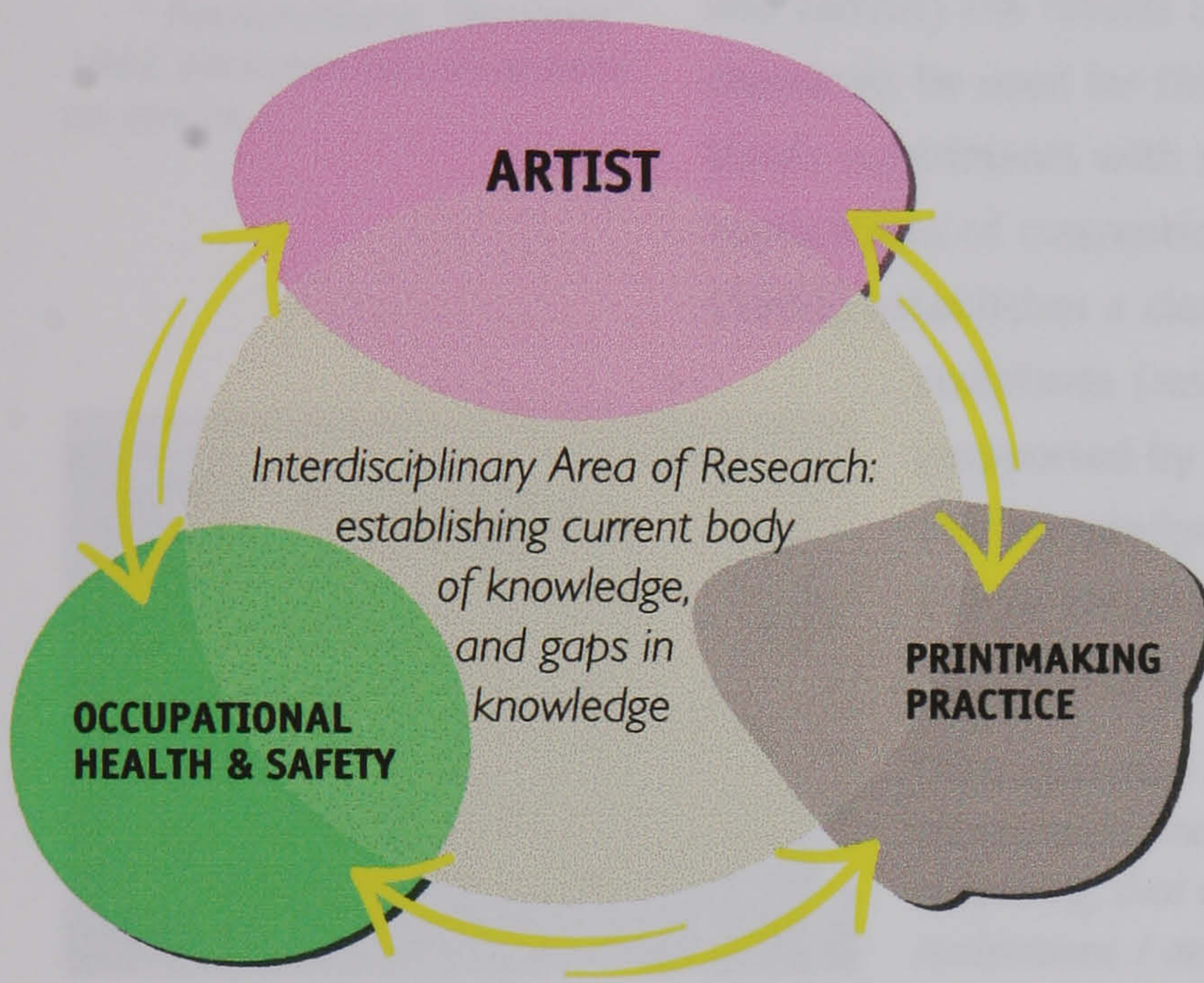
- will the imposition of quantifiable means of establishing levels of risk, restrict the diversity or 'acceptability' of certain materials which printmakers use in their creative practices?
- is a strict definition of risk [the probability of exposure to a possible hazard] an appropriate measure, if one accepts that the working practices of printmakers often willingly accept a degree of risk in relation to their creative practice?

It is these questions that this research attempts to question.

2.8 Occupational Health and Safety in Practice and the Printmaker

2.8.1 Introduction

Historically hazards associated with the visual arts was found to be very low on artists' agendas; the relatively small numbers involved and the disparate nature of fine art practices would seem to have contributed to this. The physician **Ramazzini** as long ago as 1713, endeavoured to link specific diseases with individuals working occupations and the materials they used. Amongst the many occupations Ramazzini studied were painters and printers:



"...the material of colours that they handle and smell constantly, such as red lead, cinnabar, white lead, varnish, nut-oil and linseed oil which they use for mixing colours; and the numerous pigments made of various mineral substances. The odours of varnish and the above-mentioned oils make their workrooms smell like a latrine...moreover, painters when at work wear dirty cloths smeared with paint, so that their mouths and noses inevitably breathe tainted air; this penetrates to the seat of the animal spirits, enters by the breathing passages the abode of the blood, disturbs the economy of the natural functions." [1]

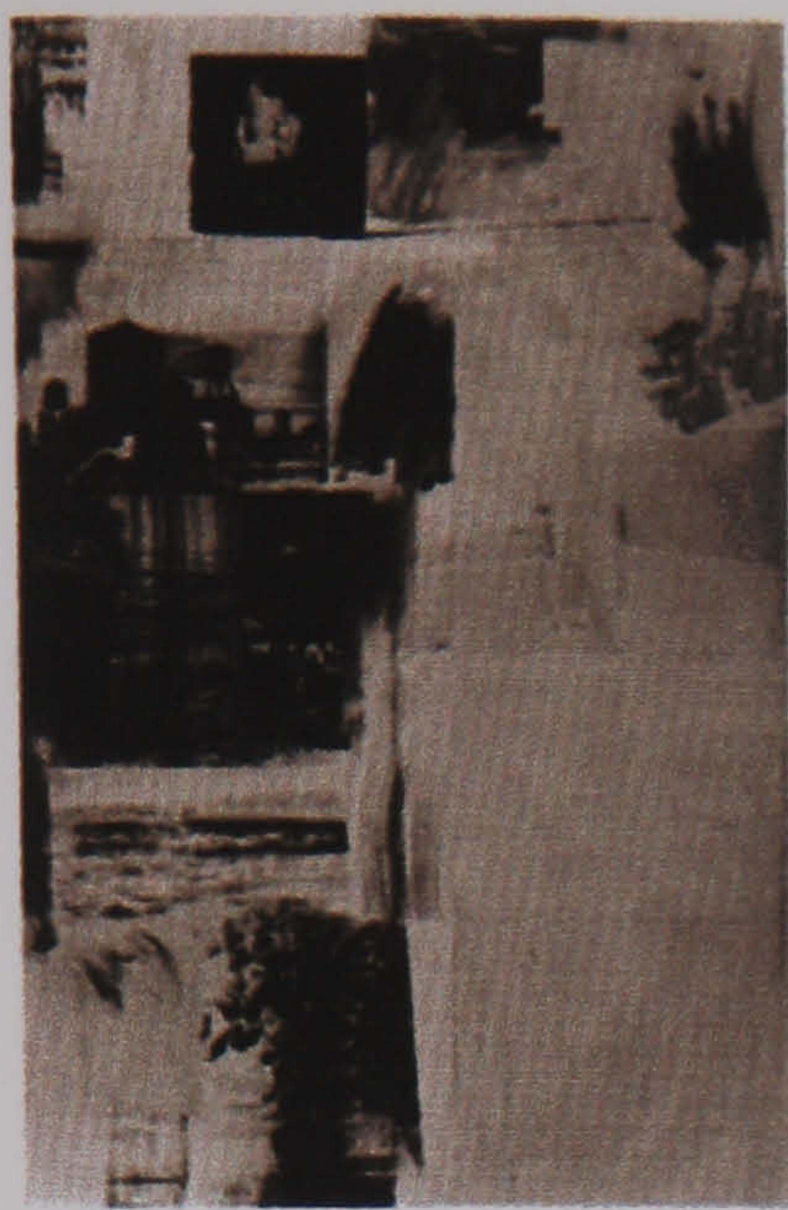
*(**Ramazzini**, translation by Wright, 1964, pp 69)*

Fig 2.7 This section will review the current body of knowledge - the strength or weakness of the links between these domains, in order to identify the gaps in that knowledge, as visualised by this diagram.

The materials used by artists' and artists working practices, particularly when working with lead pigments, has been linked with particular physiological effects (**Goya, 1746-1828** and **Van Gogh, 1853 - 1890**). Speculation links the physical painting techniques each artist adopted, to the possible acute toxic effects of these lead pigments **(McCann, 1992**). Speculation has also surrounded the health and mental problems of **Jackson Pollock (1912-1956**) as being attributed to the industrial enamel paints and hydrocarbon thinners he used so freely in his direct action painting technique, over a number of years.

The Ramazzini recount of the occupational diseases of printers is limited to the health problems associated with their manual labour and working environment. The substances used by printers at this time were limited by the type of work they did - single colour,

[1] Interestingly this account could very easily be applied to many contemporary painters and their working habits, as the materials used have change little.



[1] Rauschenberg, "Almanac" 1962, silkscreen ink and oil paint on canvas.

intaglio etching and block printing. **Bacon's** research (**1985**) into early etching techniques illustrates the diversity of substances possibly used by artists experimenting with the medium. (Bacon's account specifically relates to the development of predictable etching grounds and mordants, many being quite toxic and combustible.)

Contemporary art practices have already been characterised by the intimate working relationship artists have with the materials they use, an approach which fosters experimentation with a diversity of materials in order to develop individual techniques appropriate to their creative ideas. **Rauschenburg** (**1925-**) worked for a number years with a type of solvent-transfer drawing technique (on paper and canvas) the results of which would not be possible without the chemicals he used for this transfer process [1]. The printmaker Jim Dine's experiments with scale, have resulted in unconventional applications of conventional techniques [2]. The sculptor **Mallary** (**1963**) establishes a clear link between the materials used in his sculptures (resins and fibreglass) and his ill health (supported by medical examinations). Surprisingly with this knowledge Mallary at no stage questioned the pursuit of this creative practice, he instead adopted safer working habits in order to carry on with his practice:

[2] Jim Dine working directly on the plates for "Heart and Wall" with dilute acid, at Graphic studio, 1982. Working in this direct way was possible only due to the roll-back roof of the workshop which gave adequate ventilation. The fumes from this 'spit biting' techniques on this scale would have been extremely hazardous.

"The character of my work has become more or less inseparable from these materials. It should not be surprising, that my current attitude towards them is ambivalent. I am 'grateful' for what they have enabled me to accomplish, but wary of the harm they can inflict." (pp 43-45)

This particular and close working relationship artists have with the substances they use, often relies on combinations of unconventional substances and the experimental applications of these for creative advantage. This inevitably results in cumulative and synergistic properties not foreseen in conventionally prescribed or industrial usage. **Wheeler (1980)** has suggested:

"Professional artists not only come into contact with chemicals in art more frequently, but also with greater duration and diverse combinations." (pp 282)

This apparent lassitude when it comes to an understanding of the potential hazards associated with certain materials and the often extremely hazardous working environments artist accept, (see **Cousins, 1994** see also **Minter, 1990**) has been suggested, is based on the notion of creative 'freedom' - artists' principal objectives are the development a personal visual vocabulary. This section will try to establish that certain working practices and materials are potentially hazardous, and to identify endeavours of artists to positively respond to possible changes brought about in their practice through this process.

2.8.2 Quantitative Studies: Hazards Linked to the Visual Arts

Very few quantitative studies have looked in any detail at the visual fine arts. This would seem to reflect the esoteric nature of this occupation compared to industrial practices. **Miller** and **Blair** (**1983**) identify the particular hazards resulting from long-term exposure by professional artists to the materials they use. Another study by **Barry, Miller, Blair** and **Aaron** (**1992**) identified cancer 'hot spots' amongst American artists between 1940 and 1969, highlighting an increased mortality from certain types of cancers. They go on to link the substances used by artists to the higher Proportional Mortality Ratio (PMR) of bladder cancer and leukaemia amongst these artists, predominately painters, with only 3% male and 4% female of the study group being identified as printmakers:

> *"These cancers are known to be elevated in industrial workers exposed to dyes and solvents - exposures that artists may also experience." (pp 171)*

Their studies do not identify specific chemicals attributable to these cancer risks, but recommendations are made to limit exposure to all known (VOC) hazardous materials. **Prockop** (**1978**) diagnosed a graphic artist suffering neuropathy as being related to the solvent materials used in his practice, and **Glasbrenner** (**1984**) specifically identified solvent-based screen printing materials (VOC's) as being the sole contributory source of the illness of a patient. The limited number of specific studies reflects the relatively small numbers involved (professionally) in fine art practices.

Studies of USA undergraduate printmaking departments by **Schott** (**1980**) and **Pearlman** (**1979**) indicated that exposure levels regularly rose above prescribed short-term limits but averaged out below long-term exposure levels for the aromatic hydrocarbon solvents tested. Many of the observed hazards were identified as student or staff related e.g. poor housekeeping and poor working practices were often not being followed. Interestingly the Schott study made a direct link between these printmakers' creative practices, and the autonomy with which they applied these materials:

> *"often there was total disregard for personal safety, health, and well being in the guise of keeping an environment which is non-restrictive and conducive to free expression." (pp 49)*

The **New Jersey State Department of Health** and **The Centre for Safety in the Arts, USA** (**1986**) jointly carried out a survey to ascertain artists' actual working habits. The results showed that: artists often work in close proximity to their living quarters, with 50% having studios at home, the average working week being 28 hours; a total of 50% of all studios did not have exhaust fans, and the majority did not observe safe working hygiene practices; over half used respirators when using hazardous materials but of these 23% were inappropriate for the purpose. In the UK a survey of fifty-three art colleges to ascertain the conditions in which artists work was conducted by the **North-West Regional Advisory Council for Further Education 1974**, (in **Challis** and **Roberts**, **1984**). This survey made reference to the working conditions and accidents reported, but given that no systematic means of recording was adopted the results were inconsistent; but it generally expressed a concern with certain materials and the working methods adopted by art students and staff.

Fig 2.8 ACMI - labelling system for art materials.

AP NONTOXIC - products which comply to ASTM D-4236, presents no acute or chronic health hazards

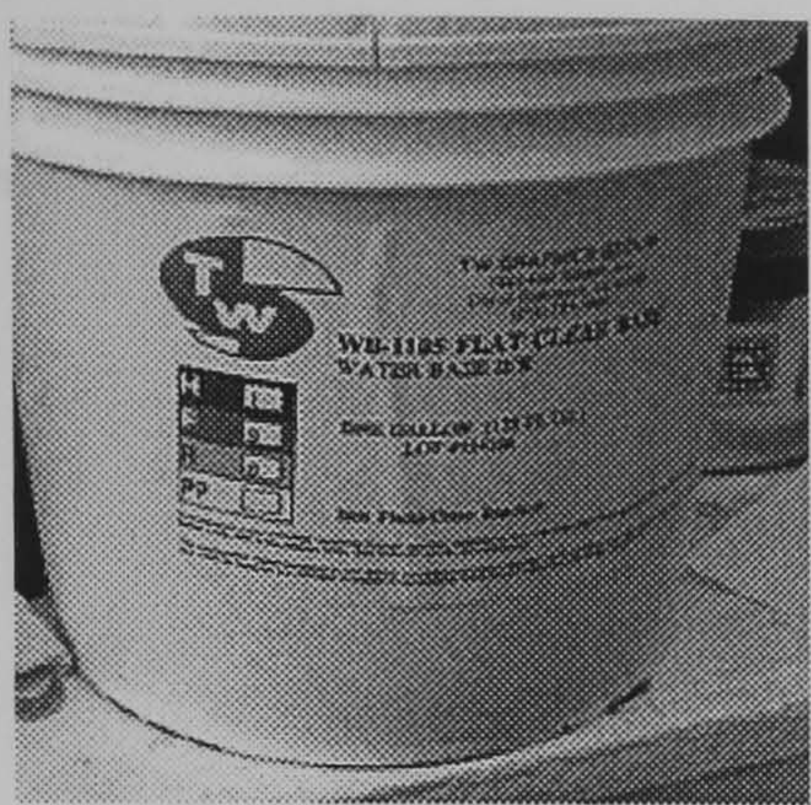
CP NONTOXIC - meets standards set by American National Standards Institute.

HEATH LABEL - indicating that product is certified (tested by ASTM), as requiring no labelling.

2.8.3 Labelling Art Materials.

Art materials are seen as a specialist area (consumer product), subject to occasional use. In the UK no attempt has been made to specifically identify these products (The National Artists Association **NAA**, a UK organisation which represents the interests of visual artists nationally consider current product labelling - CHIP and occupational health and safety legislation - adequate to cover this area). In the US testing of art materials is more rigorously pursued based on specific usage. The Art and Craft Materials Institute (ACMI) introduced a voluntary safety certificate for art materials in 1974 (**Goldwater, 1980**). This certificate has evolved and been widely accepted with the ACMI having evaluated over 17,000 products. The ACMI label (*see fig 2.8*) is only given if the product contains no materials in sufficient quantities to be toxic. It is now considered to be the industry standard, and it has to be displayed on all UK art products which are sold in America (for a detailed discussion of the campaign for better labelling of art materials and the Art and Craft Materials Institute **ACMI** labelling system see **McCann, 1992; Spandorfer, Curtiss** and **Snyder, 1993**, and **Kotz, 1984**).

It has been established that the diversity of practices within printmaking (*see sections 2.1 & 2.2*) often results in many chemicals and substances being borrowed from industry. **Montgomery** (**1980**) makes the point that industry (referring directly to the ink coating industry) has always worked to strict industry and government guidelines. But removing a product from this prescribed working situation, invalidates relevant hazard data information and cannot be expected to be universally applicable. A more universal labelling system is proposed by **McCann** (**1980**), one which might reflect the 'non-prescribed' and 'unconventional' application of materials and substances, which characterise artists' practices. In America better labelling has been supported by 'A Right to Know' legislation, which has resulted in more comprehensive product information [1], in comparison with product information data in the UK.



[1] Labelling system adopted by ink manufactures in USA, lists the hazards flammability and possble toxic effects - on a scale of 1 - 5.

In the UK the issue of separate labelling of art materials has not been considered, given that current consumer legislation is deemed adequate. The National Artists Association in its published *Code of Practice for the Visual Arts* (**1995**) suggested current occupational H & S legislation (**HASAWA** and **COSHH)** offers an adequate means of defining the hazards associated with materials for artists safe working practices. This is a surprising situation given that the **NAA** purports to represent all artists interests (whatever working situations and practices) yet the report does not accredit the often unique circumstances in which artists work.

It has been suggested by **Wheeler (1980)** that the diversity of practices within the arts is the main contributing factor to the difficulty of implementing 'universal' safe working practices. The relevance of health and safety legislation to the artist, as **McCann** (**1980**) points out, is complicated by the autonomy with which artists interpret their materials:

> *"Much of the information that is known about hazards is based on the industrial experience with the same chemical. Knowing how artists are working with these materials, we have been able to give an estimate of the hazard to individual artists and craftsman." (pp 4)*

Given that many of the materials used in printmaking have been derived from industrial practices, one would expect relevant industrial hygiene and occupational health and safety practices to also make this transition. This would seem not always to be the case (evidenced by the researcher's own experience of working in a screen printing fine art editioning studio), and is surprising when one considers the number of industrial products and hazardous substances used by the printmaker, for example, Kodak Photo Resist (KPR) as a light sensitive coating on etching plates, the use of solvent based thin film screen inks, and commercial lithographic plate processing chemicals.

Commercial product developments are aligned to artists' increasingly diverse creative practices, a point **Siedlecki (1968)** and **Agoston (1969)** have made in charting the use of synthetic paints and polymer resins by artists (now an accepted vocabulary for many painters and sculptors). Getting a balance between creativity and safety, as already suggested (**Mallary 1963**), is a consequence some artists are not willing to accept. The need to educate and inform artists, to bridge the distance artists place between their creative practice and their personal safety, is an area in which little research has taken place. **Agoston (1977)** suggests that:

> *"Writers of manuals for artists have a responsibility for disseminating to artists information on the health and hazards." (pp 128)*

The first organisations to try and bridge this gap through an educational program, were the **Hazards in the Arts**, formed by **Gail Barazani (1971)** which brought together occupational health expertise (Illinois School of Public Health) and art educators (Chicago Art Institute). The *Centre for Safety in the Arts* (**CSA**) founded by **McCann** & **Monona Rossol (1977)** extended this campaign in America and Canada. The **CSA** was founded as a non-profit resource centre offered information about the hazards associated with art practice and the promotion of safe practices through: the *Art Hazard News* (monthly newsletter), organising lectures and seminars, in order to fulfil a role of educating the educators:

> *"Art teachers are responsible not only for their own health but also for safeguarding the health of their students. By reaching art teachers, it was hoped that they could educate the next generation of artists".*
>
> *(McCann, 1992, pp 140)*

A formative conference organised by the **Society for Occupational and Environmental Health**, **(1980)** in conjunction with **CSA**, was an attempt to establish a contemporary knowledge base within this subject area, by bringing together industrial occupational hygienists and art practitioners. The conference identified the need for a better labelling system and more informed 'safer' working practices. In the UK **ArtSafe** (**Tim Challis** and **Gary Roberts 1984** & **1990**), was formed in order to address the lack of any structured organisation facilitating access to occupational health and safety data for the artist, crafts person with a similar remit as CSA in the USA.

2.8.4 Dedicated Literature for the Printmaker

The following synopsis and critical review is drawn from all available literature which directly addresses issues of occupational health and safety data relevant to the visual arts and the printmaker in particular, and identifies the different approaches that each author has adopted in order to facilitate relevant data. Where a number of different art practices are considered the review will concentrate on the printmaking materials and practices described in this research.

Health And Safety In Printmaking: A Manual for Printmakers **Moses, Purdham, Bowhay** and **Hosein, 1978** (produced in conjunction with the Alberta Occupational Health and Safety Division).

This manual sets out to review substances and processes traditionally used by printmakers, by relating substances' toxicity and occupational exposure levels. This is illustrated with a number of personal accounts by printmakers of their working practices which gives the book authenticity. In order to simplify the information presented, substances are given a toxicity rating (based on a numeric system - between 1 - 6). This system works well as an indicator and quick reference, but importantly also translates difficult to understand information. The manual made no attempt to identify safer alternatives materials.

Caution: A Guide To Safe Practice In The Arts And Crafts, **Challis** & **Roberts, (1984)**.

This manual contains information on hazardous substances and summarises this information using an alphabetic index system (this is similar to the 'Risk' phrases system now used on CHIP labels and hazard data sheets, but makes no direct reference to these). The section on printmaking was limited and did not reflect adequately the diversity of printmaking practices. The manual identifies a large number of hazardous substances and suggests suitable precautions to be adopted in their application, it suggests safer alternatives may be available, but is unable to identified what these might be was clearly unhelpful.

Health and Safety Making Art and Avoiding **Dangers, Challis** & **Roberts (1990)**.

This manual builds on the previous publication (1984), by giving a more detailed account of current legislation, and lists hazardous substances. It contains information on preventative measures (e.g. protective clothing, ventilation and safe working practices). The index system is dropped and descriptions of categories of substances is adopted and linked to 'typical' usage in printmaking. The descriptions are again drawn from 'established' definitions of printmaking practice, which does not reflect the diversity of uses and application printmakers adopt.

Print Safe, **Challis** & **Roberts** (1990).

This book offers a detailed review of printmaking practices (materials, practices and hazards) including current legislation (COSHH). The printmaking practices reviewed are again presented as static processes which in effect limits the possibility of proposing or identifying safer practices, as the descriptions of printmaking practices do not engage in questioning these practices, only in identifying the associated hazards. The scope for suggesting safe practices is therefore limited by prescriptive definitions, within the remit of current legislation.

Overexposure: Health Hazards in Photography, **Shaw** & **Rossol** (**1991**).

This contains a detailed account of the photographic processes used in printmaking with descriptions of the techniques, chemicals and materials used. This manual adopts alphabetic lists of substances and hazards, exposure levels and uses. It does make suggestions for safer photographic printmaking alternatives which does reflect a general move towards safe practice in North American publications.

The Artists Handbook Of Materials And Techniques **Mayer** (**1991**, *Fifth Edition).*

This is an extensive reference book for artists, on the materials and substances they use. It contains a general section on printmaking and also one on health and safety issues. Mayer accepts that certain toxic substances are still used by artists; the toxicity of substances are identified as are the particular characteristics that these offer the artist. The emphasis, is on good working practice and good housekeeping when working with known hazardous substances.

Artists Beware, **McCann** (**1992**).

This is a definitive reference manual, used by many American art schools as their first source for health and safety information. This is given authority by McCann's campaign over twenty years for dedicated health and safety information relating to artists working methods. The approach of this book is to identify and emphasis the risks and hazards associated with the wide range of substances and art practices that artists adopt. Wherever possible information on selecting alternative safer materials is offered, this is based on toxicological experience, rather than artists own experiences, with the result that no fundamental questioning of 'established' practice is possible. The section which deals with printmaking practices suffers from this prescriptive approach; in an attempt to inform McCann applies universal classifications of the hazards posed by substances, regardless of the quantities or circumstances in which artist actually come into contact with these.

Making Art Safely **Spandorfer, Curtiss** & **Snyder** (**1993**).

This is an American publication with a detailed section on printmaking: health and safety issues, the toxic effects of substances and a review of the issues relating to labelling art materials. Printmaking is dealt with in detail drawing on a number of examples of artists own responses in adopting 'alternative' working methods - great emphasis is placed on selecting water-based printing medium - however it is evident that quite narrow definitions of printmaking practice are still adhered to in this respect (surprisingly the book still makes reference to KPR as the only intaglio photographic process).

These reference books all offer authoritative and reliable appraisals of contemporary occupational health and safety legislation, both in the UK and in USA. The emphasis is on identify the enormous number of substances and chemicals potentially used by artists and printmakers. But without exception these manuals list in digest form occupational exposure levels and hazards relevant to a vast range of substances, however no means of contextualising this information is offered with the only terms of reference being the numeric MEL and OEL values listed. The manuals by **Moses, Purdham, Bowhay** & **Hosein** and **Challis & Roberts** (1984) try to interpret this information by adopting a system of symbols and letters respectively, that offer more accessible means of making informed judgements based on identified exposure levels. These values however are still analogous to a specific chemical, not easy to interpret when the product used may not carry that name or may be in use with a combination of chemicals.

The contemporaneous nature of the information is sometimes questionable, as each manual draws on definitions of 'static' printmaking processes and practices. The substitution of safer materials by questioning established techniques and practices is limited as a result. For example in Spandorfer, Curtiss & Snyder a discussion of the advantages of water-based screen printing is well researched, but the book adheres to quite limited definitions of practice, containing a reference KPR as the only means of reproducing photographic images in etching, this is surprising, given the remit of the book, and no alternatives are suggested (for example: indirectly screen printing onto the etching plate, or the transfer from photocopies).

There is generally a recognition that safe handling and good work practices are a key to minimising the risks associated with known hazardous materials. Minimising the risks associated with a process by substituting a similar but safer 'alternative' is a common thread, but this is often based on quite prescriptive definitions of printmaking practices. No attempt is made to fundamentally question the continued use of these 'traditional' practices or link the selection of safe practices to artists extending their visual vocabulary. The literature did offer reliable and authoritative occupational health and safety information. The extent to which the availability of pertinent information would change artists' practices is indeterminate, a point made by Walter Jule (in **Moses, Purdham, Bowhay** & **Hosin** ,1978)

> *"...If we want to make sure we're working in a healthy environment, then the reality of the situation is that it's up to us to find out how to make it safe - determine ourselves what alterations have to be made and then approach whoever it is that has the authority to implement change, at what ever level necessary." (pp II)*

2.8.5 A Practical Response to the Safety Debate: Alternative Processes & Substances

The following review of printmaking processes will be concerned with identifying printmaking practices which have responded in a general sense or expressly to 'safe' working practices or 'environmental' criteria. In the preceding section, an awareness of these safety issues was found to be limited in the literature reviewed.

The strong sense of tradition associated with printmaking, in particular intaglio printmaking, pervaded descriptions of process in much of the literature. For example comparing **Robins (1922)**, **Hayter (1949)**, **Gross (1970)** and **Ross & Romano (1990)**, the intaglio processes and materials described are ubiquitous, with the identification of possible hazardous substances or practices having only recently gained any mention in this chronology. The evident contemporary nature of 'safety' issues within the visual arts, has meant few references were found in book or manual format. The periodicals *Printmaking Today, Artists Newsletter*, and *Leonardo* formed a more contemporary but quite often didactic source of information.

The following discussion is based on having identified in the contextual review a number of key sources; commercial printing and artist derived practices which have not always been literature based, and include the researchers' discussions with peers, exhibition visits and catalogues, and the participation in and running of workshops by the researcher, these have all been integral sources of information.

2.8.6 Environmental and Occupational Health & Safety Issues: An industry Response

It has been previously established that artist printmakers' readily appropriate materials and processes from industrial printing processes, therefore a review of the issues and the techniques effecting this area of commercial printing was undertaken. From the database of The Research Association for the Paper and Board, Printing and Packaging Industries (**PIRA**), and the **HSELINE** (Health & Safety Executive CD ROM) (**1994**) a number of key areas were identified where occupational health and safety and 'environmental' legislation, together technological and material innovations have had a direct influence on the printing industry. These areas were: water-based screen printing inks and photographic stencil technology, waterless and dry-plate lithography technology, and the development of vegetable or soya oil based lithographic / letterpress inks. (A debate on the technical merits, the advantages or disadvantages of these are not within the remit of this thesis, but the researcher recognises the potential direct and indirect impact that the development of new materials and products might have on the fine art printmaker.)

The increasing awareness of environmental issues within industry (e.g. ink manufacturing) **Hansen** (**1989**) suggests has been the result of a number of factors: customers' demands, the demands caused by new material developments, and the demands of occupational health legislation, points which concur with the **Coates Lorilluex** review of ink manufacturing procedures (**1993**), and **Machin** (**1992**). **Barr** (**1995**), representing one of the largest printing ink manufacturers, suggests there is a move away from associating environmental measures with reductions in quality (as was previously the case in a much of the reviewed literature), to a position where the advantages of these changes are becoming paramount, even suggesting ecology be redefined in terms of 'ecologically based efficiency'.

A more practical approach is suggested by **Gardner** & **Huisingh** (**1987**) which links legislation, process selection and material substitution with improved housekeeping in order to reduce emissions and hazards, collectively these are termed 'Low and Non-waste Technologies', a theme that the American **Environment Protection Agency** has built on with The *Design for the Environment: Printing Project* (**1993**): a number of case studies are published which offer 'real' practical solutions to specific problems, which take a 'shop floor' approach; these in effect successfully link personal and global environmental 'accountability' to financial advantage for the company[1]. American ink manufacturers have been at the forefront of the development of water-based printing ink technology, and have solved many of the practical problems associated with the medium, developments which have even recognise the contributions and the particular demands printmakers make, in pushing water-based inks to their practical limits:

> *"The colours are more brilliant and the people who produce seriograph (screen printing) are sort of 'green' people anyway... we have people printing 110-130 colours and they can do that with far more ease [using water-based] than they can with solvent-based."*
>
> ***(Tibbetts** in **Duennes, 1992)***

The main area of concern associated with water-based inks relates to possible water pollution resulting from the cleaning and disposal of the inks. As an environmental issue the problem would seem to have moved from being one of 'emission and exposure' associated with VOC solvent based products, to one of 'down stream' and 'life cycle issues'[2] associated with water-based products as unchecked water-based inks go into the waste disposal system (*see fig 2.5*). In order to placate such concerns **Coates Lorilluex** (**1993**) suggest:

> *"The data available to us based on these studies demonstrate that ink raw materials generally have extremely low eco-toxic effects." (pp 3)*

and go on to say:

> *"no ink products including water-based, are suitable for sewage disposal without special treatment." (pp 9)*

The implication is that the emphasis is slowly shifted from establishing adequate exposure levels (exhausting the VOC solvents - shifting the problem from the inside environment to the outside environment) to more general environmental pollution controls, associated with 'life cycle' and sewage disposal.

[1] A distinction should be drawn here between legislation in the UK and comparable legislation in the USA from which these examples are drawn. USA legislation, in particular Southern California's introduction of Rule 1130.1 has in effect made the use of VOC solvent based printing inks illegal without a permit, a precedent Duennes (1992) suggests that other states will follow and which ink manufacturers are now using as a reference point, in order to pre-empt legislative standards when they invest in new ink manufacture. Interestingly no comparable legislation has forced manufacturers in the UK to make such a strident re-evaluation of their manufacturing practices and the products they make.

[2] This area of environmental consumerism and 'Green Labelling' has evolved a language and key terms which may be relevant to this thesis.

- *Life-cycle assessment - a way of determining a products environmental impact.*
- *Industrial Ecology - a way that companies can link together to gain environmental benefit from each others expertise (for example; EPA, The Design for the Environment: Printing Project)*
- *Life-Cycle Design - designing a product to minimise its environmental impact throughout its life.*
- *Cradle to Grave - a way of looking at a product over its lifetime, from design through to disposal or recycling - which is the basis of the European Eco Labelling system.*

However, the claims made by manufacturers of their products 'greenness' have quickly lost authenticity for the consumer. Elkington (1994) has suggested, given the unregulated nature of this area currently.

The technologies of waterless lithography and vegetable and soya based printing inks were generally seen to be industry specific as they have been developed out of a specific response to environmental issues (see **Ginn, 1992**). These technologies have had an impact on the printmaker (*see section 2.8.7*) by introducing possible radical departures from the practical and technical boundaries associated with traditional printmaking practices.

2.8.7 Environmental and Occupational Health & Safety Issues: Printmakers Initiatives

The following review of artists' adapted techniques, alternative material selections or substitutions draws on published material. As previously stated the nature of printmakers' practices, being didactic and evolving, often results in techniques which respond to personal working situations. This has meant information is not always accessible in a conventional published format, but quite often only exists in the printed arts works, as the artist does not usually publish in-depth analysis of their working methods. Descriptions of work contained in exhibition catalogues or by visual observations usually cannot penetrate or 'unpack' the procedural processes and selections made by others. This is an issue this research has had to address, by means of directly accessing and exchanging information through the collaborative process (*see sections 3.8.3 & 4.5.3*).

The technique of etching intaglio lines into metal using an electrolyte process, was first invented in 1839 (see **Harris 1968, 1969** & **1970**) this process has been reappraised by a number of contemporary printmakers (**Semenoff** & **Christos, 1991** and **Behr 1993, 1994** & **1995**). Their investigations are based on the possibility of eliminating strong acids when etching metal plates. The process has obvious advantages by removed the need of concentrated etching solutions (for example, nitric acid, sulphuric acid and ferric chloride) but the process also incurs a number of significant disadvantages: the speed of erosion (by electrolysis) is inversely proportional to the area exposed - so the smallest imperfection in the ground will result in significant deep 'foul bite'; the evenness of the etch relies on an even distribution of the charge across the plate which makes it difficult practically to etch large plates consistently.

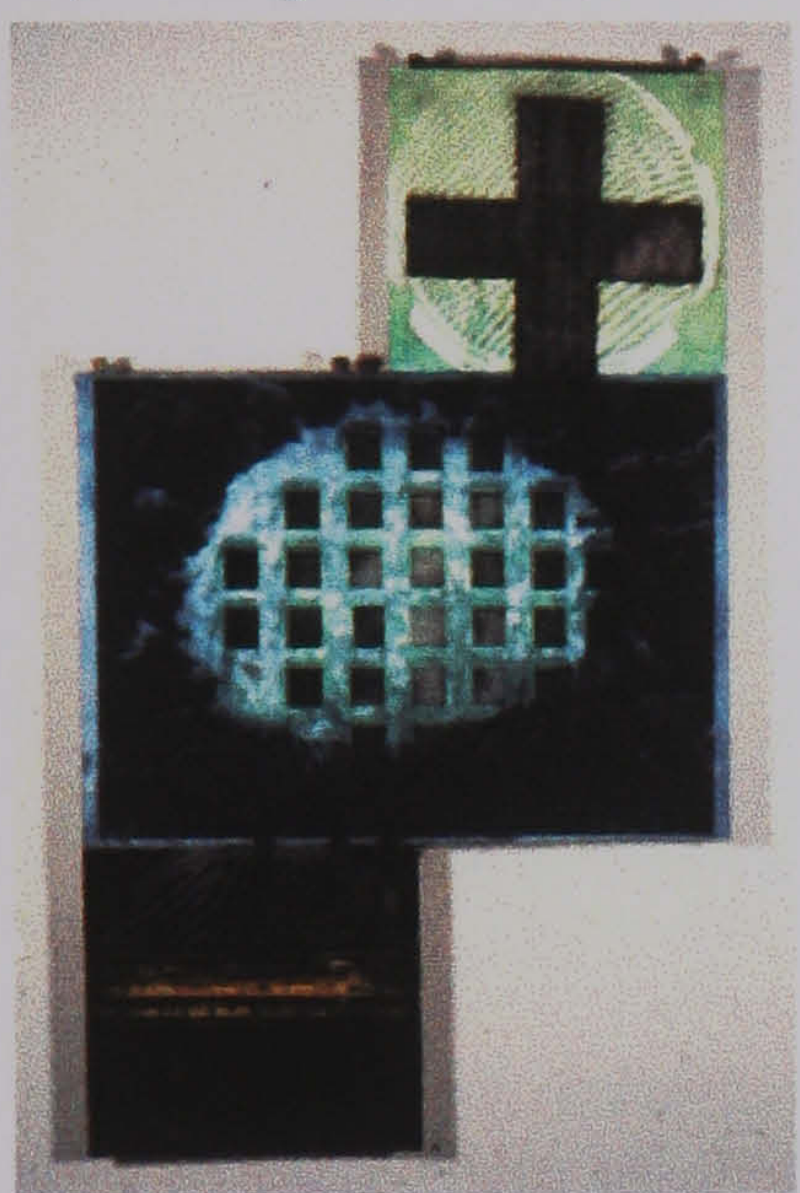
The investigation of waterless lithography (a silicon based process which has been associated with 'environmentally-friendly gains' in industry , **Graphic Arts Monthly, 1995**) as an alternative to conventional oil-water chemistry, was adopted by printmakers (**Semenoff, 1993** and **Bradly 1995**), based on the creative 'advantages' they reportedly give. The 'environmentally-friendly gains' associated with the medium in industry (the reductions in solvent emissions and water-pollution) do not readily translate to the small scale 'production' and artist derived processes described, as the techniques proposed by Semenoff and Bradly introduce a number of hazardous chemicals and VOC solvents into the workshop; however the use of pre-coated plates does seem to offer certain advantages.

A technique using a RTV[1] silicon rubber as the printing substrate, was developed by the researcher in order to print from large three dimensional intaglio printing plates[2]. The development of this technique was a response to the problems associated with printing very large and deep relief intaglio images. The resulting printing process removed all VOC substances from the inking and cleaning stages of the intaglio process. At the time this was not the rationale for this technique, only a consequence of its development. But given the remit of the research this technique does establishing a precedent for a possible radical departure from 'established' intaglio practices, leading to potentially safer and innovative working methods.

Incorporating photographic images in printmaking relies on coating the print matrix with a chemically light sensitive layer (this is a distinct category from reprographic printing, which is not within the remit of this research, for a detailed evaluation of the hazards associated with the materials used in photography and reprographic printing see **Shaw** & **Rossol, 1991**). **Young** (**1978**) identifies three forms of light sensitive coatings: diazo compounds, photo polymers and dichromate colloids. Each has been investigated by printmakers for creative advantage. Dichromate sensitised colloidal solutions have been used from as early as 1852 when **Fox Talbot** coated metal plates in order to etch a photographic image onto them (**White 1978/9**). The use of a colloidal solution has been revived by **Howard** (**1989**), however the continued use of dichromate's carries an inherent risk and has been removed from all but a very few processes in industry. Various types of pre-sensitised colloidal films are used extensively in screen printing to make photographic stencils, but these increasingly use photopolymer technology, having been identified as the least hazardous photo-stencil process (**HMSO 1988,** and **Scarpelli 1992**). Commercial photopolymer based resists Kodak Photo Resist (KPR) have been used by artists to coat etching plates[3]. More recently **Howard** (**1994**) has proposed the use of sensitised polymer films (as used in the Printed Circuit Board industry) in various intaglio and relief processes, which offer artists flexibility which previous methods did not.

[1] RTV (Room Temperature Vulcanising) is a liquid silicon rubber solution which is hardened with the addition of a catalyst. The material is used to cast intricate objects and the final cast retains a flexible form.

[2] The final cast/printed work was exhibited as part of Pengelly's MA submission at the Royal College of Art, 1989.



"Chain of Events", Pengelly (1989). A silicon rubber intaglio print, an original process developed by the artist, which does not involve VOC solvents at any stage in the printing process; in the inks or cleaning of the plate.

[3] these have been used so extensively by printmakers (Ross, Romano & Ross, 1990 and even Spandorfer, Curtiss and Snyder, 1993) it was been accepted as 'standard practice', strange when one considers that this industrial product requires scrupulous working practices and dedicated ventilation as it involves a number of very toxic VOC to coat and process a plate.

An area in which significant changes have occurred has been the move from 'oil-based' printing media to 'water-based' printing media. Most of these changes have taken place in screen printing - the importance of this area to the research project is such that it will be dealt with in its own right. These changes reflect technical advances by manufacturers influenced by legislative and market forces.

2.8.8 Water-Based Print Media: advantages and disadvantages

It has already been suggested that industry has responded to 'environmental' pressures (substantiating in practical terms the initiatives of 'legislative' demands and to a lesser extent consumer pressure) by initiating new product development (possibly generating more consumer demand and resulting in economic advantage). But printmakers' responses to 'environmental' pressures have been complicated by the inherently idiosyncratic nature of their practice and by the often unconventional applications the medium. The following review of literature from both printmakers' and manufacturers will try and establish if a more qualitative assessment of the advantages that water-based printing media offer is possible.

Within each of the main printmaking techniques - intaglio, etching, lithographic, relief and screen printing - the techniques and printing inks used have been predominately oil based. Until relatively recently (mid twentieth century) each of these processes (including screen printing[1]) relied on a limited number of substances (printing inks were simple mixtures of oil - usually reduced linseed oils - and pigment; intaglio grounds and stop-out varnishes were wax, tallow and resin based; and lithography [stone] techniques relies on gum arabic, tallow and asphaltum mixtures). The increasing diversification and sophistication of printmaking practices has been the main factor which has introduced a significant number of substances into the everyday working practices of the printmaker (**Challis** & **Roberts**, **1990** - list of over 250 substances used by printmakers, as similarly do all the manuals reviewed).

The screen printing process artists are most familiar with has had the shortest relationship with fine printmaking, the inks, stencils, solvents and printing process now used having made a direct transition from commercial practices. The industrial basis of silk-screen printing (with its patent in 1907) as a stencil process for the textile industry, cannot be separated from the development of solvent-based printing inks and related stencil materials. The practical shortcomings of water-based printing media, qualities have

[1] The historical association that stencil printing has with visual reproduction interestingly has the longest history, see for example Biegeleisen & Cohn, 1942. This water- based stencil printing used some of the earliest types of printing inks, derived from starch pastes and natural vegetable dyes, and used by the Chinese from 500 AD.

been accentuated when the medium was taken up by printmakers, see **Biegeleisen** & **Cohn** (**1942**) and **Mara** (**1979**). The particular qualities offered by screen printing (solvent-based) to the artist (multi coloured prints, multiple over printings, opacity, vibrancy and flatness of colour) are characteristics which facilitated increasingly diverse ways of working. These characteristics are now closely associated with solvent-based screen printing systems, which **Biegeleisen** & **Cohn** (**1942**), **Kosloff** (**1964**) **Kinsey** (**1967**) **Chieffo, Clifford** (**1967**) **Satt D.** & **Sacilotto D.** (**1979**), **Mara** (**1979**) and **Stephens** (**1987**) all identify with. The chronology these manuals offer of the development of screen printing as a fine art practice, reflect the practical problems rightly associated with water-based printing inks up until very recently: incompatibility between stencil medium and ink, lack of opacity, warping of the printing stock, and a short shelf life. These observations have determined attitudes towards water-based inks, which some printmakers continue to associate with the medium (*see section 4.5.2*). Therefore this review will concentrate on more contemporary attitudes and developments of artists and manufacturers.

** Generic terms which describe encompass the diversity different ink types both water-based and solvent-based. For a contemporary review of water-based screen printing as well as relief printing inks, see Pengelly, Artists Newsletter, August, 1996, which categorises the diversity of water-based screen printing ink technologies, as well as offering descriptions of their printing characteristics.*

Comparative studies by printmakers between oil* and water* based screen printing systems (**Leclaire**, **1981**; and **Johnson** & **Stinnett**, **1987**, see also Appendix: 3.8.1.2) have gone some way to dispelling the "attitudinal biases", where water-based inks have been seen as a 'hobbyists' medium. Both studies subjected the water-based prints, the production process and final printed image to a peer review process: invited artists, master printers and curators all of national reputation. **Leclaire** also used a questionnaire to identify differences in the 'learning process' between the two systems in the classroom environment. **Kreneck** (**1988**) developed "comparable" procedures and results to those he expected to achieved with oil-based inks. For Kreneck the emphasis was on getting 'controlled results', having identified that:

> *"Artists were simply allowing the medium to dictate the kind of image they were making, i.e. loose, largely unregistered images." (pp II)*

In the UK a more objective assessment of the quality of water-based systems has been attempted. The **University of the West of England** has run a number of seminars on water-based screen printing from the early 90's, and has endeavoured to establish quantitative evaluations of the different characteristics water-based inks' exhibit[2]. This prescriptive approach surprisingly makes no concession to the different circumstances and demands printmakers place on the medium, or the constant evolving and refining processes of manufactures. **Brown** (**1992**) and **Grant** (**1992**) identify advantages

[2] see *Printmaking Today, Vol. 4, Number 4, 1996.*

offered by water-based inks, again applying personal subjective criteria. The need to change in each case is in response to the introduction of health and safety legislation (COSHH in particular).

A number of other water-based media are of interest to this review. Water-based relief mono printing techniques are described in **Spandorfer, Curtiss** and **Snyder** (**1993**) which draws extensively on printmakers' own experiments with different water-based media. This was a direct response to safe practice. (Interestingly the same technique already referred to briefly in the *section 2.2.5* described by **Brown, 1992** makes no direct association with 'safe' practice, but rather it is assessed in terms of the creative 'painterly' qualities it offers the artist). This process can be traced back to the 'polytype' technique perfected by Blake (1757-1827), which is described by **Ruthven** (**1948**); the technique developed by Blake was a response to his dislike of oil painting and his intrinsic understanding of printing processes and media. The use of plant extracts (the most 'natural' pigment choice) in printing inks would seem to be the last word in 'green' printmaking. A more thorough investigation by **Shaw** (**1995**), draws on established textile colour technology to develop this possibility. A German company has produced the only commercial range of paints and coatings (including artists materials) that uses plant chemistry or *phytochemistry*. This company suggest that 'established' natural oils (linseed, orange peel, waxes and resins), confront popular perceptions that all oil-based technologies are hazardous.

A more objective evaluation of the particular characteristics and possible advantages that water-based systems offer in an industry situation, has been useful in establishing the technical specification of these inks. The following authors draws on current industrial practice to evaluate the current 'state of the art': **Charretton** (**1987**), **Smith** (**1982**), **Williams, (1991), Duennes (1992), Scarpelli (1992),** and **Joannou (1991)**; (see also Appendix: 3.8.1.2 for a more objective evaluation of the advantages and disadvantages of water-based screen printing inks used by the researcher). Certain hazards have been linked to water-based synthetic acrylic polymer and emulsion technologies, relating to the retention of certain solvents and fungicides used in these water-based inks. These risks were seen to be negligible, but do require to be mentioned. The solvent content of some water-based inks is not sufficient to require direct ventilation of VOC content, but working with these product does need ambient ventilation (**HMSO, 1988**). **Charretton's** assessment of the toxicological hazards that water-based inks and paints exhibit, links this to the presence of certain solvents and pigments[1].

[1] *See also Garabrant (1985) and Greig (1991) who identify dermatitis problems amongst workers making water-based inks and paints. However, these relate to the concentrations of hazardous substances used at the manufacturing stages, concentrations not experienced by the end user.*

2.8.9 Summary of Section: Occupational Health & Safety in Printmaking

The manufacturers of printmaking products and consumers (the printmaker) are being increasingly influenced by environmental legislation (as in all sectors of industry). This process employs two basic mechanisms of regulatory control, the first is aimed at reducing at source hazardous emissions or hazardous consequences, which has a direct impact on industrial actions (limiting waste production, emissions and water pollution). These legislative measures provide legal weight and establish boundaries by which manufacturing expediency may be assessed against manufacturing environmental efficiency. The second control mechanism engages the individual by introducing measures promoting a more health and safety conscious approach to working practices which more generally respond to concerns about global warming, ozone depletion, increasing waste and decreasing air quality, through the introduction of 'eco-labelling' and hazard labelling.

The artist printmaker in effect has to rely on this information, in order to support a personal rationale in establishing safe working methods. However, the continued use of known hazardous materials or working practices is justified by artists in two ways: first, decisions which influence the selection of a substance are based on the artists intimately linking their creative practice with a particular substance or process; second, the availability of safer alternatives was found to be limited, as the selection process was often based on narrow definitions of 'traditional' practices. This perception extended to the literature available to printmakers, which without exception contained extensive lists of substances listing their toxicological effects and relevant exposure levels. But in doing so established the premise that safe practice is a function of identifying hazardous materials, rather than linking safe practice to an opportunity to change one's practice based on creative advantage.

> *"in 1980, there literally was nothing. Now, a lot of things have come along that have given us the ability to develop water-based inks that have the promise of all the applications we couldn't do five years ago"*
>
> *(Tibbetts, in Duennnes, pp 61)*

The printmaker to a large extent is at the behest of the ink manufacturer, and their struggle to bring water-based technology for graphics applications up to a par with established solvent-based inks. To draw a comparison between commercial and artist printmakers' demands, would negate the evident struggle taking place, where printmakers' attitudes towards this changing technology are formed on the basis of subjective personal criteria and 'expected' qualities, often seen as a characteristic of the medium of screen printing, rather than of the materials used.

2.9 Summary of Literature & Contextual Review

The contextual review established three relationships which encompassed the interdisciplinary nature of this research (*see fig 2.9*). In the context of this research these relationships defined the boundaries of current practice, which this research seeks to address.

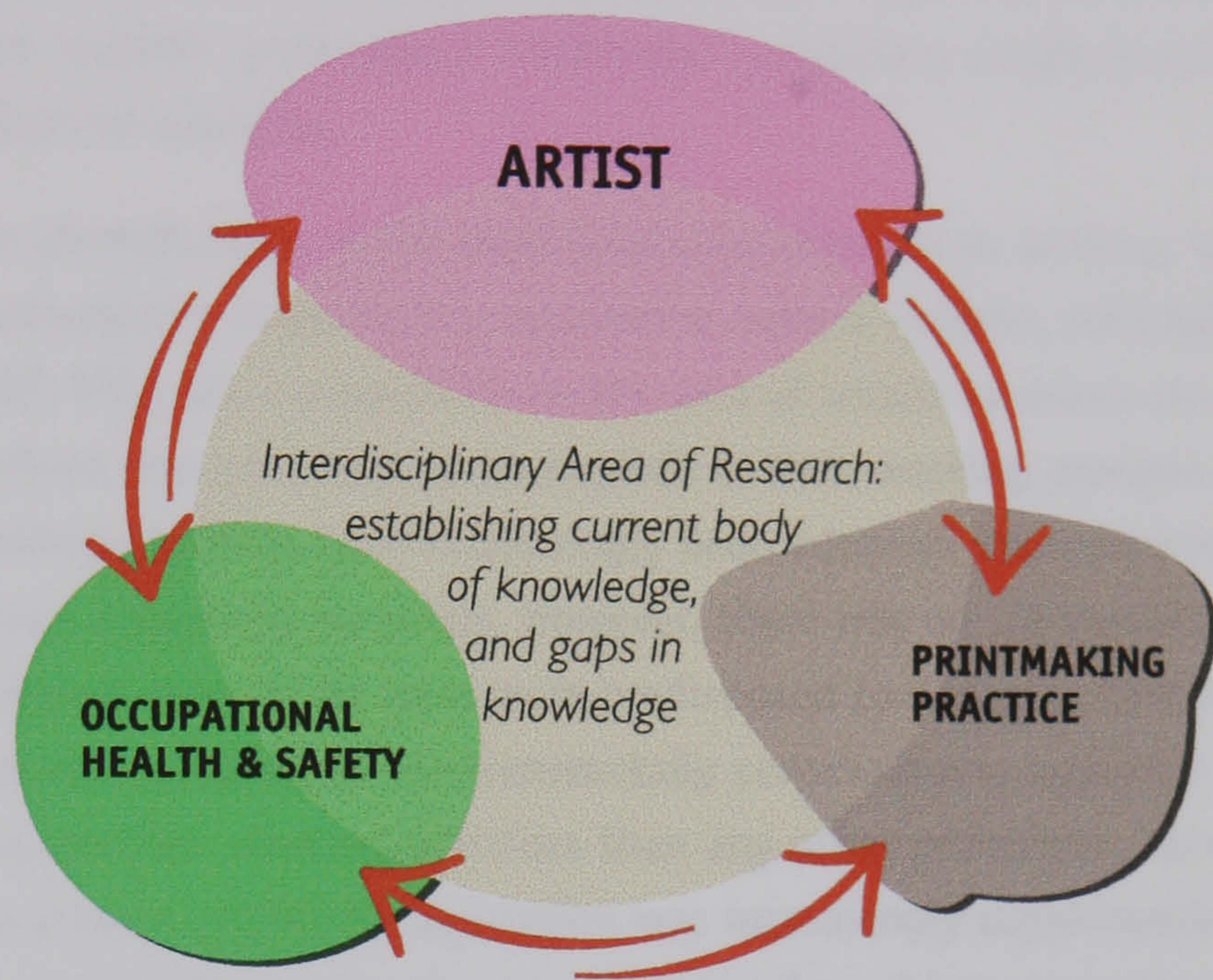


Fig 2.9 Each domain was seen to 'act' or influence all others, to a greater or lesser degree - the strength or weakness of these links between the domains demonstrated the gaps in knowledge.

The Diversity of Printmaking Practices - The contextual review identified printmaking as a changing and often innovative medium, which has developed as an intuitive relationship between artist and the printmaking media resulting in a didactic and evolving creative medium. The physical limits of printmaking have been set to a certain extent by the procedural limitations imposed by the process: scale, printing press, paper dimensions, access to resources, the types of marks one can physically print and the desired definition one accepts from that printing process. The vocabulary of printmaking practices develop in response to the physical 'limitations' of the medium; but increasingly technological advances redefined these 'perceptual boundaries' with increasingly complex and innovative media. The collaborative relationship between printer and artists, and the financial patronage of the gallery system has also played an important part in this diversification. The refinement of the medium visually, and the process of critical reflection by artists is supported by the proofing process: by physically and philosophically delineating the creative process offering a type of 'transparency' into artists working practices. The collaborative nature of printmaking practices between artist and printer has had a significant role in fostered the diversity of practices, often based on an open 'no rules' experimental approach.

The Impact of Health and Safety Issues on Practice -
Throughout the contextual review it emerged that artists were willing to accept quite extraordinary working environments or circumstances, as long as this was dictated by personal creative motives. The development of unique or unusual surfaces qualities and mark making has often necessitated the use of unconventional substances and or combinations of materials. These quite often have been borrowed from 'outside' printmakers' 'traditional' vocabulary originating from industrial practices.

The identification of the least hazardous material or working method, is adequately supported by legislative criteria (COSHH, HASAWA, CHIP, EPA) but a propensity on the part of artists to select the safest medium was not found to be implicit in their working practice. Safe working practices have increasingly been adopted when working with known hazardous materials. However, there was no substantial evidence that artists were more predisposed to adopting safe working methods or taking an environmentally consciousness approach towards their working practices than any other profession. However, the criteria offered by legislation was increasingly supplemented by a growing understanding by practitioners of good housekeeping and responsible workshop operations. Further, there was no evident to suggest that artists linked their 'established' printmaking media and materials with these non-hazardous practices. This was seen as a reflection of the individual nature of printmaking practices and the small scale of these (in relation to industrial printing for example) which has meant that neither the manufacturer or market forces could be expected to play more than a small part in developing safer 'alternatives' for the artist printmaker.

The impact that occupational health and safety legislation generally and the COSHH regulations especially, has had on these areas of practice has been central in determining the direction and content of this research. The critical issues raised by the contextual review can be summarised as follows:

- health and safety legislative criteria as a single approach can be seen as prescriptive in relation to printmakers' individual and intuitive creative practice;
- systematically adopting safe practices may introduce 'restrictive' and 'prescriptive' creative practices.

It is these issues that this research questions by means of a practice-led approach, drawing on the researchers established professional practice. This research and the adopted practice-led methodology, are seen as the basis for development of *'a framework of safe practice'* which implicitly link these previously disparate factors. The contextual review has demonstrated clearly that Health and safety issues have only recently concerned printmakers, and that mechanisms do not yet exist for the integration of safe practices at a fundamental level which are able to respond to the diversity of 'creative' practices in printmaking.

The contextual review has established the gap in knowledge namely that:

- there is as yet no common framework which links the selection of 'non-hazardous' practices with artists propensity for innovation and creative change;
- art practices are not implicitly linked to environmental concerns.

Therefore, this research attempts to address this lack of a interpretative framework, by adopting a practice-based methodology which investigates this problem from an informed perspective i.e. the researcher is a printmaker, and will use the methods of printmaking to carry out the research. This approach is more likely to be thought credible to other printmakers, than a purely theoretical or quantitative study. Whenever possible the subject of this research centres on the researcher creative practices of printmaking and the art works this practice produces. The gap in knowledge this contextual review has established, forms the basis for the proposed development of a framework of safe practice, in order that such a framework or model of safe practice might address the dual concerns this research attempts to link: the visual independence of artists creativity and the seemingly deterministic characteristic of an environmentally sensitive philosophy.

3.0 SECTION THREE: Methodology

3.1 Overview of Section

The contextual review identified that non hazardous practices and artists personal standards of 'acceptable working practice' were not linked in any structured way, to the promotion of a sustainable creative practice. This absence of any identifiable link or structure will form the basis for the methodology adopted in this research. The premise for adopting the methodology described in this section will be, that problems are solved through learning and 'problem solving', rather than through the replacement of current reality with theory. The methodology described in this section therefore, is seen as offering a means of investigating the researcher's stated aim of developing a 'framework' which integrates this. In affect the methodology offers a practical and philosophical delineation of the 'problem setting' and 'problem solving' central to the researcher's creative practice. It is from this basis that a 'model' or 'framework' might be developed which links these currently distinct areas.

Due to the practice-led nature of the project (that is research instigated in practice and carried out through practice), the researcher's primary means of generating source material has been through the visual and practical processes involved in printmaking (*see section 1.5*). The methodology adopted in this research project, and described in this section has by necessity been diverse in order that it reflect this creative practice. The methods adopted are: a critical contextual review, documenting one's own working methods by visual and text records, case studies, a questionnaire, structured interviews, qualitative and quantitative tests materials, participation in printmaking workshops, and peer review with the exhibition of the printed art works produced. These are all proposed as essential means of carrying out this research.

The diversity of methods described is seen as a necessary, yet holistic, means of contextualising the research hypothesis (*see section 1.2*). This section describes the implementation of these various methods in establishing a revaluation of the researcher's practice, and further, the impact this has had on the direction, content and diversity of the researcher's printmaking practice. The section also relates this methodology to the researcher's rationale for undertaking the research project, namely an objective practical response to hazards associated with the materials and practices accepted as 'normal' printmaking practice, prior to undertaking this research.

3.2 Rationale for Methodology: the Relationship Between Practice and Health & Safety.

The methodology adopted has been defined by the rigours of studio based 'practice-led' research (*inquiry instigated in practice and carried out through practice*). The professional working processes and practices, established prior to undertaking the research, are seen as meaningful and integral to the investigative methods employed in this research project. The researcher's experience as a printmaker and the personal visual vocabulary developed over a period of twelve years have been brought to bear on this project and are held central to the organisation of this project. In order to describe and integrate these personal and formative experiences into the project a 'holistic' approach has been adopted, which attempts to accommodate the evident diversity of that practice.

The literature / contextual review identified printmaking as an evolving medium - visually, practically and philosophically - which is constantly redefined by artists' personal and unique application of the medium at each of these levels. In order to better identify and contextualise this evolving process, three related propositions have been recognised as influential to the development and direction of the research project:

- artists' creative practices are idiosyncratic and often 'rule-less';
- printmaking evolves as techniques, materials and technology are appropriated by artists' for creative purpose;
- health & safety concerns both personal and legislative increasingly establish creative and practical boundaries within which artists work.

(see section 2.6)

Implementing an 'environmentally sensitive' approach presented apparent limitations to the researcher's practice, as this was initially seen by the researcher as a restriction on his 'established' creative practice. Further, the impact that H & S legislation (in particular the COSHH Regulations) had on these relationships has determined the boundaries within which the methodology must be contextualised. These two strands are seen by the researcher to be integral to the validity of any adopted methodology and will be described in terms of 'an internal' and 'an external' rationale (*this concept of 'internal' and 'external' rationale is developed in section 3.7.1*).

3.3 Methodology in Context

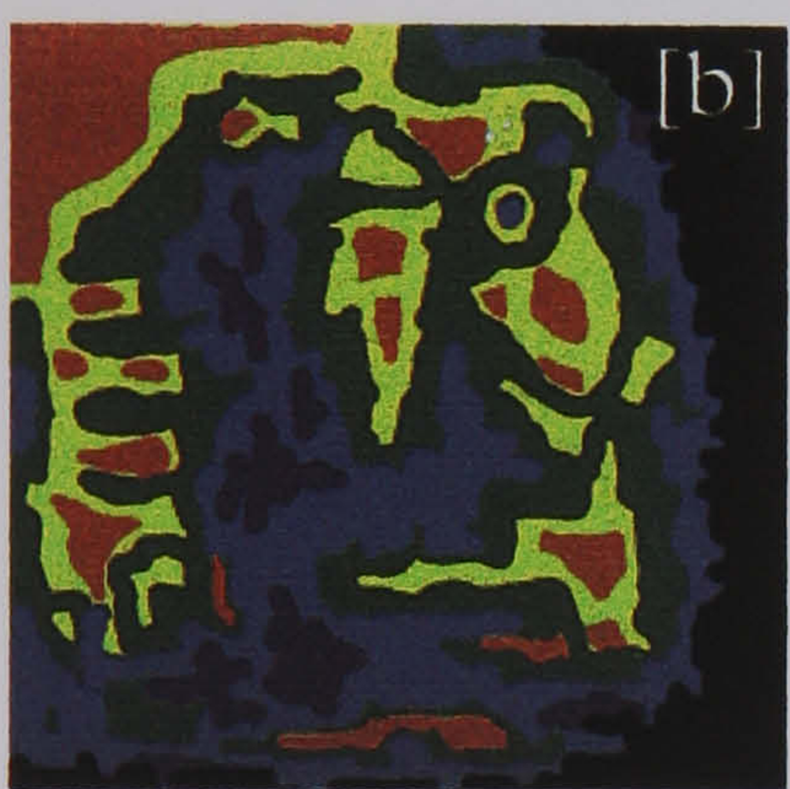
The researcher is aware of the debate surrounding the development of appropriate methodologies and rigorous research procedures within art & design (**Allison, 1988**; **Gray, 1993**). The validity of the adopted methodology to this research project has ultimately been determined by its ability to reflect and illuminate the complex nature of the objectives, which are so implicitly linked to the researcher's creative practices as a visual artist. A lengthy discussion of the validity of this type of research methodology is not felt to be within the remit of this thesis, but the researcher is aware that his adopted position does make a contribution to this debate concerning practice-led research (see also **Watson, 1992; Delday, 1996; Wheeler, 1996**). The methods adopted and the researcher's stated position in support of a practice-led methodology, has evolved by taking a position in relation to this debate. In order to make a distinction, in methodological terms between 'internal rationale' - which may be seen as subjective, and 'external rationale' - which may be seen as objective, a more detailed discussion is developed here concerning the validity of the methods adopted.

The practice-led approach adopted in this research may intimate that all the visual work produced as a consequence of this research can be considered subjective in nature, given that art work[s] are judged by the researcher to be visually 'successful' by a number of subjective criteria developed in his professional practice. These are:

- an independence of the artist / researcher's experiences in determining the subject matter of the artwork;
- the researcher's evolving knowledge base, within his printmaking practice;
- an 'open' negotiation which takes place throughout the printmaking process, based on the individual selection of subject matter, and the artists understanding and application of process.

The subjective nature of these aesthetic criteria ('internal rationale') reside in the body of professional knowledge and experience the artist/researcher has amassed over the period of his practice. The possible evaluation of the visual aesthetic qualities of the work produced offered one possible objective means of analysing the artist/researcher's practices. For example, the semantic differential techniques adopted by **Malins** (**1993**) identified apparent visual difference in the surface finish of reduction lustre glazes, with apparent aesthetic value[1]. Within the area of printmaking visual comparisons have also been made between the qualities offered by oil-based and water-based screen printing inks [**Johnson** and

[1] A pilot study carried out by the researcher to investigate differences between screen printing inks, used two identical images; the first [a] printed in solvent-based inks the second [d] in water-based screen inks.



The procedure of making two identical screen prints, which the semantic differential technique demanded, highlighted important limitations of this technique for this research. Making the 'test' prints necessitated limiting all forms of visual and practical negotiations; quality, intensity and hue of colours, print definition, ease of cleaning and type[s] of cleaning solvent used, were all ignored.

As a consequence the image was a product of this comparative procedure and the prints contained no record of the negotiation process. Further, in the experience of the researcher the 'quality' or surface finish of the prints could have been altered to afford a number of quite distinct finishes. Such comparative tests were considered as having no relevance to the objective of this research project.

Stinnett (**1987**), and **LeClaire** (**1981**)]. In both cases a peer review procedure was adopted, engaging experts - master printers, curators, gallery dealers and artist/printmakers - familiar with the 'expected' qualities of screen printed art works. Evidently this approach was based on a presupposition, that one media offers a benchmark against which the other may be judged (at the time of these comparative studies water-based screen printing inks had only recently been introduced and would be unfamiliar). Evaluations of this type, the researcher suggests, cannot take account of printmakers' intuitive working processes. The researcher suggests that any methodology which does not take account of the visual and procedural syntax that characterises the printmaking process (referred to above bullet points), cannot adequately reflect or integrate the practice-led nature of the research project.

3.4 Proposing a Naturalistic Methodology

The position taken by the researcher in relation to these issues necessitated that a holistic approach be adopted, one which is able to encompass the diversity of issues recognised to be influential to the research. This holistic approach is proposed as a means of responding to the potential conflict presented by the 'internal rationale' - which may be seen as subjective, and 'external rationale' - which may be seen as objective previously identified. The methodology adopted will therefore be determined by a number of criteria, that it should:

- be led by the researcher's creative practice and experience within fine art printmaking;
- be externally verifiable as 'environmentally sensitive', in terms of the selection of substances and processes used to carry out this practice;
- ensure all printed art work[s] be seen within a professional peer group structure of critical review, and exhibition;
- ensure that all working methods, selected materials and procedures be made transparent, in order that the working practices developed can be seen as a critique of the 'environmentally sensitive' approach (as the finished art work rarely displays or records these practical decisions).

Recognising the diversity of influences involved in this research project, it has been necessary to review issues and methodologies proposed for research into art & design. **Allison** (**1992**) identifies seven principle methodologies previously used in art and design research. These are *Historical, Philosophical, Experimental,* *Comparative, Descriptive, Naturalistic* and *Practical.* It was apparent that the research would draw on a number of these, and that it would be necessary to adapt a structure or holistic system which would reflect this complexity.

> *"The artistically oriented researcher is interested in making the particular vivid so that its qualities can be experienced and because he believes that the particular has a contribution to make to the comprehension of what is general."*
>
> *(**Eisner**, 1981, pp 7)*

The critique offered by **Eisner (1981)** identifies apparent advantages of an naturalistic 'artistic' approach (although Eisner is not making a direct reference to visual artists), compared to a scientific model (given here to mean a reductionist and Cartesian approach). **Eisner's** view does seem pertinent to the objectives of the 'artistic' holistic approach proposed in this research. A specific comparison between paradigms[1] of inquiry is not the subject of this research, but the naturalistic model is relevant in so far as it introduces the concept of epistemological issues. This can be characterised by the ability to centre problems within personal experiences, drawing on one's tacit knowledge in order to place problems within a personal reality or context. **Lincoln (1984)** suggestion that a paradigm shift has taken place in the basic beliefs which guide inquiry would seem to support this notion, which can generally be seen as moving from a positivist position to a naturalistic one, a term qualified by **Lincoln** and **Guba**, (in **Tesch, 1990**)

> *"Naturalistic inquiry is not a type of research, but a category of knowledge production, a whole paradigm. The researcher is seen as the collection instrument on which data is then filtered." (pp 250)*

Within such a naturalistic paradigm 'problems' can be described as those which reside in and result from the complexity of 'real world' situations. Naturalistic inquiry is by implication dependent on setting and is context specific. Evaluations within such a paradigm therefore should also be seen to be context specific. Terms like *Heuristic Inquiry;* (**Douglas** & **Moustakas, 1985**), *Real World* (**Robson, 1993**) and *Phenomenological Reflection* (**Tesch, 1990**) have all been used to describe an area of research which generally does not adhere to positivist empirical scientific methodology. However, there would seem to be generic characteristics evident to naturalistic methodology, namely, the researcher and subject are seen as interdependent, 'an integrative living form' **Tesch** suggests. **Douglas** and **Moustakas (1985)** propose a three-phase model in which the naturalistic inquirer might engage:

[1] Paradigm: "a basic belief system based on ontological, epistemological, and methodological assumptions" (Guba & Lincoln, in Denzin & Lincoln, 1994). Thus, any 'worldview' is ultimately centred in one's own experiences and basic beliefs, which evolve in order to encompass changing 'belief systems', as one acquires experience and knowledge.

Immersion - the exploration of the problem or theme;

Acquisition - collecting data by inference and self-analysis;

Realisation - leading to dissemination.

Unlike traditional 'positivist' methods naturalistic inquiry encourages methods that invoke or disclose insight, offering a "special kind of reflection: the one informed largely by intuition" (**Tesch, 1990**, pp 69). **Schön (1983)**, has attempted to describe the creative dialogue and negotiating process the practitioner intuitively undergoes, which Schön suggests cannot adequately be described in terms of linear hypothesis testing, associated with the positivist empirical model of 'Technical Rationality':

> *"The practitioner has an interest in transforming the situation from what it is to something he likes better. He also has an interest in understanding the situation, but it is in the service of his interests in change." (pp 147)*

Schön suggests that inquiry, based on practice or a process of 'reflection-on-practice', engages at a fundamental level the practitioner's experiences (milieu), a process which cannot be adequately described by any reductionist model based on 'Technical Rationality':

> *"in practice several kinds of experiment are mixed up together, experiment in practice is of a different order than experiment in the context of research." (pp 145)*

The 'naturalistic inquirer' or 'participant observer', attempts to formulate a response which essentially externalises personal and intuitive situations, through a process of directed reflection. In this respect the study of the individual and the process of 'reflection-on-practice' forms the basis for an important body of knowledge relevant to this research project. The case study method in the context of this research is an important means of 'naturalistic' inquiry. **Robson (1993)** identifies the case study as a strategy or stance, rather than a method in itself, which offers:

> *"an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence." (pp 5)*

The case study methodology epitomises naturalistic enquiry as it essentially takes place and draws inference from natural settings. The inquirer is usually the primary data-gatherer, working from an assumption that tacit knowledge and personal experiences will be integral to the investigation. **Yin (1994)** emphasises the holistic 'multi-method' nature of this method, but suggests it is framed by the terms and conditions within which the investigation and problem is set. The case study therefore contains or supports specific propositions which are brought to the investigation, the implication being that prior knowledge or an understanding of the 'field of practice' are important criteria to the validity of this methodology. This suggests the validity of case studies are dependent on the context in which the evidence is gathered and the analysis of that evidence takes place[1].

[1] *The researcher has positively sought to place his research within this context, having engaged at a personal and professional level, in collaboration and case studies which, the researcher suggests, reflect the subject specific nature of this research (see section 3.8.3).*

The relationship between investigator and subject has an important influence on the validity of any case study, which intimates strengths (based on objectivity) or weaknesses (based on subjectivity) inherent in this method, a point made by **Walker (1995)**. As each case will be situation specific, objectivity normally associated with distance and an unbiased observation would seem to run counter to the involvement necessary in the case study methodology. A case study can only be judged successful and objective, if it is based on a rigorous and contemporaneous 'chain of evidence' which forms the basis of the objectivity sought (**Yin, 1994**). For **Wallace (1989)** objectivity is achieved by seeing the investigator's role as having both a 'phenomenological' and 'critical' function in relation to the subject. The resulting dialogue or closeness between subject and investigator can be based on a mutual involvement in the subject area; this presupposes subjectivity or weakness will be negated as a result. The case study model proposed by **Gruber (1989)** and **Wallace (1989)** is an attempt to refine the case study protocol. They propose a specific case study methodology appropriate for studying 'creative individuals' in order to:

> *"focus attention on the way the creative person is organised as a unique system for recognising, embracing, and doing the new job in hand. To see and understand this system requires neither fragmentary measurement nor ineffectual mystification, but patient attention to each unique creative person at work."*
>
> *(**Gruber**, 1989, pp 3)*

Gruber & Wallace develop the concept of a 'network of enterprise' to describe the complex and often indeterminate processes that inspire an individual *"By enterprise, we mean a set of goal directed projects and tasks that endure over time"* (**Wallace**, pp 39). **Gruber** and **Wallace** have developed this hypothesis based on a proposition, (profoundly obvious when seen from the view point of an artist) that creativity is 'purposeful' and often agenda-based. The boundaries and sources which define their system or 'network of enterprise' protocols are:

- relevant work enterprises
- work as a whole (oeuvre)
- professional milieu
- family, personal life and social-historical period.

Refining the case study methodology into a specific procedure for studying the creative individual, **Gruber** and **Davis (1993)** have recognised the complexity of sources on which an individual draws:

> *"The investigator doing a case study is interested in another range of private experiences. He or she studies not only the published or finished works but the struggles to produce them...the aim is always to understand more about how the creative work evolved."*
>
> *(**Wallace**, pp 34)*

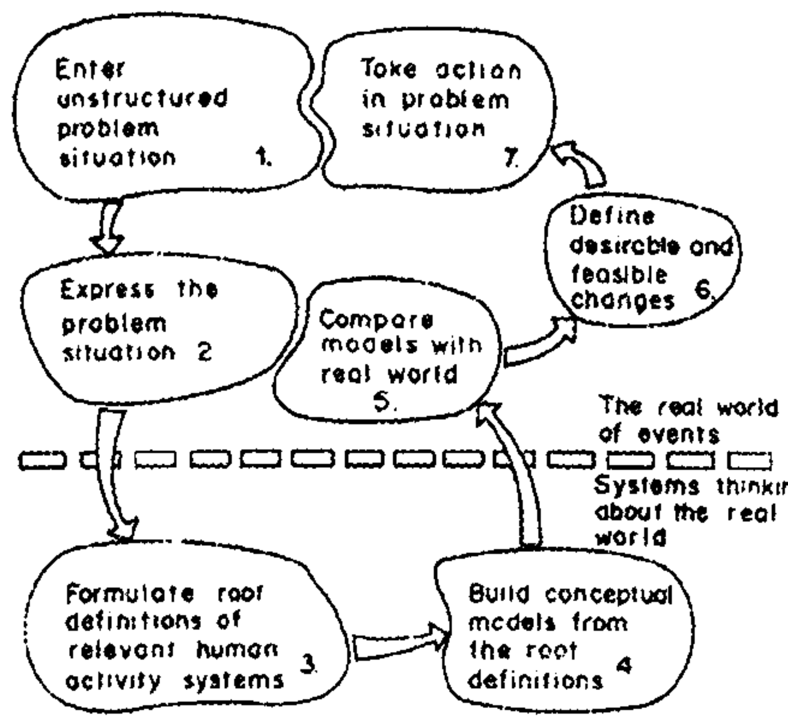
This refinement by Gruber & Wallace has been possible given the strategic decision to study extreme cases (undeniably creative individuals) with the express wish of working towards a theory of that individual. A hypothesis which Gruber proposes based on the concept that a 'network of enterprise' offers an adequate description of the evident complexity of the 'creative' process.

The studio based and 'practice-led' basis of this research recognises the importance of the artists' oeuvre prior to undertaking this research, the researchers' professional practice and experience, and the integral role these play in establishing the basis of this proposed practice-led approach. Therefore any adopted methods need to reflect the tacit basis on which this research draws. The case study methodology and the notion of system or 'network of enterprise' Gruber & Wallace propose, are felt to be central to this research which will be developed in the next section 3.5.

3.5 Proposing a Holistic 'System' View of Practice

Identifying the effect that a systematically 'environmentally sensitive' approach will have on the researcher's practice, will be an important outcome of this research. The contextual review established that printmaking practices are the result of a sequential, but non-linear series of evolving choices made by the individual printmaker. Therefore, any description of that process must be able to account for, not only those procedural stages and the artist's creative milieu, but also the external health & safety factors which result from any systematically 'environmentally sensitive' approach. The following investigation of general systems thinking is proposed as a means of further visualising in a holistic way 'internal' and 'external' influences as they impact on the researcher's practice. The relevance

Achieving 'Desirable and Feasible' Change



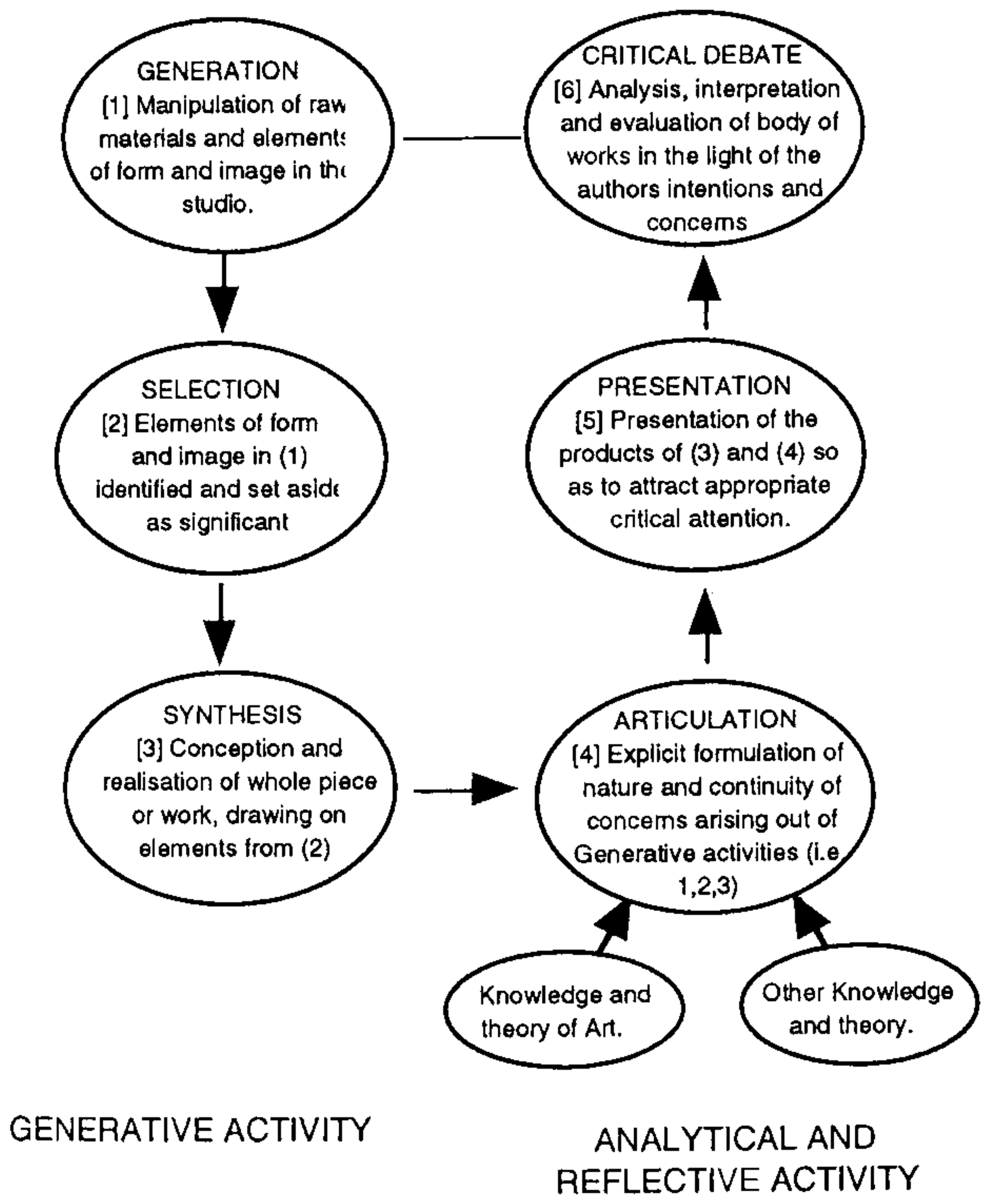
Soft systems methodology as a learning system.

[1] Checkland, 1985, systems model. A detailed discussion of systems thinking is not within the remit of this section, but the concept of visualising complex relationships and consequential actions does possibly offer a valuable device for externalising alternative actions and choices adopted by the researcher (for a description of systems within the context of 'real world' creative practice - graphic design - see Delday, 1996)

of the systems model to this research directly relates to the procedural nature of printmaking practices, which the researcher suggests can adequately be described in universal functional terms. But, the application and manipulation of this same medium is also defined by individual artists oeuvre, which is much more difficult to identify. Systems thinking [1] establishes that problems are solved through the learning process, rather than through any replacement of current reality with abstract theory.

> *"Problems are endemic in human affairs, they cannot be solved once-and-for-all, and call for a 'problem' and 'process-oriented', rather than technique-oriented approach."*
>
> *(pp 27, **Checkland**, 1988)*

Checkland here would seem to identify with the 'creative' or 'reflection-on-practice' approach proposed by **Schön**. In this regard similarities are evident between system thinking and the shift towards more 'naturalist' phenomenological approaches which are relevant to this research (*see section 3.4*), as the emphasis is on the visual representation of complex relationships and problems.



[2] This cyclical system map proposed by Cornock offers one possible fine art methodology, which interestingly engages all the methodological approaches Allison has identified as applicable to art and design research. Of most interest to this research has been the separation of 'procedure' from 'analysis and reflection' within this system model.

Criksyzentmihalyi (1988) has adopted a systems view of creativity, in order to assimilate the evident diversity of influences that previous, quantitative approaches had ignored, or had been unable to respond to adequately. **Feldman (1988)** elaborates on this concept suggesting that creativity operates on many level simultaneously. Feldman's and Criksyzentmihalyi's ideas, the researcher suggests, offer the closest description of the complexity of influences, which the researcher recognises. This system model recognises that creativity operates simultaneously at many levels: personal, discipline based and at a more ubiquitous cultural level.

In his study of fine art students' working methods **Cornock (1983)** has gone as far as to suggest that artist's working methods may be interpreted in purely systems methodology [2]. Cornock identified with systems thinking [principally those ideas proposed by Checkland] the possibility of deriving general principles or a generic language to describe more individual practices universally. In doing so Cornock has proposed that fine art practices, has a distinct methodology of their own. The model proposed is cyclical, moving from *generation*, to *selection*, to *synthesis*, and finally to *presentation* and *critical discussion (see diagram opposite)*. This cyclical process Cornock suggests is further conditioned by universal knowledge forms; theory of art, initiative experiences and environmental variables. These have been described as 'organisationally static art systems' and 'organisationally dynamic art systems' the latter being associated with art works which involve environmental (physical) influences - kinetic and site specific sculpture where:.

> *"The art work includes within its system-property description a part of the physical environment, an artefact which varies as the environmental variable(s) chosen vary".* *(**Cornock** pp 418)*

The art work in this 'system' description by Cornock identifies the specific interaction between artist (personal milieu), and 'environmental' or 'physical' variables (external criteria). Cornock develops this idea to specifically describe kinetic and physically interactive art works[1].

[1] See for example Klüver's (1991) description of Rauschenberg's audience-interactive sculptures 'Oracle, Soundings and Solstice", or Watson's (1992) investigation of of both physical and chance considerations artist actively foster in their work; each offer a detailed investigation of the physical and environmental variables in artists' work.

The researcher generally identifies with these authors in their attempts to articulate the evident complexity of the creative processes by its visualisation as a system concept or model. These various system models by **Cornock**, **Gruber** (case study protocol), **Criksyzentmihalyi** and **Feldman** have gone some way towards encompassing the 'diversity of practice' associated with printmakers' working methods, recognised in the contextual review. Thinking about printmaking practice in these terms has been an important process for the researcher, as the systems concepts adopted here have offered a means of visualising the complex interactions that evidently take place between artist, creative practice and field of practice. This notion of system, and the visual means by which relationships may be seen has helped integrated the larger cultural and environmental objectives that this research addresses with the evident creative independence of the artist.

The limitations of a literature-based review, was evident in its inability to reflect the diversity and spectrum of contemporary printmaking practices (*see section 2.2.7*). The diversity of contemporary practices are the result of personal experience and tacit knowledge which are often not recorded or written down (but never the less are in the public domain and open to peer-review). This characteristic of practice based problem solving, or 'expert' knowledge, derives from a fundamental principle that creative artists' evolve personal solutions in response to cultural and environmental criteria. This supposition, the researcher suggests, is described well by the open and evolving methodology described by **Schön (1993)** as 'reflection-on-action', 'net work of enterprise' by **Gruber** & **Wallace (1989)** or 'Soft Systems methodology' **Checkland (1988)**. This research has pre-empted the artist/researcher's to fundamentally question his 'established' practice and all prior 'expert' knowledge, by systematically adopting nonhazardous working methods. Therefore prior experience and previously established boundaries of 'acceptable practice' have been challenged by this process. This fundamentally describes the conflict imposed by the artist/researcher's objectives. The idea of a model based on the system concept, or a 'framework' within which safe practice can be related to prior practice and ones' personal knowledge base, is advanced as a response to this possible conflict.

Faced with a problem situation, there is a tendency to work within known parameters and to apply known methods, which inevitably draw on past experiences. In order to maintain an open and unbiased approach, which will not be limited by prior learnt procedures or by established practices, a systematic re-evaluation of every aspect of the researcher's printmaking practice needed to be instigated (*see section 1.3*). It quickly became evident how important integrating cause and affect characteristics particular to the printmaking medium would be to any proposed system or framework (given that the smallest selection[s] or alternative selection[s] of material and procedure influences the visual synthesis of the work). The importance of this generative relationship which links the visual and practical solutions one develops, the researcher suggests, is directly related to the unique procedural nature of the printmaking medium [1]. The contextual review has endeavoured to describe this selection procedure as an integrated [practical and visual] language, which is specific to the medium.

[1] Cornock's system model has gone some way towards involving these procedural decisions. But this model is unable to support the generative - visual practical - relationship at a micro level, which the researcher suggests is so fundamental to the printmaking medium.

The artist printer **SW Hayter** was most notably concerned with the articulation of this process (from the artist's perspective), based on his life long collaborative workshop teaching which fundamentally linked idea with technique. Hayter discusses gravure here, but universal connotations are apparent, suggesting that the visual language of aesthetic, in which technique is subordinate to the idea, will never adequately be able to describe artists' relationship with the medium:

> *"The mutation of design to a point where, at these fluid moments in the elaboration of a work, points as I have suggested which may be considered as more creative perhaps than the inception, that an enormous field of possible action shall be open rather than few directions or even one inevitable course."*
>
> *(**Hayter, 1949**, pp 44)*

The physical impact of process for Hayter is as important as the narrative invoked through cultural reference or artists own 'creative' oeuvres. A description of visual grammar which does not engage the artist's manual and procedural manipulation of the medium (which are often not evident in the final work) will be profoundly limited. The holistic systems approach proposed in this section, is seen as means of engaging all the procedural decisions which go some way to describe the printmaking medium. The delineation of these as a series of sequential stages, the researcher suggests, can be described as language, one which evolves as a consequence of the manual and visual integration which the artist engages: a language which operates at a very basic functional level, but describes the sophisticated procedural and visual syntax which each artist establishes.

A philosophical discussion of the plausibility of a universal visual language in the arts, is not proposed here. What is proposed is the concept of establishing a 'system' or 'framework' which encompasses the cyclical nature and diversity of practical processes, pertinent to the objectives of this research. The development of a 'framework of safe practice' will have to engage this concept of a personal [visual and practical] language.

3.6 Summary of Overview

The overview has described the rationale which determined the epistemological criteria applied to the selection of methodology. A brief review of relevant research approaches has been presented; these authors describe research strategies and methods relevant to this project (case study, practice-led, reflection-on-practice, participant observer, and systems methods). This has been important in recognising the determinate, but nonspecific, influence that H & S legislation and an 'environmentally sensitive' approach may have on the researcher's creative practices. The concept of a 'system' model within which the researcher's practice takes place, has offered a means of distinguishing between 'internal' and 'external' rationale.

A more appropriate definition of system has been proposed, given that the research does not attempt to establish universal prescriptive boundaries within which all printmaking practice takes place. The environment or system for the purposes of this research, is specific; it contains everything that is influential to the artist/researcher's creative practice, which includes the influence of health and safety legislation and that of an 'environmentally sensitive' approach when implicitly linked in this way to individual practice. This system concept has been influential in determining the boundaries and criteria by which the proposed 'Framework of Safe Printmaking Practice' might be developed.

3.7 Specific Methods Adopted

3.7.1 Introduction

The aim of this research has been to explore through the practice of printmaking - the production and exhibition of a body of printed art work - the potential impact an 'environmentally sensitive' approach may have on the researcher's creative practice and visual vocabulary.

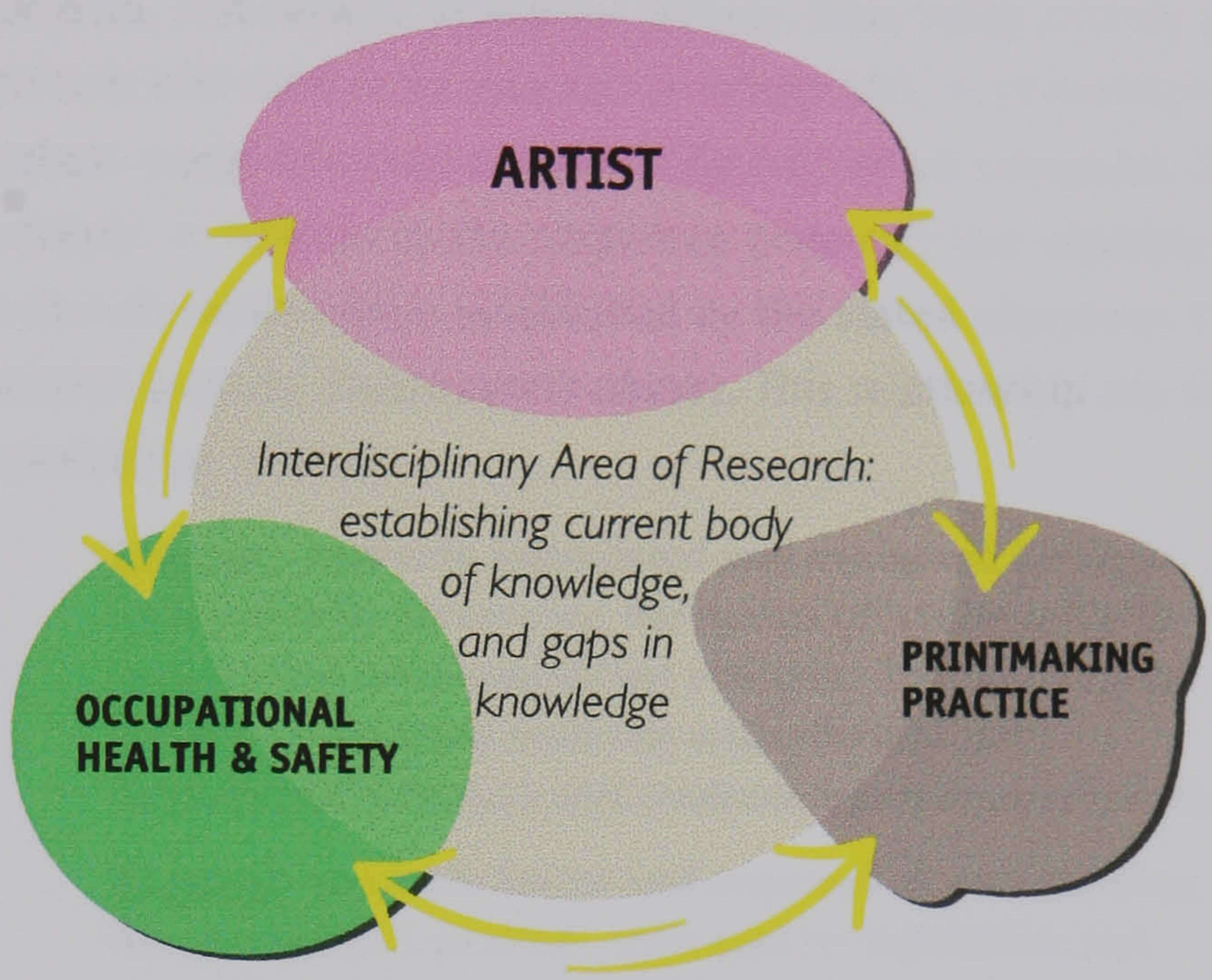


Fig 3.1 The interdisciplinary relationships established in section 2 are linked to specific methods in this section. This multiple method approach the researcher has adopted is a reflection of the indeterminate yet evolving nature of this practice-led research (see fig 3.2).

This has necessitated defining boundaries within which this research takes place, given that the researcher's role as 'participant - observer' extends the artist's usual role of 'independent' practitioner. This has resulted in the need to adopt a multiple-method phenomenological approach, in order to encompass the research objectives, namely that the research should:

- be practice-led, based on the researcher's creative printmaking practice;
- result in printed art works that are evaluated within a professional peer group structure of critical review, and exhibition;
- that this work will be externally verifiable as 'environmentally sensitive';
- that this practice will utilise working methods and develop procedures which can be see as a critique of the 'environmentally sensitive' approach proposed.

The adopted methodology must therefore been shown to reflect both personal and legislative agendas. It has already been shown that personal priorities, established by individual artists, tends to raise personal criterion. It has also been shown that creative practices rarely draw on *internal* and *external* criteria when individuals make decisions (the contextual review identified the low priority health & safety issues currently hold for the majority of artists). Therefore if a 'systematically environmentally sensitive' approach is to be developed, which responds implicitly to both individuals working practices, and current legislative criteria, then many sources and methods will need to be adopted to reflect this. A chronological 'system' model has been proposed (*fig 3.2*) which integrates these methods, in relation to the subjective (internal) and objective (external) relationships established by the stated objectives this research pursues (*bullet points above*). This relationship can be described as follows:

> <u>Internal</u> - methods assimilated and evaluated through own practice: developing the means of 'systematically questioning own established practice'. The resulting art works and adopted methods will critically test 'established' practices and promote innovative solutions;
>
> <u>External</u> - methods learnt and acquired: contextualising the researcher's practice, informed by legislative and environmental concerns which were originally considered to be outside the researcher's practice.

The system model represents two important elements which the practice-led methodology has had to address:

• first' to make a distinction between methods brought to the research project: *methods assimilated and evaluated through the researcher's practice* (e.g. own professional practice, exhibition of art works, and the exchange of professional practice through practice-led workshops), and those which have been used to contextualise the objectives of the research: *methods externally learnt and acquired as a direct result of the research* (e.g. questionnaire, collaborative case studies, structured interviews and the physical tests of materials and substances).

Chronology of Adopted Methods Relating to Research Domains

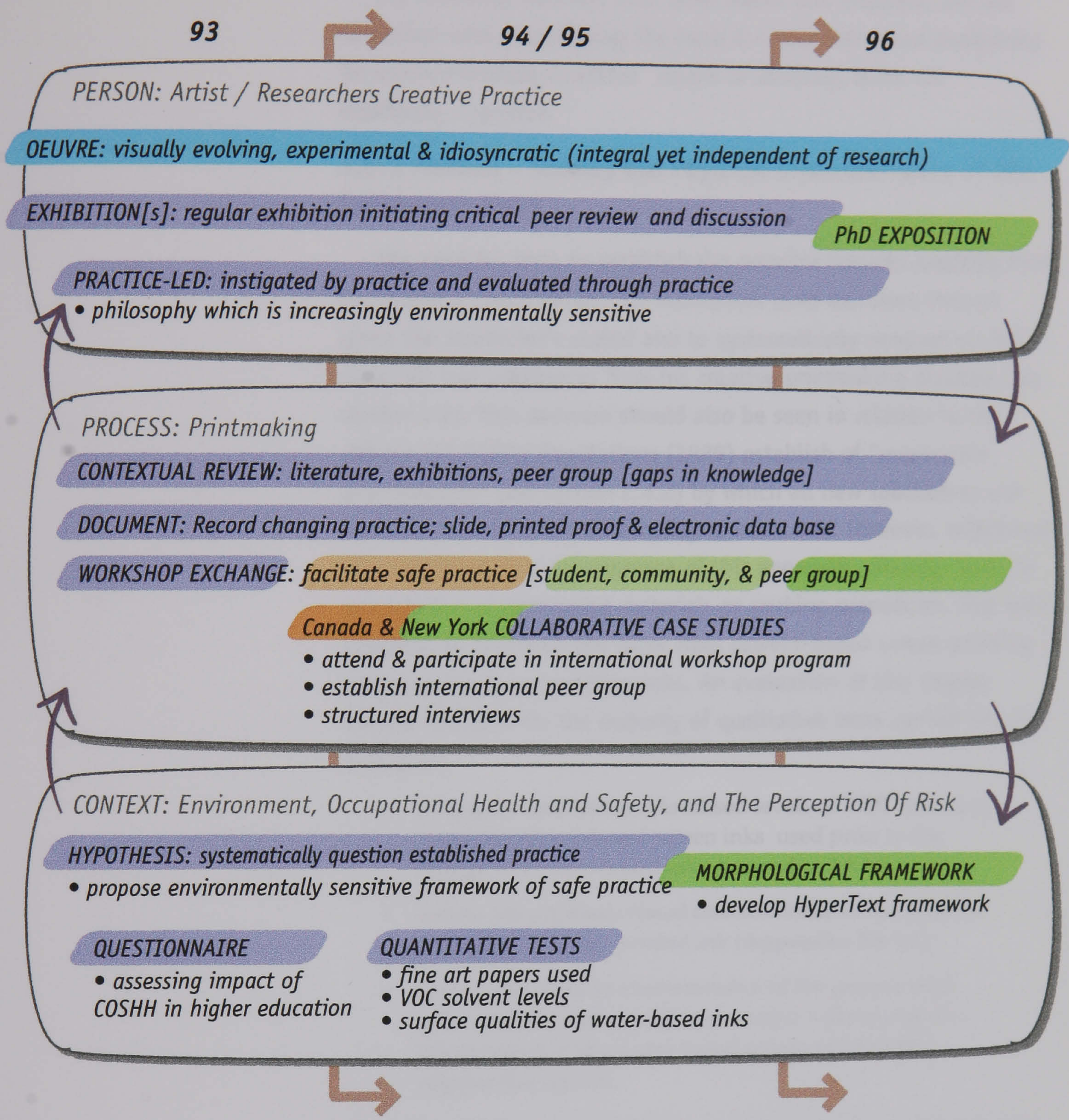


Fig 3.2 Simultaneous relationships between adopted methods which reflections the indeterminate yet evolving nature of this research (established in section 2). The individual methods adopted are seen as interdependent, in order to reflect the practice-led methodology of the researcher.

• second, the independent yet simultaneous and interdisciplinary nature of all these methods, which has necessitated a holistic 'systems' approach in an attempt to describe the indeterminate practice-led process, that the research has adopted.

3.8 Methods Externally Learnt and Acquired

The following methods have been learnt and acquired, and are concerned with establishing the basis for integrating and evaluating 'an environmentally sensitive' means of working; these are essentially objective.

3.8.1 Method - Testing the Physical Characteristics of the Substances Used

The need for tests to establish the possible hazards resulting from the physical characteristics of substances used has been limited, given the researcher's stated aim to systematically removed all VOC materials and substances from his creative printmaking practice (*see section 1.2*). This decision should also be seen in relation to the criteria the COSHH Regulations (1989) establish of "reasonable practicability" (*see section 2.4.2*) by which all new substances and working procedures are continually re-evaluated. However, withdrawal of a substance as a consequence of this approach naturally leads to substitution of alternative materials or working procedures. One such substitution has been the move from solvent-based screen printing inks to water-based printing inks. An evaluation of this change formed the basis for the majority of qualitative tests carried out, for example:

- testing the ambient and localised levels of VOC resulting from the solvent-based screen inks used prior to the change to a water-based ink (**Appendix: 3.8.1.1**);
- testing the physical/visual characteristics of the adopted water-based screen printed ink (**Appendix: 3.8.1.2**);
- testing the physical characteristics of the papers used, given that the paper used was a major influence on the performance of the water-based screen printed ink (**Appendix: 3.8.1.3**).

These descriptions are detailed in appendices as the researcher felt reporting the physical processes of testing, although interesting, did not have a direct impact on the objectives of this research, as previously stated (*see section 3.3*). The results and observations however, will be referred to in the analysis (see Section 4 and also Section 6).

3.8.2 Method - Questionnaire

In order to gauge the effect that more rigorous health and safety legislation (COSHH Regulations in particular) was having on the execution of printmaking practices, a questionnaire was developed to determine the extent of this impact, if any. Through discussions with colleagues and printmaking lecturing staff at the researcher's institution, together with the researcher's own experience of having made prints in a number of different working environments, it was decided to limit the survey to higher education institutions. (A copy of the questionnaire proforma is contained in the Appendix: 3.8.2.1.) The questionnaire was limited to higher education institutions in order that a more exacting response would result (given the diverse approaches and levels of accomplishment found within the whole spectrum of printmaking practice). This was felt to be of more direct relevance to the objectives of the project, as the questionnaire offered a means of identifying within this area the potential impact (positive or negative) that the implementation of the COSHH Regulations might have on the utilisation and instruction of printmaking practice.

A formulaic approach which might provide quantitative responses (**Chesson, 1993**) was not felt to be appropriate for the purposes of this questionnaire. **Robson** (**1993**) suggests that the questionnaire can be used as a 'passive' tool in order to seek, analyse or explore aspects of the 'real' world. As the whole subject group had been identified, similar subject experiences and possible vernacular use of subject specific language could be expected between researcher and subject group. An informal, open, but subject specific type of question was adopted given that this would yield more response than multiple choice or polar opposing YES/NO questions. It was expected an 'open' approach would generate the most relevant and honest responses, which engaged personal 'expert' responses.

Using **The Course Guide** (**1993**) and **Individual University & College course perspectives** (**1992-93**), a list of undergraduate and postgraduate fine art printmaking courses offering more than one of the four main printmaking media was identified. A final list of institutions was drawn up (Appendix: 3.8.2.2). This data was supplemented by telephone enquiries to identify individuals within those institutions who had direct responsibility for delivering the course structure or purchasing the materials used (lecturing staff, studio demonstrators or technicians). The questionnaire was sent to a total of 59 colleges in the UK from which 48% of colleges responded (see analysis and Appendix: 3.8.2.3 for the detailed records of responses).

3.8.3 Method - Case Study Methodology as a Collaborative Relationship

The case study methodology adopted in this research is seen as a means of contextualising individual[s] creative practices (visual and practical) and the environmental boundaries within which their practice takes place (legislative and personal, local or global environmental considerations). General considerations which define natualistic enquiry and the case study methodology have been discussed previously (*see sections 3.4 & 3.5*). However in the context of this research a further discussion of these particular issues is felt to be necessary.

The primary source of information from which the case study draws is narrative, arrived at through purposeful, directed and informed discussions, between interested individuals. **Wallace's (1989)** suggests *"...it goes beyond the narrative, it tells a story but with commitment of working towards a theory of creativity."* This theory of creativity, thus centres on individual[s] particular environment or circumstances, which frames their work:

> *"The case study reflects a respect for the whole person and a respectful interest in the multiple contexts of the subjects thought and work. 'Wholeness' is here considered an ideal."*
>
> *(**Gruber, 1989**, pp 29)*

This proposition is an important consideration for the researcher, given that the narrative evolved as a consequence of this research and has resulted in 'mutual expert' processes that are unique to printmaking. The case study or more accurately 'collaborative process' has illustrated the importance of this unique situation. The collaborative process is an expression of this 'mutual' interaction which takes place at a number of levels, the result of visual, practical, vernacular and 'expert' narrative.

The contextual review established that within printmaking a unique relationship exists between printer as *facilitator* and artist as *originator*, which is pertinent to the objectives of the research. The importance of this relationship at all levels of printmaking practice cannot be underestimated. The collaborative workshop process brings together the practical 'expert' knowledge base of peer group within the field of practice; the process is the result of the practical knowledge each brings. This has been a process the researcher has positively pursued in this practice-led research.

Further, the collaborative projects undertaken have been initiated independently by the researcher, and are a particular response to the objectives of this research project. The undertaking to extend his practice (*see objectives section 1.3*) has resulted in the researcher identifying and engaging within an international peer group, who are directly involved in the investigation of 'alternative' or 'environmentally sensitive approaches' to printmaking practice. The collaborative process has offered a means of externalising the researcher's objectives within this international context [1].

[1] *For the researcher this collaborative process offers a more valid environment in which to engage ones peers than conventional conference and paper submissions, based on the proposition that this collaborative relationship is particular to printmaking.*

The researcher established two collaborative projects in the course of this research (*see also interviews section 3.8.4*). The first was with Keith Howard, at the first international workshop of *'Safe Etching and Photo Etching Techniques'* Alberta, Canada (1993). The second was with the master printer Ronni Henning at her screen printing studio in New York (1994). (Detailed records of these collaborations are contained in **Appendix: 3.8.3.1** & **Appendix: 3.8.3.2**, on enclosed CD ROM).

3.8.4 Method - Structured Interviews

The following discussion of structured interview methods should be seen in the context of being a constituent part of the more general collaborative case study methodology described in section 3.8.3. The basis for a structured interview may range from the 'conversation with purpose' as **Robson (1993)** advocates, to a more 'focused' style [**Yin (1994)**, **Kvale (1983)** and **Zeisel (1989)**]. But a common element in each of these interview protocols is the 'theme-oriented' nature of the 'research interview'. In this respect, the qualitative interview protocol is aimed at illuminating nuances which importantly describe aspects of an individuals 'life-world'. The protocol proposed by Kvale aims to induce objectivity to an essentially qualitative but 'structured conversation' situation, where:

> *"...precision in description and stringency in meaning and interpretation in qualitative interviews corresponds to exactness in quantitative measurements." (pp 175)*

In each of these protocols ubiquitous qualities are evident: objectivity [informed by prior-knowledge of subject area], openness [maintained by adopting a flexible interpretation of the 'interview guide';] and sensitivity [drawing on inter-relational personal skills, being open to responses as they develop in the course of the interview]. These qualities informed the researcher's subsequent interviews and formed the basis for the discussions described in section 3.8.3 and related appendices. Importantly, in each of the collaborative 'cases' the 'structured' discussions took place after having completed the collaborative printmaking projects. The records of these 'informed' discussions (full transcripts are contained in ***Appendix: 3.8.4.1, Appendix: 3.8.4.2*** & ***Appendix: 3.8.4.3***) as a result, should be seen as an extension of the collaborative process, given that the discussion reflected the particular 'expert' and collaborative experiences of both the collaborating printmaker and the researcher. The description of each 'case' and the means by which each was developed reflects the ethos of the 'collaborative printmaking' process (*see section 2.2.2*). The individual nature of each 'collaboration', determined that no universal description of this relationship was possible. However, the boundaries within which these 'collaborative practice-led' projects took place can be, as **Yin** (**1994**) suggests, identified by the characteristics which determine that a complete case is presented - *"one in which the boundaries of the case, that is the distinction between the phenomenon being studied and its context, are given explicit attention".*

3.8.5 Method - Workshop (facilitating 'safe practice')

Throughout the period of the research, the researcher was actively engaged in exchanging professional practice and facilitating practical results of the research by means of the workshop forum in order to introduce 'safe practice' at a number of levels. These have taken place with printmaking undergraduate students and lecturing staff at Gray's School of Art, The Robert Gordon University; adult & community education art class run by Aberdeen City Council; and workshops at Art Colleges throughout the UK.

3.9 Methods Internally Assimilated and Evaluated Through Practice

The following methods are concerned with the process of making prints which are 'environmentally sensitive', which critically test 'established' practices and cultivate innovative solutions. They are essentially subjective methods which are personally assimilated and evaluated through practice.

3.9.1 Method - Defining Own Printmaking Practice as Experimental and Innovative

An exploration of practice-led methodology, as a multiple-method holistic approach, has been previously developed (see section 3.3). However, it would be useful to qualify this description in relation to the rationale now applied in this discussion. This section will describe the researcher's practice in these terms: the principle of this practice-led methodology is the fundamental contribution that the artist / researcher's continued visual practice makes - therefore all methodological concepts evolve from this principle. The basis of this proposition has been previously stated (*see sections 1.1.1, 1.1.2 & 1.1.3*). It would be pertinent to recap on a number of key issues that relate to the nature of that practice, which has been a preeminent component in determining the methodology adopted.

The researcher's previous working methods have been described as experimental and innovative; the basis of this statement is framed in an empathy or relationship the researcher has with the media and materials used in his practice. The creative advantage for the artist is in the result of a series of evolving decisions: deliberate or fortuitous. Printmaking for the artist / researcher is a philosophical description of this evolving relationship between these materials their manipulation for creative advantage, and an intellectual response to subject matter. The medium of print, the researcher suggests, can no longer be described in singular terms defined by specific or as combinations of media[1]. Categories which were once sufficient to describe printmaking processes (etching, screen print, lithography, relief or more recently electronic media) are increasingly inadequate to describe the diversity of techniques accepted and amalgamated by the artist. Specific descriptions are increasing irrelevant as a means of classification. The researcher / artist sees this as an integral creative process, which forms the basis for contemporary precedents of innovation and change, which John Hillard articulates when talking about a series of large digital but monoprinted images:

[1] A survey of the prints exhibited at the Bradford International Print Biennial between 1978 and 95 (catalogues of exhibitions) illustrates the increasingly elaborate but open 'multiple-method' nature of the printmaking medium (see also Castleman, 1991; Cohen, 1985; Brown, 1992)

A proposed draft for a BSI classification of prints by Winkelman (1995), has attempted to address the apparent gap between classification of printmaking processes for gallery, exhibition and curatorial purposes, and the 'free form' manipulation of the medium by printmakers. This proposed classification is an attempt to keep up with artists' constant redefinition and controversial application of the medium.

"In discussing (and demonstrating) issues that are in part historically recurrent, in part rooted in late-Twentieth-Century experience, it seems fitting to be able to use the trappings of both - to take the soft, traditional substances of canvas or watercolour paper, and adorn them with scanned and digitized images from Ektachrome film."

*(**John Hilliard**, pp 112)*

The visual work generated in the course of this research can consequently be seen as the result of both idea [visual - aesthetic] and technique [process - aesthetic]. The subjective nature of the researcher's aesthetic decision processes, and the dialogue or syntax referred to above, have determined to a large degree the physical and visual qualities inherent of the final printed art works.

A consistent theme in the researcher's printmaking work has been the large scale of the work produced [*'ICI'* (1985), *'Human Disfigurement'* (1989) refer to section 1.1.2]. The researcher suggests this had previously acted as a means of redefining visually and physically the boundaries within which the artist's practice took place. This 'method' has been used as a critical element when adopting the 'environmentally sensitive' approach (systematically selecting nonhazardous materials and processes), in order to investigate the possible practical limits or advantages that new or alternative practices offer. For detailed descriptions of this 'method' refer to Appendix: 3.9.3.1, Appendix: 3.9.3.2 & Appendix: 3.9.3.3 [on CD ROM at the back of this thesis].

3.9.2 Method - Exhibition and Critical Peer Review

As a means of validating the aesthetic results of the researcher's practice (the printed art work as a self contained visual statement) the researcher has actively pursued the exhibition, on a regular basis, of work produced in the course of this research. However, what this could not do was offer any validation of the procedural decisions made. The exhibition of this work alone, could not adequately describe the intrinsic procedural processes and practical dialogue the artist experiences whilst making a work of art. The procedural dialogue, the researcher suggests is so important to the outcome, but is not explicit in the final art work. The artist/researcher has made a conscious decision to limit the discussion of the visual subject matter of the work which will not be dealt with here.

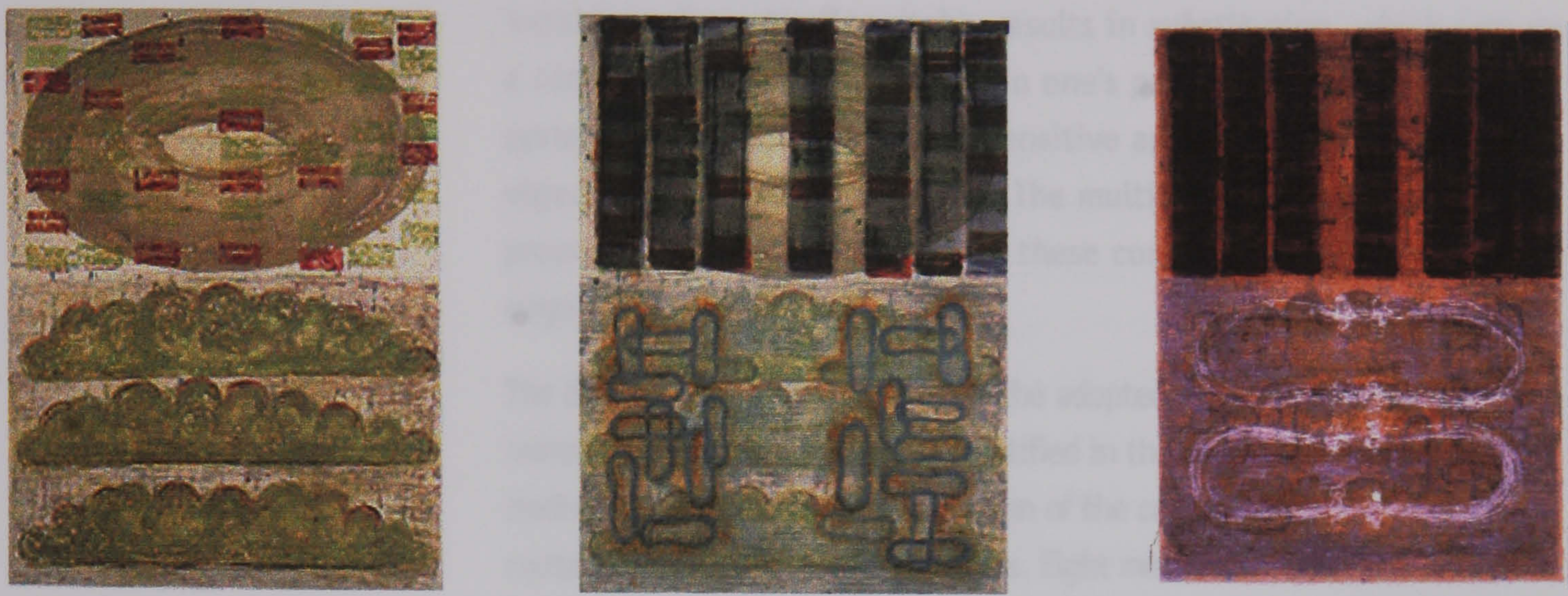
The exhibition of the researcher / artist's work resulting from this research has been the main means of exposing this work to critical review by an 'expert' peer group. The exhibition and subjective critical assessment of that work has been the basis by which the contemporary art world operates. The extent to which this offers a satisfactory objective means of evaluation is not the remit of this thesis, but expert peer review (however subjective) has been used successfully as the means of selecting exhibitions and assessing within fine art education (**Gray, 1988**). Research by **Dawson (1982)** into the means by which aesthetic value judgements are made within an art education environment, identifies a rigour to this system which validates the strength/depth of subjective but 'expert' aesthetic judgements:

> *"What is involved is not whether a person agrees with the experts - but what are the characteristic (training in art, design, personality, philosophical outlook etc.) of the experts with whom he agrees."*
>
> ***(Dawson,** pp 48)*

The work produced in the course of the research project has been publicly exhibited on a regular basis. This has taken place within a number of exhibition venues: 'open' competitive submission exhibitions; Bradford Print Biennially (1993), Royal Scottish Academy, Society of Scottish Artists & Aberdeen Artists (1993, 94, 95, 96) and an artist initiated group show at the Verein Kunstler Gallery in Berlin (1994). The work has also been subject to more informal peer review processes, in illustrated lectures [slides and examples of the researcher's art work] to printmaking undergraduate and lecturing staff at UK art schools and an international peer group of printmakers - Canada (1993) and New York (1994). The description of the printed art works within such a peer review process has offered a critical forum, within which a debate concerning the 'creative' and 'aesthetic' visual qualities of the work has taken place.

3.9.3 Method - Documenting Practice: slide, video, printed proofs and electronic data base

Documenting the physical processes and selections made has been integral to the research process. Recording these decisions has offered a means of revealing information which is often hidden or embedded in the final printed art work. The activity of printmaking involves the generation of multiple printed records [proofs]; this proofing process has been central to the practice-led methodology adopted in this research. The proof offers a tangible visual record of each creative or practical decision and its result, *"which is growing almost organically in the medium"* (Hayter 1949, pp 43). This valuable information is often apparently hidden in the final printed art work. Retaining a physical copy of this chronological record [proofing process], has not always been possible; for example when making a monoprint. In order to present as complete and contemporaneous a record as possible other means were used to record and document this 'hidden' information e.g. photographic records, 35 mm transparency film, digital still photography, and video tape.



These three artists proofs, from "Obedience to Universal Reason 2#" (Pengelly, 1995) are recorded using digital photography. These illustrate the often radical visual change and metamorphosis that takes place, decisions determined by both artist and the medium, often resulting in an evolving visual vocabulary which can be seen as a product of this creative process.

The recording process **Yin (1994)** suggests should form a verifiable and contemporaneous 'chain of evidence', in order that any external observer may be able to follow the derivation of evidence from start to finish. But the researcher suggests that the validity of the recording process itself is limited by a number of factors: recording has often involved stopping the process one is interested in recording, and the record itself in what ever format can only offer a partial description (visual, narrative or practical). In order to address this issue, photographic and diary records have been integrated by means of an electronic database [using Filemaker Pro] for each print discussed in the thesis. These records identify and extrapolate the relationship between practical and creative decisions when defined by an environmentally sensitive approach [see **Appendix: 3.9.3.1**, **Appendix: 3.9.3.2** & **Appendix: 3.9.3.3**].

3.10 Summary of Methodology Section

An integral component of the practice-led methodology proposed in this section has been the objective to fundamentally question established printmaking practices, based on an increasingly informed and 'environmentally sensitive' approach. This raised a number of interesting issues: removing a substance or process from one's 'established' practice inevitably results in substitution, which sets up a consequential chain of events in one's practice; adopting a systematically environmentally sensitive approach necessitates objectivity and external validity. The multiple method approach proposed has been a response to these concerns, by endeavouring to engage the whole subject area.

The diversity and specific nature of the adopted methods is an attempt to mirror the diversity of practices identified in the contextual review. The methodology as a result is a reflection of the complexity of this 'real world' context which the research addresses. Eight methods were used - the artist / researchers practice, physical tests, questionnaire, case study/collaborative projects, structured interviews, facilitating 'safe practice' in workshop situation, documenting practice - all of these have been supported by the basic practice-led structure the researcher has adopted. An important consequence has been that many of these methods were employed simultaneously (*see fig 3.2 chronological of methods adopted*).

The researcher's aim of developing a 'framework of safe practice' - developed from the systematic re-evaluation of the procedural and visual grammar associated with that practice - has been a consequence of this multiple-method research process which has attempted to integrate 'external' factors (predominately legislative but also circumstantial), with a personal 'internal' response informed by the artist/researchers' printmaking practice.

4.0 SECTION FOUR: Results and Analysis

4.1 Overview of Section

The methodology described in Section Three identified the multiple method approach that this research has adopted, in an attempt to reflect the diversity of influences affecting the subject area. Therefore, this analysis will reflect this multiple method structure established by the methodology overview (*see sections 3.1 & 3.2*), as well as offering an opportunity to contextualise the circumstances and visual results of this practice-led approach. Therefore whenever possible the analysis will engage in discussing the results of this practice-led approach (individual printed art works) in the context of the proposed system or model (*see section 3.5*), given that the visual printed work has been an integral part of establishing safe practices in response to health & safety criteria, at a personal and legislative level. Interpreting the findings in this way from multiple sources, will form the basis for the proposed 'framework of safe printmaking practice' described in *section five*. The premise of this multiple method is that problems are solved through the learning process, rather than through any replacement of practice with theory.

4.2 The Hypothesis

The hypothesis presented at the beginning of this thesis was:

> *The integration of environmental and occupational health and safety criteria implicitly to the researcher's creative practice, will result in expanding and diversifying the practical and visual vocabulary of that practice and should result in a body of work which is creatively sustainable; visually exacting, and environmentally sensitive. This paradigm shift will form the basis for the development of a 'morphological framework of safe practice'.*

4.3 Rationale for Analysis

The research has sought to explore this hypothesis, by proposing a 'framework of safe practice', which engages the artist / researcher's 'natural' empathy for divergent and evolving creative solutions, at a practical and visual level. This analysis section is based on, whenever possible, an evaluation of the visual work generated by the researcher in the course of this practice-led project. These prints, art works in their own right, may also be seen as a tangible response to the criteria the researcher has endeavoured to reflect in this project:

- that the works are developed in response to the researcher's already established creative practice, subject matter and experience as a fine artist;
- that the works are externally verifiable as 'environmentally sensitive', both in terms of the substances and processes selected to carry out this practice;
- that these printed art works are subjected to critical review within the public domain when ever possible through a process of exhibition and professional peer group review;
- that the working methods and procedures are made transparent and assessable, in order that these may be seen as a critique of the 'environmentally sensitive' approach proposed in this research.

These criteria have been influential in the development of the proposed 'framework of safe practice' (*see section 6*). The adopted methodology has been both a response to these criteria, and forms the basis of an interpretive structure the 'framework of safe practice' may propose. The printed art works are the focus (when ever possible) of this analysis, as they in effect constitute a contemporaneous record of this physical and visual developmental response to these criteria.

The researcher's experiences have been informed by an apparent dichotomy which accepts the evolving nature of his printmaking practice as a central concern and driving force, but also increasingly questions the notion that choices made solely on the basis of creative expediency (which establishes personal boundaries of acceptable practice) cannot continue to be seen as 'acceptable', when evidently working in this way may present real risks. The esoteric nature of individual's experience, personal and professional which presently determine definitions of acceptable practice (*see section 2.5*), is important to the following analysis as it will ultimately determine the integrity of any proposed 'framework of safe practice'.

The COSHH Regulations and the system of assessment it introduces has been an important defining factor, to which this research project has responded. The following analysis of the COSHH Regulation protocol (1988) is from a practice-specific perspective:

Step 1

- *Identifies and questions the range of substances used: many substances used in printmaking are appropriated from an 'industrial' application or uses.*
- *Identifies and questions all nonspecific and unconventional use of substances by printmakers.*

Step 2

- *Questions working habits that may be creatively expedient, and the close working proximity to potentially hazardous substances which printmaking practice and printmaking workshops sometimes involve.*
- *Questions the continued use of certain substances and materials, when there are safer alternatives available.*
- *Asks the individual to question their 'prior' knowledge and understanding which may be the result of 'idiosyncratic' 'learnt' printmaking practices, based on more universal notion of risk.*

Step 3

- *Introduces the notion of responsibility (taught or learnt), whereby agreed 'unsafe' methods are identified and 'safe' working practices promoted.*

Step 4

- *Introduces the concept of risk assessment to the artist / printmaker.*
- *Raises the issue of organisational responsibility for individuals actions (whether for creative purpose or through carelessness).*

Step 5

- *Possibly questions printmakers 'freedom' to familiarise and innovate (materials and methods) when based solely on 'visual & creative expediency', as individuals may not link this process to safe practice.*

fig 4.1 Adapted from COSHH Regulation 1988 protocol, by Pengelly, 1996, see section 2.4.3

This examination has identified a number of possible conflicts that exist between individuals creative expediency (expected of the printmaking medium) and the system of risk assessment the COSHH protocol introduces. The impact that COSHH potentially has on the 'independent' and 'expedient' artist is central to this analysis, as this examination of the COSHH protocol shows. The proposed 'framework of safe practice' should integrate all aspects highlighted here if it is to respond to both occupation health and safety criteria, and individual artists' creative practices.

4.4 Structure of Analysis

The analysis of each method is defined by boundaries established by this research (see fig 4.1), and the chronological model proposed in section 3.7.1. The analysis of the adopted methods has been presented in a sequential fashion, this however does not reflect the simultaneous nature of the multiple methods adopted in this research, and should be seen as a concession to the format of this written section of the thesis.

Chronology of Adopted Methods Relating to Research Domains

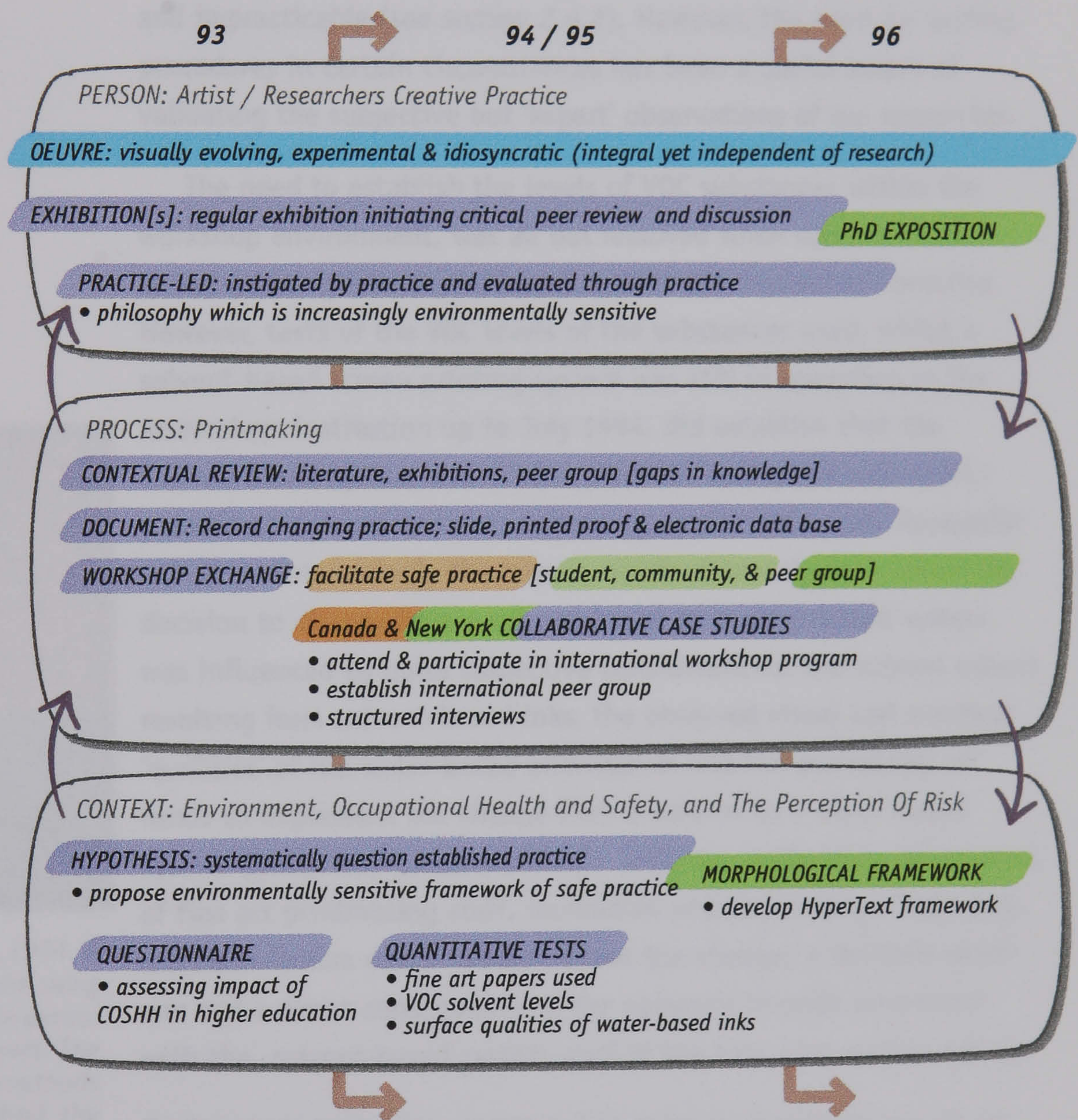


Fig 4.1 The interdisciplinary relationships this research addresses: people [artist researcher], process [printmaking practice] and context [environmental and health & safety issues], is analogous to: internal [artists creative practice or oeuvre], external [process and context] rationale (see section 3).

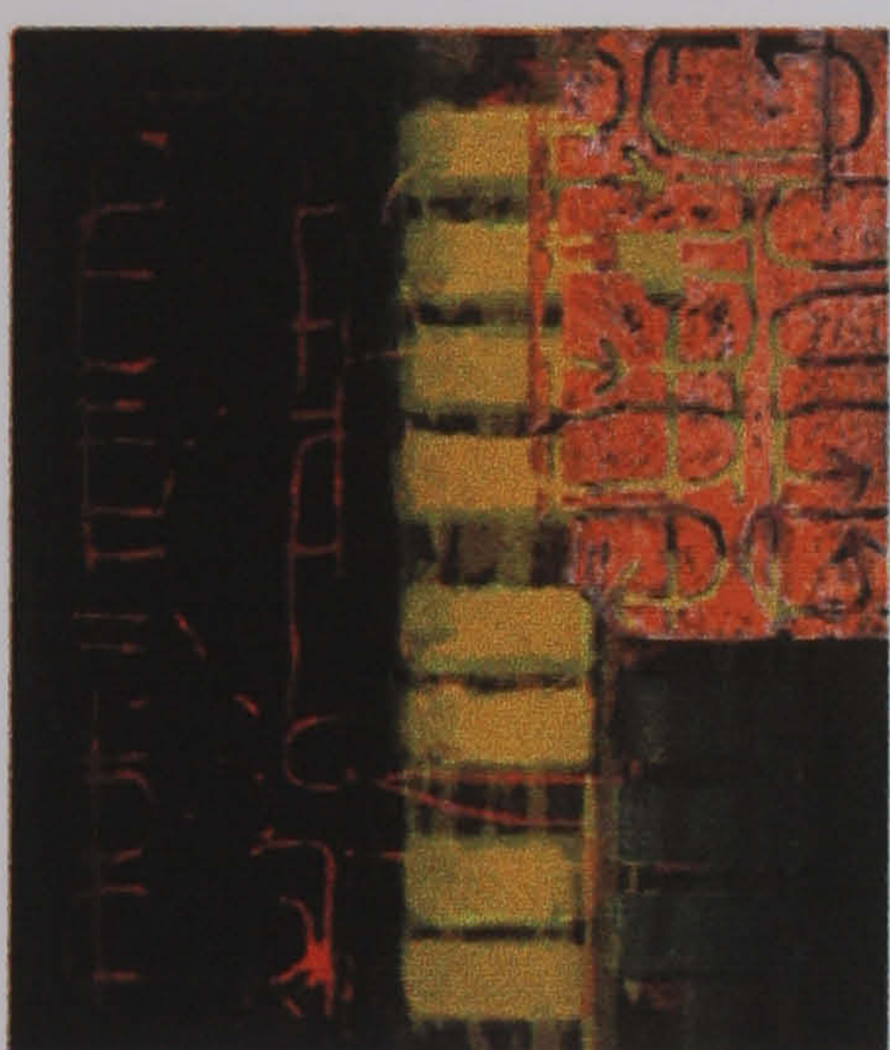
4.5 Analysis of Externally Learnt and Acquired Information

This section will be concerned with describing the application and results of the methods, which have been essentially learnt and acquired, sources which have formed the basis of the researcher's increasingly informed health and safety practice.

4.5.1 Analysis - Physical Testing of Substances Used

The need for physical testing procedures has been limited, given the researchers systematic removal of VOC substances from his printmaking practice, also the possibility of establishing universal safe limits for any given substance has been shown to be unlikely and impracticable (*see section 2.4.2*). However, the need for testing procedures in certain circumstances has been a useful means of validating the subjective but 'expert' observations of the researcher.

The need to establish the levels of VOC substances within the workshop environment, was all but removed when solvent-based screen printing inks were discontinued in the researcher's practice. However, tests of the VOC levels of the substances used, whilst a solvent-based screen printing system was still in operation in the researchers institution up to July 1994, did establish that the solvent-based system and related practices took place well within prescribed legislative limits, defined by EH/40 1994 (*see* ***Appendix: 3.8.1.1***). Interestingly the criteria which ultimately determined the decision to change from a solvent-based to a water-based system, was influenced by quite subjective considerations: the solvent odours resulting from solvent-based inks, the observed visual and practical 'qualities' of the water-based alternatives and the availability of funds to implement the change from a solvent to a water-based system (a decision which was made with the institutions department of fine art printmaking staff, technician and researcher). These were the main factors which brought about the change, a decision which was not a direct consequence of the apparent hazards associated with the solvent-based system used at the time (*see section 4.6.1*).



[1] "Untitled" Pengelly, 1994. A water-based screen print using the Hydroprint ink with in excess of 50 over printed layers. The researcher's working methods with this ink established the practical 'limits' of this commercial ink for fine art purposes. As this number of overprintings (which would not be normal 'commerical' practice) resulted in a 'sticky' surface finish which remained even when the ink was dry, making them completely impractical to work with.

Further tests were also carried out in order to determine the visual surface characteristics of the adopted water-based inks used at this time (Coates Lorilleux *Hydroprint*). This was a response to the practical problems associated with the multiple number of over printings often see in fine art printmaking[1] but rarely seen in commercial applications of these inks. These tests were ultimately inconclusive (see **Appendix: 3.8.1.2**), but interestingly did support data resulting from tests of the physical characteristics of the fine art printing papers used by the researcher.

These tests (to determine the physical characteristics of the 'fine art' papers used) help to identify tangible qualities which supported the subjective but 'expert' observations made by the researcher independently of these results (*see **Appendix: 3.8.1.3***). It was found that the porosity or 'openness' of the paper defined by the measurements for *Bulk*, *Tear* and *Cobb* did offer objective criteria which identified those papers which were less prone to deform or 'cockle' under the demanding conditions the artist imposed. These results when seen in combination the physical characteristics of the water-based inks used, offers conformation that the main perceived 'problem' associated with water-based inks that of paper 'cockle' does not occur or can be eradicated given the correct selection of printing paper and water-based screen printing ink[2]. This result however should not be seen in isolation and it is not offered as a universal rule. There evidently is a close relationship between the physical characteristics of the papers used, and the individual creative demands made of the medium by the artist; for example the artist/ researcher's use of 'impasto' printing and the monoprinting techniques have pushed the practical boundaries of the water-based printing medium (*see **Appendix: 3.9.3.1, 3.9.3.2** & **3.9.3.3** for discussion of these individual techniques and their application*). The quantitative testing procedures used in this research have been useful in that they have corroborated the subjective but essentially 'expert' observations made by the researcher, which had previously been informed largely by experience and intuition.

[3] see, Pengelly, 1995, Artists Newsletter, August, for a discussion of individual characteristics of a number of different water-based screen printing systems)

4.5.2 Analysis - Questionnaire

The questionnaire sought to establish the influence that health and safety legislation, specifically the introduction of COSHH regulations and the protocol of risk assessment it introduced, on the practice and teaching of printmaking at undergraduate and post graduate levels in the UK. A summary of the objectives influencing the decision to adopt a questionnaire have been previously stated, in the methodology (*see section 3.8.2*).

The results of the questionnaire (**Appendix: 3.8.2.3**) show that the introduction of the COSHH Regulations have played an important role in raising an awareness of health and safety issues within this educational sector. Further it introduced an increasingly objective basis by which printmaking procedures and processes could be evaluated [*in Question: **P2** and **P4***].

> *"Etching and screen were identified as areas where students were not conforming to requirements..."*

The extent of any changes brought about by this process was seen to be determined by individual institution's interpretations of the COSHH regulations and risk assessment protocol. As a consequence polarised points of views were evident at all levels. The individual nature of creative practices in printmaking, and the promotion of greater health and safety awareness resulted in some conflicting opinions. This became evident when respondents made an association between 'traditional' methods as being 'creative', 'flexible' and 'innovative'; this was not an association made so readily with the 'alternative' safer materials or practices. The introduction of COSHH and the notion of 'acceptable practice', was not generally linked with creative practices ('flexible' and 'innovative' use of materials), qualities which was unilaterally associated of the printmaking medium [in *Question: **P3** (i), **P3** (ii) and **P4***].

> *"We consider that water-based technology inhibits the creative process..."*
>
> *"Flexibility is a key word"*

The general impression, was that where change was required it was often restricted to specific areas or practices rather than being linked to a more general safety 'philosophy'. This was manifested in the quite specific changes to practices e.g. adopting water-based screen printing systems, the removal of ammonia for degreasing purposes, the removal of KPR (Kodak Photo Resist) as a photographic etching resist and the installation of dedicated ventilation and protective respirators when resin aquatint methods and chemical etching processes were used [*Question: **P2**, **P3** (i), **P3** (ii), **P4***]. The resulting changes can be seen as a response to the COSHH assessment process rather than a pro-active responce in its own right.

> *"There has been a tendency during the last four or five years to investigate alternative methods of printmaking. This has been resource driven as much as by health and safety implications."*

The most tangible change took place in the replacement of solvent-based inks with water-based screen printing systems, the majority of printmaking courses then using a water-based system [*Question: **P3** (i) and **P3** (iv)*]. However, changes in working practices cannot be so readily linked to the introduction of COSHH: changes in the way colleges are funded and the structures of the courses with a move to a modular systems were also cited[1]:

The opinion that change (when based on 'safest' printmaking practice) could represent a restriction to creative practices in printmaking, was often framed within preconceived notions and

[1] The Royal College of Art: National Symposium on Printmaking in Higher Education (1995) adressed a number of these issues.

preconditioned notions about 'traditional' boundaries. The creative possibilities that new and innovative safe practical responses might offer as a result, were seen to be limited by this presumption [*Question:* ***P3 (iv)***].

The questionnaire established that water-based screen printing media are used in over 80% of higher education fine art printmaking courses / workshops (January, 1994). However, acceptance of the media was often qualified (critically) by personal opinion related to the specific quality or performance of a water-based screen printing system used e.g. longer drying time, good flow properties, poor opacity, length of open printing time, and poor colour and pigment quality. Experience derived from individual results was often applied generically:

> *"We decided that the quality of these inks, although better than expected, were not good enough to replace the standard oil based inks."*

However, an equally strong case was made for the perpetuation of students' creative practices no matter what the circumstances, often as a direct consequences of the advantages (practical and visual) they identified in these new materials [in *Questions* ***P3 (iii), P5 (i)*** *and* ***P3 (ii)***]:

> *"Students will always innovate and experiment with a variety of materials and methods..."*
>
> *"There are new properties to explore..."*

The questionnaire was enormously helpful in determining current attitudes, concerns and practical responses to the introduction of the COSHH regulations. Importantly the results from the questionnaire established that a growing awareness of the safety debate within printmaking was a direct response to this legislation. Personal prior experience and limited notions of what constituted 'traditional' practice however still determined the extent to which 'alternative' methods or working practices were accepted.

4.5.2.1 Analysis - Post Questionnaire Event

On the 30th of March 1995 the Royal College of Art hosted a *National Symposium on Printmaking in Higher Education,* attended by representatives from 39 educational institutions which offered printmaking at a undergraduate and post graduate level. The symposium in effect represented a core peer group of individuals within those institutions with a responsibility for determining the course structure and instigating the COSHH Regulations within their departments.

The researcher presented a paper at this Symposium *'Environmental Issues: A Positive Influence on the Development of Printmaking Practices in Higher Education',* (see **Appendix 4.5.2.1.1**). The recorded discussion which followed this paper was of enormous interest, within the context of the issues raised by the questionnaire, as the discussion supported the conclusions drawn from the questionnaire[1]. The range of opinions within this forum, although unilaterally accepting of the ever increasing diversity of practices within printmaking, were divided as to the extent that 'safe' practices could be a positive influence on this evident diversity of printmaking practice.

[1] *The taped transcripts of the symposium were unavailable at the time of writing this thesis. They will be available at the RCA library archive.*

4.5.2.2 Summary of Analysis Questionnaire & Symposium

The questionnaire and symposium illustrated the diversity of opinions and interpretations held within this area. There was evidently a disposition towards linking safe practice with printmakers' 'independent' visual creative practice. This was manifested in a tendency to associate the introduction of safer working practices, with the questioning of 'established' traditional practices: implying that this imposed a limitation on the creative process. These responses however were generally linked to the introduction of water-based screen inks. The limited number of water-based screen printing systems on the market at the time of the survey (October 1993 - January 1994) was seen to contribute to this negative response (at the time of this survey, the system used in the majority of higher education courses was the Lascaux screen printing gel). A number of different systems have since been introduced onto the market, promoted as 'dedicated artists screen printing systems', as well as an increasing number of 'industrial' water-based systems (see **Pengelly, 1995**).

Narrow definitions in the application of terminology with words like 'traditional' and 'alternative', often precluded an objective evaluation of the creative possibilities that these media may offer. This dogmatic stance did not extend to the students, who *"will always innovate and experiment"*, given that experimentation with processes and materials they have to hand was an expected demand made by students.

The unmistakable impact that COSHH has had within higher education fine art printmaking was interesting in the way it established a precedent for safe practice rather than introducing ubiquitous rules. As a result the influential factors which determined the extent changes to 'established' or 'preferred' practices took place, were the physical resources available (including the workshop situation), and individuals' often subjective interpretations based on narrow definitions of acceptable practice.

4.5.3 Analysis - Case Study as a Collaborative Relationship

The rationale supporting the case study methodology has been based on an identified need to reflect and visualise contributions from within the printmaker's professional field of practice, from practising artists who have been directly influenced by health and safety issues. The case study methodology is appropriate given the established structure within printmaking takes place which supports collaborative working (*see section 2.2.2*).

The two 'collaborative printmaking' projects contained in this section where initiated by the researcher. In each case the researcher has sought to extend his creative practice; learn new methods, work in unusual or demanding surroundings, and or exchange practical and visual ideas: as a direct result of the collaborative exchange. The researcher sought to work with recognised practitioners (from within an international peer group) who had made a recognised practical contribution to the field of practice, based on the unique environmental circumstances within which each worked. The criteria which established the boundaries within which these collaborative cases took place should be regarded as generating descriptive rather than explanatory evidence. These are:

- that the collaboration is not a simple learning process based on an exchange from one to another, but a reflection of each individual's practical experiences;
- that each 'collaborative' project is based on, and initiated by, a mutual interest and concern for the impact environmental concerns and health & safety issues have on those individual's printmaking practice.

Initially each report is developed with reference to the practical processes learnt through the collaborative process (**Appendix 3.8.3.1** & **3.8.3.2**). A discussion of the physical and philosophical means involved, was pursued in tape recorded discussions, and informal but subject specific interviews, between the researcher and the 'collaborative printmaker' (see **Appendix 3.8.4.1**, **3.8.4.2** & **3.8.4.3** for transcript of tapes). These have been invaluable in contextualising the case studies presented here for analysis.

4.5.4 Collaboration One: Keith Howard

4.5.4.1 Introduction

Between 2 - 5 August 1993, a printmaking workshop was given by Keith Howard, an Australian printmaker resident in Canada. This took place at Fairview College, Peace River, Alberta, Canada. The workshops had been advertised in Printmaking Today as *"Non hazardous photo-etching and alternative etching materials and methods".* The workshop offered an opportunity for the researcher to extend his printmaking vocabulary by working collaboratively in a workshop environment with other printmakers with an interest in this area of practice.

A detailed description of the photographic processes and material, are contained in "Safe Etching for Photographers and Artists" **Howard** (**1991**), and Printmaking Today (Printmaking Today Summer, 1995, Autumn 1993, and Autumn 1994), and so will not be dealt with in any detail here. The following case study will be determined by the boundaries established previously. The record of the collaborative printmaking process has been presented as a chronological diary **(Appendix 3.8.3.1**).

4.5.4.2 Workshop Environment & Background Information

Howard, a printmaker and lecturer at the time for Grande Prairie Regional College, had his etching workshop in a geographically isolated situation, an hour flight from the nearest large city, Edmonton. As a consequence Howard relied on materials that were readily available to him. The isolation of the workshop in effect imposed a logistic problem for Howard as 'traditional' etching materials had to be ordered from Edmonton or Toronto.

Howard's workshop was situated at this time in an isolated position, access to conventional printmkaing materials was difficult.

The driving force and original impetus for the experimentation by Howard came from a concern for his own health, as a consequence of the etching materials he was using and the lack of any available 'safe' photographic process for rendering fine detail images on intaglio etching plates [the available processes being complex (photogravure) or potentially hazardous (Kodak Photo Resist)]. The combination of these personal health concerns, the unique workshop environment, the identified need for a 'simple' photographic etching technique, and Howard's 'inquisitive' personality determined the criteria or rules he established, that his practice should:

- present the lowest health and safety risk;
- have the ability to produce a full range of tonal values;
- exhibit a degree of technical simplicity and predictability;
- be as inexpensive as possible;
- use products that are readily available.

(Howard, 1991)

It was on this basis that Howard re-evaluated his printmaking practice culminating in the development of practical solutions which addressed these criteria.

4.5.4.3 Analysis - The Collaborative Process

The major component of the workshop was the photographic processes Howard proposed - making halftone separations with conventional photographic enlargers (using 35 mm black and white negatives), and non-glare glass as a 'halftone' screen. These were used in combination with a sensitised gelatine colloidal coating for copper etching plates [These processes are discussed at length in (Howard, 1991, Printmaking Today 1993, Autumn, pp 22-24) and are not the concern of this analysis].

The basis for Howard's proposed 'safe etching' techniques involved a 'back to basics' approach, which identified and then questioned the physical characteristics that materials must posses in order to perform their desired function. For example, an etching hard ground must offer an even coating on the etching substrate (plate) which will resist the action of the chemical etching medium[1]. By asking what medium will give the same results - where alternative safer materials may be found and introduced which expressed the criteria Howard set himself (see above).

[1] An etching ground has traditionally been made from wax, bitume, and benzine based solvents.

The account of the workshop concentrates on this substitution procedure. Given the nature of the workshop environment i.e. a group workshop situation and the relatively short period of time (over four days) the prints produced by the researcher were approached as tests in order to gauge the creative limitations each potentially offered (having adopted a 'healthy scepticism'). They are not presented as finished art works, within the context of the researcher's body of work, but do offer visual 'signals'.

The collaboration with Howard introduced a number of practical and procedural changes to the researchers working practice. These can be generalised as follows:

- to question all prior, established or 'traditional' practices;
- the substitution of 'safer' acrylic media and water-based products, wherever possible;
- to link these changes (new materials and philosophy) with an opportunity to develop a different visual vocabulary.

The etching processes advocated by Howard have been influenced primarily by two distinct factors. Firstly, the recognition that procedure need not be based on the 'reapplication' of traditional procedures or materials; this shift of thinking in effect questions the concept which links 'tradition' with accepted practice, but substitutes criteria which is relevant to the circumstance which define one's own practice:

> *"It's all very well having tradition, but how do you think new traditions begin or respond. Through a certain group of people that have the courage to change, because you need courage to change."* (Howard)*

* *Extracts from recorded discussions between researcher & KH, (see Appendix: 3.8.4.1 & 3.8.4.2 for full transcripts).*

'Tradition', if that term is applicable, is superseded by a process of continual personal questioning, a type of 'reflection-on-practice'. This critical model of practice responds to developments and refinements within one own practice as they happen:

> *"It's to do with vocabulary, more techniques with which to explore your creative development."* (Howard)*

This process Howard describes in terms of the "kinetic" nature of printmaking processes, a characteristic positively sought in his practice. This point should be qualified: the researcher does not suggest that printmaking as a visual medium does not engage in this type of evolving dialogue elsewhere, but specifically in this case, change can be seen to be a direct result of a 'paradigm shift' informed by criteria extraneous to the creative process, i.e. personal health and safety concerns.

Secondly, by freeing up associations the medium has with traditional approaches introduces the concept of accessibility which helps to 'demystify' process. These processes have had the effect of offering Howard the opportunity to continually re-evaluate his approach at a very basic level:

> *"Well it occurs to me there's an evolution of thinking, there's an evolution things have to go through, I'm sort of tuned in, is the only way of describing it, tuned into the possibilities, for instance a lot of things happen by accident."* * *(Howard)*

The word 'opportunity', is central to the philosophy Howard develops. The 'opportunity' to re-evaluate printmaking practices, based on an approach which places health and safety issues centrally within his field of practice:

> *"I'm trying to demystify the whole process of mark making and printmaking. As un-exciting as getting acrylic floor polish and pouring it on a plate and scratching into it, there's nothing mystical about that"* * *(Howard)*

* *Extracts from recorded discussions between researcher & KH, (see Appendix: 3.8.4.1 & 3.8.4.2 for full transcripts).*

This collaborative workshop had a direct practical impact, by introducing a series of materials and working methods to the researcher e.g. the application of various acrylic media for etching resists, the concept of a porous etching resist, non-VOC solvents. As a consequence many of these have been incorporated into the researcher's practice; these have also been amended based on the individual circumstances the researcher's own working methods demand (*see appendix 3.9.1.2*).

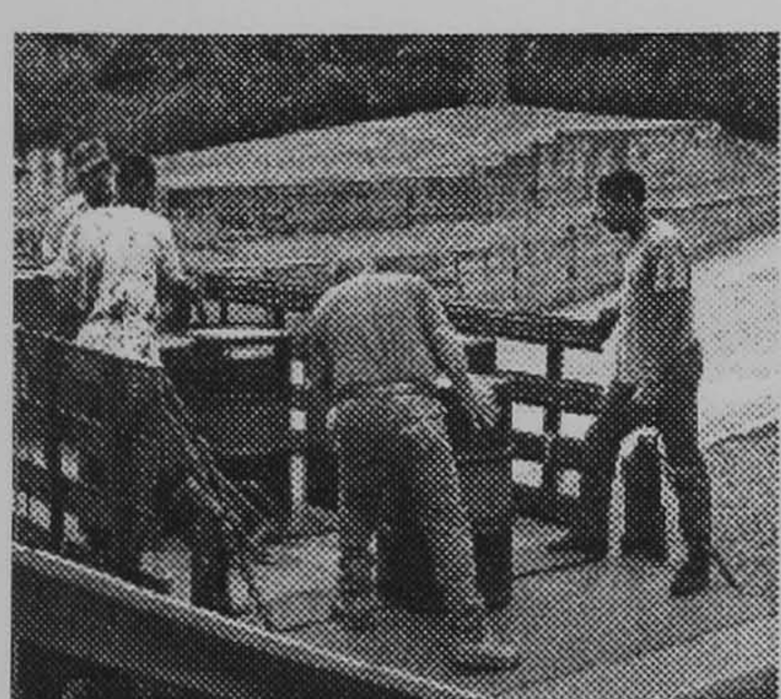
4.5.5 Collaboration Two: Ronni Henning

4.5.5.1 Introduction

The researcher became aware of the work of Ronni Henning through a short article ("Water Solution" in Print Collectors Newsletter, 1991, Vol. 22 Pt: 5/6 pp 50), which made reference to the particular environmental problems that Henning's workshop 'enjoyed'. This made the prospect of working with Henning, and having to adapt to this working environment, interesting from the researcher's point of view. Having initially approached Henning by letter, outlining a mutual interest in 'safe' printmaking issues, the researcher was invited to work in the workshop, for a month in the summer of 1994, on a collaborative project to produce an edition of water-based screen prints.

4.5.5.2 Workshop Environment and Background Information.

Henning's workshop was not connected to the sewerage system, so all water at this time had to be collected in barrels for subsequent treatment and disposal.



The workshop was housed in the converted jockey's gymnasium of a Long Island estate, the building being part of the New York Institute of Technology. Henning used this workshop, a self-contained professional editioning studio, as well running an active educational program with undergraduate students attending the college. Henning is a master printer with 25 years experience of editioning artists fine art screen prints. Having become concerned for her health in relation to the solvent-based inks used for the majority of this period, in 1987 Henning adopted a water-based screen printing system (as many colleges and workshop in the USA where doing at the time). However, the workshop was not connected to the local sewerage system, but relied on sewage drainage tanks (as the site had a high water table). The Environmental Protection Agency [EPA] as a consequence had advised the college not to allow contaminated water from the screen printing workshop to be disposed of in this way.

A photographic department, which was situated downstairs from the screen printing workshop, had been similarly advised by the EPA. So the college installed an evaporation system in order to reduce the quantities of waste water produced. The screen printing workshop was connected to this system. However, the type of residue produced by the screen printing workshop, proved to be unsuitable for this system, producing large quantities of foam, which blocked up the evaporation unit. As a result the college decided that the waste water should be collected untreated in barrels from the workshop for disposal by a specialist commercial company. These circumstances formed the unique environment in which Henning worked: a professional screen printing editioning workshop which used a water-based printing system, which could not produce excessive amounts of waste water.

The researcher originally planned to produce an edition of water-based screen prints in collaboration with Henning under these unusual circumstances. The collaboration also offered an opportunity of working with materials not available in the UK at this time. The record of the collaborative printmaking process has been presented as a chronological diary **(Appendix 3.8.3.2)**.

4.5.5.3 Analysis - Collaboration Two: Henning

The local environmental criteria defining the circumstantial boundaries within which the workshop operated, had a recondite affected on the collaborative process. The development of Henning's field of practice and the resulting visual vocabulary was a direct response to these environmental circumstances.

The impact this had on the researcher's field of practice highlighted the differences imposed by these conditions, which resulted in significant change, within the researcher's field of practice, namely:

- the introduction of monoprinting processes based on water-based painting media;
- the questioning of established practices based on experience of the 'unique' local environmental circumstances of this workshop situation.

The extraordinary working environment initially imposed limitations on one's practice; this however was contrasted with the creative collaborative process, which offered a means of both identifying possible limitations and proposing practical solutions to these perceived boundaries. The practical and environmental boundaries imposed by the workshop manifested in a number of ways: the researcher had to completely alter the original collaborative objectives - *editioning a conventional screen print*, and had to continually adapt and learn from the situation.

Given that change was imposed by the extraneous local environmental conditions, Henning's response to this particular workshop environment illustrates a tenacious adaptability and 'open' inventive response:

"I would clean screens, how can I describe it, it was less than primitive. So I would clean them with spray water bottles to clean the stencils off, it would take a long time, as you can imagine it slows things down a lot...now, that was not a good solution" *

* *Extracts from recorded discussions between researcher & RH, for full transcripts see Appendix: 3.8.4.3*

These external criteria were not the only motivation for change; personal collaborations between 'experts' was also seen as a means of evaluating and introducing new possibilities, or material into her practice as a direct result of the collaborative process:

"With monoprinting for me what's interesting is having different artists come in and the way they approach the screen...after the initial sceptical approach even after seeing what's been done, and they paint their thing and I print it and they go, wow, from then their hooked." *

Clearly for Henning there was a relationship between her evolving, but 'expert', practice through the collaborative process, and a more didactic interdependence with the changing circumstances in which that work or collaborative process takes place, determined by the practical and environmental criteria the workshop imposes. The procedural adjustments to her practice and the monoprinting technique developed, are the direct results of this interdependence.

The collaborative project introduced a number of new working methods and possible new material selections to the researcher's practice: using hand spray bottles to clean screens, water-based screen printing for professional artists editioning and monoprinting techniques using water colour and gouache. This resulted in complete change of direction, as *"I had intended to collaborate on a 'conventional' edition of water-based screen prints"* (*see appendix 3.8.3.2*), this change affected the researcher's work at a fundamental level. The collaboration with Henning forced the researcher to question previously accepted areas of his printmaking practice: it opened up a whole area of visual qualities not associated before with screen monoprinting.

4.5.6 A Cumulative Analysis of Collaborative Process: Howard and Henning

The collaborative process between artist and printer has a tradition of mutual exchange and dissemination, based on the individual's particular expertise or empathy within their own field of practice. The collaborative process is based on a type of altruistic exchange. The relevance of this exchange process has an increased importance when seen in relation to the more universal environmental, and legislative health and safety criteria which increasing influences artists' practices. An important consequence of this collaborative working relationship is the process of dissemination on which it is based:

* *Extract from unpublished interview, with Michael McCann, Centre for Safety in the Arts, New York, 1994 and the researcher.*

> *"One of the things, is trying to get people to publish, how they work"**

It was evident that Howard and Henning responded to the unique set of problems associated with their own working environment[s]. Their devolved working methods subject to these conditioning factors yet transferable to others within the context of a collaborative working relationship. Importantly Howard and Henning each dismissed the concept that somehow the medium was negatively affected by these circumstantial, environmental, or logistic problems they worked within. Rather these factors formed the basis for their individual, and often innovative practical responses. The supposition that invariability somehow imposed a degree of inertia on their printmaking methods was dismissed.

This raises important precedents (creative, visual and practical) which each case embraced the following:

- questioning the notion of a 'traditional' approach - established ideas based on accepted or prescribed 'traditional' practice is increasingly inadequate;
- identifying and adapting materials used in practice need no longer be limited by the conventions of acceptable 'traditional' practice;
- a non prescriptive systematically 'open' relationship between working environment and working practices resulted in a creatively positive response to the physical and physiological circumstances in which practice takes place.

Each of these cumulative factors have determined the means by which change has taken place. These collaborative projects have highlighted the strength of the interdependent relationship between the material and procedural aspects of printmaking practice, and the external criteria - local, environmental, legislative and personal influences - which have all had an positive effect in extending the boundaries and diversity of their practice. It was apparent, that there was no consistent 'rule' based approach or any framework within which these changes took place as each can be seen a personal response to individual and circumstantial situations. The collaborative process however has proved to be methodologically open, offering tangible means by which the mutual yet singular objectives of collaborator and researcher, can be directed towards the exchange of visual ideas, process solutions and tacit information.

4.7 Analysis - Practice-led Workshops

Apart from the collaborations described in section 4.5.3, the researcher has been involved in setting up and running a series of workshops throughout the period of the research. These have engaged the whole spectrum of printmaking practice, for example:

Adult community arts projects

In 1993 the researcher was asked to advise on and set up a water-based screen printing facility for a local District Council Arts Department, and has been employed as a tutor running numerous screen printing and photographic screen printing classes for adult and special needs groups.

Undergraduate printmaking students

The researcher has been involved in as a lecturer, at the sponsoring institution since 1993. Introducing to the students when ever possible, practical aspects of the research resulting from the collaborative projects and the researcher's own working methods e.g. photo etching, acrylic based etching grounds and techniques, water-based screen printing and water-based stencil techniques.

Community adult arts screen printing workshop. The client is painting a stencil for a water-based screen print.

Student (at the researcher institution) working on monoprinting project.

Collaborative workshop with practising professional printmakers

The researcher has also given a number of specific 'master class' workshops to other professional printmakers (photo etching, acrylic etching techniques, water-based screen printing and mono printing) The experience of the workshop participants at this level which engages both parties in a practical dialogue, has been enormously useful to the objectives of this research. The following analysis of one of these professional/collaborative workshops has been important to this research as a learning process. The workshop analysis is also important in that it directly engaged a peer group of printmakers with which the researcher had regular contact (lecturers in the researcher sponsoring institution and a contemporary artist who teaches in London).

4.7.1 Professional Collaborative Workshop Objectives

The diversity of methods and materials presented by the researcher at this workshop (which took place over five days) was an attempt to reflect the inherent flexibility that 'alternative' printmaking media offered. In effect the workshop offered a learning situation for both the researcher and the participants. The workshop also offered the possibility of obtaining critical perspectives on these processes, as what might be acceptable for one artist, may not be for another. The processes and materials introduced at this workshop were presented in the form of a comparative table, in order that the participants might make their own comparisons and evaluations[1] (see **Appendix: 4.6.1.1**).

[1] *A photographic record of this workshop, was taken at the time using an digital camera. However, these images have been lost due the discs being corrupted.*

4.6.2 Analysis of Professional Collaborative Workshop

The open 'non-prescriptive approach' adopted by the researcher, resulted in an investigative approach was taken by all the participants. The general reaction of the participants to the techniques introduced at the workshop was enthusiastic but objective and critical. The qualities and mark making potential each pursued reflected their individual 'styles'.

The main comments made in relation to screen printing concerned:

- the relatively pleasant working environment, having non of the 'usual' solvent odours; these it seemed, had become an accepted part of the screen printing process;
- the ease with which screens where cleaned off with only warm water and a sponge;
- the surprising similarities between the colour mixing, handling, and flow properties of the water-based system used and solvent based inks, similarities which were seen as an advantage;
- the affect on the paper (cockling) and drying time was very much less than expected, (an observation made by two participants making comparisons with other water-based systems[2]).

[2] *Two participants had experience with the Lascaux gel screen printing system, which had fundamentally different printing characteristics, to the Coates Lorilleux Hydroprint system used for this workshop (see Pengelly Artist Newsletter, August, 1995).*

The comments and observations resulting from the intaglio and etching techniques introduced, were less clear cut. Given that a number of the materials and procedures used relied on 'domestic' products e.g. household cleaner, acrylic floor polish. The substitution of acrylic floor polish as a hard ground for example was a radical shift in practice, when based on traditional perception of what a hard ground should be (heating the plate, rolling the wax ground and then smoking the plate with wax tapers). The new procedures and materials introduced at this workshop initiated discussions regarding the nature of conventional and non-conventional methods based on the 'look' of the materials used. These alternative 'domestic' products where seen as 'odd' or unusual. A strong abiding perception of there being a 'correct' 'traditional' method seemed to stop a more 'open' evaluation of the actual creative result achieved which these new materials.

[1] A new lift ground mixture resulted from this workshop collaboration. This unusual mixture of vaseline, vegetable oil and blue filler (a water miscible screen stencil medium) resulted in very interesting positive brush masks being retained, which could be etched.

[2] This screen monoprinting technique used water soluble felt tip pens, drawn directly onto the screen. The image was then printed with clear water-based screen base.

However, a number of innovations did result from this collaborative workshop; for example, a lift ground mixture that gave very delicate and responsive brush marks[1], when used in combination with the acrylic hard ground; also, a screen monoprinting technique which used felt tip pens in combination with the screen printing base[2].

As a direct result of this workshop the department at the researcher's institution adopted a water-based screen printing system. In the etching studio the resin aquatint system has been supplemented with an safer airbrush spray aquatint system (using a mixture of Hunt Speedball and acrylic based medium). However, the difficulty of maintaining the air brush (as students tend not to clean it adequately after use) has meant this is infrequently used. Only two of the workshop participants have subsequently adopted these techniques and evolved their own working methods and vocabulary with these techniques.

The objectives of the workshop was to explore these 'alternative' materials and methods in order that these might be introduced at the researchers institution. This has been the case for screen print, but the etching techniques have not been integrated into the regular practices of the printmaking course. An attempt to integrate these methods in parallel with the established working methods the department used, proved impracticable as the two system confused students and resulted in cross 'contamination' between these two distinct working methods and led to poor inconsistent results. This is disappointing, as the researcher suggests their are proven advantages both visually and from a health and safety perspective, to be gained from adoption of these techniques in this educational situation.

4.7 Analysis of Methods Internally Assimilated and Evaluated Through Practice

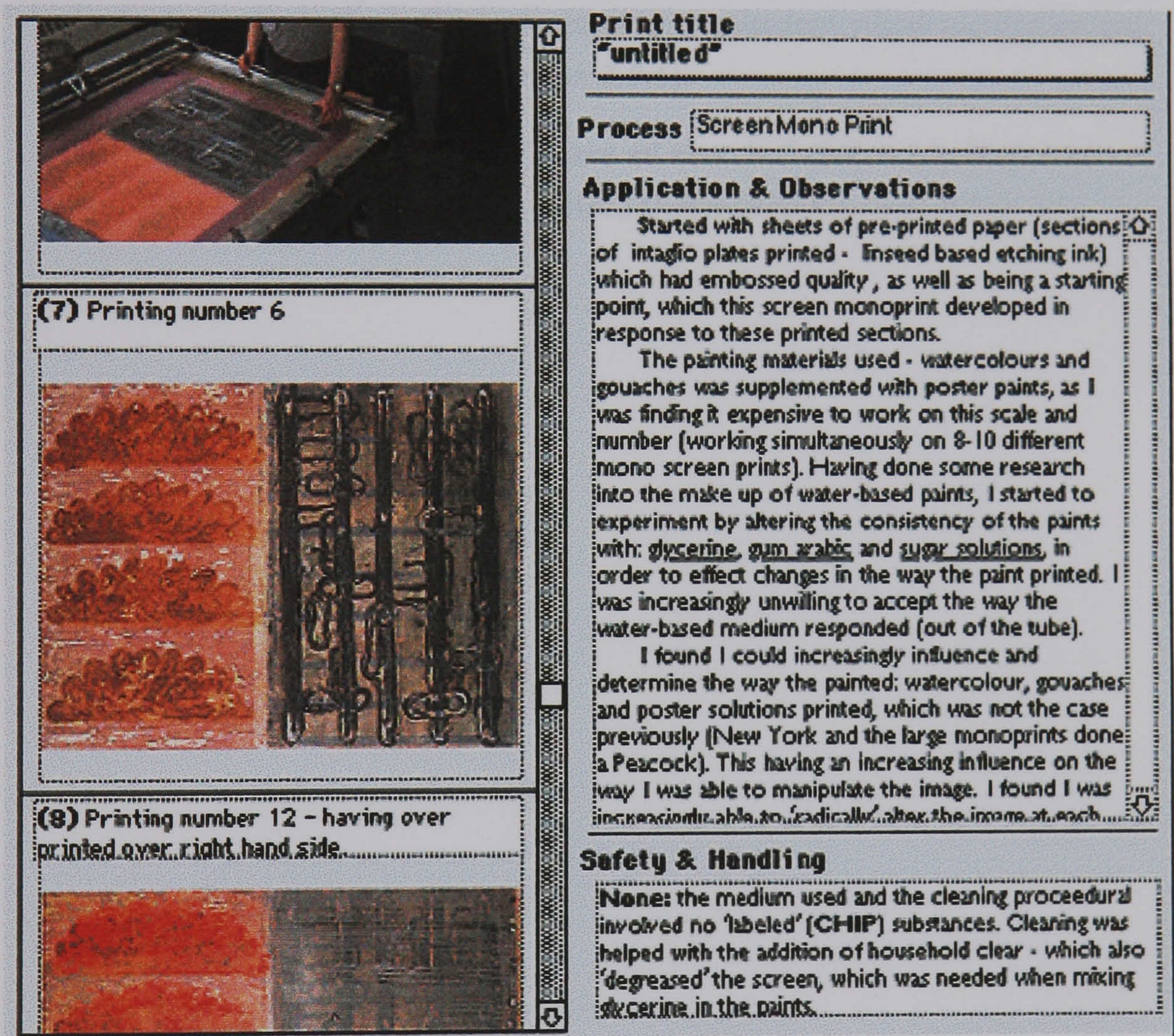
This section of the analysis will evaluate specific methods which represent the means of achieving, through the researcher's practice-led approach, a personally defined 'environmentally sensitive' body of work. Having initially set out to establish a systematically 'environmentally sensitive' approach, the researcher initiated a process of re-evaluation and substitution within every area of his usual or 'preferred' printmaking practice. The methods and techniques used collectively redefine this discipline, and are the basis for the 'environmentally sensitive' body of printed art works produced in the course of this research. However, it cannot be emphasised strongly enough that the validity of these works is ultimately determined by 'visual and 'aesthetic' sensibility of the body of work produced. The printed art works would be facile, if their only purpose was to document and define the boundaries of acceptable 'environmentally sensitive' practice.

4.7.1 Analysis - Documentation, Recording of Practice using Electronic Data Base

The implication of adopting a systematically 'environmentally sensitive' approach, as previously stated, can only be determined through the physical and intellectual process of making prints (section three discussed the premise of this practice-led methodology). The following discussion describes the analysis of procedural and material selections which have informed and developed the researcher's printmaking vocabulary. This analysis accepts the intuitive and idiosyncratic working methods of the artist, as each selection and manipulation is the result of a personal evolutionary process, a type of feedback based on the visual and practical evaluation artists make which is a unique response to each action and each selection. The printed art work in this instance is the physical culmination of this negotiation, but the printing and proofing stages involved in this art work potentially offer a visual chronology of this process, and a transparency of methodology.

When ever possible visual records of all working methods and the various stages of development have been taken (35 mm slides and digital images). This has been invaluable in making more transparent and accessible working methods critical to the development of the finished art work, which had previously not be accessible or were not visually evident in the final printed image. However, even these methods were unable to record or sufficiently illustrate the subtle inferences and alterations which continually take place as the recording process meant stopping work in progress to record or reflect on intuitive decisions. However, printed proofs have been retained, whenever possible as physical evidence. These proofs and the contemporaneous photographic records have been incorporated into database records (FileMaker Pro) [1]. From this material and the researcher's own evaluations (through participant - observation) a selection of prints are now analysed, not only in terms of the their creative advantage (visual and procedural), but importantly in terms of the particular practical and environmental aspects raised through the making (negotiation) process.

[1] FileMaker Pro is a relational electronic database, which has been used by the researcher as a simple contemporaneous diary. This has been useful as a 'container', and as a means of linking visual and written responses, to the practical but intuitive 'creative' decisions made in the course of making the print.



This is an example of one FileMaker record which was used to keep a contemporaneous visual record of all working processes, practical decisions and visual results of the researcher's practice. A typical record includes: title of print, printing processes used, notes on the application of these processes and observations about the results, notes on the associated hazards these decisions presented (very limited given the researcher's adopted environmentally sensitive working methods), and a scrolling image field containing a visual record of the image as it develops and the practices adopted to achieve this.

4.7.2 Analysis - Selected Prints Produced by Researcher

The prints included in this analysis have been selected on the basis that they have in some way engaged aspects of both, internal and external criteria established in section 3.2. These prints represent the integration practices previously learnt, and those adapted by the artist/researcher's determined by his own visual vocabulary and innovative and experimental approach. These prints also represent an practical response to the preconceptions established in the questionnaire that water-based substances may limit the printmaker's vocabulary e.g. scale, number of over printed colours and intermixing of media. The prints may therefore been seen as both a critical, practical response to these factors. This has been achieved by making the printed art works as large as practicable, and an evocation of the researcher's independent visual vocabulary and subject matter (*see section 3.9.1*).

These printed art works have all been included in the final Ph.D exhibition, which this written thesis supports *(see section 5)*.

Title: "Six Degrees of Separation #1" Date: 1995

Description: An editioned (six in total) water-based screen print image using Hydroprint inks, with a over printed varnish dusted with iron filings, print dimensions 120 cm x 92 cm, printed on Lavis Fidelis 180 gsm paper.

Method: The printed effects were achieved using a number of hand painted stencils (8-12 colours) working directly on the screen using the Hunt Speedball screen filler as a negative resist stencil and as positive resist. A dilute acrylic floor polish cleaner (a mild alkali) was used to draw positive marks into the Hunt Speedball. The print also used two photo stencils. The art work was originated from a printed wood block printed using a water-based relief ink [Graphic Chemical] with was then reworked by hand. The final vertical elements, were printed in a clear acrylic varnish and 'dusted' with iron filings whilst they there still wet so the iron filing adhered to the varnish.

4.8.2.1 Analysis "Six Degrees of Separation #1"

This editioned print is the most 'conventional' of the prints contained in this analysis section. The advantages of working with the water-based inks (no VOC solvents or retarding agents, screen wash or thinners and none of the odours associated with solvents and the ease of screen cleaning) were well understood by the researcher and 'expected' of this medium. However, the size of the print imposed certain practical conditions and possible limitations which had only been alluded in previous but smaller prints[1]. The effect of these characteristic - the increased surface tension and hold-out - proved to have a significant practical effect on this print given its relatively large size:

- physically it was more difficult to print edge to edge as the increased squeegee pressure needed to print this large image area was difficult to apply;
- the textured paper accentuated this problem and made it difficult to get the ink to 'bottom out' in certain areas (at the edges a consequence of printing with a single parallel arm mechanism).

These two factors resulted in an inconsistency and unevenness at the edges of the print, which was accentuated by each successive printing (it was increasingly difficult to 'fill-in' areas that had not been printed properly early on). The rest of the print was unaffected, as enough pressure could be applied, but as a consequence a number of prints were unacceptable.

The tendency of the ink to build to a gloss after only 3-4 printings (an unsatisfactory quality, *see appendix 3.8.1.2*) was solved by over printing a matt acrylic varnish This was an unsatisfactory solution as it required printing yet another layer. The problems identified above which were self imposed by the scale of the print, all affected to varying degrees the visual appearance of the work. However, the researcher felt the print was successful. The very fluid mark making in this print was the result of stencil techniques developed, these involved working directly on the screen with various dilutions of floor polish cleaner which resulted in very uncharacteristic screen printing marks in the finished print.

The key factors which influenced the development of this print were: the scale of the print as a critical element; with no deformation of the paper even when working to this relatively large size; the types of inks used, which compounded adverse qualities observed in previous work resulting in exaggerated hold-out problems.

[1] A characteristic of the water-based inks used on this print is the higher surface tension present. This influences the way in which the inks perform in two ways: first, the ink is less likely to 'drop' through the screen which is an advantage - giving better definition. Second, the ink has a tendency to 'hold-out' on the surface of the paper. The printed layer tends to sit 'up' on the paper surface or 'hold-out', often giving brighter colours and better gloss, but this also results in possible disadvantages for the printmaker as it is more difficult to get this type of ink to fill the rough papers usually used in printmaking (see Appendix 3.8.1.2)

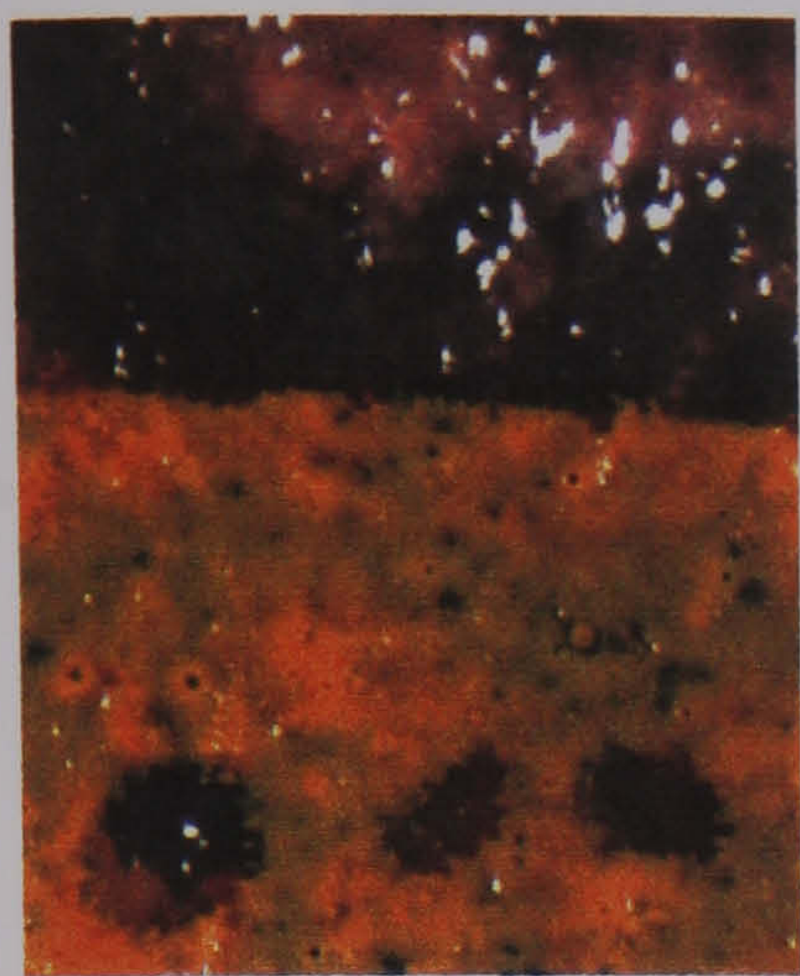
Title: "Untitled" Date: 1994

Description: A water-based screen printed image using Hydroprint inks, with relief printed areas. The dimensions of the print are 60 cm x 50 cm, printed on Somerset smooth 300 gsm.

Method: The print used hand painted stencils (25-30 colours) in combination with four photo stencils, the art work originated from printed wood blocks using water-based Graphic Chemical inks and reworked by hand in each case. A number of elements in this print were relief printed by an impasto technique [1] using the Hydroprint screen inks this resulted in a very heavy deposit of ink on the paper.

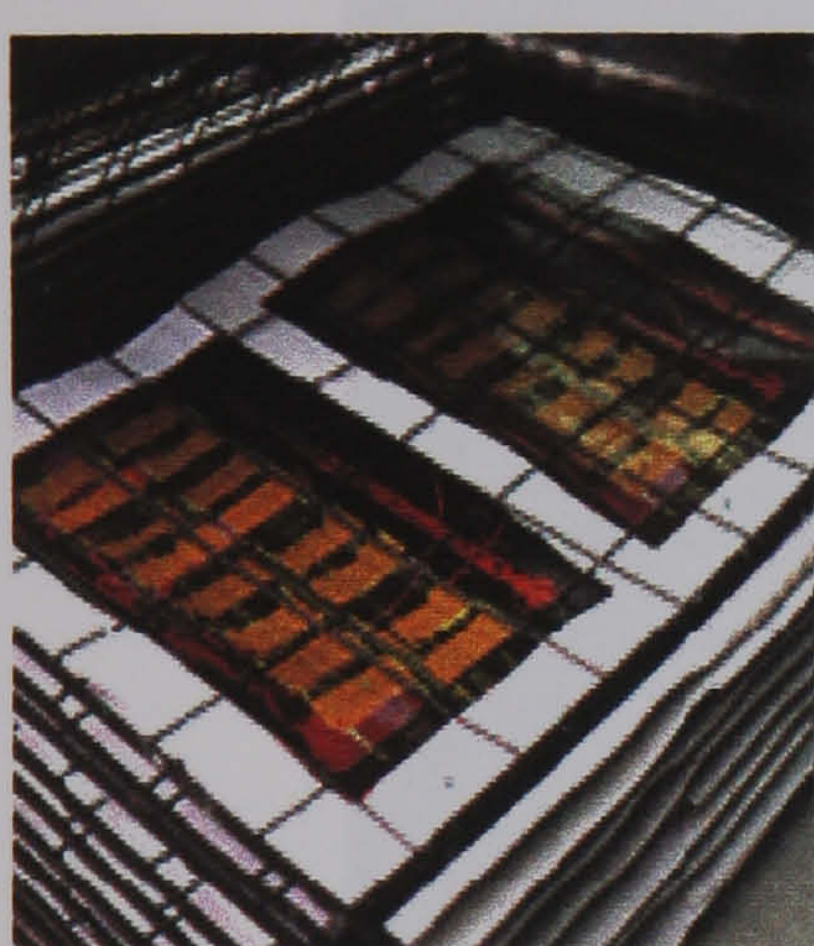
[1] Impasto - a technique developed by the researcher (previously only used with solvent based inks) involving painting a thick deposit of water-based ink onto a relief block. This was then printed by hand onto paper placed on top. The effect was a very thick build of ink, very uncharacteristic of water-based printing.

4.8.2.2 Analysis "Untitled"



[1] This microscope image (x60) of the finished print illustrates the particular quality of this ink surface.

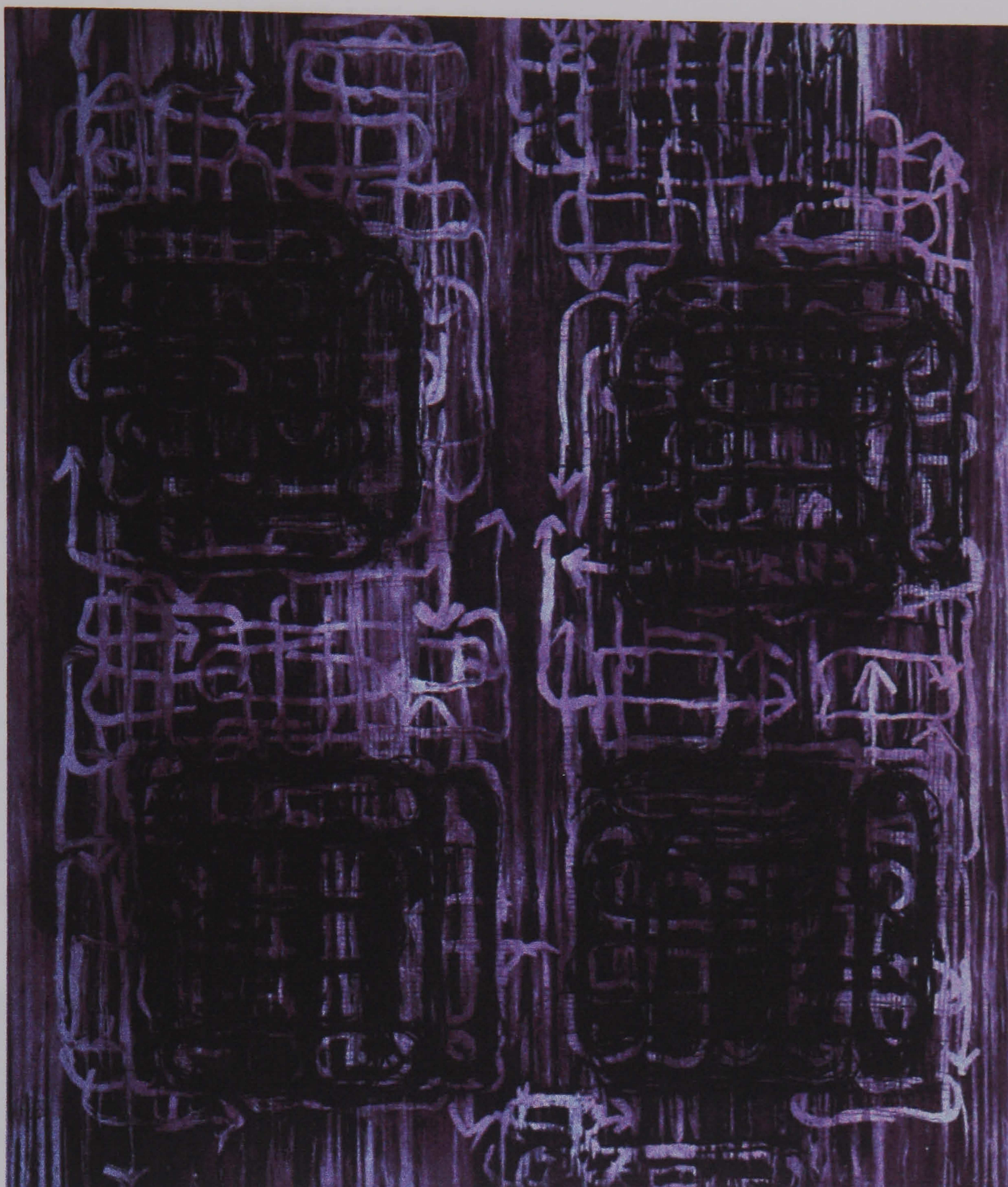
In an attempt to establish practical and visual limitations of the Hydroprint inks the researcher deliberately printed a considerable number of over printings and relief impasto printed layers, building up a physical surface on the paper with these inks. The tendency for the ink to 'hold out' was less of a problem in this print, a much smaller image than *"Six Degrees of Separation # 1"*. However, the ink's tendency to build up to a gloss was accentuated by the relief printing and multiple layers[1] (see appendix 3.8.1.2). The sheer weight of ink caused the paper to deform, but no more than previously observed when using solvent based ink for similar types OF techniques [2].



[2] Prints in drying racks about half way through the print; the deformation of the paper can be clearly seen. This was a result of the weight of relief printed ink at certain points.

Visually the print was not successful and has not been exhibited by the researcher. The print had become in effect a 'test' rather than an independent visual statement. But the print did highlight certain important limitations of this water-based ink (Hydroprint). The very thick surface layer of ink produced, gave the print a 'wet' quality; the prints could not be stacked on top of one another without them sticking together even when fully dry. In effect this print established a practical limit of this type of ink, a quality which does not occur with other inks used by the researcher. At this time a small limited number of commercial water-based inks were available in the UK, which originally determined the selection of this ink. The researcher now uses another more 'adaptable' ink (see the comparison of different inks in appendix 3.8.1.2).

The key factors influencing the development of this print were: the thickness of the ink imposed as a critical element; the types of inks used resulting in the surface having a 'sticky' gloss quality; and the tendency for the paper to deform under the extreme condition imposed by this printing technique.



Title: "Altitude"   Date: 1995/6

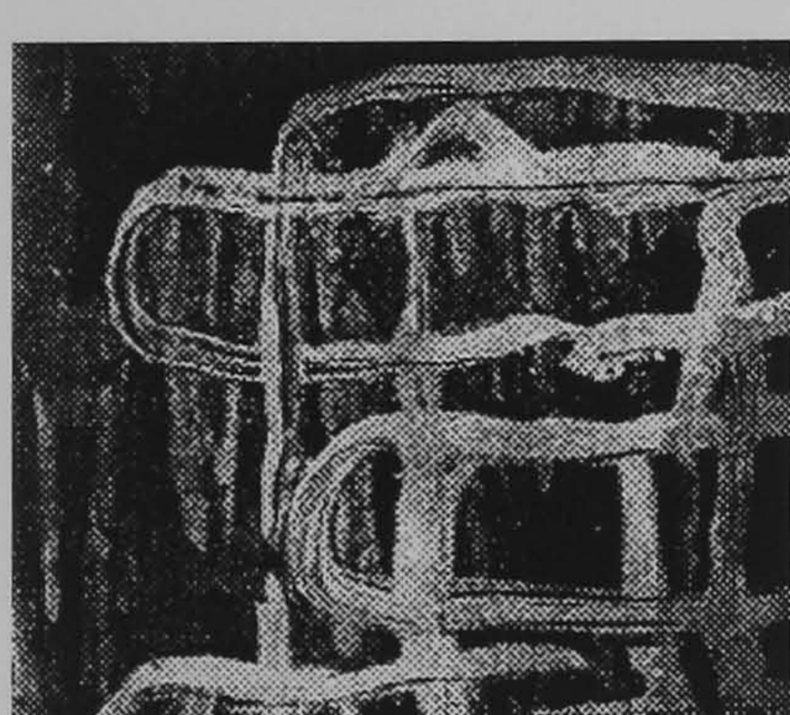
Description: Etching on steel. Printed in one colour with linseed oil based etching ink, dimensions 100 cm x 90 cm, printed on Velum Arches smooth 400 gsm.

Method: All grounds and mark making are produced by applying and working a series of hard grounds by directly drawing into these grounds using water soluble 'positive' and 'negative' resists: acrylic floor polish, Hunt Speedball screen filler, and porous stop out techniques - dilute Hunt Speedball screen filler. The plate was reworked in this way a total of 6-8 times and etched using a dilute nitric acid solution in combination with these grounds and drawing techniques. Printed using linseed oil intaglio inks, (see **appendix 3.9.1.2** for full description).

4.8.2.3 Analysis "Altitude"

[1] One example of a steel plate which tested a lift ground technique, using a mixture of blue stencil filler & petroleum jelly, in combination with acrylic hard ground and a nitric acid etching solution. This combination had previously only been used on copper plates with a ferric chloride etching solution.

[2] The application and manipulation of these techniques for critical and creative purpose is dealt with in some detail (in Appendix: 3.9.1.2); this analysis will deal with the practical and visual results of these techniques as manifest in work.

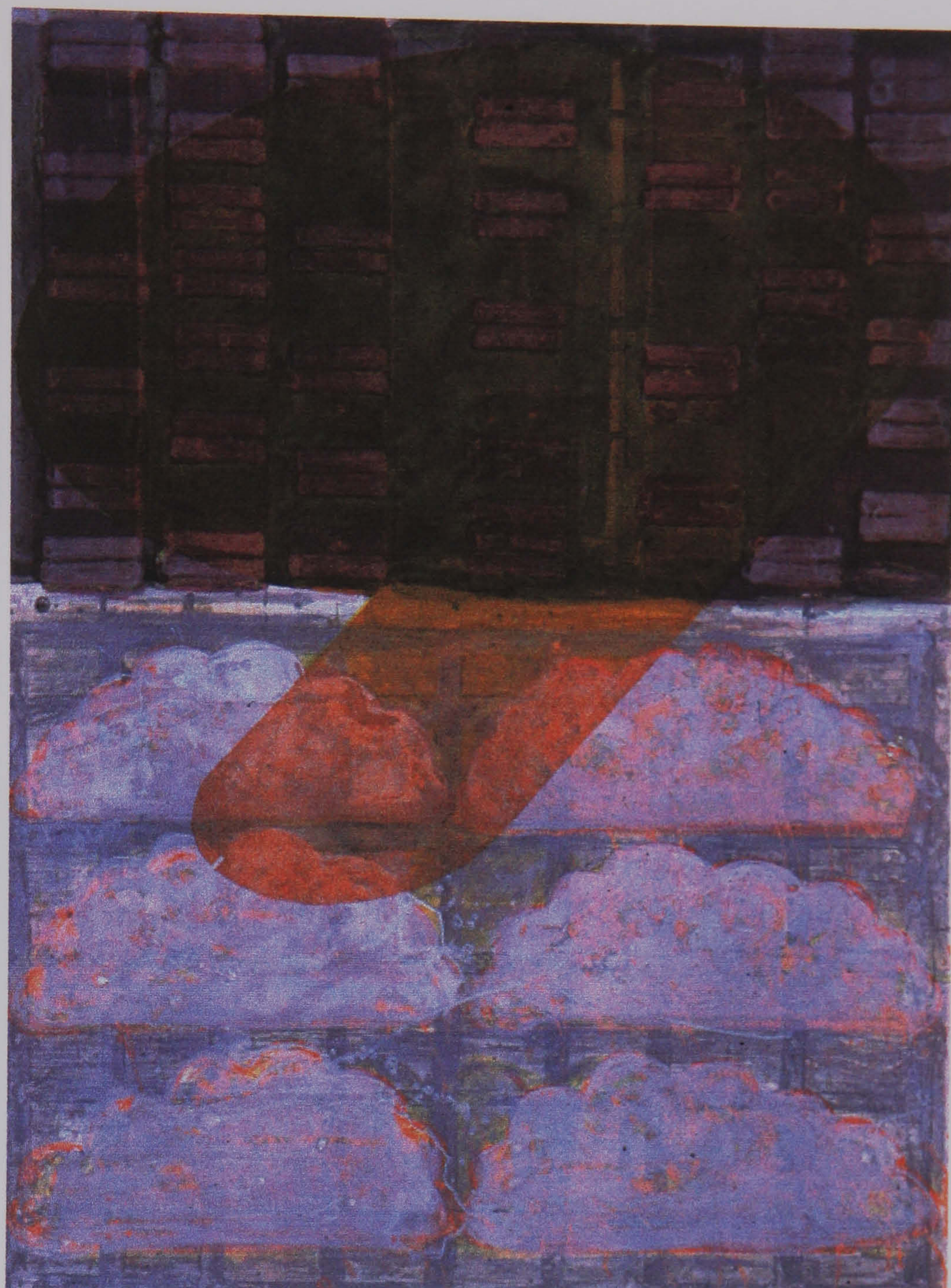


[3] A detail from "Altitude" illustrating the 'dissolved' quality produced and controlled by the interaction between the etching solution [nitric acid solution] and etching grounds [dilute Hunt Speedball solution].

A large number of small test plates using water soluble etching grounds on steel plates were carried out in order to make comparisons between the performance of these techniques on copper (those learnt in Canada, see appendix 3.8.3.1), and these techniques on steel using solutions of nitric acid at the etching medium[1]. By this process it quickly became apparent that due to the small size of these test plates (20cm x 15cm) the researcher could manipulate the media to achieve whatever results desired, more importantly the process of 'testing' did not engage the artist/researcher in achieving creative results, and this large etching (one in a series of three) was a response to this. Scaling up any procedure or technique, had the affect of accentuating or highlighting problems inherent in the technique, an approach the researcher has continually adopted throughout this research [2] as a critical test of its practical application.

Critically evaluating the merits (visually and practically) of the techniques adopted highlighted one significant difference between 'traditional' wax and resin based grounds, and the water immiscible grounds adopted. It was possible to use for creative advantage the interaction between ground and etching solution, by controlling the tendency of the ground has under certain conditions to dissolve in the etching solution[3]. This resulted in a quality which could not easily be achieved with normal wax based grounds. The negative side of this was that the water immiscible grounds tend to 'foul bite' more easily. This etching has developed this quality for creative advantage and the types of marks achieved the researcher suggests, have a successful visual quality, however under different circumstances these qualities may not be satisfactory and would be deemed a failure of the ground.

The key factors influencing the development of this print were: the size of plate as a critical element; the types of grounds used as a means of introducing 'wash qualities'. Each of these factors has been adapted for visual/creative ends in this work, extending the vocabulary of marks available to the researcher. However, possible limitations were evident - the grounds used were very prone to 'foul bite' and demanded strict preparation and 'rigorous' workshop practice.

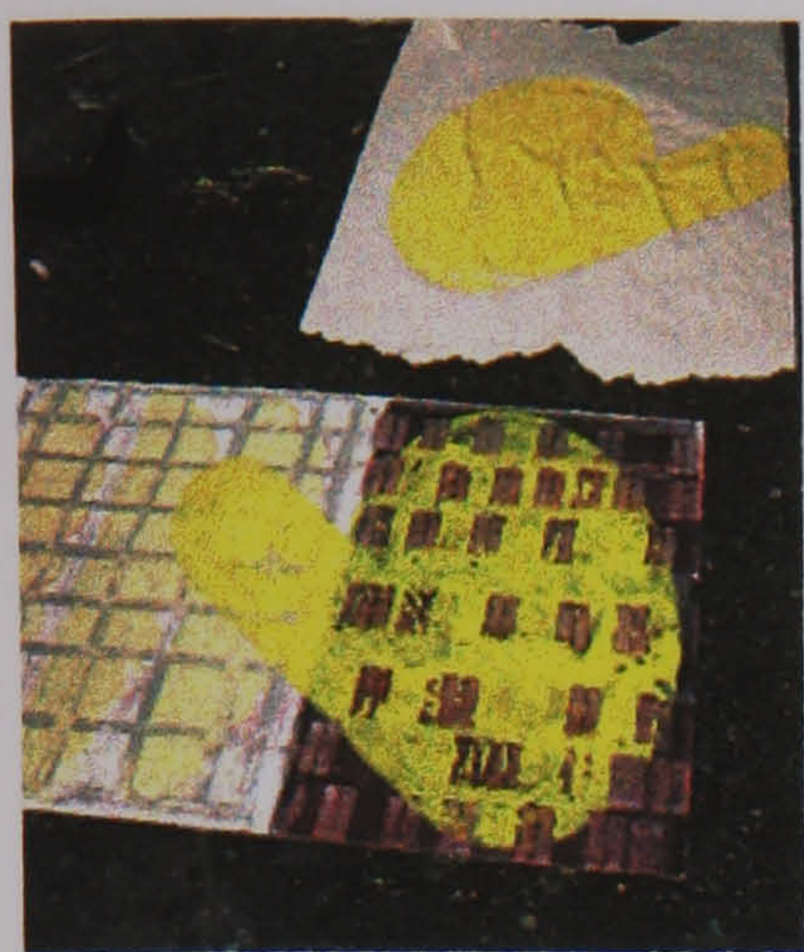


Title: "Obedience to Universal Reason #1"

Description: A water-based mono screen print, with water-based impasto relief print; dimensions 120 cm x 108 cm, printed on Somerset HP 300 gsm.

Method: Using hand painted 'mono' stencils painted directly onto the screen using various water soluble paints: watercolours, gaouches, and poster paints; printed using the TW Graphics 1000 series clear flat base, supplemented with spectrum acrylic gel medium, relief printing area used undiluted or retarded TW Graphics base. Printed a total of 15-18 times each with a separate painted screens. The print has also a total of 2-3 relief block over printings, also (see **appendix: 3.9.1.1** for detailed visual record of the development of this "Obedience to Universal Reason" series).

4.8.2.4 Analysis "Obedience to Universal Reason 3#"



[1] Proof of "Obedience to Universal Reason #1", showing the 'resist' quality achieved with the iridescent pigment affected by the impasto relief printed section.

The relief printing on "Obedience to Universal Reason #1" illustrates the extreme deformation of the paper surface resulting from this technique. This paper cockeling 'settled' when the ink was completely dry.

The mono printing techniques the researcher had originally learnt (in New York, see **appendix: 3.8.3.2**) was increasingly being altered and adapted: visually - building up many layers of generic imagery, and practically - incorporating impasto relief printed areas, and developing an increasingly sophisticated control over the painting materials used (e.g. watercolour, gouaches and poster paints) which was not previously possible (in New York). This resulted in an increasing flexibility with this process, an ability to engage creatively in the manipulation of these media.

This print, as a consequence of introducing glycerine, gum arabic and sugar solutions to the manufactured artists paints and pigments used the researcher was able to developed much greater control over what printed and what remained in the screen which was had not previously been the case in the collaboration with Hennings (see **appendix 3.9.1.1**). The iridescent gouache paints used resulted in an unexspected 'resist' effect where the iridescent gouaches reacted with the impasto layer printed on top [1]. This combination of individual material selection and increasingly sophisticated handling resulted in a developing practical vocabulary which in tern resulted in unique visual qualities. The increasing sophisticated manipulation and control of these materials were linked to the development and 'direction' of the visual content of this mono print which had a significant (positive) influence on the work visually.

The key factors influencing the development of this mono print were: the greater sophistication and manipulation of painting media, but increasingly altered and controlled these products for creative advantage ; the resist technique - a reaction between two types of water based printed media.

4.8.3 Summary Analysis of Prints

The analyses of these prints has been a subjective evaluation of each based on the procedural decisions made. This analysis has not involved any discussion of the subject matter related to these prints development, rather their development in the context of this discussion is seen as a response to the researcher's manipulation of the materials for creative advantage, as a consequence each has been approached as a developmental process - evolving visually as a direct consequence of the material and practical decisions made, but defined by the criteria established by this research (*see methodology section 3.4*).

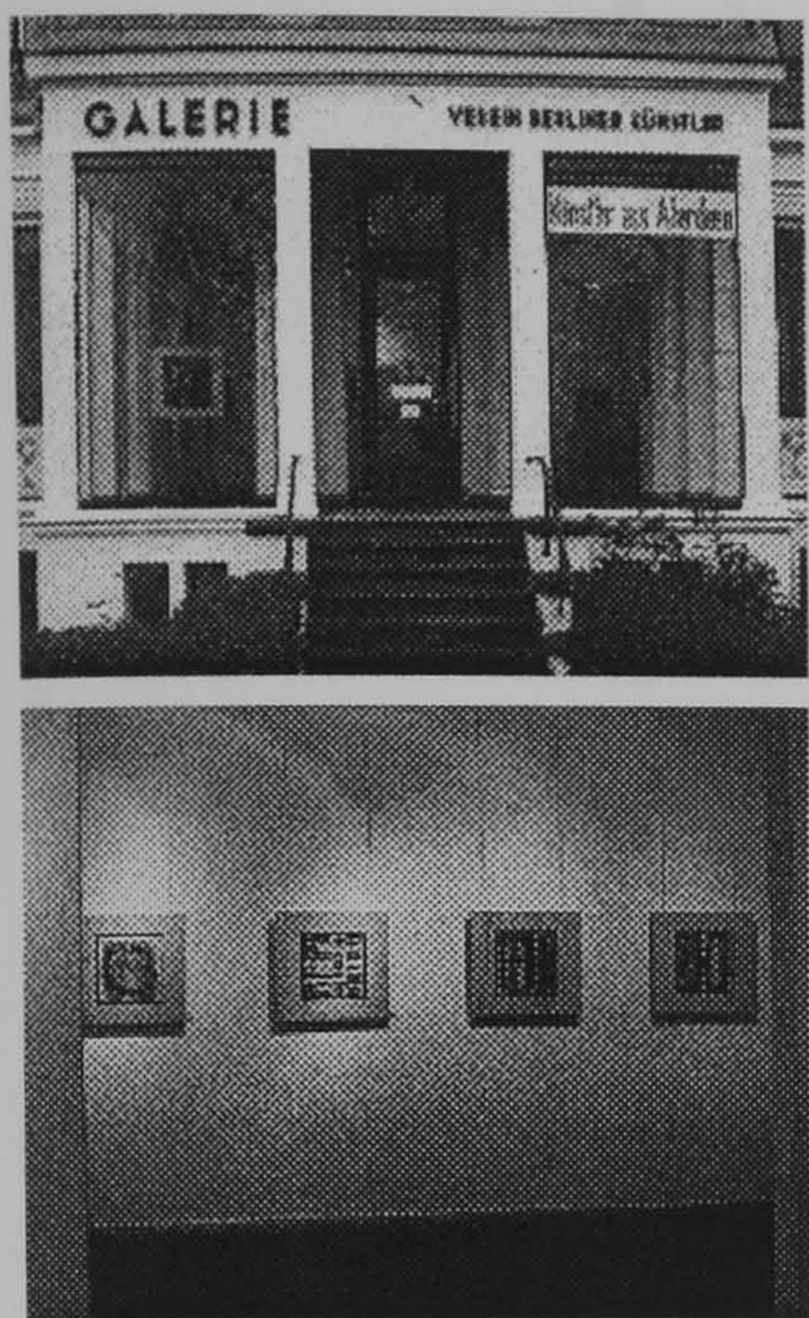
A number of key factors are common to each of these works: the range of nonhazardous materials - only water-based; scale of the work - as a critical 'test' element; adopting a systematic approach to safe practice - working within prescribed boundaries of safe practice with the substitution of all VOC for less hazardous substances; and a developmental 'open' (reflection-on-practice) approach - responding visually and practically to the individual circumstances the selected media opened up creatively.

Although no comparative analyses was attempted there are clear parallels to be drawn between these works, as common factors link these works (see above). These prints represent a period in which the researcher was actively engaged in evolving a personal practical and visual vocabulary which implicitly engaged and responded directly to the health and safety criteria proposed by this research. This process of increasingly engaging a rigorous occupational health and safety position was found not to be a limit on the working practices of the artist/researcher. Rather, in certain situations supported and acted as catalyst for the visual and practical development of the work, which extended the researchers vocabulary. However certain critical aspects have been introduced into the researchers working methods as a consequence of this systematic process: these materials and working methods were found to demand rigorous procedures and working practices, and were 'unforgiving' of bad working practices or 'shot cuts'. It was found that in order to achieve the freedom to manipulate these media for creative advantage a systematic approach to one's printmaking practices had to be adopted.

4.9 Analysis - Exhibition of the Researcher's Printed Art Works

Throughout the period of this project the researcher has continued his professional practice as a practising visual artist, pursuing exhibitions and the peer review of the work produced in the course of the project. This process has taken several forms: submission of work for 'open' exhibition (a competitive process where a limited selection of works is made by an invited jury, for exhibition); the organisation of an international group exhibition (in collaboration with other printmakers); and informal but critical discussions with experts concerning particular works.

The former are well established means of disseminating one's visual work in the public domain. Given the objectives of this research project, however the finished prints demonstrate few explicit procedural or material choices made by the researcher in the course



Illustrating the researcher's work in a Berlin exhibition, these examples are water-based mixed media on board - no photographic record of the prints in situ are available.

of making these works; these elements the researcher suggests are embedded in the work. So adopting an 'environmentally sensitive' approach need not be visually evident in the final printed art work. Further, the visual content and subject matter of the researcher's work are by nature open to subjective personal evaluations of taste and personal aesthetic preference; a discussion of the relative merits of objective or subjective evaluations of the finished prints have already been offered. This analysis will therefore infer that a personal critical evaluation (which took place continually throughout the making process by the researcher), and expert peer review of the work (exhibition within competitive gallery environment), does offer an adequate critical means of contextualising the finished work and visual results of the procedural and materials selections made by the researcher. The practice-led methodology adopted stated categorically in the introduction that the written text in effect supports the main body of this research - the printed art works. The PhD submission includes therefore, as a central component the exhibition of the researcher's work, as the culmination of this practice-led process (*see section 5 for a photographic record of the exhibition and accompanying catalogue in wallet*).

The researcher has exhibited on a regular basis throughout the period of the research project [1]. At no stage has the exhibited work, to the knowledge of the researcher, been identified 'critically' as anything other than work within an 'established' printmaking tradition of visual expression. The description of the work when submitting it for exhibition (which usually requests a description of the printmaking medium used) did not identify the use of water-based media; this was deliberate in order to reduce the possibility of the work being identified as 'alternative' water-based media, which might have a affected critical preconception of the work.

[1] 'Open' submission exhibitions: Bradford Open Print Biannually (17 July - 24 October 1993), Royal Scottish Academy (1993, 94), Society of Scottish Artists, (1993, 94.), Society of Scottish Artists selected works Pier Art Centre Orkney (1995), Aberdeen Annual Open Exhibition (1994 & 1995), and a group show at the Verein Künstler Gallery, Berlin (January 1994).

The process of 'open' submission has offered a regular opportunity for the researcher's work to be placed within a public forum, for possible critical peer review. The relative merit of this process however, when seen in the context of the sometimes subjective nature of this process, does limit any extrapolation of this observation to more universal definitive measures of artistic the 'worth' or perceived aesthetic quality in the work. As previously stated the researcher has adopted a position which accepts the subjective but critical nature of the 'negotiation process' between artist and medium. The researcher's work has only once been reviewed in the press in this period, which commented positively on the visual subject matter and physical characteristics of the printed surface. One may assume that the media and printmaking process by which the work was derived does not fall within the remit of such a review article.

Response to the researcher's work from more informal peer group situations, where the researcher has given illustrated slide talks about his work at college in the UK and workshops in Canada and New York, these have all provided direct and expert feedback concerning the work at various levels: visual, practical, content, process etc. This process was both informative and critical, in the sense that it exposed the visual results of the procedural and material selections made. It is possible to conclude that inclusion in such a range of reasonably high profile exhibitions, means the work has been viewed in a positive light.

4.10 Summary of Analysis Section

The practice-led multiple method approach adopted by this research has been a direct response to a need to integrate an 'environmentally sensitive' approach implicitly with the researcher's practice (a central aim of this research). The multiple methods adopted have been contextualised in terms of their *external* and *internal* influence on the researcher's practice. The simultaneous characteristic of this approach (see fig 3.2) is a function of the levels this research has had to address; *externally* - learnt and acquired information: physical tests, questionnaire, case study, interview and collaborative workshops; and *internally* - assimilation and evolution: documentation of practice, production of printed art works and the exhibition of this work.

The need for quantitative physical tests has been limited in this research. However, measurable characteristics were identified in the papers tested which supported the researcher's own observations that papers with an 'open' porous quality (that certain fine art papers exhibited), were better suited to the demands of water-based screen printing inks. The questionnaire identified a marked disparity between the perceived effect that COSHH had on printmaking practice within higher education, and actual implemented responses to the COSHH Regulations (this was reiterated at a follow up symposium). The strong sense of tradition associated with this area of practice was often linked to the sheer diversity of printmaking practices. However, this same strong sense of tradition also imposed a prescriptive boundary, as there was a reluctance to accept change when associated with safer printmaker practices, as opposed to change which was 'freely applied' when driven by artists' individual creative demands, implemented at every level of practice.

This theme was not reciprocated in the case studies, surprising given the extreme working environments to which each artist responded (logistic, environmental and personal health and safety criteria). The researcher's collaborations supported the proposition, that different levels of experience and individuals' adaptability to changing working environments had a significant influence in defining attitudes and establishing personal boundaries of 'acceptable' practice. The collaboration with Howard identified a spectrum of materials and techniques which did not 'fit' established or 'traditional' practices, as each was judged on the results they offered within an open approach, which has been described as systematically 'unbiased'. This was reiterated in subsequent 'expert' discussions, in which Howard's own practice could be seen to evolve from this unbiased workshop process:

> *"I think it's about time printmakers took an equally responsive attitude, its all very well having tradition, but how do you think new traditions begin or respond. Through a certain group of people that have the courage to change because you need courage to change"*
>
> *(Howard taped interview, see **appendix 3.8.4.2**)*

The collaboration with Henning introduced new working methods to the researcher's practice which established a fundamental shift in the researcher's practice. The collaboration highlighted two important factors; apparent limitations, imposed by even the most extreme working conditions, do not necessarily directly correlate to restrictive practices, and second, an 'open' and innovative approach in the pursuit of visually exacting creative practices will 'feed back' into safe practice, when based on an 'unbiased' but 'expert' approach.

In each of these collaborations there was an expectation that the individual printmaker would innovate and respond 'creatively', whatever the working situation. This 'process of innovation' was not limited by traditional preconceived ideas about practice, and what was 'inside' or 'outside' that practice, a supposition which is based on limited definitions of 'traditional' practices with respect to these collaborations. Change for creative advantage engaged each collaborator in a continual process of negotiation with the creative and environmental conditions imposed or applied to their practice.

The researcher's own practice has progressively and thoroughly adopted a systematically 'environmentally sensitive' approach. This has been a continually evolving process; drawing on external and internal reactions, resulting in an individual vocabulary both visual and practical, which is increasingly independent of the physical or theoretical associations that 'safe practices' originally imposed. This is based on having identified specific advantages and disadvantages with a range of techniques - screen printing, relief printing and intaglio which have extended the visual vocabulary of the researcher *(see **appendix 3.8.3.1** & **3.8.3.2** on **CD ROM**)*.

Documenting the work has been an important critical element in identifying at what stage, and under what circumstances the process of change occurs: substitution and manipulation (originally determined by the proposed environmentally sensitive approach), influences the work, for creative advantage *(see **appendix 3.9.1.1, 3.9.1.2, 3.9.3.1** & **3.9.3.2** on **CD ROM**)*. The importance of this recording process, has been in being able to realistically document the creative practice by linking image with text over time, which the FileMaker electronic data base records have enable the researcher to do (see above appendix on CD ROM at the back of this binding). This has helped to link specific innovations and new techniques with individual circumstances and particular working situations. The FileMaker records have offered a tangible means of reflecting-on-practice, making 'visible' and 'transferable' the intuitive processes which are not evident in the final work, through this type of time-based documentation.

This analysis has attempted to bring together various sources of evidence, into a systematic description of the boundaries which currently define 'safe printmaking practice'. The contextual review identified a lack of a comprehensive vocabulary of practices and materials with which it would be possible to perceive of safe printmaking encompassing the diversity of printmaking practices. However, the analysis has identified the means by which sustainable change may take place when it is supported by non-prescriptive definitions of practice (not necessarily non-traditional) and 'expert' yet 'insightful' understanding of the functional characteristics of the media used. By definition these factors are unique to each practical working environment and the demands individual artists demand and place on their practice. It is the conclusion of this analyses that their exists a need for a 'framework of safe practice' which will both promote and integrate, personal and health and safety criteria, and that this should be further developed.

5.0 SECTION FIVE: Ph.D Exhibition Submission

5.1 Rationale for Exhibition: Thesis as 'Holistic' Argument

This written text [partial thesis submission] contextualises and describes the research undertaken. However, a critical element of this research has been the practice-led basis by which this research has been carried out, where the methodological issues this research addresses stem from practice and also feed back into that practice (*see section 3.2*). The researcher has brought to this research his experience and commitment as a independent visual artist, who's work - the generation of original visual ideas and the exhibition of this visual work within a public forum - forms the critical basis of this research. Therefore the visual work produced in the course of this research [printed art works, editioned prints and monoprints] has been a continuation of the researcher's established professional practice as a visual artist, but these have been contextualised through the objectives and aims of this research (*see sections 1, 3, 4 and 6*).

The exhibition of the visual work generated in response to the research rationale importantly forms the central component of this submission, which comprises three key equal elements in total:

- this written text;
- a body of printed art works;
- a computer based 'risk assessment' database or 'morphological framework of safe practice'.

These three related but distinct elements constitute a comprehensive argument or - holistic thesis - within the context of this submission.

The exposure of these visual art works to the public domain, and possible criteac by the researchers peers, therefore has been an integral element. This process of exhibition or initially 'publishing' of the findings of this research [an ongoing process, as this body of art works will be exhibited at subsequent venues] is proposed as an important but not universal means of placing one's research work within the public domain.

5.2 Record of Exhibition

The following photographic record of the exhibition space including reproductions of examples of the work exhibited, is limited by the medium of reproduction this written text imposes. However, it does offer a visual indication of the scale and visual nature of the work.

Fig 5.1 Grays Gallery [lower foyer] at the researcher's institution, which offered a dedicated environment for the exhibition of this work, spot lighting and the physical space to hang the work.

Fig 5.2 Grays Gallery [upper foyer] at the researcher's institution, which offered a dedicated environment for the exhibition of this work, spot lighting and the physical space to hang the work.

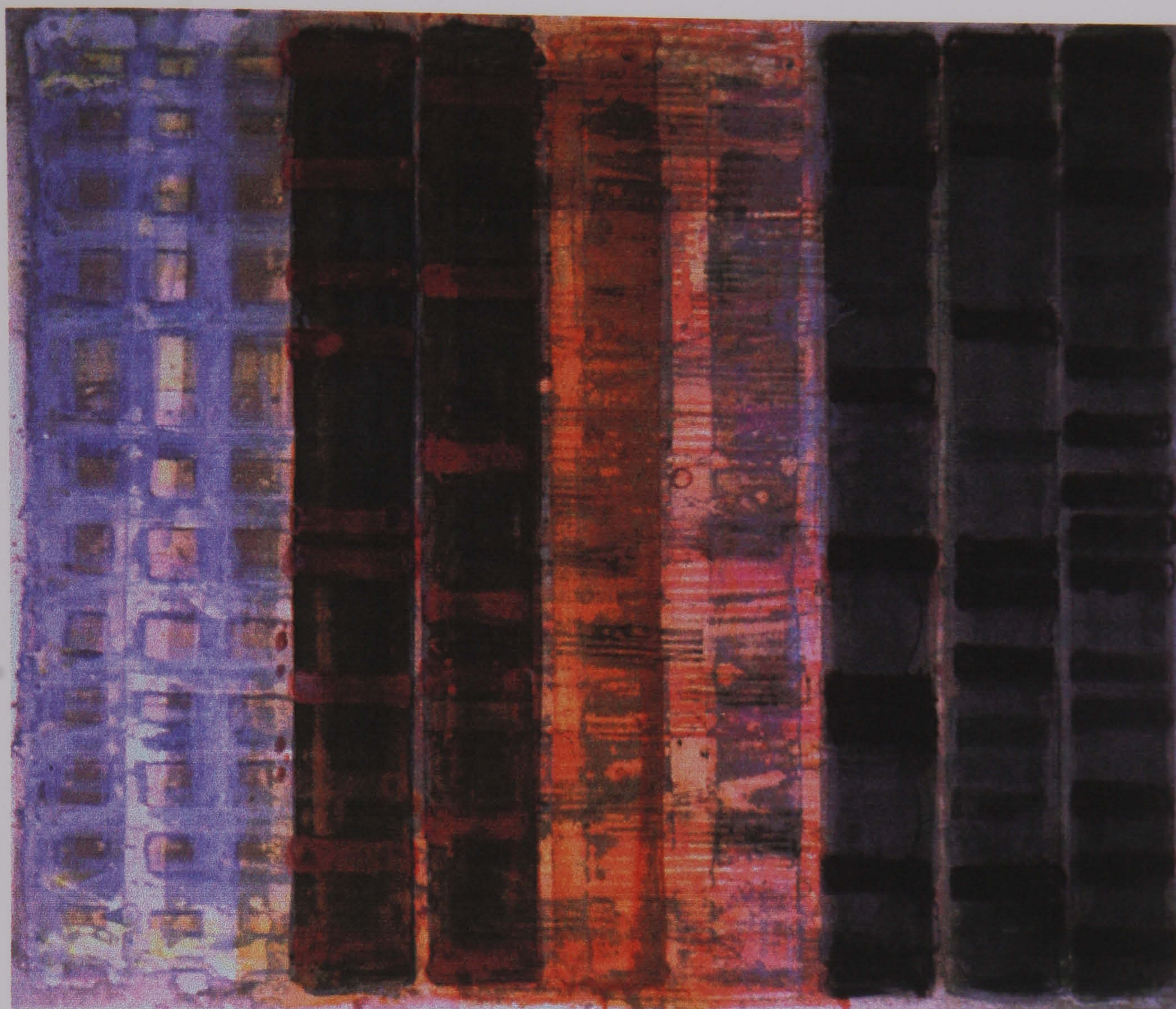


Fig 5.3 "Six Degrees of Separation #2" 1.18 x 1.20 m, water-based screen mono print, using water colour and gouache pigments.

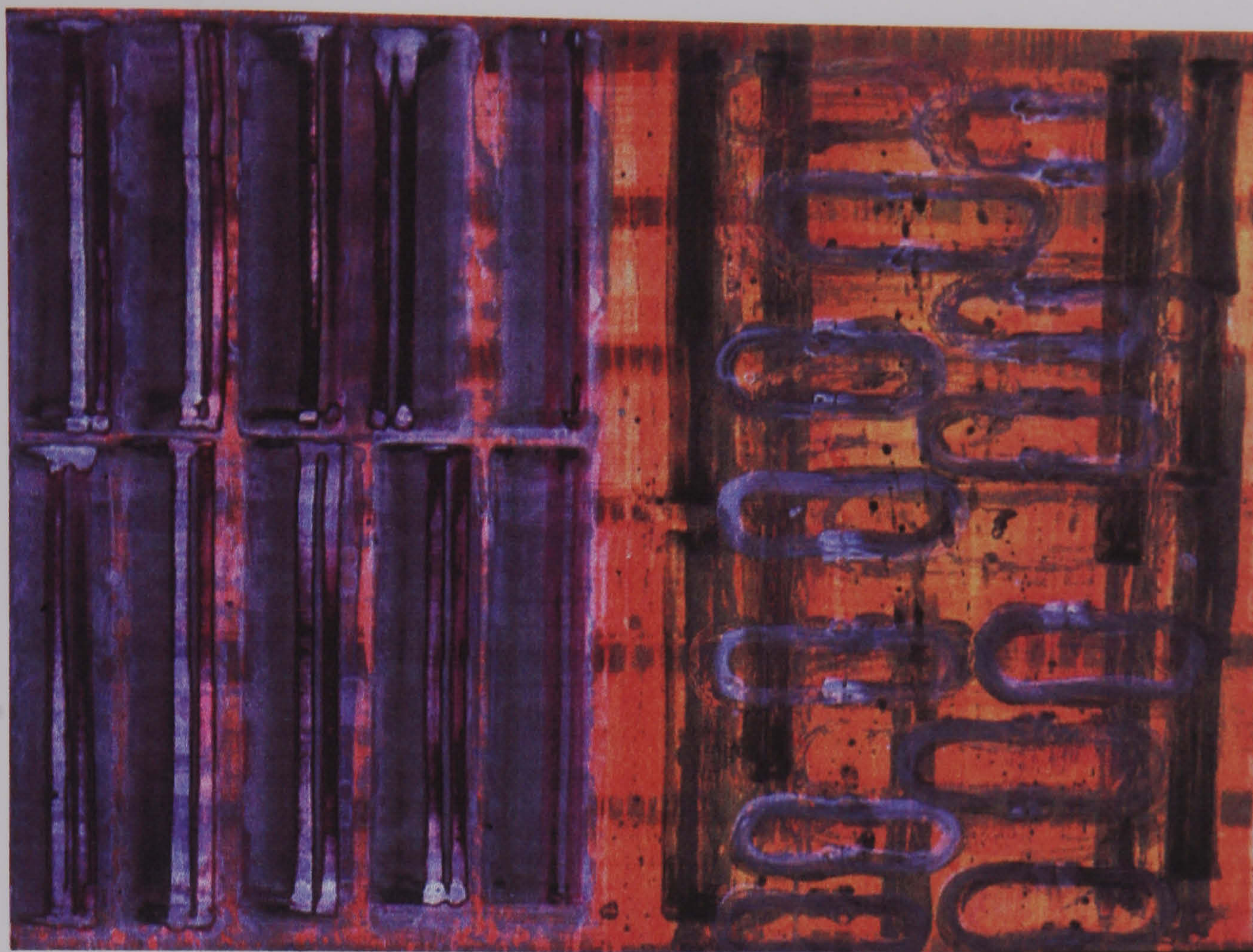


Fig 5.4 "Decentering Culture" 0.75 m x 1.08 m, water-based screen mono print, using water colour and gouache pigments.

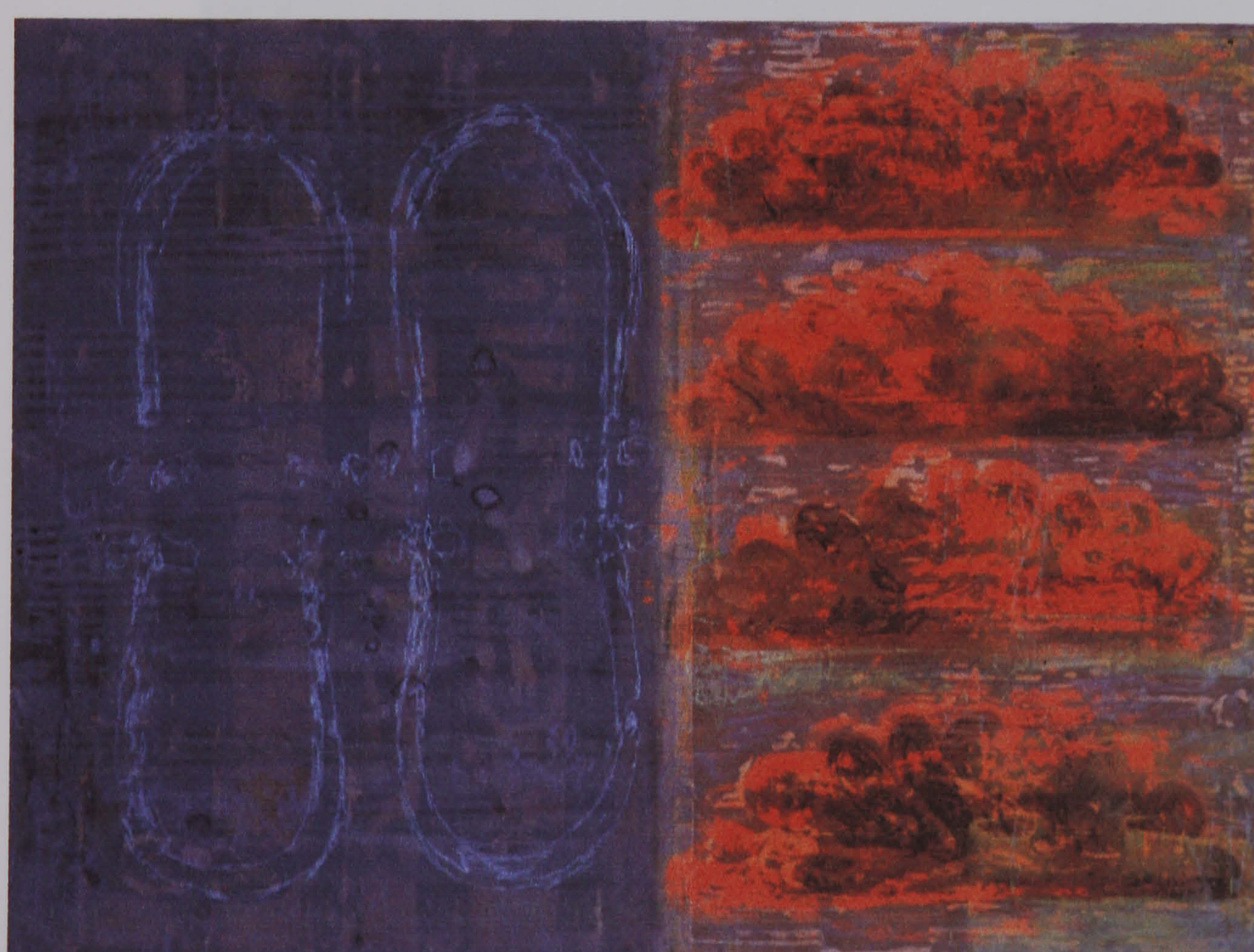


Fig 5.5 "Lifelike" 0.75 m x 1.08 m, water-based screen mono print, using water colour and gouache pigments.

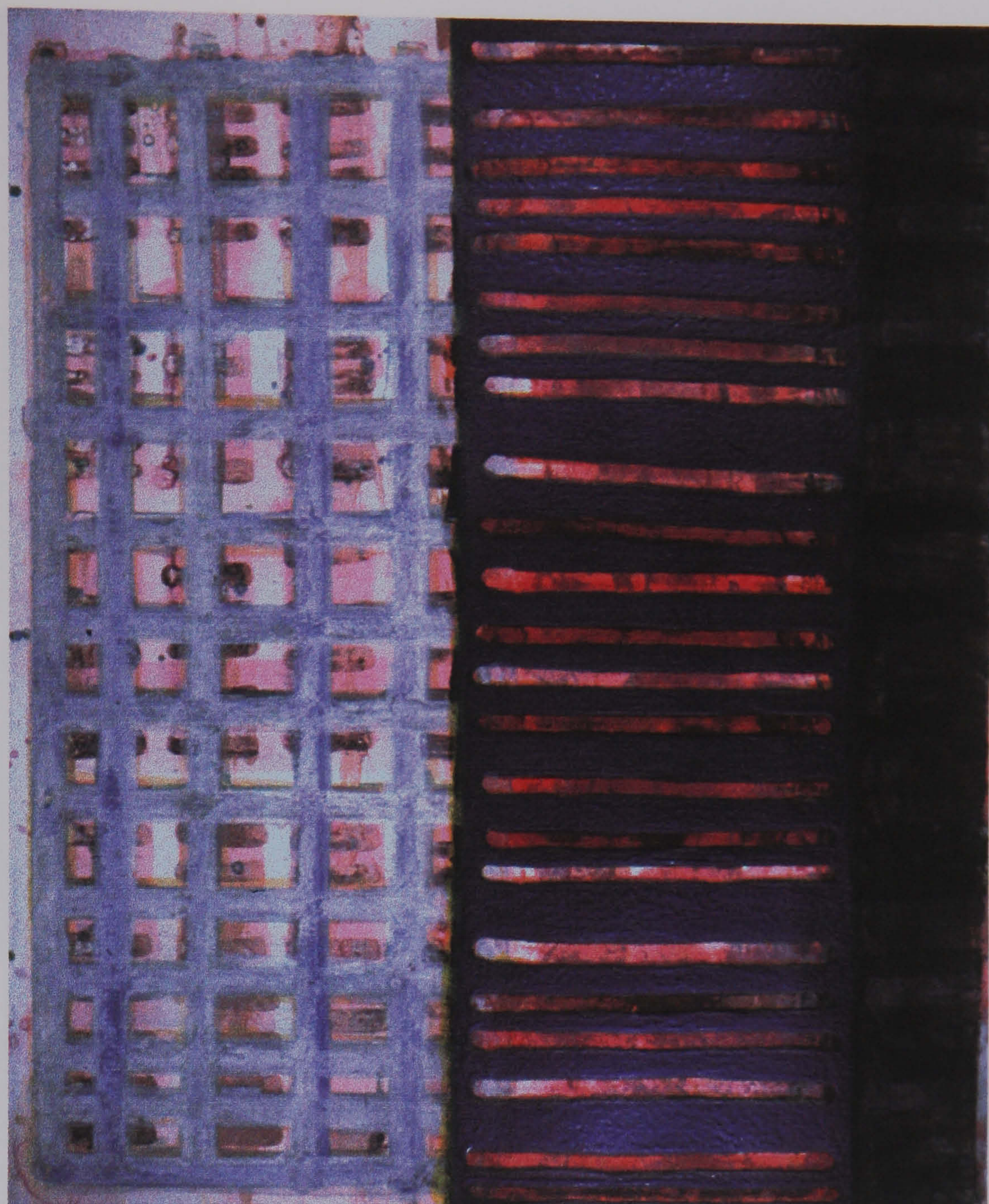


Fig 5.6 "Layer of Types of Order" 1.18 m x 1.20 m, water-based screen mono print, using water colour and gouache pigments, with water-based impasto relief printing.

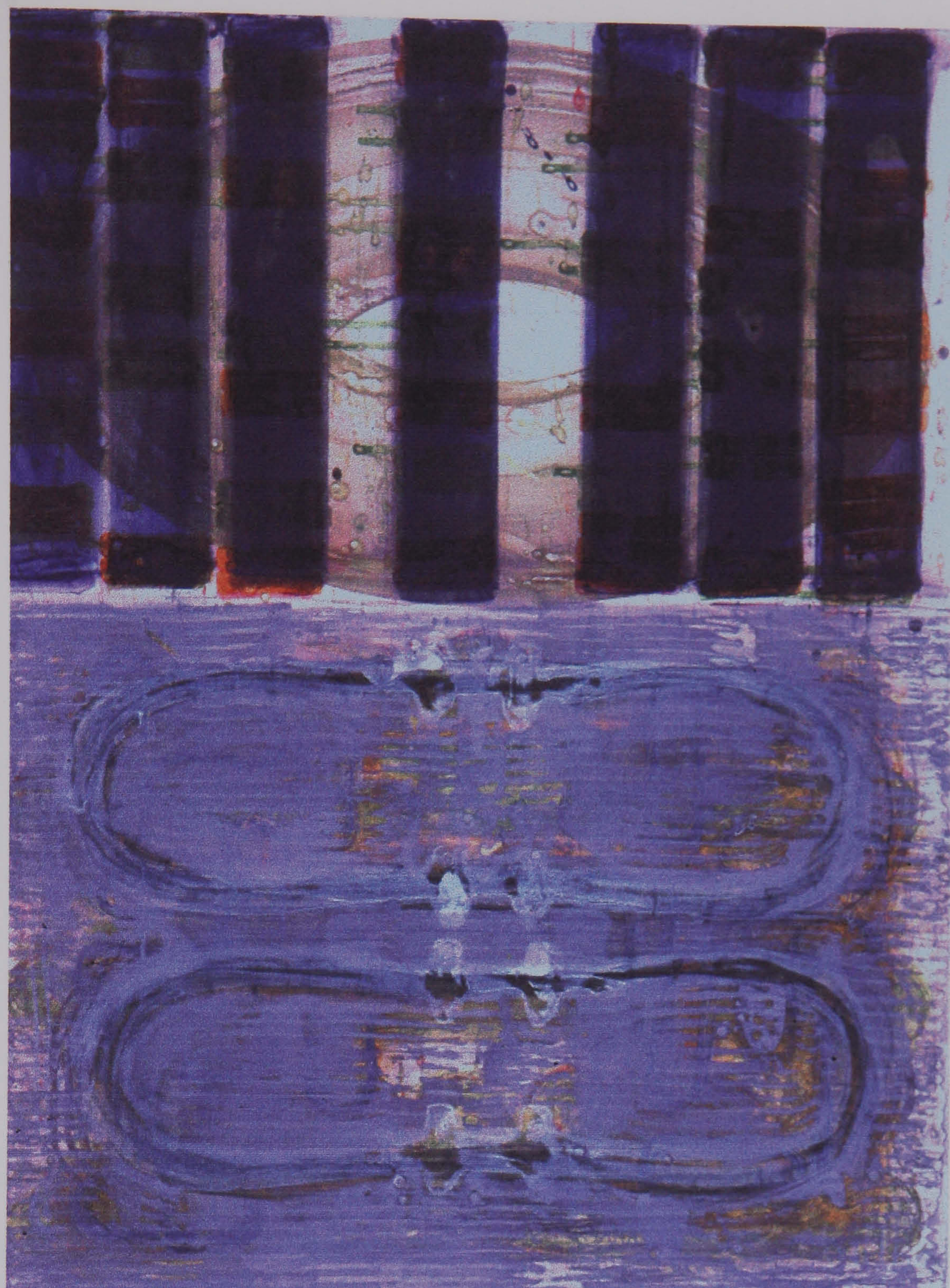


Fig 5.7 "Obediance to Universal Order #2" 0.75 m x 1.08 m, water-based screen mono print, using water colour and gouache pigments.

Fig 5.8 "Obediance to Universal Order #3" 0.75 m x 1.08 m, water-based screen mono print using water colour and gouache pigments, with relief printing also water-based media.

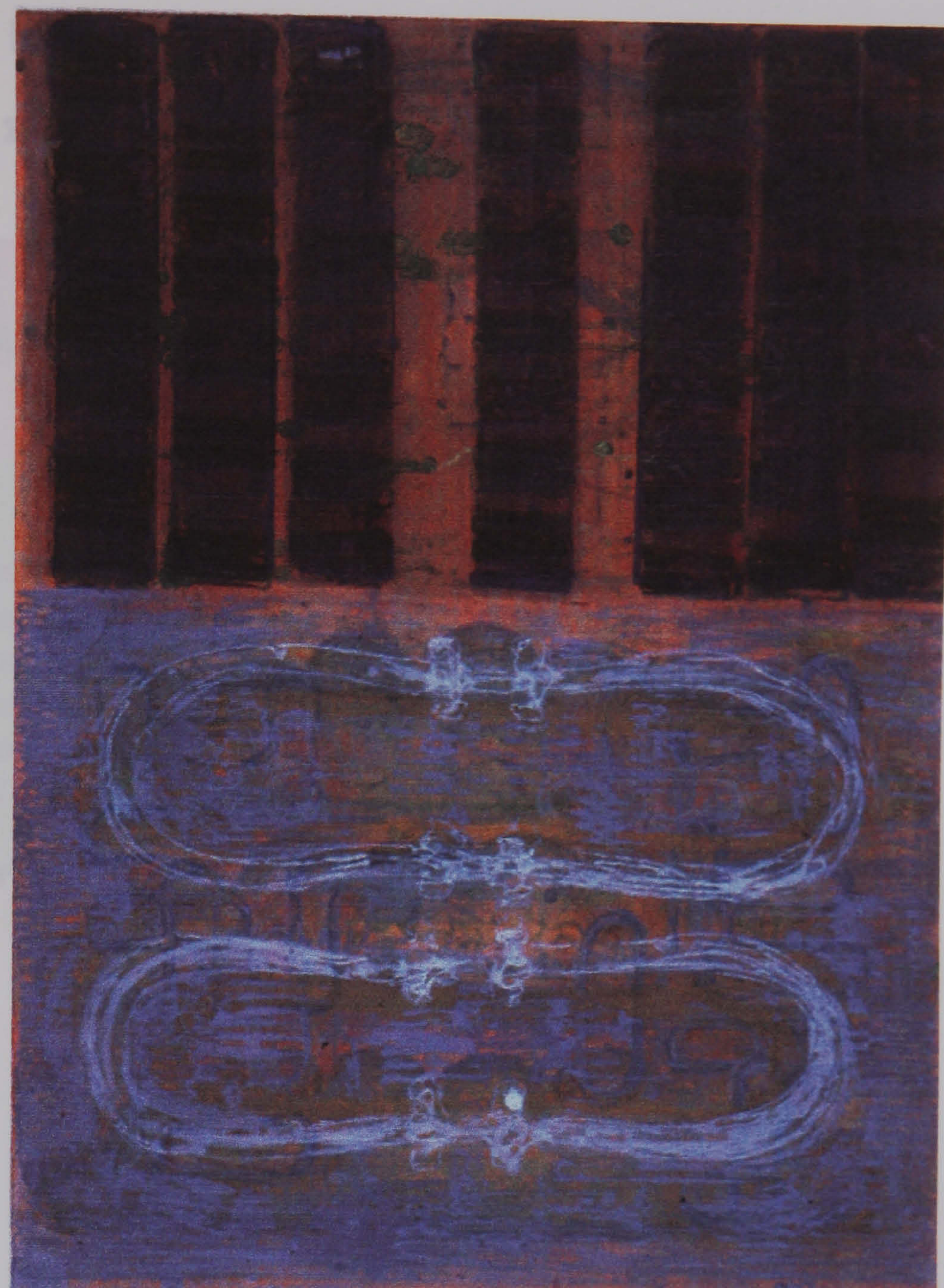


Fig 5.9 "Obediance to Universal Order #4" 0.75 m x 1.08 m, water-based screen mono print, using water colour and gouache pigments.

Accompanying the researcher's exhibition, and contextualising the visual subject matter from which this work draws, was an accompanying catalogue (*see **appendix 5.2.1***). This document contains a review by Lennox Dunbar, senior lecturer in printmaking at the researcher's institution, this supported the exhibition and offered a means of critically contextualising this work. The developed computer based 'morphological framework of safe practice' also formed part of this exhibition submission (see **appendix 6.1** on accompanying CD-ROM at the back of this thesis).

6.0 SECTION SIX: Discussion and Conclusions

6.1 Introduction: Proposing a Framework of Safe Sractice

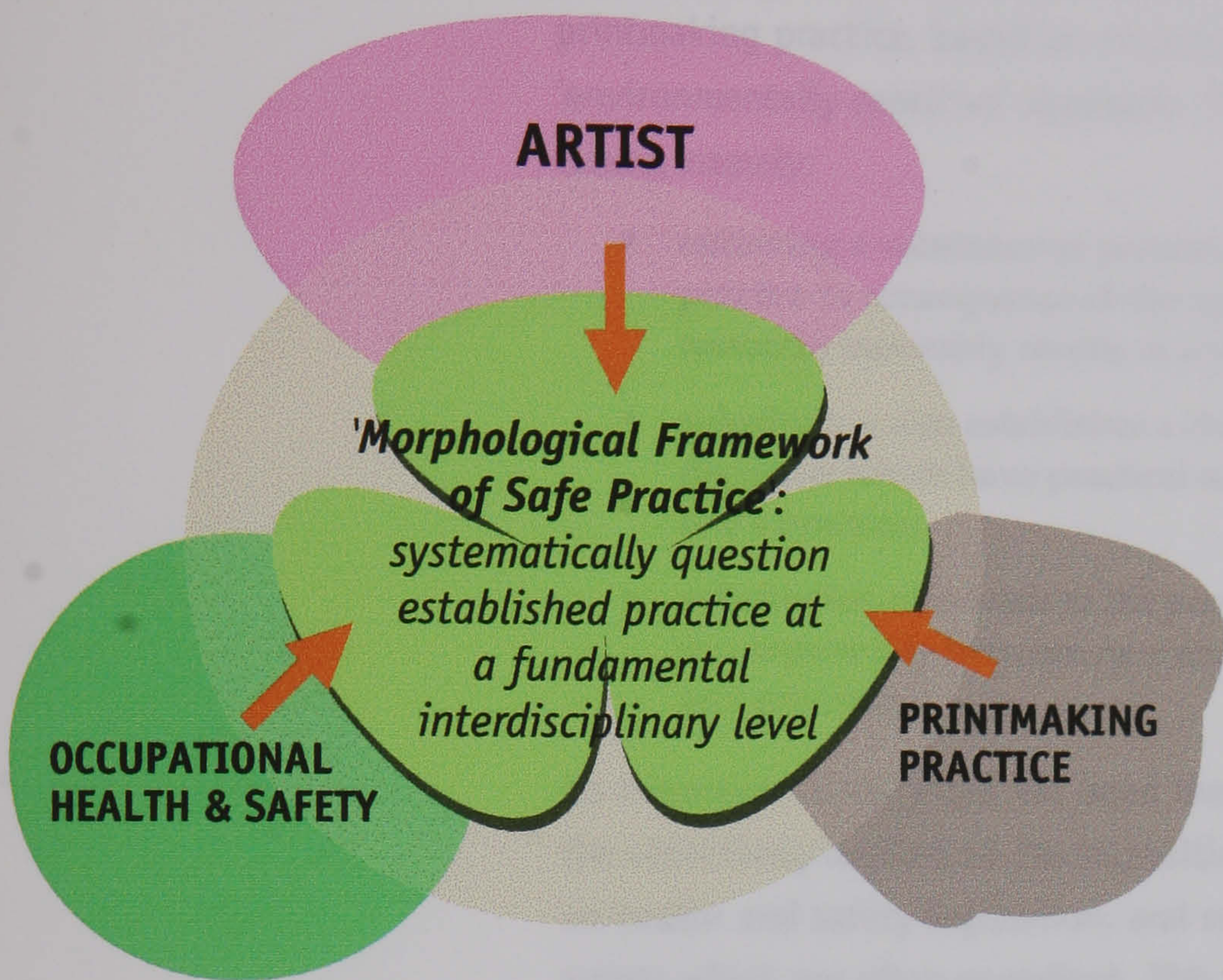


Fig 6.1 Illustrating the interdisciplinary relationship which has led to the proposal for a 'framework of safe practice'.

This section will be concerned with the description and discussion of the proposed 'framework of safe practice', and the development of the morphological model which the framework will use, as a direct response to the practice-led approach this research has adopted and the results and analyses of this research. The research has sought to establish, at a fundamental level, an implicit link between printmakers' creative practice and an 'environmentally sensitive' approach, which will engage all aspects of 'safe' practice, including legislative and personal criteria. The notion of morphology developed in this section is an attempt at defining a comprehensive framework within which it would be possible to integrate previously distinct components - the idiosyncratic nature of individual artists' practices, appropriate legislative criteria and sustainable creative practices in printmaking. This morphological framework demands a sequential examination of process at a fundamental structural level, in order that all possible, previously un-considered alternatives may be considered, so that new combinations or solutions may evolve through such a re-examination.

Therefore this discussion and conclusion section will contain the description of the principles and development of this framework. The framework is seen very much as a result of the research process contained in this thesis. The development of the morphological framework, the practice-led nature of this research are consequentially interdependent of each other.

6.2 The Results of a Systematic 'Environmentally Sensitive' Approach.

An integral component of the practice-led methodology has been the researcher's aim to fundamentally question his established printmaking practice, based on an increasingly informed 'environmentally sensitive' approach. This raised a number of key issues, namely:

- removing a substance or process from one's 'established' practice (a consequence of the approach adopted in this research) inevitably results in a substitution;
- substitution also establishes a chain of consequential decisions which have practical and visual impact on one's practice;
- substitution also leads to the possibility of incompatibility between new and unfamiliar substances and processes.

An important issue raised has been the potential conflict between the objectivity implied by the imposition of external criteria based on health and safety legislation, and subjective decisions made by artists which are often expedient. This research has established that there is no existing model which integrates this diversity influences. This has been critical in establishing the basis for the proposed morphological framework. This framework must therefore operate at a number of levels:

- as an interpretative tool which integrates individuals 'working practices,;
- as a reflection of the fundamental heterarchical structure of printmaking practices;
- as a support to the concept of external validation of artists' creative decisions by health and safety legislative criteria.

Collectively these levels have determined the structure of the proposed morphological framework model.

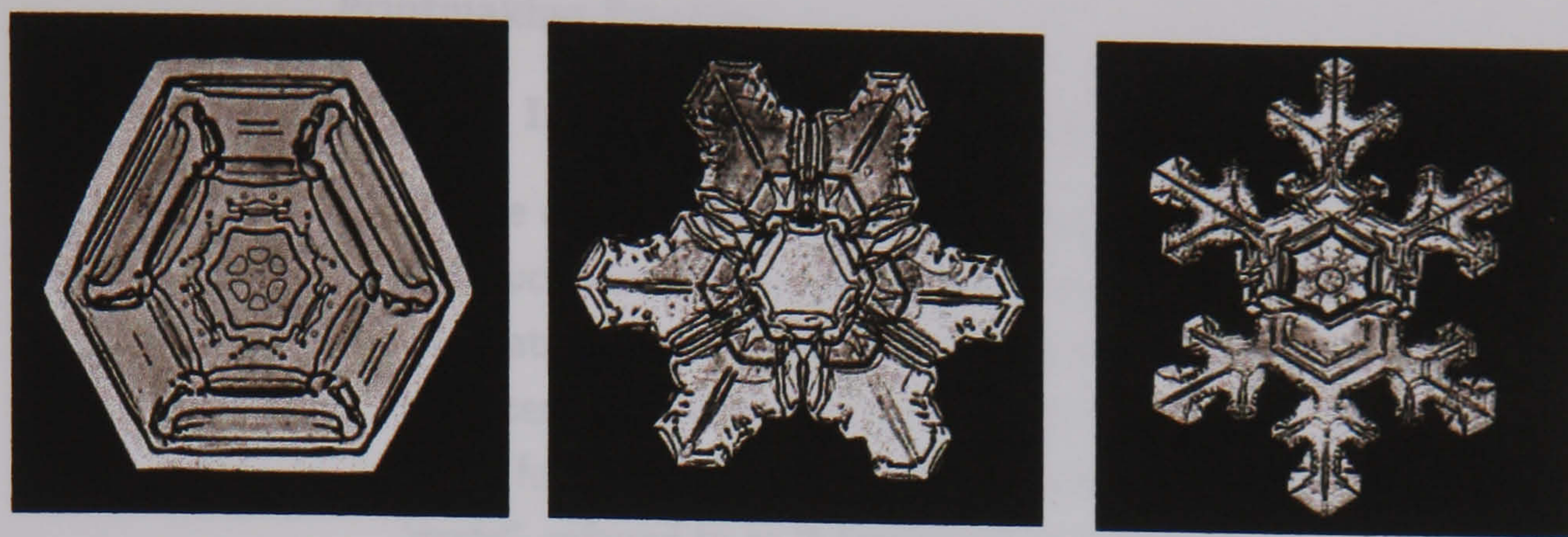
6.3 Morphology: A Definition

The methods adopted in this research and subsequent analysis have all contributed to the idea of a framework of safe practice, one which may be morphological in nature. The possibility of developing a universal model which describes all elements particular to a medium and the visual grammar evolved from that medium, has already been discussed (*see section 3.5*). Therefore the concept of a fundamental structure which encompasses both visual and practical selections, which can implicitly link safe practice to creative practice, is the fundamental basis for the proposed 'framework of safe practice' discussed in this section.

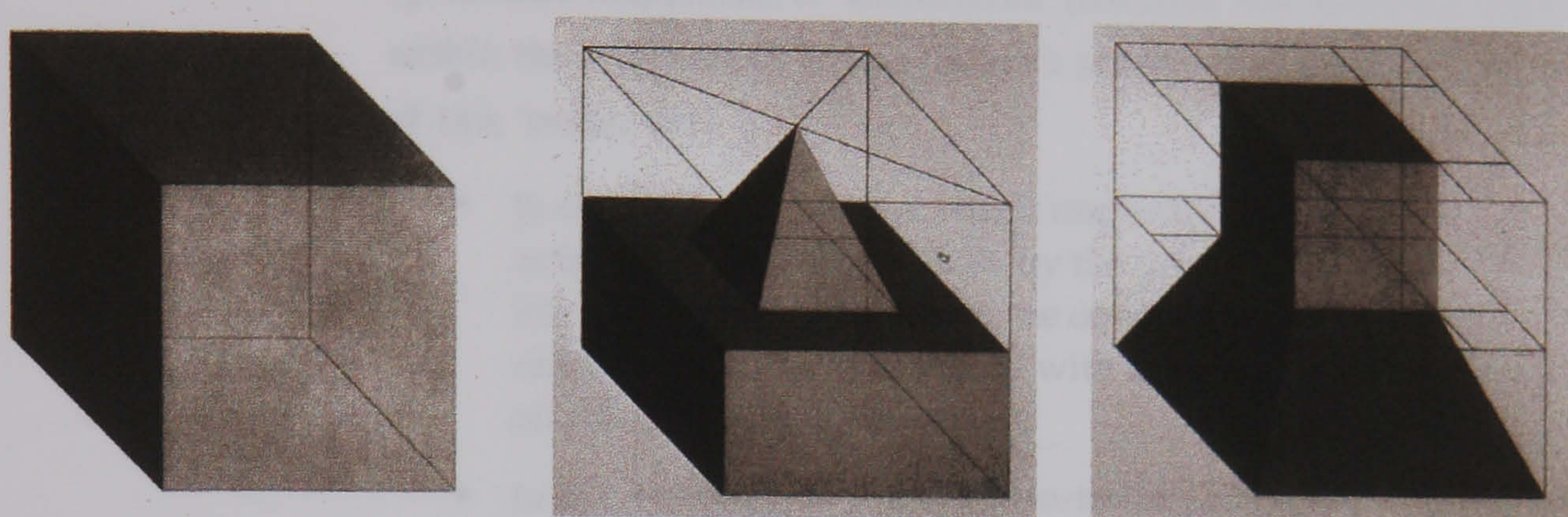
The term morphological is used here to describe a process of 'systematic identification and description'. The Shorter Oxford Dictionary definition identifies the term with the science of form - *'the structures homologues, and metamorphoses which govern or influence that form'*. This concept of metamorphosis is pursued by **Pinker (1994)** in his description of the morphological nature of language. Pinker uses terms 'inflectional' morphology and 'derivational' morphology to describe different aspects of this evolving characteristic of language. He suggests that all language forms can be generated from a set of basic structural rules and finite vocabulary. **Holtzman (1994)** develops this concept of a universal 'morphological' foundation which he suggests can be expressed by a form of *'rule-governed creativity'* (pp 112) for all language forms: oral, written, harmonic and visual which (drawing on the concepts proposed by Chomsky).

This definition of morphology, in the context of the argument presented in this thesis, suggests an evolutionary visual form or structure, resulting in an evolving visual grammar generated by the interaction of the physical and aesthetic processes which describe the printmaking medium. The suggestion is that multiple levels of practice, and infinite solutions are possible from known forms, structures and methods. The researcher identifies his own practice with the generative process which the morphological concept supports. This concept of a generative visual and procedural grammar is a familiar idea, given the well documented evolutionary characteristic of the researchers ideas (*see* ***appendix 3.9.1.1*** *&* ***3.9.1.2***) and the generation of organic image forms as a direct result of the print medium (*see fig 6.2)*.

Morphology as a Visual Metaphor



Morphology in nature: generic snow flake form



Morphology in art: Sol LeWitt, 1977, "Forms Derived from a Cube"

Morphology in nature: cellular microstructure of plant forms

Morphology in Art Practice: generic visual forms developed as a direct result of process - Pengelly, "Obedience to Universal Reason Series" 1995-96.

Fig 6.2 Morphology as a Visual Metaphor

6.4 Developing a Morphological Framework for Safe Printmaking Practice.

6.4.1 Introduction: Developing a Morphological Concept

One of the central aims of this research project has been to introduce a structure which supports the selection of 'safe' methods and materials, which will also support printmakers individual creative practices. There is no such interpretative structure at present which might fulfil this aim. This section describes the development of a 'model', referred to as *'A Framework of Safe Practice'*, for the systematic reappraisal of 'established' practices and materials used within the researcher's / practitioner's printmaking practice. The aims of this 'model' are:

- to establish a procedure which implicitly links every action and or selection made by the printmaker, to an informed comprehension of the occupational health and safety implications associated with that decision (based on risk assessment processes);
- to introduce the concept of non-traditional 'unbiased' selection procedures, which accept the idiosyncratic but expert 'tacit' knowledge base that directs artists practice;
- to develop a 'morphological model' which extends the visual and practical creative vocabulary of printmakers.

This has resulted in a paradigm shift by the researcher, where all established working practices and attitudes have been questioned by means of a sequential examination of those processes at a fundamental structural level.

6.4.2 Morphological Analysis Technique

Morphological analysis was first proposed by **Zwicky (1948)**, as a means of introducing controlled systematic design to apparently complex problems [1] in order to:

> *"..visualize and comprehend all of the essential interrelations among physical objects, phenomena, concepts and ideas, as well as evaluate the human capabilities needed for all future constructive activities." (pp 3)*

This morphological process, adapted by **Saint-Germain (1990)** is described as:

> *"essentially a heuristic approach to a search thus permitting an overall view of various components of a specific situation in a systematic manner." (pp 61)*

[1] The utopian fervour of Zwicky's statement should be qualified by the historical context in which it took place - post second world war - which initiated Zwicky's original investigation of morphological analysis techniques.

The morphological analysis technique, proposed by Zwicky, is governed by a set of rules; this protocol forms the basis for all subsequent applications of this morphological method [**Norris (1963)**; **Saint-Germain (1990)**] These rules are:

1. Establish an exact statement of the problem which is specific in that it does not lead to confusion. This initial statement determines what does and does not belong to the problem definition.
2. All of the parameters that characterise the function or problem statement [1] must be identified.
3. Each parameter will generate a number of alternative valid solutions which conform to that parameter. The resulting independent solutions, should not be reducible i.e. no two solutions can occur at the same time. This introduces the concept of 'open' presumption-less generation and selection.
4. Determine a means of comparison, in order that 'unrealistic' combinations will not conflict. Information is filtered, based on experience and 'expert knowledge' by rejecting or accepting solutions and combinations, based on physical and practical particularity.
5. Assess the 'success' of certain paths, 'optimal' solutions are practically applied, where decisions are supported by the 'open' presumption-less morphological structure.

The premise of morphological analysis relies on deconstructing a stated problem up into all its fundamental procedural elements or parameters; to each stated parameter is attached every possible stated solution (so that every possible permutation for a given problem is at least stated if not finally considered). This procedure results in a morphological matrix (fig 6.3) listing parameters vertically, and listing all possible category solutions horizontally, which describes the 'means' of achieving each category solution. The concept of morphology, in the context of this research, therefore suggests a sequential examination of process at a fundamental structural level, in order that all possible, un-considered, alternatives may be considered, and that new combinations or solutions may evolve through re-examination.

From a procedural perspective there are strategic similarities between the morphological matrix and the sequential practical processes which describe the printmaking process, given that each printmaking process (etching, screenprint, relief or lithography) can be described as a sequential set of possible alternative decisions made by the artist. The selections and decisions made by the printmaker in effect forms a personal route, as only certain selections are made (which this research has shown to be determined by environment, available resources and experience, see section 4.5.6).

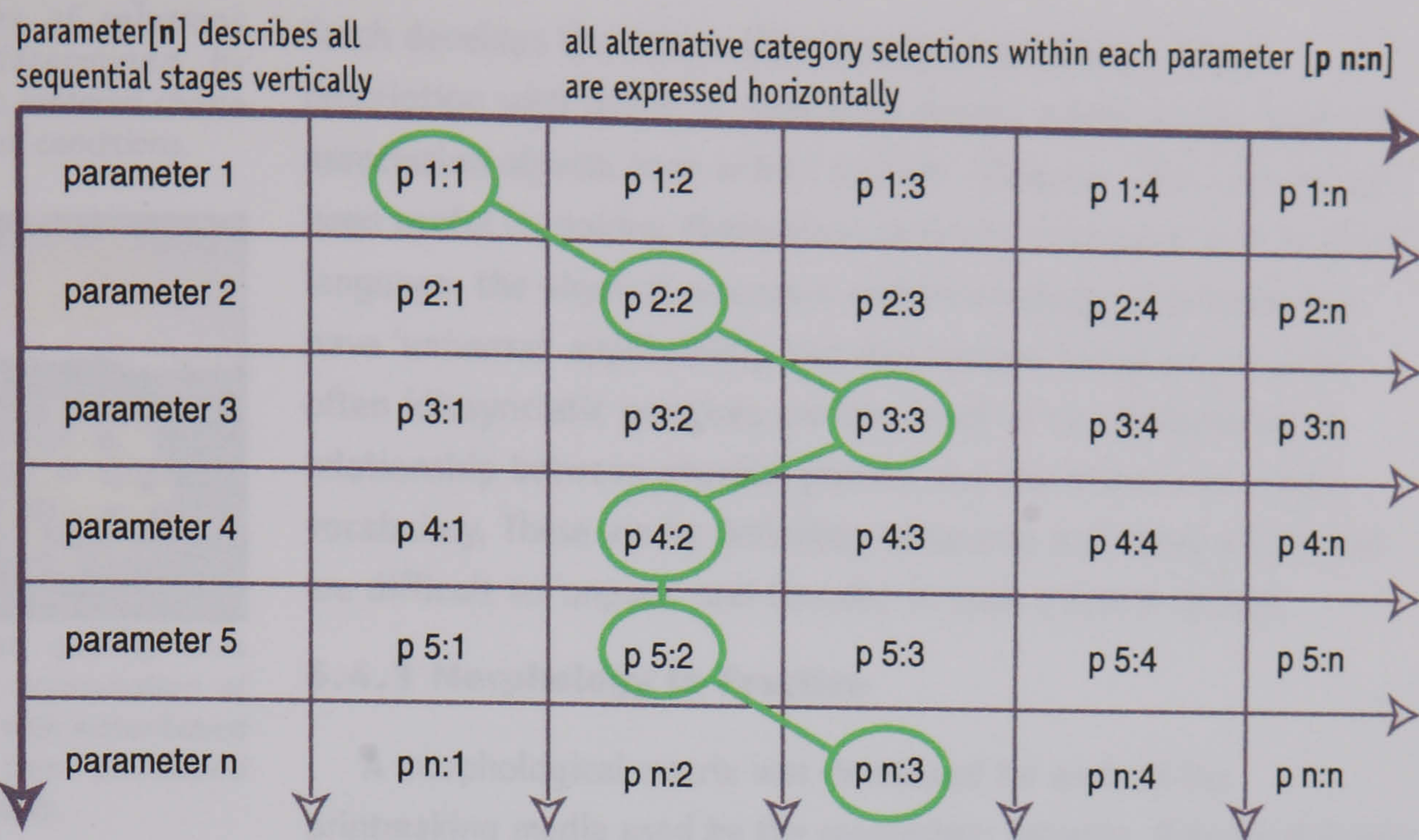


Fig 6.3: A morphological linear matrix proposed by Zwicky, Norris, and Saint-Germain, in which each route through the matrix - represented by the connected nodes and lines - describes one single solution. In this matrix all other possible solutions are given equal consideration as they are stated if not pursued in the matrix. The matrix in effect acts as a 'store' for all known and untried solutions to a given problem.

[1] Tight Morphology (in the context of this research) describes the single solution approach often found in text book and technical manuals on printmaking. It's limited by an inability to describe what is an evolving creative vocabulary.

[2] Slack Morphology (in the context of this research) a type of 'non-ordered enumeration', which positively pursues non-biased change as a determining influence - aligned to creative expediency. An example of this type of model, is the ARP system developed by Watson (1992).

The effectiveness of the morphological matrix evidently relies on individual experience and expert knowledge within a subject area in order to 'load' material data, define parameter categories, and determine the means of comparison. Yet the 'rules' governing the morphological concept seek to remove prejudice and support the generation of alternative solutions, based on an unbiased evolutionary approach, as all solutions are presented for comparison within the matrix. Norris has suggested this will result in two morphological models. First, tight morphology[1] which is based on 'restricted enumeration', the action of limiting the boundaries and total number of solutions derived from experience; second, slack morphology[2] which is based on 'non-ordered enumeration', the action of determining many possible solutions, essentially unlimited.

Adopting this technique has involved establishing parameters and solutions which describe the various printmaking media; this was made surprisingly difficult given that a vernacular language is often used to describe printmaking techniques, an aspect the researcher has had to consider given the diversity of these definitions. Establishing the means of parameter categorisation, evidently cannot always be seen in singular terms, as has been suggested in the basic morphological model. **Tesch (1990)** suggests that rigid definitions become increasingly irrelevant as one concedes that problems reside in practical situations:

> *"On the one hand it is obvious that categorisation is helpful...on the other hand it seems artificial in many cases. To avoid forcing categorisation, we will have to allow for borderline cases, or concede that categories overlap." (pp 136)*

Tesch develops the notion that 'membership' offers a better description with which to categorise things, based on the degree of association objects have within a given category[1]. This concept has been useful in making distinctions between vernacular and technical language: the physical processes and terminology of printmaking have 'universal' applicability, but descriptions based on personal often idiosyncratic practices are the result of an interdependent relationship between physical process and the artists own visual vocabulary. These are by definition unique to individual artists and are difficult to 'unpack' and transfer in such a matrix format.

6.4.3 Morphology in Practice

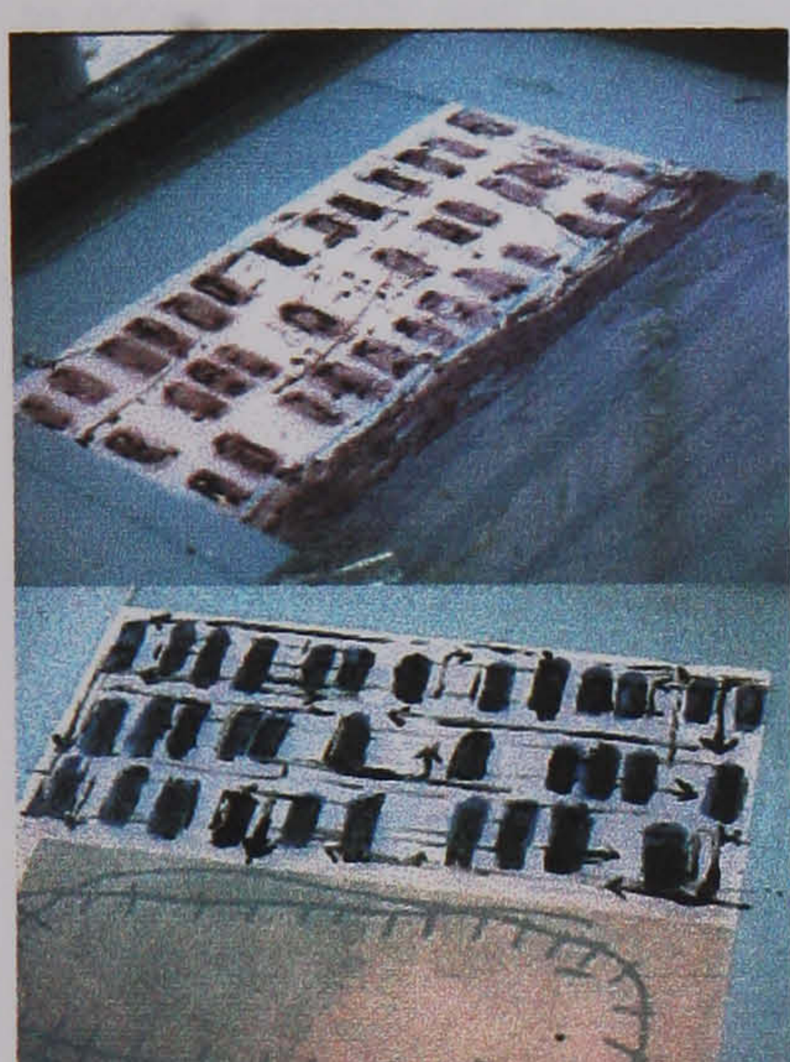
A morphological matrix was developed for each of the printmaking media used by the researcher: *Intaglio*, *Relief* and *Screen Printing*. The statement of the problem and its identification (as defined by rules [1] and [2] of the morphological protocol) were defined by the aims of the research project and have been previously described *(see section 1.3)*. The parameter boundaries of the matrix were defined by the sequential processes involved in rendering a design onto a print matrix (screen, relief block or intaglio plate), and printing that design onto a given substrate. The resulting *'first generation'* matrices were developed, these illustrate the concept of the morphological 'linear' model (**Appendix: 6.5.1.1**). This basic linear morphological model established certain restrictive characteristics of this particular model, namely:

- the categorisation of unplanned and eclectic drawing and mark making procedures could not easily be translated into the linear format of this morphological matrix;[1]
- the linear matrix did not implicitly link an environmentally sensitive 'option' to the selection process - as no means of externally validating or filtering selections made was implicit in this linear model;[2]
- the matrix did not identify or highlight the consequences resulting from selection of certain combinations of materials - given that certain combinations were incomparable with each other.[3]

The basic morphological grid (as used in the *first generation* matrix appendix 6.5.1.1) proposed by Zwicky was developed by **Saint-Germain (1990)** into a more interactive 'learning tool'. Saint-German's model retains the basic premise of the linear morphological analysis model, but proposes to filter selections by means of subjective evaluations of the 'probability of occurrence'. This Saint-

[1] *Examples of solutions which are determined by individual artist, material choice or environmental conditions.*

This resist quality was achieved by a combination of irridescent and with water-based relief inks, this produced unexpected results.



Two stencil methods which visually give the same results, but practically require quite different substances - one based uses VOC & one being 'non-hazardous' (see fig 6.3 on the next page).

Success is often the result of experience and 'expert' tacit knowledge which quite often is not supported by established working methods - here a combination of materials which had previously worked did not give expected results.

German suggests, enables the user to determine a 'best fit' criteria for each route through the matrix. This modification develops the concept that the user directly engages in tailoring the matrix by identifying the most (personally) 'successful' path.

The concept of sorting information by introducing extrinsic values e.g. probability of occurrence, evaluation of risk, the application of strict health and safety criteria, and tailoring that information according to individual workshop environments, seemed appropriate to the aims of this research and the concept of the morphological matrix. Instead of a linear framework, which has been shown to be restrictive, an interactive hypertext[1] based framework was developed which implicitly links previously extraneous 'risk assessment' methods and health and safety criterion with their working environments and individual artist / printmaker's creative practices.

[1] *HyperText - information which is dynamic and evolving environment (usally electronic text based), enabliling the user to access, modify and reconstruct information based on their individual needs.*

The diagram *(fig 6.4)*, is an attempt to embody a holistic perception of risk, which brings together criteria identified as external and internal to this research *(see section 2.4.6). The* proposed hierarchical model of risk expresses the practice-led basis of this research (*see section 1.3*). This is integral to the proposed 'framework of safe practice, which must integrate this process of change with the concept of a 'hierarchy of risk', in order that the framework encompasses the diverse value systems (legislative, personal, creative, peer and process-based) which influence printmaker's decisions and choices.

The researcher believes that his working practice has engaged in a dialogue with 'risk' at each of these 'risk levels' in order to establish a personal balance of risk. In effect the researcher has moved between tolerance [Risk = Creativity] and acceptance [Risk = Hazard] in order to obtain the desired visual outcome: a process which is informed by practical experience and creative expedience. The concept of boundaries of acceptable practice, based on legislative criteria [Risk Analysis], potentially invalidates this intuitive creative process - the visual and practical cycle artist work within. The proposed 'hierarchy of risk', is an attempt to integrate each of these decision levels (whether visual or practical) into a comprehensive model of safe practice [Morphological Framework], which will fundamentally link creative practices with this dialogue of 'risk'.

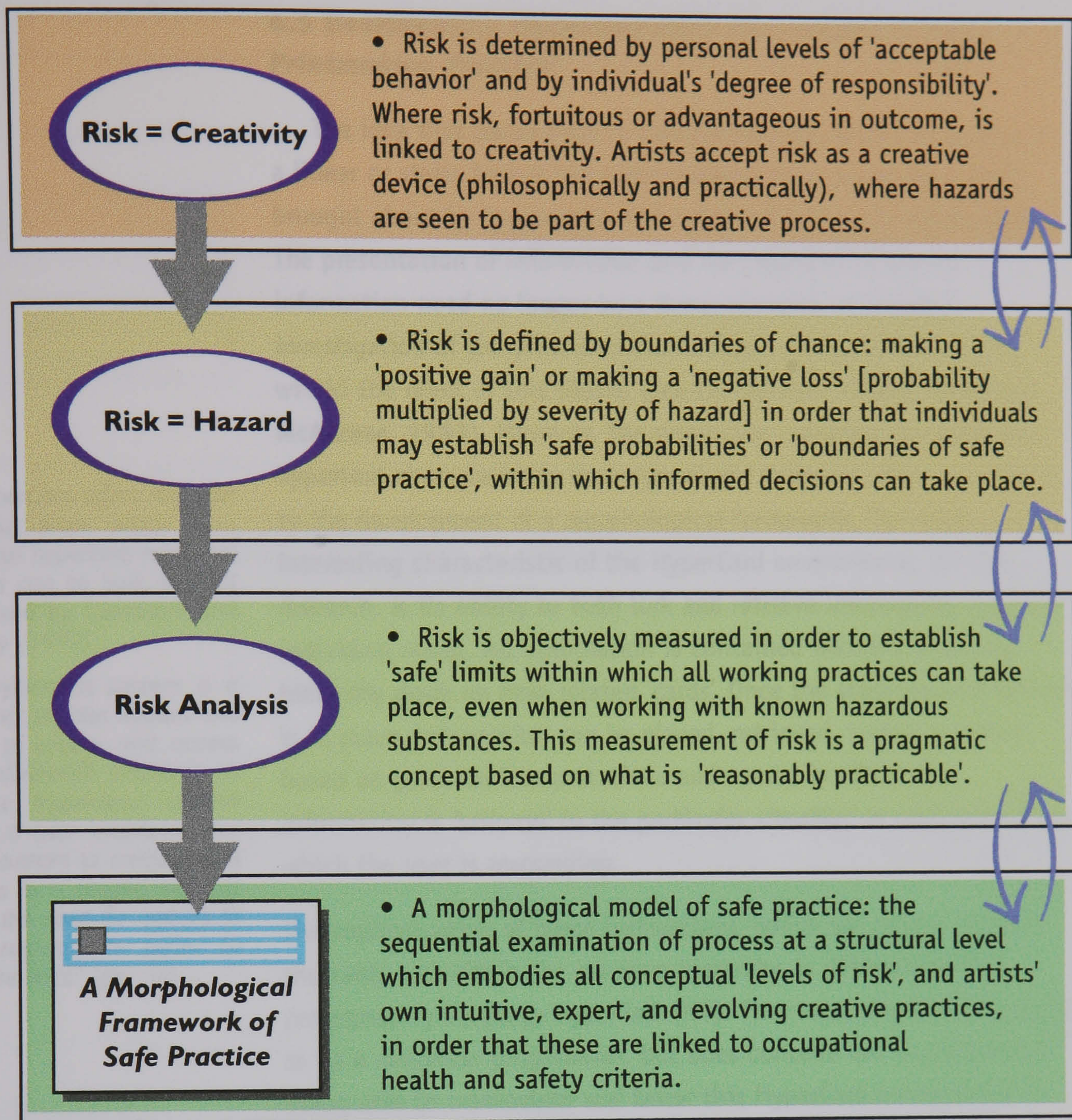


Fig 6.4 A 'hierarchical model of risk' which is proposed in order to address the heterarchical structure implicit in the model of 'safe printmaking practice' adopted in this research. Developed by Pengelly

A 'morphological framework of safe practice' for printmaking has been developed as a means of bringing all these potentially distinct levels together. The 'open' intuitive structure of the morphological model involves the sequential examination of process at a fundamental structural level, in order that all possible previously un-considered alternatives and new combinations or solutions are considered. The 'hierarchical model of risk' reflects the interdependence between creative practice, material selections, and the concept of personal and legislative boundaries of safe practice.

6.5 Developing a HyperText (HT) *'Framework of Safe Printmaking Practice'.*

The idea that documents or information can only be presented in a linear or static format has been challenged by a paradigm shift brought about by hypermedia and hypertext computer environments. The presentation of information and the means of accessing information need no longer be a linear process. A detailed investigation of the principles and concepts of hypertext is not within the remit of this thesis, (see for example **Fraase, 1990** and **McAleese, 1993**). However, the researcher considers the particular hypertext characteristics that HyperCard [1] software offers, as central to the development of a morphological framework. The most interesting characteristic of the HyperCard environment, for this research, is its ability to both link and retrieve information based on individual needs. All information is contained within a 'stacking' hierarchy made up from related 'cards'. Once the stacking architecture is in place, information can be placed, retrieved, sorted or linked based on personal interpretations and needs; in effect the information is 'tailored' to the particular situation or environment to which the user is responding.

[1] HyperCard offers the user a tool kit from which non-hierarchical hypertext relational structures can be built, a point emphasised by Coulouris and Thimbleby (1992) :

"A hypertext system is a system that enables authors and readers to create and access textual information structures. A complete hypertext system includes a user interface that enables authors to create nodes and links in a simple manner, avoiding the need for authors to write programs in order to implement links." (pp vii)

The sophistication of these instructions, which are passed between the cards and within the stacking hierarchy, is determined by a programming language HyperTalk (HT). The researcher does not claim to be a computer programmer, but does concede the importance of being able to manipulate and tailor this HyperCard environment to the individual needs and stated aims of the proposed model (*see section 6.4.3*). From the initial linear models (*appendix 6.5.1.1*) it became apparent that a number of important criteria would need to be incorporated into any HT morphological model, if it was to fulfil the aims of the morphological risk model described in this section, namely that it should:

1 have the ability to display information in a manner which reflects the procedural and cyclical nature of the printmaking medium;

2 have the ability to support the generation of alternative parameter selections, resulting in 'open' and unbiased conditions for the user;

3 have the ability to order all selections resulting from 1 and 2, based on an individual risk assessment protocol - which reflect individual workshop environments and universal boundaries of risk, (represented by the 'hierarchy of risk' model).

Morphological Heterarchy [risk = creative practice = safe practice]

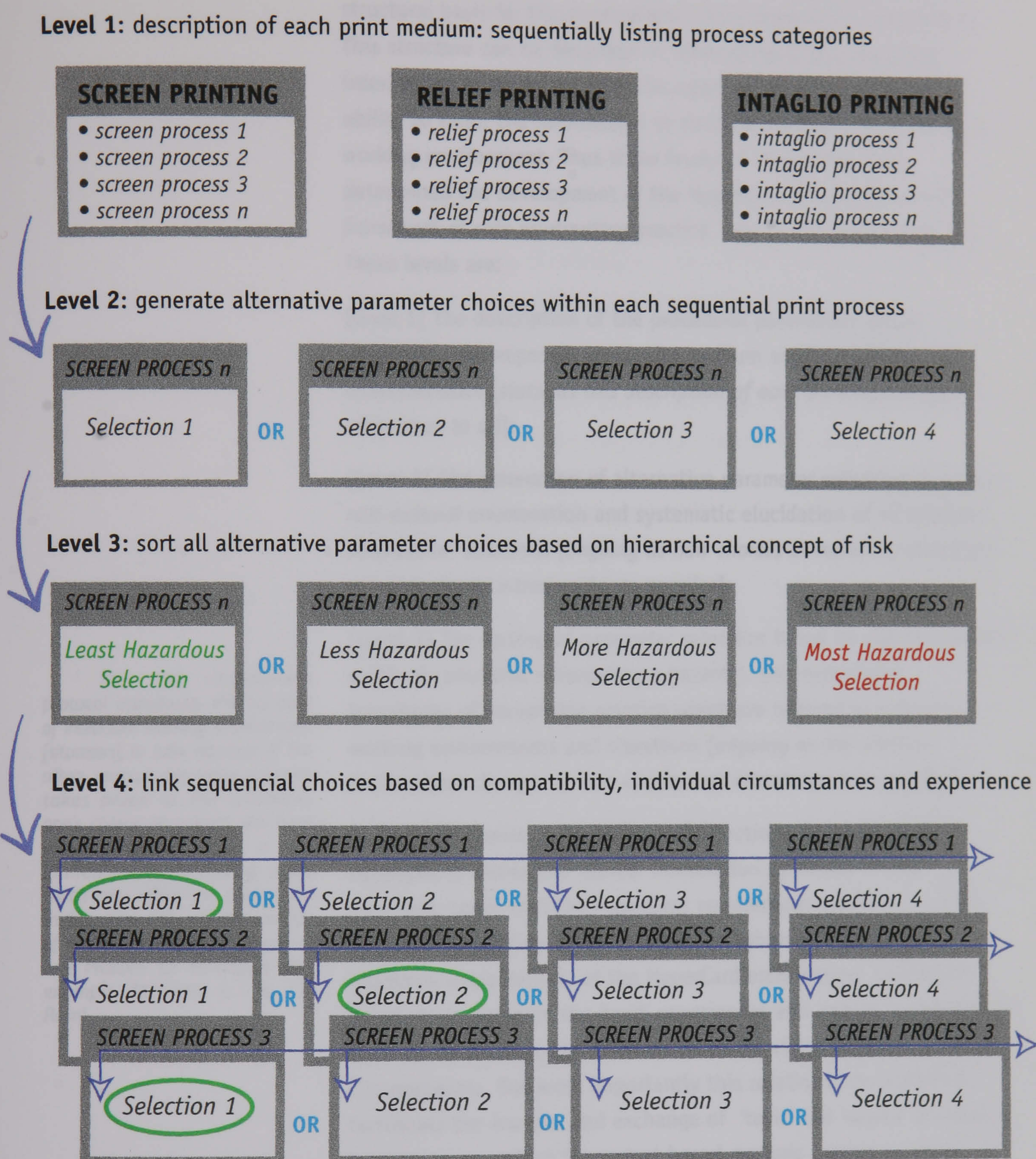


Fig 6.5 Morphological Heterarchy: this diagram illustrates the distinct levels that the HyperText architecture must support if it is to fulfil the objectives this research has established.

Therefore the proposed *HT 'Morphological Framework of Safe Practice'* would need to support: a structure which is able to respond to individual printmakers' visual vocabularies', providing an unbiased presentation of all possible material and process choices; and incorporate an evolving 'hierarchy of risk' structure, which corresponds to health and safety legislation, which is also informed by artists' own 'levels of acceptable behaviour'. In effect, the framework should offer a systematic means of generating 'sustainable non-hazardous creative practice' within printmaking.

The objectives of the research, to which the morphological protocol has been applied, were further defined in order to establish a structural basis for the development of the HyperCard environment. This structure can be described in terms of increasing levels of interaction, enabling the user the means of interaction and the ability to tailor the information to their own working practice and working environment. Thus these levels of interaction have determined the development of the HyperCard *'HT morphological framework of safe printmaking practice'*, and is illustrated in fig 6.5. These levels are:

[level 1] The description of the procedural parameters which universally encompasses each print medium and its cyclical characteristics [*static as this description of each printing process is ubiquitous to all*];

[Level 2] The generation of alternative parameter selections based on non-ordered enumeration and systematic elucidation of all possible alternative solutions [*ongoing as new choices or materials selections are periodically introduced into practice*];

[Level 3] The sorting of parameter selection based on risk assessment protocol (situation x frequency x hazard[1]), this establishes boundaries of acceptable practice which are tailored to individual working environments and situations [*ongoing as the working environment changes as new choices are introduced into practice*];

[Level 4] Interlink parameters and selections, by establishing connections within the 'stored' information by means of the hypertext 'tools' that the HyperCard architecture provides e.g. *links, linkbacks, navigation arrows and pop-up information boxes*. The relational characteristic of the HyperCard architecture, provide the ability to incorporate the 'tacit' experiences and 'expert' knowledge of the user by tailoring the information to individual needs and working circumstances. But most importantly this relational characteristic facilitates the transfer and exchange of 'tacit' and 'expert' knowledge between users, which linear text based manuals cannot [*ongoing, as the process of 'problem setting' and 'problem solving' particular to the visual artist, will identify new combinations of substances, materials or working practices*].

The framework 'stack' was developed by the researcher, with additional scripting from a number of published stacks [**Coulouris** and **Thimbleby (1993)**, HyperText *Index, 'links'* and *'linkback'* scripts], and additional HyperTalk scripting and design from a software programmer. The diagram [fig 6.5] illustrates the

[1] This risk assessment protocol introduces the concept of individual working environment [situation], to take account of the often unique situation practice takes place in. For example, one's choice or actions will have an impact on those in the immediate surrounding area, which may effect the choice one makes (see full working version of HyperCard 'HT Framework of Safe Practice' for description and example, Appendix 6.1 on CD Rom)

heterarchical nature of the resulting stack. However, the key concepts contained in the *'HT morphological framework of safe practice'* can only be appreciated by actually browsing within the hypertext environment; a working version of the final electronic hypertext morphological hazard database is included with this text (see **appendix 6.1** on CD ROM), which forms an integral component of this holistic Ph.D thesis submission.

6.6 [HT] Framework of Safe Practice Summary

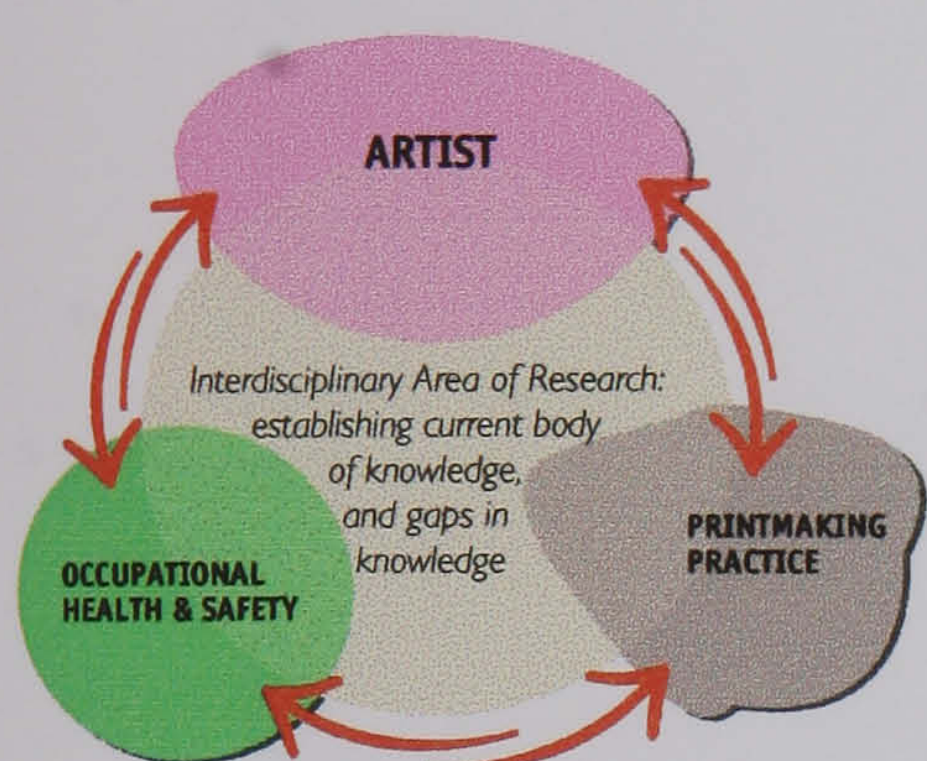
The possibility of offering a universal framework of safe practice was never the aim of this research. Such a ubiquitous model has prescriptive connotations, and would not be acceptable to a cohort of professional printmakers. This research is centred on the researcher's own practice, and as such this model can only allude to a universality through the ubiquitous 'transferability' of the printmaking practice itself. The goal of the research has always been to develop a framework or model which supports the transfer of principles and the exchange of tacit knowledge from the individual to the public domain and vica versa. This has been initiated in order to implicitly link individuals idiosyncratic creative practices, to an environmentally sensitive and sustainable practice.

The resulting 'HT morphological framework of safe printmaking practice' is proposed as a means of facilitating individual printmakers to develop visual vocabularies and working practices which respond to legislative boundaries of safe practice. The framework ultimately can only offer a structure within which the printmaker may work. The researchers' creative practice is in a continually evolving state of 'problem setting' and 'problem solving' which increasingly encompasses aesthetic and environmental factors. The researcher suggests that this process is implicitly linked to a heterarchical concept of 'risk taking' *(see fig 6.4)* which is critical to the evolving and generative nature of his printmaking practices, which is creatively yet environmentally sustainable.

6.7 Outcomes of the Research and Conclusions

A number of outcomes and conclusions have been drawn from the contextual review, the practice-led [multiple method] methodology and subsequent analysis, which relate to the hypothesis presented in this thesis, namely that:

> The integration of environmental and occupational health and safety criteria implicit in the researcher's creative practice, will result in expanding and diversifying the practical and visual vocabulary of that practice, and should result in a body of work which is creatively sustainable, visually exacting, and environmentally sensitive. This paradigm shift will form the basis for the development of a 'morphological framework of safe practice'.



[1] A thorough literature review was undertaken, defined by three relevant areas or domains: person [artist/researcher], practice [printmaking medium] and context [environmental and occupational health and safety issues]. This review resulted in a wide ranging and 'expert' critique of contemporary printmaking practice, perceptions of risk and occupational health and safety issues drawing on texts, visual sources, and personal tacit experiences. This established the generative nature of contemporary printmaking and suggested that the diversity of practices was a function of artists' creative independence and expedient use of materials. However, one limiting factor was the often narrow definitions of what constitutes 'acceptable practice' (when based on restrictive notions of 'tradition', having stronger heritage than the visual statements of artists). This review established that there was no evidence to suggest that safe practice or adequate definitions of risk was currently implicitly linked to artists generative and evolving creative practices.

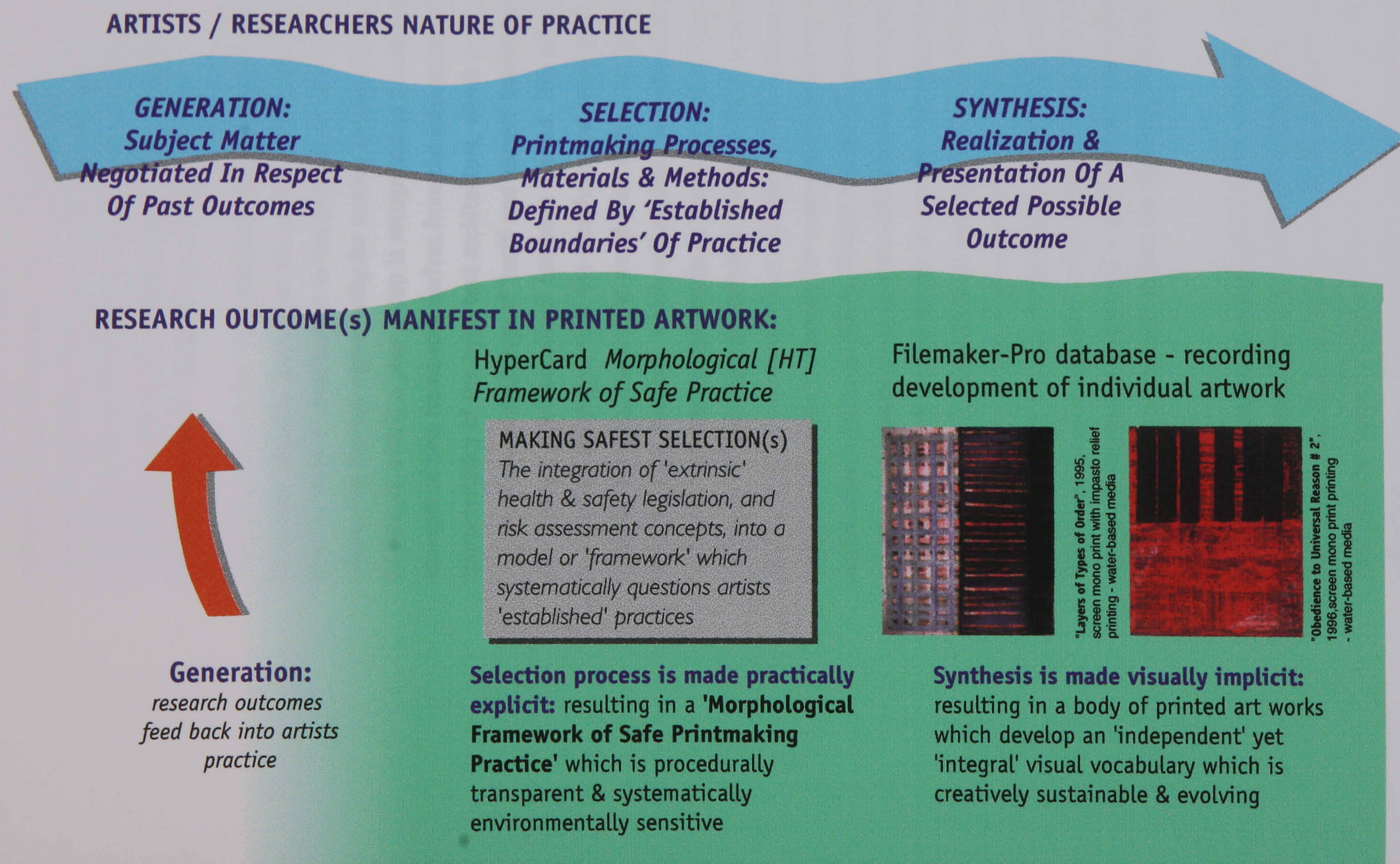
[2] A methodological approach was undertaken which acknowledged the researchers' artistic practice. This methodology was characterised by a practice-led approach i.e. the research was generated by practice and carried out through practice, and drew on a range of related methods. This multiple method approach has responded to empirical and epistemological perspectives (external [objective] and internal [subjective] rationale). The pursuit of this particular methodological approach, with its integration of multiple methods and multiple sources into an appropriate paradigm of inquiry, has provided other practitioners - researchers with an example of how a practising artist might carry out research, drawing on dual empirical and epistemological roles, which has contributed to the development of a methodology which engages implicitly 'artistic' practice.

[3] The adopted multiple method approach, formed an integral 'whole' or system, in an attempt to describe the researchers' oeuvre, the diversity of practice and the environmental context, which defined this research. This concept of system [person, process and context] was developed into a 'framework of safe practice', which integrated morphological analysis concepts. The notion of morphology, in the context of this system model, linked the sequential examination of process at a fundamental structural level, with risk assessment criteria, in order to promote un-considered alternatives, or new solutions. This morphological model offers a means of representing printmaker's individual practices, through the generation of alternative and unique solutions, and links these practices, to the subjective evaluation of alternative 'safe' processes by means of a heterarchical risk structure. The physical outcome of this 'model' was a 'HyperText Morphological Framework of Safe Practice' which took the form of an electronic relational database.

[4] A set of prints have been produced which physically embody the objectives of this research, by linking the idiosyncratic and individual creative practices of the researcher to the use and selection of non-hazardous 'safe materials and practices'. The prints embody a systematic reappraisal of the researchers' 'established' printmaking practice and have resulted in a more divergent visual vocabulary. The electronic *FileMaker* database records (*see visual records on accompanying CD ROM*) have offered a tangible means of visualising this generative process, and making the development of these prints methodologically 'transparent' and accessible.

The original and independent contribution to knowledge of this research has been: the development of a 'HyperText Morphological Framework of Safe Practice' which promotes the concept of a heterarchical risk assessment protocol; a body of original printed art works which practically and philosophically demonstrates the intrinsic relationship this research has established between 'safe practice' and artists increasingly divergent visual and practical vocabularies *(see fig 6.6)*. A further outcome has been a contribution to the methodological debate within art and design research - based on the practice-led multiple-method methodological approach this project has taken, to which the researcher has made a valid contribution.

FIG 6.6 The Relationship Between Artists Practice & Research Outcome(s) As Manifest In Printed Artwork: the integration at a fundamental level of 'safe' practice which is generative, environmentally sensitive & creatively evolving



6.8 Limitations of the Research Process

The simultaneous, eclectic and often didactic nature of the researchers' creative practice has at times highlighted tensions between the practice-led approach adopted and the research ideology imposed by the examination structure. As a result the analysis was felt at times, not to be suitably responsive or insightful of the intuitive and tacit nature of this creative process.

The limitations of the '[HT] Morphological Framework of Safe Practice' have been logistic, given that the premise for its development has been to make a contribution to the practice of 'safe printmaking' as a whole. The limited opportunity for testing the morphological framework within a peer group is recognised as a weakness, as the strength of this framework derives from the interactive relational characteristics of the hypertext architecture, which is a function of the transfer and exchange of 'tacit' and 'expert' knowledge between user groups, a process which has been limited. This will be addressed in a further development of the morphological framework, which will 'publish' the database on the world wide web as an *"Interactive Morphological Website"* which will exploit the interactive potential of internet computer environments to facilitate and develop the exchange of contemporary practices between users irrespective of ability, working environment or experience. This development it is hoped will provide the means for more multi-disciplinary and sustainable creative practices, linked at a practical and philosophical level to an increasingly pluralistic definition of environment within printmaking, and art and design in general. The software adopted for the original '[HT] Morphological Framework of Safe Practice' (HyperCard 2.2) has also imposed a semiotic constrain on the visual interface, as this version of HyperCard did not readily support a diverse range of visual data: colour images, video clips or audio clips, which the researcher suggested is crucial if the morphological framework is to adequately reflect the diversity of printmakers practices.

The visual and aesthetic development of the art works resulting from this research, which had been exhibited independently throughout the project, has been limited the researcher suggests, by two factors. First, by the research structure and its demands of recording and reflection on one's creative practice imposed sporadic working methods which were not conducive to the uninterrupted development of work. Second, the lack of access to studio space; at no point over the period of this research did the researcher have regular access to a dedicated studio environment or workshop space which would have given the opportunity for periods of time to reflect - simply as having the space to regularly lay working proofs out in order to make comparisons or to be surrounded by one's work. As a result certain directions which might have offered fruitful aesthetic and practical solutions could not be pursued. This was accentuated by the practical conditions imposed by the media and scale of the work undertaken. For example, the monoprints are generally felt to be successful, but the intaglio etchings, of which only one has been included in the exhibition, have been severely limited by this lack of studio space.

6.9 Potential for Future Developments

The rigorous means of reflection on practice that this research has initiated (through recording and analysing working methods and structured collaborative working practices) has helped the researcher to objectively examine his working practice. This in turn has had a profound influence on the researcher's professional practice: more ambitious exhibiting of work, dissemination of 'safe' practice through workshops, developing a generative visual vocabulary, and the restructuring of the researcher's practice, are all directions which will be pursued as a consequence of the research. A natural development of the original HyperCard 'Morphological Framework', which would address the identified limitations of the original model, would necessitate wider accessibility and peer group evaluation. This would be the development of the 'Morphological Framework' as an Internet Web Site. The 'open' and egalitarian structure of the *world wide web* makes it an ideal 'testing ground', with the possibility of such a 'published' *Internet Morphological Framework* acting as a repository and database of innovative and environmentally sensitive printmaking practice.

6.10 Conclusion

This research has initiated and supported a restructuring of the researcher's professional practice, through the development of a body of printed art works, which intrinsically embody the aims of this research. The research has established that safe printmaking practice can be linked, for creative advantage, to sustainable environmentally sensitive practices which are generative, evolving, and result in a diversity of printmaking practices.

This research has resulted in the development of a 'Morphological Framework of Safe Practice', an interpretive tool which integrates the diversity of printmaking practices and current health and safety legislative protocols into a model for creatively sustainable yet safe printmaking practices.

6.11 Summary of Thesis

Section 1 (*Introduction*) The research arose out of a personal concern with the hazards associated with certain materials and unconventional methods used in the researcher's professional practice as a printmaker. This process of questioning 'established' practices formed the basis of the proposed hypothesis; that at the beginning of the research there were no means of integrating safe yet creatively sustainable practices. Definitions of contemporary printmaking practice were described and relevant key terms and technical language explained.

Section 2 (*Contextual Review*) A review of literature-based material alone was considered to be limited; the resulting contextual review extended this by including non-text based sources, exhibition visits and documentation, and personal reflection on practice. This both established the context in which the research took place, and reflected the diversity of contemporary printmaking practices. The sections evolved by the review contextual were:

- a critical review, highlighting the diversity of **contemporary printmaking practices**, characterised by a reliance on materials and practices often of an industrial nature; the increasing collaborative nature of printmaking (practical and visual); the increasing influence of technology; the important generative role that monoprinting and proofing techniques play in the develop of the printmaking medium; and the developmental, often creatively expedient, nature of the medium;
- a review of relevant **occupational health and safety legislation**, physiological issues of cause and effect, and the concepts of risk were considered; a distinction was made between environmentalism and safe practice, in order to establish the philosophical context for this research;
- a review of the practical issues - the personal perceptions of printmakers and all available literature - established the limited scope of this literature to define a relationship between **creative practice and safe practice,** given the evident distinctions artists made between their 'open' creative practice and perceptions of 'restrictive' safe practices.

The contextual review established that there was not a collective rationale which implicitly linked printmakers' creative practices to a systematic, yet sustainable approach to safe practice.

Section 3 *(Methodology)* A practice-led methodology was employed, involving a multiple method approach. In order to respond to the epistemological domains established in the contextual review - person, process and context - specific methods were categorised in terms of being either: *externally learnt and acquired methods*: quantitative testing procedures, questionnaire, case studies, focused interviews, collaborative workshops; or *internal assimilated and evolving methods*: facilitating safe practice through workshops, practice-led research, documenting working practices, development of innovative and idiosyncratic but safe practices, and the exhibition and peer review of the researcher's work.

Section 4 *(Results and Analysis)* The analysis reflected the multi-method structure set out in the methodology, but extended the concept of the internal and external rationale into a system model in order to bring together these divergent sources. It established that personal perceptions and experience played an important role in setting a precedent for safe printmaking practices. This correlated to 'rigid' *(traditional)* and 'flexible' *(non traditional)* attitudes towards change, when change is influenced by 'external' health and safety or legislative rationale. A body of printed art works were developed which embodied the central premise of this research - that innovative and sustainable creative practices could respond to 'external' occupational health and safety, and legislative rationale.

Section 5 *(Exhibition as Holistic Thesis)* This section outlined the various elements of the Ph.D submission - written text, morphological database, and exhibition of body of visual work. This record of the exhibition / examination presents photographic reproductions of the printed art works and the exhibition space, together with the accompanying catalogue containing a critical review of the researcher's art work.

Section 6 *(Discussion and Conclusions)* The analysis of all sources of data and the production of the body of printed work, has supported the hypothesis presented in this thesis for the development a model or framework which would integrate sustainable creative practice and environmental rationale. A non-prescriptive relational HyperText model or *'Morphological Framework of Safe Practice'* was developed, incorporating the 'tacit' experiences and 'expert' knowledge of the printmaker, linking this professional knowledge to a heterarchy concept of risk assessment. This morphological framework together with the development of a body of printed art works has made an independent and original contribution to the body of knowledge in printmaking, and has brought about the restructuring of the researcher's practice, as an example of 'safe practice'.

References

A

Adams, D
Joseph Beuys: Pioneer of a Radical Ecology, Art Journal, 1992

Agoston, G
Health & Safety Hazards of Art Materials, Leonardo, Pergamon Press, Vol. 2, 1969.
Comments on Recent Editions of Art Manuals, Leonardo, Vol. 10, 1977

Allison, B
Ariad Index of Research in Art & Design (1992)

Ashby, E
Reconciling Man & the Environment, Oxford University Press, 1978.

Armstrong, E
Tyler Graphics: The Extended Image, Abbeville, 1987

Arran, G
Postmdernism and the Environmental Crisis, Routledge, 1995.

B

Bacon, C
Etching: The Early Period- 1400-1645, Unpublished MPhil thesis, 1985.

Barry, A Miller, & Blair, A
Cancer Risks Among Artists, Leonardo, 1992

Barr, E
Warming Trends in Ecology. Graphic Arts Monthly. March 1995. pp 2-3

Behr, M
- Electroetch, Printmaking Today, Vol. 3 no 1, 1995.
- Etching & Tone Creation using Low Voltage Anodic Electrolysis, Leonardo, Vol. 26. No 1.

Benjamin, W
The Work of Art in the Age of Mechanical Reproduction, in Illuminations, Fontana Press, 1992, pp 211 - 244

Biegeleisen, J & Cohn, M
Silk-Screen Stencilling as a Fine Art, Mcgraw-Hill, 1942

Brown, K
Ink, Paper, Metal, Wood: How to Recognise Artists Prints. Point Press, 1992

C

Castleman, R
- Seven Master Printmakers: Innovation in the Eighties, The Museum of Modern Art New York, 1991
- Prints of the Twentieth Century, Thames & Hudson, 1988

Challis, T & Roberts, G
- Caution a Guide to Safe Practice in Arts and Crafts, Sunderland Polytechnic, 1984
- Artists Handbooks 2: Health & Safety, AN Publications, 1994
- Printsafe: a Guide to Safe, Healthy and Green Printmaking, Estamp, 1990

Charretton
Water-Based Paints: Composition, Toxicological Hazards, Preventative Measures, Cahiers de Notes Documentaires, No. 128, 1987

Checkland, P
- Systems Thinking & Methodology, Journal of Applied Systems Analysis, 1988
- Achieving Desirable and Feasible Change: an Application of Soft Systems Methodology, Journal of the Operational Research Society, 1985

Chick, A
The Graphic Designers Green Book, Graphics Press Corporation, 1992

Coates Lorilluex
The Impact of Printing Inks on the Environment, 1993

Cohen, R
The Medium isn't the Message, ARTnews, October, 1985
Picasso: Inside the Image, Thames & Hudson, 1995

Cornock, S
Towards a Methodology for Students of Fine Art, Journal of Art & Design, 1983

COSHH
A Step by Step Guide to COSHH Assessment, HMSO, 1993

Coulouris, G and Thimbleby, H
Hyperprogramming, Addison-Wesley, 1992

Cousin, M
Danger & Safety, Art History, Vol. 17, 1994

Criksyzentmihalyi, M
Systems View of Creativity, in the Nature of Creativity, Ed, Sternberg, Cambridge University Press, 1992

D

Dawson, J
A New and Exciting Test of Aesthetic Judgement and their Capacity to Predict Success of Art and Design Degree, Unpublished Ph.D Thesis, 1982.

Delday, H
Towards a Bilingual Graphic Imaging System, Unpublished M.Phil, Robert Gordon University, 1996

Denes, A
Notes on ECO logic: Environmental Art Work, Leonardo, Vol. 26, No. 5, 1993

Douglas, B & Moustakas, C
The Heuristic Inquiry:The Internal Search to Know, Journal of Humanistic Psychology, Vol 25 no. 3, pp 39 - 55, 1985

Duennes, J
Substrate Concerns: Substrate and Application Considerations for Water-Based Inks, Screenprinting, Vol. 82. No. 9, 1992

E

Elkington, J
The Guardian Newspaper, 1June 2, 994

F

Feldman, D
Dreams, Insights and Transformations, in The Nature of Creativity, Ed, Sternberg, Cambridge University Press, 1992

Freese, M
Macintosh Hypermedia, Scott, Foresman & Company, 1990

Fine, R & Corlett, M
Graphicstudio, Prestel, 1991.

Frankel, M
The Social Audit Pollution handbook, The MacMillan Press, 1992

Frankenthaler, H
in Helen Frankenthaler Prints: 1961-1979, Harper & Row, 1980

G

Gablik, S
The Ecological Imperative, ART Journal, Vol. 51, No 2.1992

Gardner & Huisingh
Waste Reduction through Material and Process Substitution, in Hazardous Waste & Hazardous Materials, Vol. 4. no 1, 1987

Gilmour, P
- The Mechanised Image, Arts Council, Exhibition Catalogue, 1978
- Kelpa Studio Artists Prints, The Tate gallery Catalogue, 1980
- Symbiotic Exploration or Collaboration: Dine & Hamilton, The Print Collectors Newsletter, 1985

Ginn, U
The Effects of Technical change on Employee's Health Within Harmsworth Quays Printing Limited, Unpublished Diploma in Occupational Health Nursing, Robert Gordon University, 1996

Glasbrenner, K
Maladies may be linked to Artists Materials, Journal of the American Medical Association, March, Vol. 251, no. 11

Goldman, J
American Prints Process & Proofs, Harper & Row, 1981

Goulding, K
The Environmental Agenda. Taking Responsibility: Art Design and Performing Arts. Pluto Press, 1992

Gray, C
Teaching Styles in Higher Art Education, Unpublished Ph.D. Thesis, University of Aberdeen, 1988

Gray, C & Pirie, I
Artistic Research Procedure: Research at the Edge of Chaos?, in Design Interfaces Conference Proceedings (Vol 3) The European Academy of Design, University of Salford, 1995

Gross, A
Etching Engraving & Intaglio, Oxford University Press, 1992

Gruber, H
The Evolving Systems Approach to Creative Work, in Creative People at Work, Oxford University Press, 1992

Gruber, H and Davis, S
Creative People at Work, Oxford University Press, 1993

H

Hansen, W
Printing Ink Developments: Present and Future, paper presented at IARIGAI 20th International Conference of Printing Research Institutes, Conference Publication, 1989

Harris, E
Experimental Graphic Processes in England 1800-1856, Journal of the Historical Printing Society, 1968, 69 & 70

Hassold,, C
Graphicstudio, Art papers, Vol. 16. part 2, 1992

Hayter, S.W
- Interdependence of Ideas and Technique in Gravure, Tiger's Eye, pp 41-45, no. 8, 1949
- New Ways of Gravure, Pantheon, 1962

Holtzman, S
Digital Mantras: the Languages of Abstract and Visual Worlds, The MIT Press, 1994

Hilliard, J
in Contemporary British Art in Print: The Paragon Press 1986-95, Scottish National Gallery of Modern Art, The Paragon Press, 1995

Howard, K
- Safe Photo Etching of Photograhers and Artists, Wynne Resources, 1989
- Printmaking Today, Spring, 1994

I

Irvins, W
Prints and Visual Communication, Da Capo Press, 1992

J

Jackson, Norman and Carter,
The Perception of Risk, in Risk Analysis, Assessment and Management, by Ansell, & Wharton, Wiley, 1992

James, B
Environmental Education Information, Council for Environmental Education Fact Sheet, November, 1992

Joannou, G
Screen Ink Developments, Screen process, April, 1991

Johnson, L and Stinnett, H
Water-Based Inks: a Screenprinting Manual for Studio and Classroom, 1987

Jones, C and Thornley, D
Conference on Design Methods, Pergamon, 1963

K

King, S
Implementing COSSH in the Printing Industry, International Environment and Safety News, Winter, Vol. 8, no. 4, 1990/1

Klüver,
Four Difficult Pieces: Art & Technology, ARTnews, pp 81 - 100, July, 1991

Kosloff, A
Screen Process Printing, The Sign of the Times, 1964

Kotz, M
The Campaign for Art Hazard Legislation, ARTnews, pp 49-55, 1984

Kreneck, L
Shop Notes on Water-Based Screenprinting, printers Unpublished Notes, 1988

Kvale, S
The Qualitative Research Interview: A Phenomenological and Hermeneutical Mode of Understanding, Journal of Phenomonological Psychology, Vol 14 No 2, pp 171-196, 1983

L

Lave, L
Health and Safety Risk Analyses: Information for Better Decisions, Science, Vol 236, pp 291-295, 1987

Leclaire, C
Screen Printing with Water-Based Inks: an Alternative for Studio and Classroom, Philadelphia College of Art Eduction, unpublished MFA thesis, 1985.

Lister, R
Infernal Methods: a study of William Blakes art techniques, The Camelot Press, 1975

Luke, T
Art & the Environmental Crisis, Art Journal, Vol. 15, No. 2, pp 72-76, 1992

M

Machin, F
The Effects of Environmental Issues on the Screen Process, Coatings International, 1992

Malins, J
The Monitoring and Control of Specialist Ceramic Kiln Atmospheres and Emissions, Unpublished Ph.D. Thesis, Robert Gordon University, 1993

Mallary, R
The Air of Art is Poisoned, ARTnews, October, 1985

Mara, T
Screen Printing: A Manual, Thames & Hudson, 1995

Mayer, R
The Artists Handbook of Materials and Techniques, Faber & Faber, 1991

McCann, M
- Labelling Needs of Art and Craft Materials, in Health Hazards in the Arts and Crafts, Conference Proceedings Society for Occupational and Environmental Health, 1980
- Artists Beware, Lyons & Burford, 1992

McCray, M
Electroworks, International Museum of Photography, Exhibition Catalogue, 1978

Miller, B and Blair, A
Bladder Cancer Among Artistic Painters, American Journal of Espideminology, Vol. 118, no 3, pp 418, 1983

Minter, S
The Psychology of Safety: Risk Perceptions and Safety Behaviour, Occupational Hazards, October Vol. 52, pt. 10, pp 85-87, 1990

Montgomery, J
Industry Viewpoint on Labelling Arts & Crafts Materials, Society for Occupational and Environmental Health Conference Papers, 1980

Moses, C. Purdham, J. Bowhay, D. and Hosein, R
Health and Safety in Printmaking: a Manual for Printmakers, Alberta Labour Occupational Hygiene Branch, 1978

N

Norris, K
The Morphological Approach to Engineering Design - in Conference on Design Matters, Pergamon Press, 1963

P

Parry-Janis, E
Deviation & Its Imperatives: the Plight of the Unique Print, Print Collectors Newsletter, Vol. 21, part 6, pp 211-213, 1991

Pearlman, E
Evaluation of the Exposure to Organic Solvent Vapours in the Sever Hall Silk-screen Studio, Unpublished Degree Thesis, 1985.

Pengelly, J
Inks and the Environment, Artists Newsletter, August, 1995
Pinker, S
The Language Instinct, Penguin Books, 1994
Prockop, L
Neuropathy in an Artist, Hospital Practice Journal, November, pp 89-92, 1978

R

Ramazzini, B
Diseases of Workers - 1713, translated by Wright, W, Hafner Publishing Company, 1964
Rickmann
Croners Environmental Management, Special Edition, November, 1993
Roberts, G
Is Art Dangerous?, The Artists, February, 1995
Robins, W
Etching Craft, The Bookman Journal & Print Collector, 1922
Robson, C
Real World Research: A Resource for Social Scientists and Practitioner Researchers, Blackwell, 1993
Rose, C
The Dirty Man of Europe, Simon & Schuster, 1991
Ross, J, Romano, C & Ross, T
The Complete Printmaker, the Free Press, 1990
Ruthven
The Techniques of William Blake's Illuminated Painting, Print Collectors Quarterly, Vol. XXIX, 1948

S

Saint-Germain, M
Morphological Analysis (Aid to Decision Making), Unesco Division of Educational Policy and Planning, 1990
Sanders, P
ECO-Art: Strength in Diversity, Art Journal, Vol. 51, no. 2, 1992
Satt D. & Sacilotto D.
Screen Printing History and Process, Holt, Rhinehart & Winston, 1979
Scarpelli, T
Stencil Considerations for Water-Based Inks, Screen Printing, Vol. 82, 1993
Schnailberg, A
The Environment from Surplus to Scarcity, Oxford University Press, 1980
Schön, D
- Generative Metaphor: a Perspective on Problem-Setting in Social Policy, 1979
The Reflective Practitioner, Basic Books, 1983
- The Fear of Innovation, Science in Context: Readings in the Sociology of Science. Edited by Barry Barnes & David Edge. Open University Press, 1982
Schott, D
Potential Hazards Found During a Study of College Art Departments, in SOEH Conference Proceedings, 1980
Semenoff, N & Christos, C
Dry Copier Toners and Electro-Etching on Intaglio Plates, Leonardo. Vol. 24, no.4, 1991
Shaw, S & Rossol, M
Overexposure: Health Hazards in Photography, 1991
Shaw, P
Fruit & Veg: or growing your own inks, Printmaking Today, Vol. 4, No. 4, pp 26-27, 1995
Siedlecki, J
Potential Health Hazards of Materials Used by Artists, Journal of the American Medical Association, Vol. 204, no. 4, 1968
Simpson,, P
Paint, Pop & Chips, Creative Technology, Summer, 1995
Smith, T
A Review of Water-Based Printing Inks, Pigment and Resin Technology, 1982
Solnit, R
Art in its Ecological Context, ARTweek, April, pp 18-20, 1990
Spandorfer, M. Curtiss, D. and Snyder, J.
Making Art Safely: Alternative Methods and Materials, Van Nostrand Reinhold, 1993
Stephens, J
Screen Process Printing a Practical Guide, Blue print, 1987

T

Tesch, R
Organising Systems and How to Develop Them. Qualitative Research: Analysis Types and Software Tools, The Falmer Press, 1990
Tromans, S
The Environmental Protection Act, Sweet & Maxwell, second edition, 1990
Trussell, D
Arts and Planetary Survival, The Ecologist, Vol. 19. no. 5, pp170-176, 1989
Turner, S. & Innocent
Europe for Printmakers, Estamp. 1994
Twyman, M
Lithograhic Stone and the Printing Trade in the 19c, Journal of the Printing Historical Society, 1972, 74 & 75

W

Watson, A
An Exploration of the Principle of Chance as a Stimulus to the Creative Activity Know as Sculpture, unpublished PhD Thesis, Robert Gordon University, 1992

Wharton, F
Risk Management: Basic Concepts and General Principles. in - RISK Analysis Assessment and Management, Jake Ansell and Frank, Wiley, 1992

Wheeler, G
Chemical Hazards in the Arts, Journal of Chemical Education, Vol. 57, no.4, 1980

Wheeler, E
The Role of Architectural Ceramics in Contemporary Site Specific Art, Unpublished Ph.D Thesis, University of Northumbria, 1996

White, H
A Note on W.H.Tolbot and Photo-Engraving, Journal of the Historical Printing Society, 1978/9

Willi,
Pat Steir Print's 1976-1988, The Tate Gallery (exhibition catalogue), 1988

Williams, R & D
American Screen Prints from the Collection of Reba & Dave Williams, Exhibition Catalogue, 1991

Wilson Art Index
Version 3.2.1, 1995

Winkelman,
Printmaking Today, Vol. 14, No. 2, 1995

Woodward, D
The Decline of Commericial Wood-Engraving in 19c America, Journal of the Printing Historical Society, no10, 1974/75

Wynne, B
Science and Social Responsibility, in Risk Analysis and Management, Ansell and Wharton, Whiley, 1992

Y

Yin, R
Case Study Research: Design and Methods, Sage Publications, 1994

Young, I. c
Materials in Printing Processes, Focal Press, 1978

Z

Zeisel,
Inquiry by Design: Tools for Environment Behaviour Research, Cambridge University Press, 1989

Zwicky, F
Discovery, Invention, Research: Through the Morphological Approach, MacMillan, 1969

Appendix 3.8.1.1 Quantitative Test of Air Quality - Screen Printing Workshop at Researchers Educational Institution

Introduction

The screen printing system used in the researchers institution was solvent based, until early 1994 (at which point the department, on the recommendations of the researcher, changed to a water-based system). Changes over to a water-based system within higher educational institutions can be directly related to the introduction of the COSHH Regulations, and a growing awareness amongst fine art instructors of the potential hazards solvent screen inks present (see Appendix 3.8.2.3). However, the incentive for change based on occupational health and safety criteria is not prescriptive. Therefore an investigation of the VOC levels induced by the solvent based inks was undertaken, in order to quantify potential changes recommended by the researcher on behalf of the printmaking department.

Measuring air quality levels resulting from the use of VOC substances used within screen printing area at Grays School of Art were carried out on November 1993, in order to determine if established levels (EH40/92) were being exceeded. At this time the department was using *Ash Coating Limited* ,microfilm colour range of inks, these where supplemented with a Xylene, white spirit mixture for retarding the inks and for cleaning purposes.

Previous studies which had measured the levels of VOC solvents resulting from fine art screen printing practices are limited. Both Pearlman (1979), and Schott (1980), studies identified that the levels of VOC only occasionally rose above prescribed TVL levels [threshold limit value], but never went above TWA levels [time weighted average]. As a result each study identified the need to control the levels of exposure by physical means: installing local ventilation, and by introducing better working practices and protective clothing[1].

[1] *These studies should be seen in relation to contemporary US legislation at the time [the introduction of Californian legislation and EPA has been responsible for significant changes in practice and has been instrumental in forcing manufactures to continually improve water-based screen printing systems.*

Experimental Procedure and Results.

The Robert Gordons University safety officer, carried out a number of Drager tests for both Xylene and white spirit. These measurements where taken whilst the workshop was being used by between 5 and 8 undergraduate students. Drager tests for Xylene and white spirit were taken from number of locations. The results were as follows;

	XYLENE	WHITE SPIRIT
GENERAL STUDIO (Ambiant reading for studio)	10 ppm	10 ppm
BREATHING AREA (Test taken as student washed screen with solvent)	50 ppm	20 ppm
INK MIXING AREA (Test taken over ink container)	10 ppm	10 ppm
WASTE & RAG CONTAINER (Test taken over waste container)	50-60 ppm	30-30 ppm
The recommended levels for Xylene was 100 ppm, and the recommended levels for white spirit was 300 ppm at the time these tests where carried out (EH/40 1992).		

Discussion

The results showed that levels were found to be well within recommended working levels [EH/40 1992] on the day of this tests. A number of recommendations however were made by the safety officer, to further improve the working environment of this screen printing facility. These were:

- install additional ventilation, as the existing fans were inadequate and in the wrong position for maximum affect;
- Locate the new fans on opposite walls in order that they create a circulating air flow within the studio;
- improved working practices. Although the levels for white spirit were within guidelines by inhalation, the main problem with white spirit was from absorption through the skin. Therefore better working practices and housekeeping by students should be adopted i.e. the use of appropriate gloves when working with these substances;
- drying racks should be located close to windows so that fans can evacuate VOC vapours from drying inks;
- consider finding alternative to the solvent based inks used.

In analysing these results it could be speculated that solvent based screen printing is a non hazardous process, as these measurements established that safe working perimeters are being conformed to. However, these measurements have only offered boundaries within which working conditions and creative art practices can be seen to be taking place within established 'safe' parameters. They do not take into account students and staff growing dissatisfaction with the solvent inks used, the solvent odours and working environment created by these materials.

Four months after these tests where carried out the printmaking department adopted a water-based system on the recommendations of the researcher (having tested a number of different water-based systems, see Appendix 3.8.1.2). This decision ultimately took place in response to personal and 'circumstantial' conditions voiced by staff and students.

Appendix: 3.8.1.2. A Quantitative Test to Determine the Gloss Characteristics of Water-based Screen Printing Ink Surfaces.

Introduction

In the early stages of the research a number of different water-based inks were tested 'subjectively' by the researcher, these were purchased or supplied as samples from a number of different companies. This process was supplemented periodically as new inks became available to the researcher. The printed qualities these inks, when working under similar conditions, would often result in quite different visual characteristics and surface qualities. A series of tests were carried out with the intention of gaining a measurable attribute with which to supplement the more subjective selection processes of the researcher with measurable criteria.

** water-based and solvent based are generic terms to describe a diverse range screen printing inks. They do not offer a universal description of all the different ink formulations within each category, but for the purposes of this discussion the researcher suggests they are sufficient to offer a distinction.*

The selection of one *water-based ink in preference to another was a subjective process, based on personal experience, availability and critical but tacit observations. A number of other factors also influenced this selection process; product availability, cost, colour range, quality of pigment, the presents of hazard labels [given that VOC solvents are used in some co-solvent and emulsion water-based inks], stencil selection and durability, drying or 'open' printing time, ease of cleaning, and the intended printing surface. All of these factors in some way influenced the researchers assessment of what was acceptable. The tacit nature of this 'expert' but subjective evaluation had underpinned the researchers creative work.

Acrylic Mediums: historical and technical background

The acrylic mediums used by artists can be categorised into two basic types: acrylic emulsion - consisting of minute beads of a acrylic polymer and pigment which are held in dispersion by water by a wetting agent, and acrylic polymer solution - where the acrylic is dissolved in a solvent which keeps the acrylic in solution, such as water, amines, or mineral thinners. Both types of acrylic mediums; emulsion and polymer solution, dry by the evaporation of the solvent agent from the body of the medium, this results in an insoluble surface on the substrate. The speed of drying process is determined by the type of solvent used, and its 'latent heat of evaporation' which is in tern influenced by the relative humidity in the working environment. As water-based printing inks have a higher 'latent heat of evaporation' they generally require longer to dry but for the fine art printer longer production and drying times are not usually an issue as they are in commercial printing. A more detailed discussion of the physical and chemical characteristics of acrylic mediums can be found in **Resin Review** (1966), **Smith** (1982) **Young** (1973) and **Mayer** (1991).

The fundamental difference between VOC solvent-based and water-based screen printing inks is the presence of water as the solvent or flow agent. The higher surface energies or surface tension present in water-based inks affects has been shown to affect the performance of these inks on the rougher surfaces (Duennes, 1992) such as those commonly found with the fine art papers used in printmaking. The increased surface energies of water-based inks increase the inks tendency to 'hold-out' on paper surfaces. So when these inks are printed onto absorbent rough fine art papers this 'hold-out' characteristic results in the need for more squeegee pressure to get an even printed ink layer (see Appendix: 3.8.1.3).

Previous Test Procedures Used Within Fine Art

Literature regarding the quantitative testing of the aesthetic 'quality' of inks and water-based inks in particular was found to be limited (*see section 3.3*). However, subjective comparisons between solvent screen printing inks (seen as the established medium) and water-based inks (seen as the alternative medium) have taken place **Lecleire (1980)**, and **Johnson** and **Stinnett (1987)**, both studies adopted a peer review procedure which compared identical commissioned fine art screen printed images. This 'expert' peer review process was supported by 'objective' evaluations of the hazards the inks presented. This type of qualitative peer review was useful in that it addressed the important issue of confronting preconceptions in the field (see Appendix 3.8.2.3). The researcher suggests this type of evaluation is limited by a number of factors: the continual state of development that products undergo, differences in working environments and the idiosyncratic nature of individual artists working methods.

The researcher had worked with a number of different water-based screen printing systems; *Daler Rowney: System 3, Gibbon Marlor: Paint Box, Sericol: Aquacolour QL, Lascaux Screen Printing Gel, Ash Coatings: Aqualex, Coates Lorilliuex: Hydroprint, Hunt Speedball: permanent acrylic and TW Graphics 5000 & 1000 series systems*, before selecting the *TW Graphics 5000 series and Coates Lorilliuex Hydroprint* systems. Both had been used extensively by the researcher in his printmaking practice.

The test would measure the gloss 'build' each selected ink exhibited. The TW Graphics 5000 was an American ink the researcher had used whilst working collaboratively with Ronni Hennings, New York, 1994 (see **Appendix: 3.8.3.2** on **CD ROM**). The Coates Lorilliuex inks had been selected by the researcher in preference to a number of commercial water-based inks available in the UK (at the time of this research took place).

There was no product information or hazard data sheets which identified individual substances present in these products, it was not possible therefore, to infer differences in the composition of these two inks. Informal discussions by telephone ,with the manufacturers of the inks also resulted in no further information. It has been recognised that the composition of screen printing inks is very complex **Gutherie (1992)**, **Younge (1974)** and **The Printing Ink Manual (1992)**, therefore identification of the particular composition of these inks however useful, was not felt to fall within the remit of this research project.

Experimental procedure.

When light strikes a regular surface it will tend to be reflected in a regular way, this is called the *specular reflection*. When light is reflected off the surface of paper or a printed surface the light will be scattered to a certain degree depending on the irregularity of that surface, this is called the *diffuse reflection*.. These reflective characteristics, enables the measurement of the surface gloss of a given surface. The device used is called a *Glossmeter*, which measures the amount of reflected light, off a given surface, by means of a photoelectric cell. The devise is calibrated by first taking a measurement off a polished black tile.

Two sets of paper samples were prepared, Somerset 300 gsm HP and Bockingford 300 gsm (see **Appendix: 3.8.1.3** for detailed analysis of each paper). On each paper sample a number of sequential printing [x1 thought to x8] with a prepared printing solution (see fig 1). The printing and stencil material used where: 120 T monofilament nylon mesh on a wooden mesh, diaso direct photostencil medium and polyurethane square blade with a 75° shore hardness.

Printed Ink Solution and Observations

	HYDROPRINT WFX PROCESS BASE	TW GRAPHICS 5000 SERIES CLEAR FLAT BASE
Printing base:	this base was 'print ready' (a subjective description of the medium based on experience) straight from the container.	this base was much too thick to print, after working it remained thick (not a Thixotropic solution).
Colouring solution	only having access to the clear flat 1000 TW base, no comparisons could be made between colours, so a pigmented solution of watercolour was added to each in order to compare the two clear printing bases a pigment was added.	
Retarding agent: Spectra-acrylic gell retarder	adding this did not alter the 'print ready' quality of the Hydroprint base as the Gel Retarder had similar viscosity.	the TW Graphic base was much thicker than the Hydroprint, so the addition of the retarder helped to bring it down to an 'ideal' printing consistency.
Thinning agent: normally water	no water was added to the Hydroprint base as it came in a 'print ready' consistency	due the thickness of the TW Graphics 1000 series ink, the retarder was not sufficient to reduce the base to a 'print ready' mixture. However, in order to keep the test consistent no water was added.

Fig 1

Results and Discussion

Each of the printed samples was measured using the Glossmeter, from which a series of readings where obtained. The results from these tests (see fig 2) offered a graphic illustration of the increasing gloss finish of each tested surface. The build up of gloss from the Hydroprint sample reached a peak of 50-60, compared to the Graphic Chemical TW 1000 ink which reached a upper limit of 23-24. The limited nature of this type of test has pointed to the inadequacy of such quantitative data, in supplementing the researchers subjective, but 'expert' observations. The researcher suggests the more tacit, and by inference contemporaneous, grounded knowledge, which artists are familiar with; those learnt by example, or gained through collaborative workshop situations (see section 3.4) are more appropriate as evaluative means. Given that the printed surface can be altered, within limits, to achieve any given or desired results (see section 4.7.3).

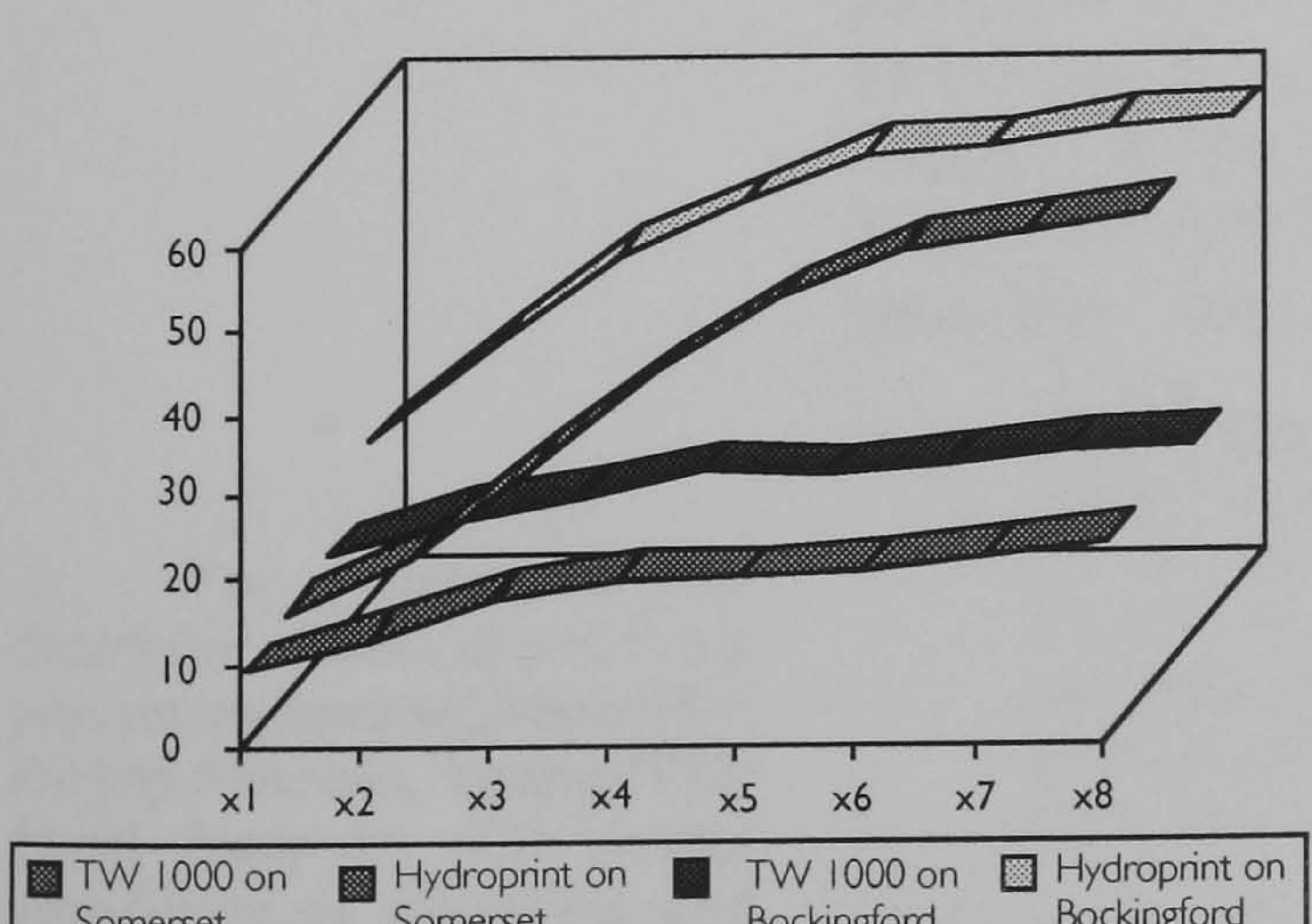


Fig 2

Appendix: 3.8.1.3 - A Quantitative Test of the Fine Art Papers used in this Research

Introduction

A critical element which influences the physical quality of any printed surface and therefore influences the visual aesthetic qualities of that art work, is the substrate on which the art work is printed. For the printmaker selecting a particular paper is part of the visual process. The selection of one paper over another is determined by a number of considerations; individual experience, the printmaking process being selected, the type of printing ink used and the desired quality or finish (selecting a rough paper surface for example). Choice therefore is not a function of the papers ability to offer the best reproductive qualities, which is predominately the case in a commercial printing situation, but for the printmaker subjective aesthetic evaluations take place, often in preference to practical considerations of image resolution. The use of water-based printing inks in screen printing and relief printing has introduced new considerations to the printmaker, as water-based print media may possibly effect the performance of the paper. In order to determine the degree to which these changes, brought about with the introduction of water-based printing, wil. influence the physical characteristic of the papers used, a series of quantitative tests where initiated by the researcher. These tests were carried out by The Donside Paper Company at their paper laboratory, in Aberdeen Scotland.

Physical Characteristics Affecting the Paper: Printing Media, Ink Type and Drying Processes

The particular characteristic which distinguish printmaking from *commercial* print applications are; the thickness of the ink layer, multiple printed layers (sometimes in excess of 100 printings with screen printing for example), the intermixing of different printmaking processes, and the extreme physical stresses resulting from multiple printing processes often used by printmakers. The performance of the paper under these extreme conditions therefore is a critical element in this creative process.

In each of the printmaking processes (electrostatic, laser and ink-jet printing being the exception as these use powdered resin or polymer 'toners' fixed by heat or fine jets of colour dyes respectively) ink is physically applied to the substrate as a thixotropic liquid. The processes by which this liquid ink film dries, affects a reaction on the surface of the paper. These drying processes are:

> **Oxidation and polymerisation** - Linseed oil based inks; intaglio, relief, letterpress and lithographic inks dry when they are exposed to the atmosphere. The *drying* linseed oil thickens by forming molecular links or chains, the oil in effect changes from a liquid to a solid film by chemical interaction with the oxygen in the atmosphere, this in tern holds the pigment in place.
>
> Another class of inks which use polymerisation are acrylic resins. These are used extensively in artists acrylic paints and certain classes of water-based screen printing inks. A further subclass of inks which dry by polymerisation are the photo-reactive inks which dry by ultra violet radiation.

[1] *For a more detailed description of these chemical and physical processes see; Materials in Printing Processes,* ***Young, 1973,*** *Focal Press or The Artists Handbook of Materials and Techniques,* ***Mayer, 1991,*** *Faber & Faber. Each offers more detailed descriptions of these processes.*

Absorption - the liquid ink is drawn into the porous surface of the paper by capillary action, where the papers network of fibres and particles provides a large surface area. Absorption effects all the printing inks used by printmaker to some extent. For example; some water-miserable relief inks use glycerine as the vehicle and dry solely by means of absorption.

Evaporation - drying is achieved through the evaporation of the solvent vehicle from the body of the ink. The evaporation of the solvent[1] usually into the atmosphere leaves an ink film on the surface of the substrate. This drying method is used extensively for screen printing inks on paper.

[1] A generic term to describe the substance that keeps the resins and or pigments in a liquid state, which describes both VOC and water miscible substances

The drying process or combination of drying processes induce a physical reaction with the paper. This can be particularly noticeable with water-based inks and can result in characteristic paper 'cockle'. This is the result of the aqueous *solvent* content of the printing ink, being absorbed into the body of the paper which deforms its surface before the solvent content [water] is evaporated. In order to determine the degree to which these dimensional changes or paper 'cockle' can be attributed to a given physical characteristic of the papers used, a series of tests where initiated by the researcher and carried out by The Donside Paper Company at their paper laboratory, in Aberdeen Scotland.

Paper Raw Materials and Manufacturing Processes

Paper usually consists of a layer of inter-meshed cellulose fibres, formed from an aqueous solution of a cellulose based fibre. This paper layer is formed on a fine wire mesh which allows the water content to drain away leaving a 'matt' of cellulose fibres[2]. Papers used by artists for watercolour, drawing and printmaking are almost exclusively made from cotton cellulose fibres or high grade wood pulp. These papers will have very few, if any additives, which can normally be found in commercial papers (these additives are used change the papers characteristics; added smoothness, flatness, opacity, or brightness).

[2] The Fine Art printmaking paper market accounts for a very small percentage of what is an enormous and very important medium (it would be difficult to imagine a society running without it).

The papers used by printmakers can be described as being of three basic types:

Handmade -formed from scooping cellulose pulp in solution, from a vat using a wire mesh. Handmade papers are still made in this way today, these can be identified by the four deckled edges formed by the hand held frame the size is limited by the size of the frame used.

Mouldmade - is made from the same basic materials as handmade but on an industrial scale using a cylindrical mesh. This paper is characterised by having two deckled edges, it is made in a continuous length. This paper is usually torn down into set sizes, leaving no cut edges.

Machinemade - is made in a continuous process on a paper making machine consisting of a number of rollers and dryers. The process is quicker and utilises a different quality of pulp. This paper is usually machine cut into desired sizes.

Fine art paper is quite often sized[3] in order to improve its durability and dimensional stability. Another important characteristic of fine art printmaking papers are their neutral pH levels, as high pH (acid paper) will make the fibres discolour and become brittle over time, effecting the archival nature of the final product and eventually the colour of the

[3] A colloidal solution which is applied by a number means; internal sizing, engine sizing, tub sizing and surface sizing, each of which will determine a particular characteristic in the paper. Ultimately this effects the amount and degree of moisture absorption and the resilience of the paper to physical penetration.

printed pigment. (The enormous diversity of papers, mean any general description cannot exactly describe the subtle differences that individual manufacturing processes and different cellulose fibres impart, for detailed description of fine art paper manufacturing processes and their individual characteristics see **Turner** & **Skiöld, 1983** and **Turner, 1991**).

Subjective 'Expert' Methods of Selecting and Testing Papers

A great deal of information can be learned from subjective observation or direct physical examination of a paper sample. Machine finished paper will have an impression of the wire mesh on the underside, if the paper is made on a double wire mesh process (bringing together two separate layers together so the machine sides are inside) the paper has no visible mesh impression. Calendared[2] paper will also diminish this visual signal making it more difficult to see the machine direction of the paper, as the fibres in machine made papers have a tendency to line up along the direction of the moving wire mesh which will show the machine direction. By cutting two strips from a paper sample, one from the length and one from the width, and by holding the strips horizontally it is possible to identify the machine direction as one will have a tendency to sag, the machine direction runs across the strip that sags most.

[2] Calendaring is a physical smoothing process, applied at the manufacturing stage using rollers which press the paper imparting a particular surface finish: 'silk' or 'gloss'

Holding the paper up to the light it is possible to judge if a paper is closely made or if there are any impurities present. The degree to which the paper is sized can be gathered by drawing across the paper with an ink pen, if the writing ink feathers or penetrates to the other side, the paper has very little size. The sound paper makes will also indicate the amount of sizing present, soft papers make little noise. Observing how the paper performs under actual printing conditions is the most obvious form of test, where observation and expert knowledge are applied and continually developed in relation to specific circumstances.

Conditioning

The ability of a paper to gain or lose moisture has a direct effect on the dimensional stability of the paper. Uneven moisture gain or loss will lead to local dimensional changes giving rise to uneven or paper 'cockle'. If the take up of moisture is even the paper will increase in all three dimensions, the highest increase being in the thickness and the lowest in the machine direction[1]. The use of water-based printing inks has called into question selections based on experience or 'feel', as printing with water-based inks will in effect produce extreme localised increases in moisture content, as the printed image usually positioned centrally surrounded by a border of un-printed paper. It is the combination of moisture and the uneven printed surface which produces the characteristic paper 'cockle' associated with water-based printing inks.

[1] The increase in the cross direction may be as much as ten times that of the machine direction.

Objective Physical Tests used on Paper Samples

A series of tests which conformed to British Standards 3432, 3983, 3631, 4468, 4420, 4432, 6538 and 2644, for SUBSTANCE*, THICKNESS*, BULK, ASH*, TENSILE* or TEAR*, BENDSTEN TEST*, BRIGHTNESS BRI 457*, COBB*, and POROSITY* where carried out by the Donside Paper Company. A selection of papers used in the course of this research where tested. These papers characteristics are described by their manufactures as; **ARCHES 88**, a mouldmade paper, 100% cotton, watermarked, acid free paper; **SOMERSET**, a mouldmade paper, 100% cotton, watermarked, acid free and buffered with calcium carbonate; **LAVIS FIDELIS**, a hard (gelatine) sized mouldmade paper, 25% cotton, watermarked, a two sided calendared paper, one smoother than the other; **BOCKINGFORD**, a mouldmade paper made from high grade chemical woodpulp, internally sized, with four machine cut edges; **SAUNDERS WATERFORD**, a mouldmade paper, 100% cotton, acid free, available in three surface finishes HP, NOT and ROUGH, four deckled edges and surfaced sized with gelatine; **GERMAN ETCH** (Hahnemuler Etching), a mouldmade paper made from alpha cellulose, four deckled edges, watermarked and acid free this paper is very lightly sized; **JAPANESE PAPER no. 1** & **no. 2**, made from very long cellulose fibres which gives the paper different printing characteristics to European papers; and **PARILUX**, a machine made high quality commercial coated printing [dimensionally smooth and pre-coloured], non acid free [used in the test as a reference point for the tests carried out by Donside Paper. The results of the tests for Substance, Thickness, Bulk, Ask, Tensile, Brightness Cobb and Bendsten tests (see below) can be seen in Table 1.

** SUBSTANCE - determines the grams, per square metre of the paper sample. An average value is recorded.*

** THICKNESS - measures the thickness of the paper. Readings are taken on different parts of the sample and averaged. The result is expressed in microns.*

** BULK - This is the ratio of thickness to the mass of paper per unit area. Bulk = Thickness / Grams - an indication of the papers make up and it's treatment, indicating the ratio of air space to solid matter within the sheet. The addition of fillers, heavy beating/refining, or calendaring processes all increase the density of the paper, a low number indicates dense material.*

** ASH or loading - Measures the amount of non fibrous material in the sheet. It is used to assess the amount of filler or loading used. The carbon of the fibres is burnt off, leaving as a residue the minerals existing in the sample.*

** TENSILE or TEAR - the tensile strength of paper is defined as the minimum tensile force necessary to fracture a piece of paper. This test is generally accepted to determining the strength of paper and is relates to the type, quality and treatment of the fibre.*

** BENDSTEN TEST for SMOOTHNESS - measures the smoothness or roughness of paper surface. As a general rule, the smoother the paper, the better the reproduction. For rougher papers printing may fail to 'bottom' in the valleys of the paper surface so more printing pressure or more printing ink will be required to avoid this.*

** BRIGHTNESS BRI 457 - brightness values are recorded from the Reflectance of a single sheet using light at 457 nm.*

** COBB (or sizing value) - a measure of the absorption, or resistance to water. The test is sometimes known as a sizing test. By weighing the paper before and after treatment, the uptake of water can be determined.*

** POROSITY - measures the air permanence of the paper indicating the openness of the linters and fibres. The test gives an indication of the compactness of the sheet, and indicates the tendency for fluids, such as ink, to penetrate the surface.*

PAPER NAME	Somer-Set	Bocking-Ford Drawing	Bocking-Ford Drawing	Saunders Rough	Saunders Cp/Hot Surface	Lavis Fidelis	Velin Arches Blanc	Velin Arches Blanc	German Etching	Japanese Paper No.1	Japanese Paper No.2	Parilux Cream Matt
INDICATED WEIGHT	300 gsm	300 gsm	535 gsm	356 gsm	356 gsm	280 gsm	400 gsm	280 gsm	nfg	nfg	nfg	170 gsm
SUBSTANCE	299	279	480	344	352	281	386	293	299	36	86	170
THICKNESS	574	470	779	686	716	2004	2444	1928	1972	384	965	686
BULK	1.92	1.69	1.62	1.99	2.03	1.78	1.58	1.64	1.65	2.66	2.81	1.01
ASH	7.9%	1.6%	2.6%	1.5%	1.9%	3.4%	0.72%	0.68%	8.4%	3.1%	0.28%	32.8%
TEAR	176/208	240/272	464/496	288/320	272/368	200+	174.5/117	151.1/94.4	65.3/50.1	24.5/23.2	41.2/24.7	10.5/70.3
BENDSTEN	1900/1850	2400/2500	2300/2500	3600/3600	2900/3000	1900/1200	1000/600	1200/1450	1500/1450	600/500	1100/850	10/10
BRI 457	83.99	88.45	89.27	75.68	76.63	81.94	75.91	77.15	73.59	56.53	59.55	78.74
POROSITY	780	240	200	200	400	260	280	320	400	1900	1800	nfg
COBB Front/Back	16 / 23	11 / 24	17 / 31	19 / 25	19 / 27	22/ nfg	18/ nfg	16 / nfg	18 / nfg	51 / nfg	191 / nfg	nfg

Results and Analysis

The Ash measurements confirmed the fine art papers tested were very simple substances, unadulterated with any additives or fillers, with the exception of the Parilux paper, as expected. The fine art papers tested gave extremely high Bendsten measurements compared to the Parilux, this reflected relative coarseness of the fine art papers, Parilux is specifically manufactured for its ability to reproduce fine printed reprographic detail, a quality not associated with fine art papers. Where the grain and relative roughness is a reflection of the non-coated surfaces of these fine papers.

The Porosity measurement gave interesting results with the Somerset, Saunders, German Etching and the Japanese papers having the highest figures. When seen in relation to these papers high Bulk figures and low Tear measurements, these measurements were seen to offer a possible indication of the papers softness or openness. The results of the Cobb measurement was also seen as potentially offering a measurable value indicating the papers performance when used in combination with water-based inks, as the amount and type of size in the paper effects the speed, quantity and evenness of any moisture absorption. Given that the amount of size will effect the degree of movement between the cellulose fibres as they try to expand when wet. The results of this measurement however did not indicate significant differences between these papers, as was expected.

The papers in the experience of the researcher which gave the best results when used in combination with water-based screen printing inks, were Somerset, German Etching and Arches 88, as these produced the least paper 'cockle' or were better able to become 'conditioned' when printing with an uneven layer of water-based ink. These observations are supported by the tests, as these paper where found to be the more 'open' and porous papers. These tests have identified measurable qualities; *Cobb, Porosity* and *Bulk,* which have supplemented the artists experience and selection processes when selecting fine art paper from use with water-based printing media.

Appendix 3.8.2.1 Questionnaire Proforma

The following questions are not placed in any order of importance. Your help in answering all these question is very much appreciated.

Please return to:

Jon Pengelly,
Department of Fine Art, Printmaking,
Grays School Of Art, Garthdee Road,
Aberdeen
AB9 2QD
Tel: 01224 262 000

P1

(i) Have you found it difficult to establish which materials, inks, solvents, etc. have 'good' or 'bad' health and safety records?

(ii) Do you rely on manufacturers for the relevant health and safety information, concerning the materials used in your printmaking workshops?

(iii) Would your department request a 'Hazard Data Sheet' before placing an order with a company for a product/material that is unfamiliar to you or you have not used before?

P2

(i) Does your department use water-based screen inks?

(ii) Does your department use water-based block printing inks?

(iii) Does your department use any other materials or methods of a 'unconventional' nature?

P3

Have you found advantages to working with any of the above materials, (Water based inks etc., if used within your department)?

P4

(i) Has your department seen any significant changes due to the introduction of the COSHH regulations.

P5

Has your department had to restrict or give up any working practices or materials as a result of a COSHH assessment?

P6

(i) Are students reluctant to work within any particular area of printmaking as a result of it being perceived as unhealthy?

(ii) Have staff and students responded positively to alterations in printmaking methods or new materials?

P7

Has the college or University provided additional funding to implement any changes within the printmaking area that may have resulted from COSHH led assessments?

NAME and POSITION:

ADDRESS of your COLLEGE or UNIVERSITY:

Appendix: 3.8.2.2. List of Graduate and Postgraduate Fine Art Printmaking Courses Questionnaire was sent

Anglia Polytechnic,

School of Art, The University College of Wales,

Brighton Polytechnic,

Bath College of Higher Education

Bristol Polytechnic, Faulty of Art, Media and Design,

Byam Shaw School of Art, London

University of Central England, Birmingham

Bradford and Ilkley Community college

Bretton Hall College,

Bournemouth and Poole College of Art and Design,

Camberwell School of Art and Crafts

Cardiff Institute of Higher Education

Cumbria College of Art and Design

Central Saint Martins College of Art and Design

Chelsea College of Art and Design

Cheltenham and Gloucester College of Art

Coventry Polytechnic School of Art and Design

Duncan of Jordanstone College of Art

University of Plymouth

Edinburgh College of Art

Falmouth School of Art and Design

Glasgow School of Art

Goldsmiths College, University of London

Hertfordshire College of Art and Design

Harrow College, Faculty of Art and Design

Humberside Polytechnic Faculty of Art and Design

Kent Institute of Art and Design

Kingston University, Faculty of Art and Design

Lancaster University, Department of Visual arts

Leeds Metropolitan University

Lincolnshire College of Art and Design

London College of Printing and Distributive Trades

De Montfoed University, Faulty of Art and Design

Liverpool John Moores University, Media and Design

Loughborough College of Art and Design

Manchester Metropolitan University,

Middlesex Polytechnic, Faculty of Art and Design

University of Newcastle upon tyne

The Norfolk Institute of Art and Design,

Nottingham Polytechnic Faculty of Art and Design,

Nelson and Morgan College Faculty of Creative Arts,

University of East London,

Royal College of Art

Royal Academy Schools

University of Reading, Department of Fine Art

Sheffield City Polytechnic

The Slade School of Fine Art

University of Sunderland, School of Art and Design

University of Ulster, Faculty of Art and Design

The Ruskin School of Drawing and Fine Art

West Surrey College of Art and Design
Swansea Institute of Higher Education,

Wimbledon School of Art

Winchester School of Art

Wolverhampton Polytechnic School of Art and Design,

Appendix: 3.8.2.3 Summary Analysis of Questionnaire

Questionnaire Structure

All UK degree and post graduate fine art courses that offer printmaking as an option, where identified, using *The ADAR Course Guide* s (1993). This information was supplemented by individual college perspectives (1992-93), and where necessary by telephone enquires to identify individuals within each institution; lecturing staff, studio demonstrators or technicians with the responsibility for delivering the course or implementing the COSHH Regulations and assessment procedure. A list of 60 institutions was finalised (see **Appendix: 3.8.2.2**).

Draft copies of the initial questionnaire were circulated to the printmaking lecturing staff at Grays School of Art for comment prior to sending. This process brought about the inclusion of Question [P7] in the final draft of the questionnaire (see **Appendix: 3.8.2.1**). The researcher felt that the vernacular style adopted in the questionnaire would be more likely to initiate full and unqualified responses. The limitations and latitude inherent in this approach, were considered, but given that the researcher had an intimate professional knowledge of the subject area and the whole subject group had been identified, it was not felt that this would have an adverse effect on the final analysis of the returned questionnaires.

The questionnaire was sent in October 1993 to 60 colleges and institutions from which 30 questionnaires were returned.

Questionnaire responses

Response: P I (i)

Manufactures information was generally not felt to be always relevant. This was seen as a result of the information being excessively technical and difficult to relate to printmaking practices.

> *"information is not always easily understandable you have to decipher the technical information yourself sometimes."*

A number of responses clearly identified personal experience and 'expert knowledge' within printmaking as an adequate means of compensating for the apparent 'gap' between manufactures information and 'grounded' experience given the lack of dedicated information in this area.

Response: P I (ii)

Product information was generally felt to be assessable. But it was often felt not to be appropriate given the individual and often unique nature of printmaking processes.

> *"some information is very technical and not always pertinent to our particular situation."*

Specialist printmaking manufactures and suppliers were generally felt to be more helpful than larger 'industrial' manufactures given their practical understanding of the end use of their products.

Response: P1 (iii)

Responses suggested there was a degree of confusion regarding the obligation of manufactures to make this information available, and for the department to systematically request hazard data sheets when purchasing a product. In a few cases the respondents were not aware of their responsibility to request, and retain this data.

Hazard data information was often supplemented by experience, and personal knowledge, and the recommendations of experienced artists. This type of 'grounded' information was proposed as adequate criteria for the selection of materials by a few respondents.

> *"All materials we use are normally recommended to use by artists who have used them before and have an in depth knowledge of the health & safety implications."*

It could be inferred that a materials' creative potential identified by an expert from within the field of practice was the most important criteria, in accepting its use even before its safety record was established.

Response: P2 (i) & (ii)

A question which resulted in an unambiguous response. It was evident that each institution had taken a position with regard the use or possible introduction of this medium.

- **Twenty One** printmaking departments had adopted water-based screen printing inks.
- **Eight** printmaking departments had retained solvent based screen printing inks.

*also **three** indicated they where thinking of changing from solvent to a water-based system. Also **two** indicated they were using water-based and solvent-based in parallel to each other.*

The response to this question categorically shows that solvent-based screen printing inks, at the time of this survey, were a minority process within Fine Art higher education printmaking courses and institutions. The majority of courses had changed within the last two years, often making a direct link between the need to change and the introduction of the COSHH Regulations. The system adopted by the majority of departments was the Lascaux system.

A wide range of responses, assessing the quality of the printed results of water-based inks, was evident. These often made direct comparisons between previous results achieved with these solvent-based inks and expected results from the water-based inks.

> *"Previously we had a very efficient extraction system, but this summer (1993) despite this we felt that it was necessary to switch over completely to water based inks."*

> *"We have used water-based since 1992. But due to the cost and poor quality we have reduced screen printing drastically."*

"we decided that the quality of these inks, although better than expected, were not good enough to replace the standard [oil based] inks. Once we had decided to stick with oil based printing processes, we then reorganised working practices etc. to make the department safer."

Experience built up over time with the solvent-based inks, played a significant role in determining individuals attitudes towards the water-based systems adopted. A number of responses suggested that expectations of quality and the versatility expected of the medium had been lowered as a consequence.

"water-based inks are more user friendly and are closer to the students technical experience when starting the course. Students are more used to watercolour and acrylic than oil paints."

"water-based inks are difficult to remove without screen wash if they are allowed to dry on the screen. Otherwise the only problem concerns the restricted range of stencils that are not water soluble."

"We consider that water-based technology inhibits the creative process. Difficulty with hand cut or painted stencils, etc. Most solvent based inks goes onto rags and to industrial waste disposal, not down a sink, arguably greener."

Response: P2 (iii)

This seemed to be a badly worded question, as 'unconventional' resulted in a number of interpretations. Respondents however did associate printmaking with a series of practical questions which reflected students creative purpose. Printmaking offered individuals the means to develop a visual response to the materials used.

"there has been a tendency during the last four or five years to investigate alternative methods of printmaking.This has been resource driven as much as by health and safety implications."

"Flexibility is a key word."

"students will always innovate and experiment with a variety of materials and methods, and this is by and large encouraged."

"Students are generally encouraged to work within experimental / mixed media processes - but always within safety regulations."

Response: P3

This question was not specific enough, responses often made reference to previous question. But it did further identify the personal and individual nature of attitudes, towards the printmaking medium. It also highlighted a more general association between environmental issues and the changes taking place.

"There are new properties to explore. Cleaning is less of a problem with water-based screen inks."

"In many cases the relative freedom of not being restricted by conventional methods has resulted in work of greater ambition scale wise and an interesting mix of methods being employed."

"Yes, due to their environmental compatibility."

"Minor novelty value. Traditional etching / relief best for our students. Water-based inks - clean, easy to use, no odour."

Response: P4

The introduction of the COSHH Regulations and risk assessment process was seen to have a unilateral impact on the organisation of workshops.

"considerable changes to workshop plant and organisation e.g. hazard labelling on all solvent dispensers."

"health and safety has taken on a greater significance since these changes. But working practice has not been affected adversely."

"Etching and screen were identified as areas where students were not conforming to requirements for the use of solvents."

The COSHH regulations were generally seen as a catalyst, instigating re-evaluations of previously established 'traditional' practices. The COSHH regulations were also seen as a means of supporting established 'safe practice' policies, established prior to the introduction of COSHH. In these instances COSHH was considered to be an integral part of the course structure.

"we have become very much more aware of the need to establish a safe use of materials and to completely eliminate the use of others." [not specified which have been replaced].

This question initiated respondents to frame their answers in a form which made critical comparisons between the water-based they used and solvent -based screen inks they previously used.

"poor quality inks [water-based], unable to use light papers, stencil emulsion needs drying time - storage. Unable to use gum paper / direct stencils. Too much preparation time required. Expensive for general use. Students don't develop skills of much worth in photo-screen printing compared to relief or etching."

"The students did find some disadvantages in the early days of working with the Lascaux materials.... this year the new intake of students simply accept the situation as it appears."

"the lack of opacity in the whites for instance, making for a 'lithographic mode' of working."

"Using new and unconventional things necessitates invention and flexibility. At times it can be difficult to convince people (staff and mature students especially) to use the new materials which do not give the same results as the old conventional materials."

Prior experience of 'traditional' materials had a fundamental influence on expectations. This was evident in the difference approaches which students and staff adopted. It seemed to reflect a precondition, which the individual brought to the medium [refer to earlier statements which established terms for 'traditional' and 'non-traditional' materials and processes]. Resulting in imposed limits within which 'acceptable' practice takes place. This was seen by a number of respondents as a acceptable consequence of the 'safer' or 'environmental' materials and working practices.

Response: P5

Change was mostly associated with the immediate change to a water-based system. No direct reference to staff or students' preferences only to an apparent 'lack' of versatility of the water-based inks adopted.

> *"Nothing major - except for the imminent change to water-based screen inks, which will be an important change, and a restriction of creative methods for some individuals."*
>
> *"we have obviously moved away from hazardous chemicals and restricted the use of solvents.This has not limited our work in any way."*
>
> *"No, the changes have come because we felt it better for the department not because of the COSHH assessment... but the COSHH exercise made the hazards very clear and so did effect decisions in that way."*
>
> *"No this has not been necessary."*
>
> *"The only materials that we have stopped using generally are oil based inks in screen printing. Otherwise for individual students we usually find that by adopting completely different working practices, which are often very awkward and inconvenient, we can nevertheless achieve the end product safely."*
>
> *"Not so far, abandoning solvent based inks was a decision related to the difficulty of keeping both water-based and solvent based inks in use with novice printmakers. The resulting confusion could have been disastrous."*

Other identified changes noted were; removal of ammonia solutions as a de-greasing agents [intaglio plate preparation], tighter workshop practice, restricted use of VOC solvent cleaning solutions as screen wash, in particular no longer necessary with the water-based inks used. However, a few respondents still resorted to a VOC solvent for cleaning 'dried in' water-based inks off screens.

> *"ammonia replaced.Aquatint has been restricted and students no longer reclaim screens, a job for technicians"*

Response: P6 (i)

The majority of responses made it clear that students saw no direct health consequences or problems resulted from working within the printmaking area. Printmaking practices had been made as safe as possible, so discontinuing certain working practices was seen as an individual choice.

> *"individual students are aware of their tolerance to certain processes and will not use them if problems occur."*
>
> *"No, this is because their general perception is that practices have been made as safe a possible."*
>
> *"This is rare and is usually based on personal attitudes to an area rather then on institutional perception."*

Response: P6 (ii)

Changes were generally seen to be positive. However, responses were qualified in various ways: the department has always promoted safe studio practices, staff and technician are slower to change given that they have the means of comparing distinct materials and methods, and new students have no means of making these critical comparisons.

> *"students respond to the in house practice as they do not know of any other method... staff are more resistant to change."*
>
> *"Yes, but then, there was really no alternative. Our H & S adviser would have recommended closure of the print workshops if no improvements had been made...we now have a much improved working environment."*
>
> *"Although there is a strong dissatisfaction expressed by some staff at the lack of opacity possible with water-based inks [Lascaux range]. Students, however, wouldn't go back......it has to be emphasised that these inks are not a replacement, but an addition to traditional methods, since they are different...if approached as a new method the differences can be explored and enjoyed."*
>
> *"Students are reluctant to work with oil based inks."*
>
> *"Yes, but we need a clearer lead from the institution."*
>
> *"Only those students who are allergic to substances related to the printmaking processes."*
>
> *"Not to begin with, but when it was made clear to them why they had to wear safety equipment etc. and the hazards were explained to them, that began to respond positively."*
>
> *"Yes, very positively. There is a lot of interest in developing new and safer ways of working.....we are especially keen to work with suppliers and to network with other colleges in this respect."*

Response: P7

Additional funding was made available in 18 cases for a number changes; new acid cupboards and extraction units, new screen printing extraction for departments which did not adopt water-based inks, a vacuum extraction system attached to a aquatint box. Funds where also provided in a number of cases for new protective clothing: aprons, goggles and gloves.

Appendix 3.8.4.1 Keith Howard Interviewed at Gray's School of Art on 20 th May 1994

JP: What was your original starting point, you made this statement about your Doctor identifying serious or fatal consequences from your practice?

KH: It actually started when my wife came to me and she said she was pregnant. That was the motivation really. His original advise was to stay away from the toxic chemicals in question, which I could only avoid to a certain degree. It wasn't until my roll of life was changing into that of a father. I think the life force of my son coming into being brought with it a real energy, I some how taped into that energy.

So there was nothing out of the ordinary up till that point, I was a struggling artist. I was confident with what I did.

JP: Your work proceeding this did it respond to the more technical principles of print, was there an element of that in the work?

KH: To a certain degree it did, because I'm a very sort of eclectic artist, if I get bored with one media I'll just switch media. It's always been of interest to me to move across different media. Throughout photography is the dominant force and drawing is also.

JP: That photographic influence on your work we saw in the screen prints and etchings, that proceeded the experiments with photo gelatine and the experiments that went after that. There was a continuity evident even after the changes introduced as a consequence of the health worries. Have these safe methods changes your working methods as an artist?

KH: To be honest with you Jon I haven't devoted a great deal of time to my own work after starting these experiments. When it comes to time priority, most of the time is spent exploring new and different techniques, I certainly use my own imagery but I haven't really been able to but together a new body of work for the past five years. 95% of the time spent in the studio is developing these processes, its very time consuming and demanding, writing papers and writing text.

But my images infiltrate what I do, I can see what my next body of work will be, it will be influenced directly by all these new mark making techniques I have developed, I can't help not to be I see the potential now, that wasn't there before. I feel all these techniques give me licence to move on.

JP: The training that you received and the experience that is acquired after art school training, your teaching experience. Has the introduction of H / S criteria influenced these sorts of qualities. Is there a weighting up of the advantages and disadvantages of each, or do they go hand in hand?

KH: I explore techniques that are environmentally friendly, once I explore them I am exploring the potential there, its then a matter of me translating that potential, that I see in these process, into my own image making. It's to do with vocabulary, more techniques with which to explore your own creative development. I don't see that I could explore my own creative development or image making process in any other way.

I couldn't see myself for example reverting to rosin based aquatints or bitumen or ashpheltum based products, or any lacquer based produces. I don't really have the choice, physically I don't have the choice my body would not tolerate it. I'm in a mind set now where I'm relieved I don't have to make a choice any more. I can work successfully without the hassle.

JP: The increased vocabulary we saw to day in those examples of images and types of makes, printmakers attending your workshops had achieved, that increased vocabulary is that a result of this environmental approach or is it a consequence, it just happened to be successful?

KH: Its a result and a consequence, for example I told you about the water block out that was a consequence of some one coming up to me with a thinned block out which she wanted to but an aquatint over. Then the idea occurred to me, as she wanted to aquatint around this dried aquatint, so what I said was lets paint water over the image aquatint around, when it was dry just wash off the water, so that's a consequence then I though what would happen if you just painted water onto the plate and sprayed the aquatint H/S on top and let it dry on the plate.

That became a result of a question in the workshop, its a completely new way of mark making. Now I can see isn't that absolutely glorious the soft washes you can get with that technique, at some point in my own image making process I have that as one of the letters of the alphabet of image making, and I know how to access it, so its there (head) and it started simply because a student simply asked me a question.

JP: The skills and qualities that printers and printmakers take for granted, for example the empathy and understanding of materials, are qualities generally that printmakers/printers seem to have. Do these qualities in any way develop, given that you don't have a technical scientific or chemical background to impute.

KH: I think the under lying thing I have is curiosity, the way I developed the direct Howard type a non-etch photo intaglio emulsion was simple a result of a question that popped into my head. Is it possible to print the plate without etching it, and I just went ahead and assured the question empirically , basically every thing I do is empirical. If I did have that sort of background I probably would have known this is going to work. I think having that sort of scientific background can hold you back, you don't need a scientific background if your smart you just ring someone how does, that's what I tend to do.

JP: Printmaking has always had these association with the technical, I think there's no question of printmaking not being a valid means of creative exception complementing painting and sculpture. I don't have any problem with that. Printmaking has developed via individuals applying these skills.

We have been talking about printmaking moving away from those lingering associations with graphic reproduction. Within this context. Do you see your work as a continuation of this?

KH: Printmakers have a really bad reputation of being too preoccupied with process, in relation to the imagery. I think a lot of this preoccupation has to do with the alchemist mentality, its a secrete society that deals with all these hazardous and toxic chemicals. What I'm trying to do is demystify the whole process of mark making and printmaking. As un-exciting as getting acrylic floor polish (AFP) and pouring it on a plate and scratching into it, there's nothing mystical about that what so ever. Think of the etcher of old that is getting his hard ground made up of bees wax and aspheltum and melting it and dabbing it onto the plate, rolling it on and then turning the plate upside down and smoking it with candle tapers, this wonderful ritual which the printmaker becomes engrossed in the process of preparing the ground. When it comes to drawing, it's a real let down because it doesn't have that process involved in it.

JP: Yes but printmaking is able to take on board diverse and complimentary media, such as computer generated, laser printed images and electronic generated imagery. That openness seems to run counter to what we were talking about there, process which is based on three hundred years of history and tradition.

There seems to be a dichotomy in trying to define the medium in this way, as both coexist.

KH: I think computer imagery is the next generation of mark making potential the fact of the matter is you can use computers all your life and you can have laser print outs', but does a laser printout have the same aesthetic quality as an etching, not it doesn't, certainly as a mark making tool it is valid. But in the 19 th. Century when photography was invented, the same cry was heard, about it undermining the arts it was considered a great threat to artists. I see the same thing one hundred years later with computers I don't see it as a threat, I see it as part of our creative potential.

JP: The introduction of photography was seen as the end of drawing, what happened in fact was the goal posts were just moved, artists just had to deal with it and take it on board.

KH: It was absorbed, its not a question any more about the ability of art and photography there part and parcel. There isn't an artist I know who doesn't use a photographic reference or is nor influenced by photography. Look at the way art history is taught its taught through photographs, is a very intrinsic and integral part of society. There's nothing to be afraid of any more, I think there's a certain fear by artists of computers because its to easy, only a person that doesn't know any thing about computers would say that.

JP: Gelatine as a photographic coating of etching plates and as an emulsion for negatives has got a very long history, which goes back to the origins of photography. At this early stage there was a great deal of experimenting into the diverse creative application of this 'new' medium of photography, without the preconceptions we see today.

It found its way into various printing processes; wood engraving and metal engraving, as a coating for etching plates. Do you feel the work you're doing now, 150 later, is a continuation of this or are you responding to different environmental concerns?

KH: That's a very good question. My initial investigation were prompted by my environmental and health concerns.

JP: That was your point of departure?

KH: That's the motivation partly what I spoke about before, also because I was effected very strongly by these solvents and chemicals. In a sense my gelatine based process has its roots based in the history of photogravure, the way H F Talbot developed photogravure and the way I developed it is really an extension, the knowledge the information has always been there, its just I've applied it differently. It's still very process oriented and it appeals to a lot of printmakers that are process oriented. It has its roots in the history of photogravure, so it has that sort of appeal in one regard, it's also safe to use.

Then there is the new Riston indirect Howard type which is so subtle it almost bypasses any process. As I get older, I get more open in terms of exploration of ideas and techniques I don't shut anything down. I could have kept the Riston film a secrete to protect this old idea of mine. But to me that is a totally ludicrous thing to do. Its not about protecting an old idea, its not about protecting a tradition, its about development, its about moving foreword, its about creative thinking at every level, and its about contributing something within this discipline for me that is the most important thing. What artists do with it is their choice. All I really want is to receive the credit for doing it, that is important to me.

Appendix 3.8.4.2 Keith Howard Interview - London 4 th June 1994

JP: Do you find that printmakers are blinkered in some respect, things have to have a layer of tradition, hard grounds are but on in the same way as Remberant might have. By doing printmaking they're taking on board this whole tradition of techniques.

KH: Your right, they're caught up in the great controversy about printmaking as far as the rest of the art world is concerned printmakers put far to much emphasis on process. There are certainly those that treat printmaking as alchemy they have these secrete receipt and they like the resulting mystery of the process and they like being plugged into that part of that tradition, it has a certain sort of romanticism, I think there's a point where printmakers have to stop and look at what can be done with, for example acrylic floor polish.

JP: Things are changing now, with external influences effecting printmakers decisions such as environmental and occupational health & Safety considerations also printmakers are more aware of the consequences of the materials used

KH: Plus there's also a better awareness of the ecology and the environment, so there also a growing environmental awareness.

JP: What we're talking about is dealing with these issues in the local environment of the print studio

KH: You take the case of Texas Christian University, they spent $100,000 on exhausting the fumes from the printmaking studio so the air inside the studio is clean and they end up killing a tree directly in front of the extraction. There's an environmental impact there which they're very conscious of now as a result of that, its all very well spending $100,000 on extracting nitric acid fumes, but were do they go. They go out into the environment, I think we have to take individual responsibility for our actions.

I think it's about time printmakers took an equally responsible attitude, its all very well having tradition, but how do you think new traditions begin or respond. Through a certain group people that have the courage to change because you need courage to change. Young students that work with KH safe methods don't need that because they don't have anything to change from, so it's much easier compared to printmakers who are entrenched in the traditional methods, unless they have been adversely affected by the fumes or materials. There was a young lad who came to one of my workshop who had open wounds up his arms just from working with white spirit, he looked at me and said thank god you've come along.

I know from a health and safety survey done by Dr. Robin Michael's in North America one of the questions: Have you suffered any occupational consequence as a result of printmaking do you know anv printmakers who have suffered from side effects; he said 95% of the responses were yes that they have been affected or know of some one

JP: Carrying on that idea, art schools and printmaking departments have a responsibility for the safety of students working in that environment, complicated by the fact that some students might only spend a term a few weeks or extended periods associated with degree. The responsibility extends to all the students that come into contact with hazardous materials.

KH: If they abdicate that responsibility there're going to open themselves up to all sorts of law suits, in fact what's happening in the States, Universities prior to five years ago, if there was any occupational related hazards or health concerns brought to the law courts there wasn't any particular defence the complainant could adopt, as they could say, you have come into this printmaking program and this is the way printmaking has been done for hundreds of years and this is the risk you have to take there's not other way of doing it, that defence is now lost, any case that is brought up in court they can now say it's your responsibility as an educator to be in touch with what's happening in your field, if your not in touch with these new developments, these safer alternatives then you have absolutely not right to be a teacher, that's the way the law courts look at it.

You have Universities in the States now that stubbornly stand by the traditional ways but they have to offer incoming students a safer alternative, on the one hand in this section of the printmaking studio you can deal with completely safe and inexpensive printmaking techniques or you can go into that other section and deal with a more toxic and more expensive hazardous type of printmaking that's 'traditional', which is it going to be.

JP: The soul driving force or criteria that printmakers have applied previously seems to have been creative expedience, which has lead to methods that give the marks that they want. It seems to me there has never been any outside influence such as safety issues or occupational consequences we see now. Do you think as a consequence of this your adding to the vocabulary of printmaking possibilities, with or without limiting the creativity expected of the medium.

KH: I think your right, to say that the acrylic floor finish hard ground is a replacement for a traditional hard ground is wrong, because it is actually different in a very important way. It has a subtlety and flexibility that is not present in traditional hard grounds. Then you take the use of hunt speedball screen filler and the five major new techniques it opens up for the etcher, you have a mark making potential and a creativity that is far beyond traditional techniques.

I've just done nine workshops (in the UK) and the exuberance, and vitality and the energy and the creativity produced at these workshops is astounding, the evidence was sitting on the table in front of us last night (*a reception at Central saint-Martins School of Art*) a certain freedom and liberation and experimentation that people are really enthusiastic about. Because the physical costs to themselves in terms of nausea, head aches or what ever is not there, they don't feel inhibited by polluting the environment or studio or themselves. Their just very open and free and expressive, a new freedom.

JP: Does every workshop turn out some thing new.

KH: There's a freshness there its an approach that's ideally suited to printmakers. All printmakers have to do is open there minds and eyes that's all, its right in front of them. There isn't a printmaker in the world that's ever come up to me and said the old way is better if it was better then I'm sure there would be staunch traditionalists that would love to make that simple statement, but they can't. Once the physical results are right in front of you, you would have to be blind or stupid to deny the existence.

JP: How did you come to use and experiment with the Riston film that you're most recently been working with. How did you come across that film. Which is a film that has been used in industry for 20 years.

KH: One of my students had four identically coated gelatine plates and exposed with four identical half tones under the same exposure light when lifting vacuum frame two of the gelatine emulsions just popped off the plate and two stayed on, he turned to me and said what happened? My response was 'gees I don't know' maybe I could fine a plasticiser for the gelatine to make it a little bit more elastic, I know of one plasticiser Glycerine it didn't do the job very well.

I make it my business to let every one on that phone know exactly what I'm doing, if they have an idea of what your doing they will volunteer information, as Gregory did, he said have you tried that Riston film, I said what is Riston film? and he explained it, could you arrange to sent me some, sure, actually I had to ring a chap in Toronto Arthur Henry, I rang him again I explained it to him and within two days I had a 1000 foot roll in my studio, this was about five days before I left for Britain. The first test I did was just brilliant, I could see its potential.

JP: The thing I'm interested in is how you take a film, for use in a commercial PCB (printed circuit board) process with a $100,000 machine, and translate it for use in the a printmaking process. What was you initial reaction. How am I going to stick this to a etching plate?

KH: The first thing I though was it was a polyvinyl alcohol type of product, and I deduced that alcohol will soften the emulsion so my first approach was to mix up alcohol and water mixture and simply squeegee the film on to the plate with a bead of the mixture and that worked brilliantly except that it was a bit problematic you get wrinkles at the edges, the other thing was I tried to iron it on. I only had five day so the first day I tried the alcohol solution, the second day I tried ironing it on which didn't work very well, it wasn't until the third day that it occurred to me to press it on with the etching press

JP: So you were applying the materials and expertise of your subject area

KH: What I did was look at the technical specification on this film, when I got the film I didn't have any technical information on it so I rang up Arthur Henry and ask him how to develop the film, can you fax me some technical specs, I got one useful technical fact it is rolled on 4 foot a minute, so I think an etching press has to move at 4 foot a minute basically the technical spec. Said it was rolled on with heat and pressure, and the heat was the same temperature as boiling water. So then I experimented with trays of boiling water, dropping the copper plates in the boiling water the plates hold the temperature for a few seconds, and dropping it straight onto the Riston film, that works then running it through the press. But also just misting it with hot water and running it through the press that also works.

I don't think conventional printmakers, would probably get that Riston Film and bust their gut trying to get it to etch. I don't think the concept of printing the emulsion is a new concept that I brought to light with the gelatine process, so the concept I call the Howard Type a process of hardening the gelatine with acrylic floor polish, and just print with the emulsion is completely new idea in printmaking, so if that film was given to conventional etchers they would possibly figure out how to etch it but that small shift in thinking would have been made, I say this because for my self I had gelatine coat plates for five years before it occurred to me to actually print from the gelatine, its changing your thinking

JP: So was there's an instant connection between that and the Riston film. There wasn't the same five year gestation period it happened instantly. One leads to another to another?

KH: I think if I hadn't come up with the notion that you can actually print with the emulsion, then I would have just busted my brains just figuring out how to etch with the Riston film. Because that's after all how its designed and I think if you follow the Dupont direction you will not get a very good result, because the detail from an etched plate is not very good, and they specifically say you have to expose the film with the protective layer on the film, I found you get much better detail with this backing film off, that's again adjusting my thinking, how can we make this better. I think the real challenge is to think laterally, its very easy to think within a structure or the confines of some tradition, its very easy to follow a receipt of directions.

One etcher said to me once there was a great difference between her press and an other one, I said to her, physically all an etching press is two rollers and a steel bed and some blankets and you just push, physically that's all it is, its not like the difference between a RR and a motor scooter.

JP: Could I sum up your philosophy by saying there are no rules to adhere or hinder the development in printmaking?

KH: Actually I think there are rules, I think the rule is quality that's my only defining, I have no tolerance for mediocre results.

JP: How would you define the quality we're talking about, the quality of the resulting print, or the creative possibilities, and technical qualities of printmaking?

KH: I think the quality is in the mark making potential, not in the aesthetics, the aesthetics is something I leave alone that is a completely different issue. Lets say you've got a hard ground and you want a deep etch line if your screen filler or what ever your using acrylic or whatever lifts before you have your deep etch. These's a technical problem, so that has to be addresses so that becomes a limitation, well then you have to find an answer to that limitation, so acrylic floor polish just does not work very well...

JP: Yes I've come across that, some just craze up

KH: If you know that crazing could become a technique in itself..

JP: If you need crazing apply acrylic floor polish No 2 as opposed to No 1 which gives the standard result.

KH: Quality has this symbiotic relationship to aesthetics then.

JP: Printmaking is about that, it's always had that connection between process and what the process offers the visual vocabulary. These has always been this trade off or vying for which is the most important. Printmakers will invariable go up and stick there nose right up against the glass to see how its is done before they look at what it is.

KH: Most artists are the same, painters are the same when they go up and look a paintings. But you know your right, printmakers are really concerned with surface and the process, but this whole new line of inquiry has a certain sort of pioneering spirit we are at the beginning of a new tradition in printmaking, how often can you say you were there at the beginning..

JP: Due to the numbers of printmakers that are more familiar with the 'traditional' techniques and processes compared to the numbers that have come to your workshops are still in the minority, by definition your approach is the nonconformist one, do you see that being turned around.

KH: I think it will change, its the results that printmakers get from using these safe techniques that will be the best way of propagating safe printmaking. Printmakers as you said will go up to the wall and look at it and stick the noses on it and they'll say 'how in the hell was that done' if their really admiring it or their really shocked by the quality that's in front of them, then they fine out how it was done, that's when the barriers are going to come down.

As one person on my own or a small group of people trying to change things over night is not realistic, although look wants happened in five years Jon. Its been a phenomenal response in the way its getting into the system across the world in such a short period of time, I find it a little over whelming.

JP: I know you've done a lot of workshops in art schools, have you had any interest or done demonstrations in professional workshops editioning workshops.

KH: That's the same question Silvy Turner asked last night. I've actually but my greatest energy into education, because I think that's were the change has to occur, in the educational institutions, and I've noticed that there are master printers that come to my international workshops, and come to Edinburgh printmakers were you have a whole bunch of professional printers. So going into a editioning house is something I haven't done yet, they seem to come to me.

JP: Your seeing colleges dropping etching for those sort of reasons?

KH: In north America a lot of institutions are really worried about law suits

JP: Has that been happening

KH: Yes of course there has and there are ongoing law suits to, but the fact is that the winds of change are here and it seems to be gaining tremendous momentum its across the world, since I've been here for seven weeks I've been invited to China, Russia, Spain, and Taiwan. Next year I'm going to Denmark and Sweden, things are happening really quickly.

JP: Going back a bit, I'm interested in is this process of change and the way ideas evolve. Have you noticed any cycle or pattern you've been able to observe. There does seem to be a ongoing and continuing stream of new ideas techniques.

KH: No I don't seem to run out of ideas, I don't go out looking for ideas it just occurs to me.

JP: These ideas that occur to you are they based on things that have gone before or are they sort of out of the blue 'light bulb' types of things

KH: Well it occurs to me there's an evolution of thinking, there's an evolution that things have to go through, I'm sort of tuned in is the only way of describing it, tuned in to the possibilities, for instance a lot of thing happen by accident.

For example the lift grown with the screen filler, that happened by accident. I had diluted screen filler I was using as aquatint, and straight screen filler used as stop out, and one of my students was using dilute screen filled as stop out and painted onto a plate and etched it and when I pulled the plate out I could see that it had broken through, so I was really annoyed, when I printed the plate and the annoyance just disappeared I could see the full potential of that process by diluting it.

JP: That was the test that gave a wash effect. Have you been looking at alternative to potassium dichromate. As the substance is a very hazardous material, even in dilute quantities it has a dermatological effect

KH: Well if you use rubber gloves and a respirator when its in liquid form, you only have to protect your skin. I'm more aware than anyone of potential toxins to my body. I'm the last person in the world that's going to put my self to risk, and I've talked to many different scientists about potassium dichromate. Due to its very height melting point it's one of the more safe chemicals to use. It doesn't evaporate into the environment, you have complete control over this product. I think there are photo polymers I'll use in the future....

JP: Going back a bit to your use of the word research, and the work that you've done. You're investigations come very naturally to you do you call this work research, or is this work a continuation of your creative work as a printmaker.

KH: Obviously it is research, as soon as you start fooling around in uncharted waters your involved in research. I don't consciously set my self a research task it's something that's ongoing, it's something that comes almost natural. I'm here and I'm looking around for a stop out varnish, is that research, asking questions about certain produces.

JP: Directed questions certainly are.

KH: I have this beautiful new technique that occurred because a student asked me a question. She painted a figure with really diluted Hunt Speedball stop out onto the plate, she said its dry now and I want to aquatint around the figure what do I use to stop out the figure. The first answer that occurs to me was to paint water directly onto that figure and air brush on top of it, then wash the water off the plate after the air brushed aquatint had dried and it worked fabulously. Then from that one question a student asked me was to just paint water onto a plate and air brush onto plate, let the water evaporate on a hot plate, it lets the hunt speedball stop out filler float and then adhere to the plate. When it was etched it gave the most subtle marks that went into beautiful blacks, is that research of course that's research.

Something as simple as a water resist in that regard is totally different, I don't know of anyone that's even come at that problem from that direction and its only required a very small shift in thinking again. I think research requires that shift of thinking, if your not capable of doing that then you're not capable of doing any useful research, if all you can do is just follow receipts, you have to have that ability to sift you're thinking slightly it doesn't have to be a magnificent shift.

JP: Do you think as a tutor it is possible to teach students to approach their work in this way

KH: It's a concept, it's a way of problem making and problem solving that puts the responsibility in your students hands for them to come up with a problem. Like if you always give them an answer to a problem, how the hell are they going to think creativity about the problem. I'll give you an example. In one workshop, I showed them how to coat acrylic floor polish onto a plate for a hard ground, well that in itself is a very simple activity, you prop it up in a try and pour acrylic floor polish over it. Then the same student came up to me and said we want to do one of those Howard types, I said just coat it with acrylic floor polish as you did before and I thought that was adequate explanation, but in fact it wasn't because they hadn't made the quantum leap of thinking, that it was exactly the same procedure they never thought about the consequences of what they were doing. So the next day I said well how is it going, as they haven't done it yet. I said why, 'we don't really understand what you said you have to show us', well its the same procedure as... they couldn't make the quantum leap to connect the to procedures.

No I think there's a sad lack in education.

JP: Surely it's just that some students just think in those terms.

KH: It goes back to your left brain education system, you go to high school and your fed information your not encouraged to creatively disseminate information, and your given the answers. When you come to art school the worst thing people can give you is answers, especially to the aesthetics of art, its a problem solving and problem making arena, and their not used to that. They say 'aren't we here for you to give us all the answers', wrong. That's the mind set that a lot of students go into university and college with. Its a mind set that's fostered and encouraged by the educational system as we know.

Consequently Japanese printmakers are probably the least creative technically in the world, because they come from this very linear, very dogmatic background.

JP: Tradition in Japan takes a very high profile, to step out side that is deemed to be unconventional and different. Within the visual arts and printmaking which thrives on that differentness, it would seem to present a conflict.

KH: There's an irony there, you can be creative with your image making, but you should conform to a linear set of rules and regulations, which I find astonishing.

JP: The one individual that springs to mind is Hayter.

Restart interview on subject of photographic processes.

JP: Things have moved on a great deal since you wrote the book

KH: The book had to be done in a hurry, to protect the originality of the research there were a lot of people in the printmaking world that would quite happily steel my ideas. The power of original ideas its like gold, you have to protect it, the way I protect it now is to tell every one as quickly as possible or to publish it, that's where printmaking today is good.

JP: Its out there in the public domain now.

KH: I look at the whole ecology of printmaking and I look at inexpensive ways of making vacuum frames and exposure unites, and efficiency, how to stack etching plates, do an edition of 100 prints with out blotting paper. I think it takes a lot more skill to print an etching with gloves on than without, any one can cover themselves from head to foot in ink, its a much more difficult, a refined art form, to print without getting one ounce of ink on you, I think that's the challenge. I try to address that in my workshops but there's always some one thetas putting dirty marks over the press and all over the blankets, there's always prints with great big finger marks all over them. I think that's part of the processional attitude myself.

JP: That professionalism is something that you've carried through to your investigations.

KH: I think it's not a matter of even looking at the thing in isolation in terms of techniques, I look at it holistically in terms of everything how every movement works. For instance I but a sheet of plastic behind the frostiest so that the others don't get damaged that for me was a very simple thing to do, I think I've only met one other printmaker that does that, it's such a logical thing. So it's part of this thinking process. When I'm doing a thing, how can I make it easier or simpler or better, everything.

It's not like I'm even going to sit on my laurels. For example I'm trying to make a better hard ground by mixing Hunt Speedball stop out and acrylic floor polish together to make a better stop out varnish. So it's not settling for one formula or one solution. I'm real keen to try the TN Lawrence GB water soluble relief ink because the Graphic Chemical makes a real wonderful soft ground.

JP: The GB relief ink is glycerine based so that it is re-wettable even when dry.

KH: Even if you heat it, so if you put it in the ferric chloride it will just drop off.

JP: Yes. I'm using that quality as a positive think in the screen prints that I'm working on. Were I'll take a surface print with GB off a machine cut wood block to make a screen separation. This art work is then reworked with water, dried and re-exposed to overprint the original, no solvents.

KH: There could be something in that you could make it into a lift ground maybe.

Appendix 3.8.4.3 Ronni Hennings Interview at Long Island workshop, New York on 23 August 1994

JP: The company that makes the water-based inks that I use Coates Loriuex. I know they don't have any idea about what artists use their products for, printmaking we're such a small area.

RH: Because their mostly interested in commercial printing that prints advertising, which is there main thing and not the fine art print market. Although Union ink have supplied for years and sold an incredibly good oil based ink, that's been used with print publishing over the years, their chemists were always very available. They have this water based line now which is a very good product, to me its the closest to the oil based line that there is. I would say that the TW, Nazdar is also very good.

Once I found the thing that worked for me, I stuck with that, or expanded on that using union inks when I needed to. Their (Union) not as large as TW Graphics, coming out of California, where they have all those environmental laws, they're more interested in eliminating the cadmium's and getting a comparable product- bright reds and oranges without using cadmiums.

JP: In California is there's a move towards zero emissions

RH: I guess just less toxic in terms of garbage. Their after reducing garbage. Which is a real problem in NY.

.....those barges towing Long Island garbage all around the world for a port to take the garbage from Long Island and of course no one would take it. Long Island itself has a big water problem. They have a very high water table and it gets easily polluted. To reduce the garbage they do recycling as best they can. So I think for here the main issues with environmental laws has to do with the types of garbage that comes from solvent based inks, rags and all that kind of thing.

JP: When I was around at John Nobles we were talking about the move from solvent to water-based inks. The thing that's always levelled at it, is your just moving from solvent based emission to water-based pollution, that just goes down the drain. He pointed out that he has some precautions but this was just a filter for lumps and a small grease trap setting tank..

RH: In the case of his waste. His shop is connected to the NY sewer system, which treats it through various treatment plants, so that what actually goes out into the bay has 'supposed' to have been treated. This is what your told.

I have been up to visit the print shops at NYU (New York University) were kristna Reddy is the intaglio tutor, who was one of Hayters'" assistants, does all the viscosity printing. When I when up there the students would go to the sinks and wash everything down the sink, inks solvents etc. without a though for were it was going. I think that came about because in NY your always given the impression its going to the sewage treatment plant. So in his case he doesn't have to be so concerned with pollution and his waste water, as I do here.

I my particular case we have to collect all the waste water, as you well know I probably try to use the least amount of water I can get away with in wasting up or cleaning screens.

JP: Has that always been the situation here, that the case before you set your studio up here?

RH: No, we didn't always use water-based inks, but we did still wash off the emulsion in the wash up stand, and that did all go down into the water table.

When I changed over to WB, is when the E.P.A. (Environmental Protection Agency) in New York started to crack down on all kinds of pollution. The school which was right next door to us which is *CW Post*, is connected to a sewage system, and so they (E.P.A.) didn't really bother them. But in our case, as we're on what used to be the old Whitney and Vanderbelt Estate, there is no sewage system here, so everything goes down into the ground water. The E.P.A. came around and said you can't let anything go down into the ground water. At that time I was using oil based inks, so everything is cleaned up with solvents, except reclaiming the screens. So they put a stop to me being able to do that, and cleaning the screens that way. What the school did was called up an environmental company, and in this particular case they didn't choose the right one.

JP: They had an expertise in another area.

RH: They certainly did, the company set up an evaporation system, that the photo departments waste water went into, so that the water would always be running but it would be evaporating. What ever was left over, the sediment, would be collected. What they did was they connected me to this system. But, the emulsions had some sort of frothing agents in them so that when they tried to evaporate it they would be this foam that would block and back up the system, and it wouldn't work. So then they disconnected me.

JP: This is when is all got difficult

RH: That's right, lets make prints with water based inks but don't use any water!!

JP: When was this?

RH: This was in 1987, so then they disconnected me, and then what I did, I would clean screens using, how can I describe it, is was less that primitive. So I would clean them with spray water bottles to clean the stencils off it would take a long time, as you can imagine it slows things down a lot. I would use these environmental emulsion removers, and I would but newspaper in the waste up stand. Put the screens on it and spray wash. This would all be collected in the news papers. The newspapers would then go out into the garbage.

Now, that was not a good solution.

JP: The size of screen meshes you use, were always fine?

RH: I've always used fine meshes, and with the water-based inks I've even used up to 305 (fibres per inch). Then I discovered it wasn't necessary to use mesh that fine, particularly in this new way of shooting screens were you can hold wash effects* and also John Noble does it as well he probably didn't tell you about that, I think his meshes range from 220 to 240, he is into doing multiple transparent overlays.

So then I talked to this environmental consultant here, and I convinced them to open my water supply here, and we now collect the water into these big barrels. Obviously I don't want to collect a lot because its expensive every time they come to collect the 55 gallon drums of water. They take them away and from what I can understand from other environmental people I talk to, is that they process or evaporate the water and collect the sediment which is tested to determine its chemical levels, organic or more toxic. In the case of the emulsion remover its got DIAZO in it. This determines what the sludge gets used for.

So what the school is now in the process of doing, is developing a filter system here, so that I could actually filter the water, it would go into these barrels, from which it would be filtered into another barrel, we could then reuse the water that is filtered off from all the initial cleaning stages. We would only need to go in and clean it off with clean water, as the last final wash, with a good pressure hose.

JP: Have you got some one into to design that?

RH: Yes, and he said it would be very cost effective, because you use a second hand motor, and it would come to less that $500, compared to the $500 it costs to remove each barrel.

In terms of trying to save on the amounts of printed paper going to the land fill, it not being a solvent based ink, it is essentially a plastic or polymer based ink. So you still have paper, even if it is 100% rag paper, so its neutral pH and acid free so it has all those characteristics, its still printed matter.......what I now do in the print shop is use all the over prints again and again, which they do in most shops. But I just kind of follow it a bit further, instead of using newsprint to get the print going I always use old prints, many times over. They have to be very saturated before they go out to the garbage. All the buckets that the ink comes in are reused, my solution not being able to wash out the buckets is to let the thin film dry and then just peel it off.

JP: When did the monoprinting start to develop?

RN: I had tried monoprinting at one time with this printmaker, who actually introduced me to water-based inks. He had gone to school at Parsons in NY, he had been taught by a friend of mine, who had taught at Cooper Union, I had actually met her a Chromocome a big commercial screen printing company (*Ronni had been the creative director of this company*), and I actually taught her how to do colour separations. What happened to her was she developed an allergic reaction to the oil based inks. So before me, she switched over at Cooper Union and Parsons over to water-based. She had done a lot of the initial research, this is before 1987, on were to get the best water-based inks. Mary Dorman she was the one that identified TW graphics as the best ink to use, out in California. The product they have now (TW Graphics) is much improved from then.

And so I had just finished printing large reduction prints and huge editions for two different artists and at this point I said this is it, I am just not doing this any more. They were printed in 600 edition size quite large prints Arches cover. I had four or five people working here in this shop, and they were 35-45 colour reduction prints using solvent based inks. Sometime we would watch the sun coming up after working all night long because it was all dead line work. Finally after finishing these prints for this publisher I said that's it. I don't feel well and the 'light bulb went off', I wasn't feeling well I went to get myself checked out medically at one of the hospitals with a occupational health clinic., because I was concerned. Also my daughter was working with me at the time, she was getting dizzy. This is a small shop with a low ceiling and in order to put the right kind of exhaust system in here to really expel all the bad air and bring in all the clean air on a continual basis it runs into hundreds of thousands of dollars, to put in a system like that.

So I stopped printing and I concentrated on teaching, but an artist got in taught with me and asked me to do an edition, I said I didn't want to do them. She said I know a printmaker at Parsons Greg Radich and he has learnt water-based so he'll come in a work with you which is what happened. He know a little about the make up of the print and how they reacted, and I know how to edition and print big editions and contract work with different artists and so forth, and so we collaborated here for a couple of years and actually solved a all of the big problems that occurred with the inks in editioning these prints.

So Greg was the one that said to me you know you can make mono prints, all you need to do is use carandash crayons (*a range of water-soluble coloured crayons*) and you draw on the screen and then just print it with the base. I thought wow this looks interesting, so I called up Martha Diamond a well known American artists, and asked here if she would be interested in doing some mono prints I had previously done some printing for her. She has a very gestural kind of imagery, were the brush stroke is important, and the movement is important. Anyway she came out and the results were really awful. Because Greg who was in a sense my authority on how to do this had said this is the way you do it, with these crayons. So she would draw the image with the crayons, and Greg would print it. Every thing had to be done quickly, because he would flood the screen with base and then she would go and work into it

JP: Carandash on top of the wet base?

RH: Yes, or even if she did it the other way, and then wanted to go base everything had to be done fast there wasn't a lot of time to think about it. And the result is when you wet those crayons is not really an artists colour, it looks like a process colour CMY , it just doesn't look like the kind of colour an artist would use, also you couldn't mix your colours, you had to depend on the way a crayon mixed with another crayon on the screen. Its not the same as getting an artist mix a jar of paint and then paint with that colour. So she came out and fooled around and played around with it for a while, and the results were very uninteresting, so I kind of dropped it. Greg went off into computers, and I started taking on jobs again and started to write the book at the same time. During that process because I was thinking in terms of the book and different kinds of things, I started to go back to the idea of making mono prints.

Darra Keane came out, and she started to complain about using these little crayons, why do we have to use these little crayons why can't we use water paint, what's the difference? So that's when we started.

I think first I tried printers ink, but with printers ink you have a time element, whereas an artist, working with their colour, which they mix and use and they paint and mix on the screen for two hours or more, or as you did paint the screen and leave it over night. As we developed this idea of drying the image first , but you can do it wet, there are other ways. The dry way I seem to like the best because we have a better understanding of what's going to happen, what's going to resist and what's going to print first.

JP: That for me is the most interesting. My only knowledge of monoprinting screen printing inks had been using wet printing inks and colours, painting them onto the screen, were you only get the one hit (copy). We seemed to be getting at least two or three close printed images.

RH: And then not in you case because you were experimenting to see what you could get, and how that would work in terms of your imagery, Darra she would have a specific idea, because in a sense her work has a different quality, the prints in the book have that quality, a build up of many kinds of images underneath, not all of the same image that she would work on. So she would constantly be redrawing different kinds of image on the screen and then printing it on previous printings' that she had done.

In your case you kind of did that too, although you retained the same format (structure) one configuration on one side and another configuration on the other, and went bask and printed on them.

Other artists have come out here, Jim Dewoody who is a realist painter, who essentially only wanted to work with his drawing, exact to the way his drawing was drawn on the screen. When you draw your image on the screen and paint your image on the screen, and you print it the first time and get four different degrees of intensity on the paper, you have a bit of a ghost image of exactly what you have done. In his particular case he would take a vase with a flower or a pine cone or something what ever he was doing, he would then take the screen after washing it out and drying it, he would take his initial drawing but it next to him and look at the ghost image next to him and see what is was that was missing from some of the prints. He would then go back and redraw the bit that were missing, essentially the same image maybe with slightly different colours or maybe a little bit differently drawn. Then we would go back and print the original prints in register, and reprint on top off them. So in the end he would have, maybe a dozen prints that were essentially the same image only changed in some way, the colours would be different in one or the shadows or the resist, but basically it was the same drawing, which was interesting.

JP: So what was he calling these prints

RH: He was calling them mono prints, but it would be an edition of mono prints. He was represented by the Mary Rayen Gallery on 57 Street Manhattan and she would take them and market them as an edition of mono prints but as different states, so you would have state No 1 and state No 2 etc. Its not the kind of thing were you would decide to paint twelve water colours all the same 1-2-3-4-5 like that.

The printing process allowed certain kinds of things to happen, that he would never in a million years have painted. He has told me he has a tendency to be really tight in the way he draws and paints, so he would start off with a really tight water colour drawing and then it would print, some things would resist some things wouldn't, other colours would come down in a different way to the way he thought they would come down, that would kind of energise him and move him into another place and loosen him up.

JP: The monoprinting has this taken on a more dominant role for you in you printing.

RH: I like them better than the editioning, the editioning has reached a stage were I feel I have mastered the process, doing colour separations and so forth, and my own particular way of doing colour separations. Every printmaker has an expertise in one area, which is why artists will go to Ken Tyler or they went to Chris Prater is for a particular thing they can offer.

My thing has always been colour, and I also have a particular way of making a colour separation, which appeals to some artists not to others. For me the interesting part is taking the art work, with the artist if their involved in mixing the colours or whether their interested in drawing the stencils and finding out if we can get their particular imagery, their aesthetic , their vision down in an interesting and unique way. Not better then what their paintings, but different another kind of thing. But to go from there and edition it that's boring.

With monoprinting for me what's become interesting is having different artists come in and the way they approach the screen. I say just paint your picture there, and then after the initial sceptical approach even after seeing what's been done, and they paint their thing and I print it and they go wow, from then their hooked.

JP: That sounds like what I like about printmaking, is the interaction between the medium and the artist. I'll paint on the screen and think its going to be something, remember the way I painted different layers on one screen, in fact something happens as a result of the action of the squeegee, and it changes it, through this physical interaction. I'll try to use that

RH: What you did here I thought was interesting, the fact that you found these kind of special pens.

JP: That started out as a measure if you like, I wanted to know the limits or type of possible marks. I thought it would be easy to get wash sorts of lines, but difficult to get a harder tight line. My approach has always been to go in or test the opposites, this is why I went for that way of working.

RH: Yes that's easy to get as you saw, you know you can also get, is a complete drawing with graphite pencil to print, and get several copies of that drawing...... this is also why I'm interested in getting other artists coming out here and doing these, and why I've been showing them around and promoting them, because for me getting different artists with there different visions and imagery, what they get is great.

JP: These mono prints has they opened up a whole new area of interest: materials, water colours, gouache, screen bases, poster paints all those kind of things which can be used, which wasn't the case before.

RH: That's right you can also take as much time as you like to make your picture. I really have not come across anybody that's approaching the way I'm doing it at all.

JP: We were talking about this last week. It now seems obvious in retrospect, that you've done it but not one to my knowledge had done it in this particular way before, I find that interesting, Its just a small jump in thinking or approach that offers a whole new vocabulary of marks and ways of working.

RH: Right and it actually comes from thinking about what an artists needs are, being an artists myself. Remember the discussions we had with the Dean about the whole idea of putting limits on an artists or their activity, or to get involved in environmentally safer products. Does that put a limitation on artists creativity. If I had carried on using the carendash crayons for sure it would, here I had a major artist out here, and believe me we tried hard to get these things to work, which would give her something that would be representative of what she was about. There was no way to do it like that, so it really came out of me saying artists really have to make use of their own colour. An artists colour comes from having a range and mix with a degree of certainty to get what they want.

So I thought you've go oil paint, you've got acrylic, then there's gouache, you've got water colour, there is an incredible array and variety and range of colours there, lets see what happens. The interesting thing that happens, what you've noticed, is different brands and different colours, and the media they come in tube, block etc.... will create a different result, which is what we've discussed. They all come down in a different way. Knowing this you can almost plan the order it works, knowing that something else always happens.

There are also different kinds of bases some are thinner, and wet what's on the screen faster, and therefore transfer it to the print faster.

JP: You've tried the different types TW and UNION.

RH: Even Hunt came out with a really nice base which of course they no longer have, they've changed it to an acrylic base which I don't like.

If I take TW or UNION base and I make sure they have enough retarders in to make them into the right kind of consistency I go by the consistency, depending on how much of the image you want to come down, how much you want to stay in, to come down on the second printing. I've actually printed five, I think that the most I've got.

JP: Its effected by the length of time you flood the screen before printing.

RH: Yes there is another variable. You can spray and air brush onto the screen, to get that sort of effect. the whole idea is to allow the monoprinting process, allow that unique quality that you get, which is different than painting pictures or any other printing process, let that come through and let that happen with your own vision of imagery.

Appendix 4.5.2.1.1 *Environmental Issues:A Positive Influence for the Development of Printmaking Practices in Higher Education* - Paper Presented at The Royal College of Art Printmaking Symposium, March 1995

Printmaking as a core subject area within fine art has been able to continually develop as a result of the creative and idiosyncratic nature of the artists using the medium. The resulting evolving and often innovative medium has developed out of this intuitive relationship between the artist, and the medium and materials used. The resulting; sometimes contradictory mixture of processes, some with a strong heritage going back 400 years, and having changed little, these are happily intermixed with techniques and materials that reflect printmakers grasp of current technological developments and industrial practices. This diversity characterises contemporary printmaking and has lead to an evolving and expanding vocabulary.

This reciprocal relationship between the printmaker and the materials selected, has in the past been influenced only by the creative demands the artist places on the medium, based on what that individual finds acceptable or creatively expedient. However, currently we see a third factor introduced into this relationship, in the form of **Occupational Health and Safety Legislation: COSHH** regulations, **EH40** occupational limits, **CHIP** labels and the more established **H & S** at **Work** act. These legislative measures when seen from the point of view of the printmakers own established working methods and individual creative direction, could be seem as placing a restraint on this creative process, or that these 'external' controls will limit artists creative and innovative manipulation of the medium, the very characteristics that distinguish fine art printmaking from purely graphic reproduction.

Evaluating 'traditional' and 'established' working practices in light of these 'external' legislative measures, have been realised predominantly through the **COSHH** assessment exercise, . COSHH offered a **system** of evaluating and assessing the broad diversity of practices and substances used in the printmaking workshop, where risk reduction was linked to better management of the materials used by the printmaker through;

- assessing any foreseeable risk,
- controlling the residual risks,
- to inform and instruct, based on the assessment
- to document decisions, and procedure's

These COSHH assessment criteria have offered an opportunity to review the working conditions and current practices within printmaking based on objective occupational health and safety criteria.

This has brought about a rethink within some areas of current printmaking practice, and instigated some basic questions about the materials used. For example when the substance used has been borrowed directly from an industrial environment, but adequate precautions and a basic understanding of the possible risks associated with exposure to that substance has not made that transition, he printmaker often working closely with that substance and maybe in an 'unconventional' way. Questions about the continued use of that material have been raised.

There is, however, an equally strong case to be made where in fact no change is necessary as a result of exactly the same system of assessment. Whereby an assessment of a particular workshops practice, falls well within the current boundaries set by occupational health and safety legislation.

The dilemma posed by the relatively broad interpretation possible in this area, can be illustrated very well with the current debate about the viability of water-based screen printing as an 'alternative' to or as supplement for solvent based inks. A whole range of opposing opinions have been brought to the surface as a result; ranging from hostility to any sort of change, to there being no need to change (having installed an extraction system to move the problem from the working environment to the outside environment), there have been tentative investigations of the alternatives, and also an open reception to these water-based screen printing inks and stencil materials. The problem evidently is not as simple as to install expensive extraction or adopt water-based inks at the moment, as opinion and experience build up over a long time have to influence these sorts of decisions. Having only ever worked in solvent laden workshop atmosphere an individual will find either solution a satisfactory one.

Framing the issue of changing practices in these opposing terms where, on the one side, we see change as a consequence of what are 'external pressures' on the independent creative pursuits of the printmaker. Whilst on the other, change is based solely on the creatively expedient selection and usage of these materials by the printmaker. *Making prints is rarely easy so the last thing a printmaker needs are **H & S** hazards to make it even tougher.*

I would like to offer a third interpretation with respect to the changes currently being seen within printmaking. One where the president for change, established by the introduction of environmental legislation and printmakers own concerns for the materials they use, is **linked** closely to that individuals creative practice and the procedures developed with respect to their work.

There is a real need to establish a systematic revaluation of printmaking practices informed not only by data collated so far on the substances exposure limits and associated risks. But rather, a system that guides the printmakers intuitive and creative working methods, where the informed selection of materials and working methods will continue this evolving vocabulary.

My research project at Grays is based predominantly on my own printmaking practice, through the process of making prints and applying these informed concerns within a framework based on evolving safe practices, my own vocabulary within printmaking based on personal assessment criteria as well as legislative H & S criteria has developed. This frame has developed into a HyperCard based interactive data base has been constructed in such a way that it has an open and evolving structure similar I hope to the way that printmakers approach and develop techniques.

As a direct result of this work I would suggest that an environmentally sensitive approach rather than offering a limiting and binding influence on the creative vocabulary of the printmaker presents an opportunity to diversify and increase the vocabulary of mark making potential. The influence of environmental issues leading to changes in the selection of materials and working practices for the printmaker may in fact expand and develop the vocabulary of the printmaking medium as a result of this relationship. That in fact the so called 'alternative' materials and processes, offer a versatility and vocabulary that was not possible working within the limits of so called 'established' traditional methods.

By replacing a hazardous material with a less hazardous one, a chain of consequences is initiated,

first and most obvious is the need to fill the gap left by such a substitution where one is working within established boundaries based on past experiences and training,

secondly one is offered the opportunity to establish a shift in thinking where a number of alternatives mediums and creative possibilities arising from that substitution.

By making this slight shift in emphasis away from conforming to the apparent external legislative pressures. Towards a more personal internal, need for change, where the printmaker takes the initiative for change, based on a systematic framework of safe practice that focuses on the diversity and often unique characteristics of these alternative printmaking possibilities. It will be by identifying the creative advantages these 'safe' selections open up for the printmaker, as opposed to imposing perceived limitations.

The artist will create new applications or interpretations for the materials they use, and these applications will be idiosyncratic to each artists, based on individuals creative and critical demands which are naturally applied to visual and practical problems in printmaking. If this approach is coupled with an expanded number of materials and working methods the out come will be a better understanding of the hazards associated with certain working methods and materials used currently.

COMPARATIVE TABLE - WATER AND SOLVENT SCREEN PRINTING

WATER BASED AND WATER SOLUBLE STENCILS, INKS AND CLEANING MATERIALS

Direct Stencil - negative	Cleaning Stencil

- **Hunt Speedball Screen Filler**
paint directly onto screen and dry with hair dryer to cure stencil solution & then print
- **Cleaning Hunt Speedball Screen Filler**
household cleaner Mr Muscle or hot water

Direct Stencil - positive	Cleaning Stencil

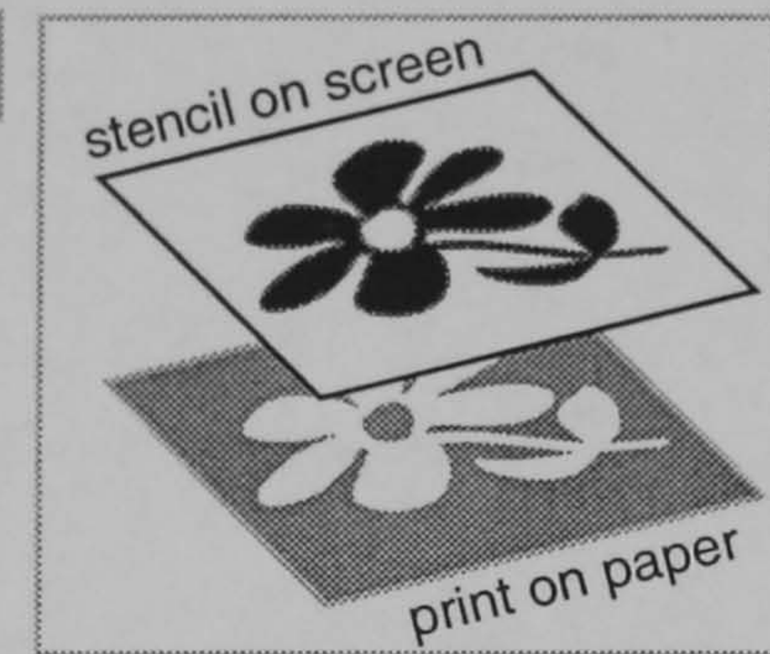
- **Blue Filler & Hunt Speedball Filler**
paint blue filler or any water soluble solution onto screen and coat with Hunt Speedball, dry with hair dryer - wash out drawing & print
- **Cleaning positive stencil**
household cleaner Mr Muscle or hot water

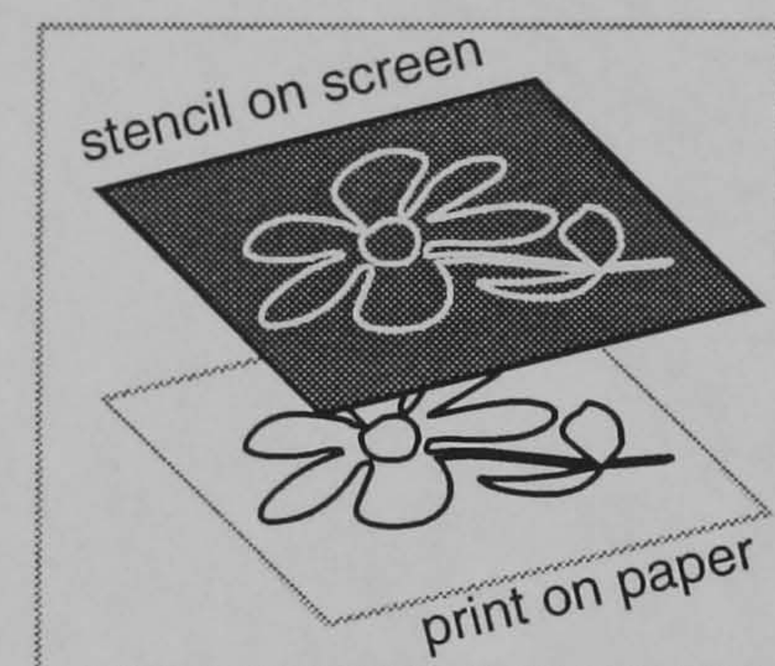
Photo Stencil	Cleaning Stencil

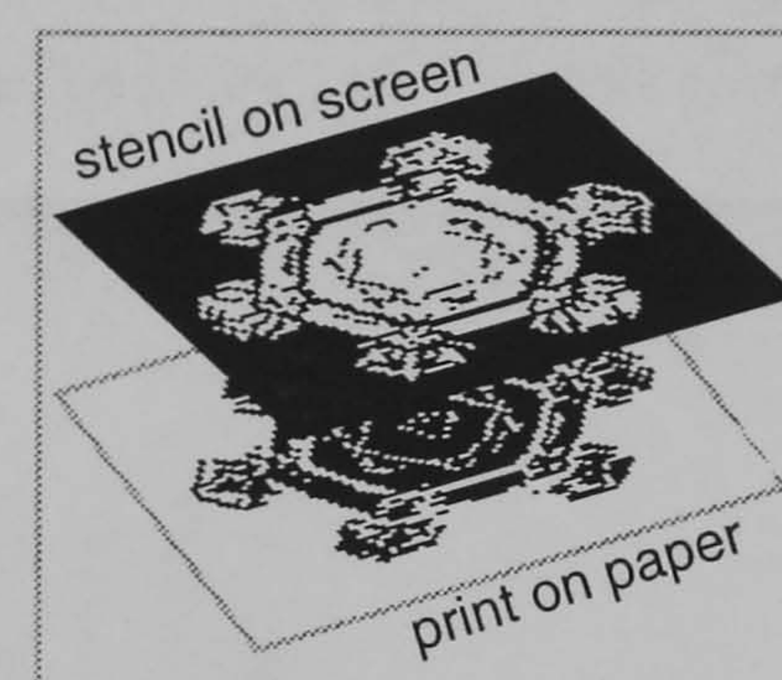
- **Screen Photo Emulsion**
coat screen in light safe situation, dry, expose art work and develop with warm water
- **Cleaning Screen Photo Emulsion**
use dedicated stencil remover

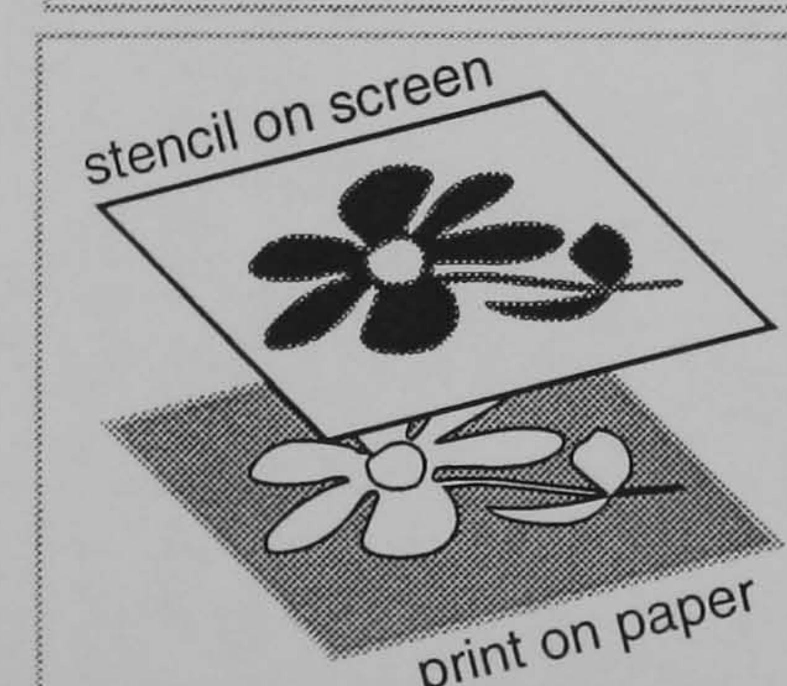
Printing Ink	Cleaning Ink

- **TW Graphics Screen Inks**
coat screen in light safe situation, dry and expose art work and develop with warm water
- **Cleaning TW Graphics Inks**
use warm water or Mr Muscle for dried in ink









SOLVENT BASED AND SOLVENT SOLUBLE STENCILS, INKS AND CLEANING MATERIALS

Direct Stencil - negative	Cleaning Stencil

- **Blue or Red Screen Filler**
paint directly onto screen and dry with hair dryer & then print
- **Cleaning Blue or Red Screen Filler**
hot water

Direct Stencil - positive	Cleaning Stencil

- **Wax Crayon/Touche & Blue Filler**
draw with solvent soluble solution onto screen and coat with blue filler, dry with hair dryer - wash out drawing & print
- **Cleaning positive stencil**
white spirit or screen wash

Photo Stencil	Cleaning Stencil

- **Screen Photo Emulsion**
coat screen in light safe situation, dry and expose art work and develop with warm water
- **Cleaning Screen Photo Emulsion**
use dedicated stencil remover

Printing Ink	Cleaning Ink

- **Solvent based Screen Ink**
commercial inks for paper and board printing, non-light fast, contains large amounts of fillers
- **Cleaning solvent based inks**
hazardous screen wash aromatic hydrocarbons & VOC solutions

Jon Pengelly

Gray's Gallery, July, 1996

Published by The Robert Gordon University

Design Donald Addison & Jon Pengelly

Photography Artist & Stuart Johnstone

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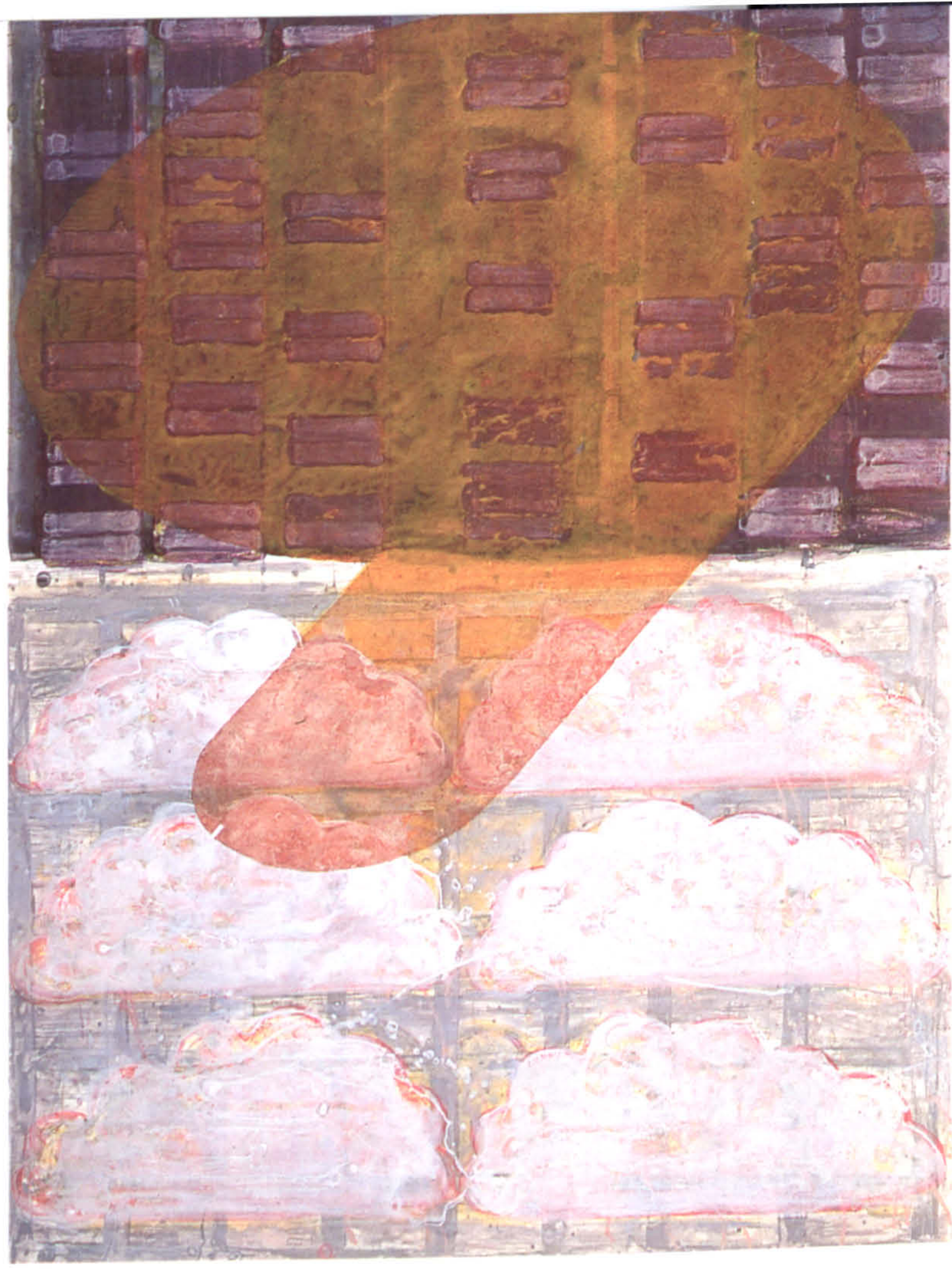
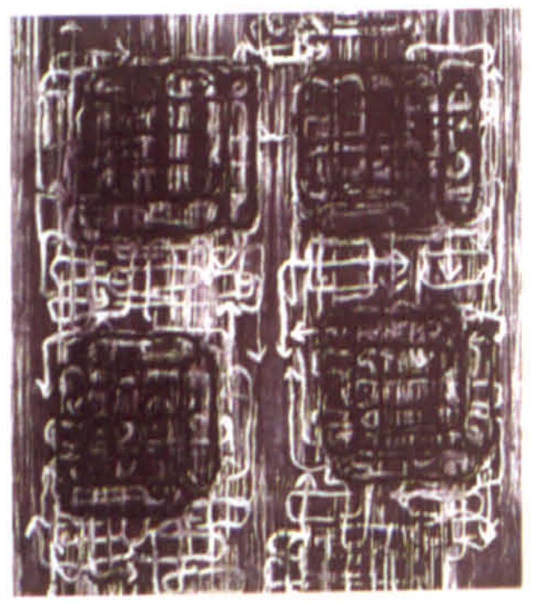


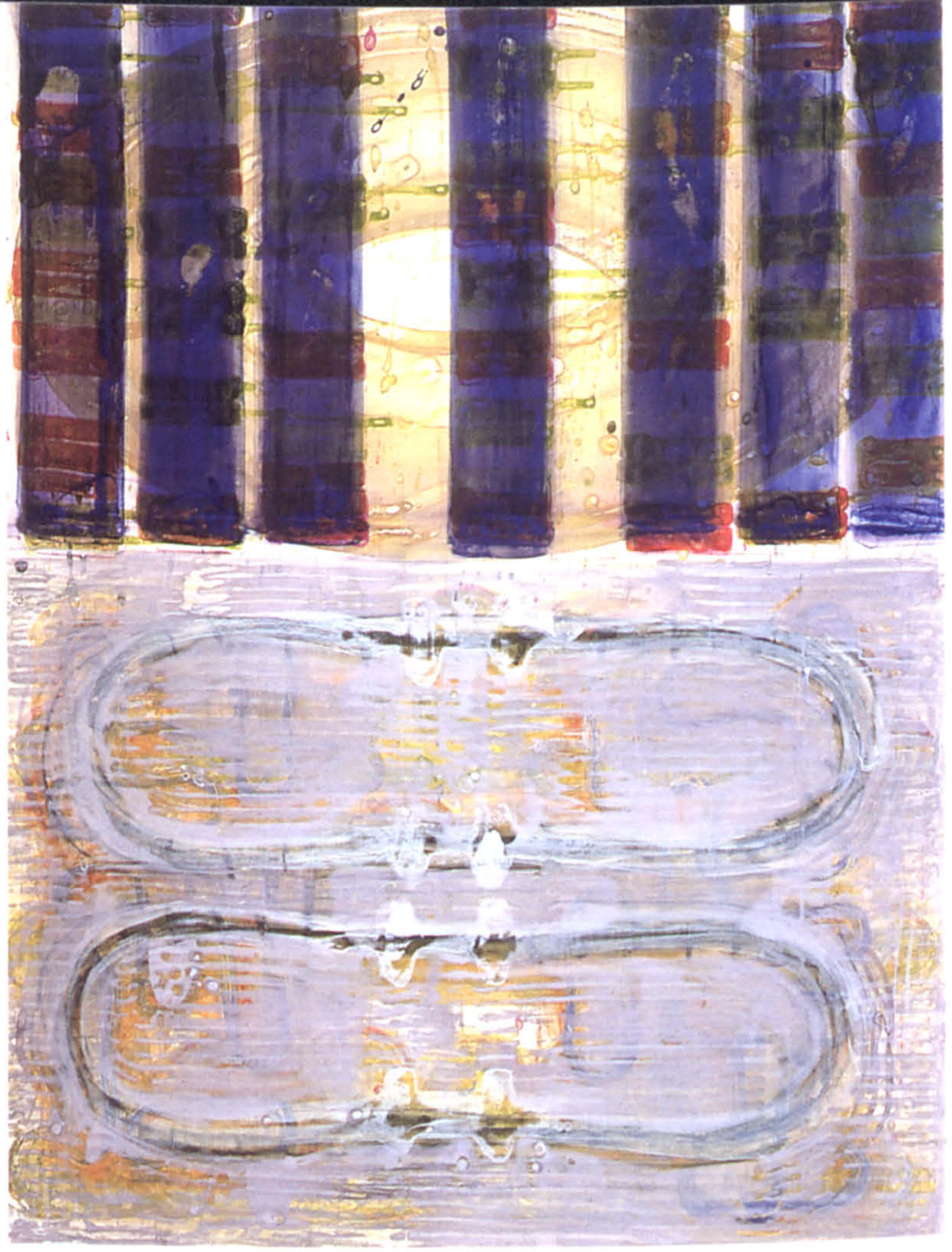
"Obedience to Universal Reason #1", 1995, 75 cm x 108 cm, screen-mono print - water-based media.

Even though there have been many links between technology and art throughout history, the nature of this practice-led research project, has required an unusual mixture of interests and capabilities. To succeed the artist/researcher has to be familiar and experienced in the technical aspects of printmaking and be aware of the hazards associated with that medium; most importantly, be a serious artist who would continue to develop as an artist with the added rigours of practice-led research. Jon Pengelly, as the artist/researcher, has fulfilled all of these criteria.



"Altitude", 1995-96, 86cm x 118cm, etching on steel.

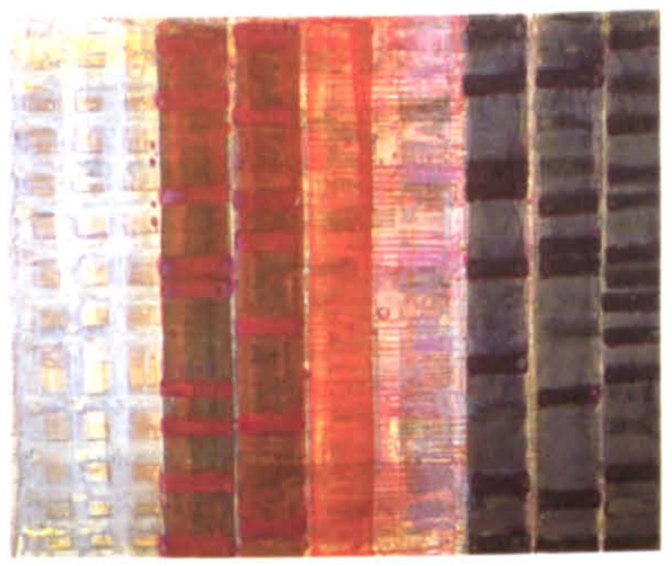
The work in this exhibition is concerned with the evolution of concepts, so the use of monoprinting (a direct process which involves the build-up of thin films of transparent ink) is appropriate as a working method. This medium offers the possibility of delineating the layering or 'proofing' process into visual and procedural dialogue which immediately responds and inputs into the development of the image. Jon's work with monoprints is a recent development, as his earlier screenprints using flat opaque colour, often embossed with heavy relief print, did not reveal the evolution of the image to the same extent.



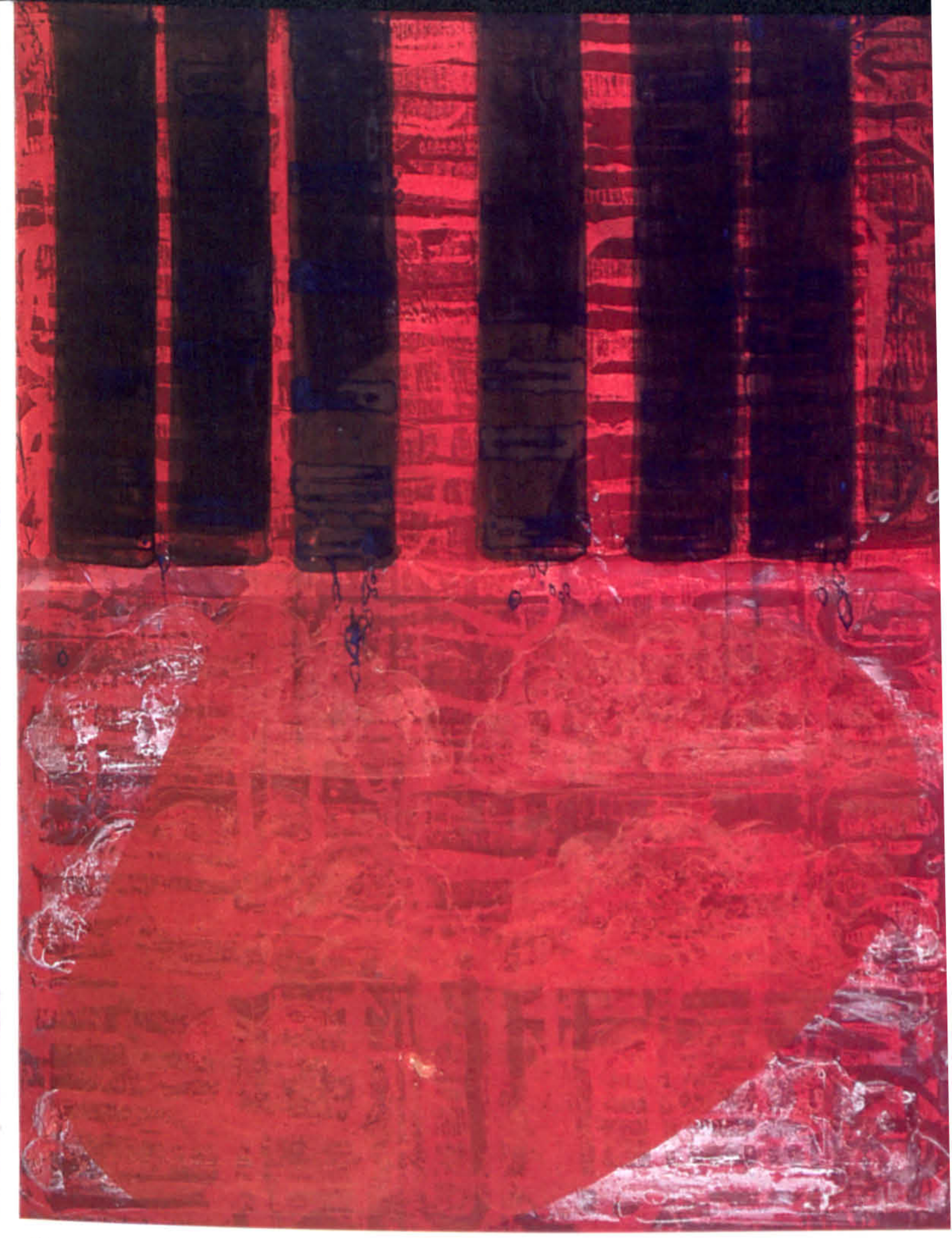
"Obedience to Universal Reason #2", 1995, 75 cm x 108 cm, screen-mono print - water-based media.

His earlier interest in the generic quality of scientific microscopic and macroscopic imagery is still evident in this work, and has in many ways helped support and direct the development of the prints, by representing a visual distinction between experiment and experience - objectivity and subjectivity - alluded too if indirectly, by this scientific reference. This establishes a polarity - practical and visual - as the work increasingly builds on the exploration of this relationship between the intuitive interpretation of subject matter and the procedural discipline the printmaking medium ascribes.

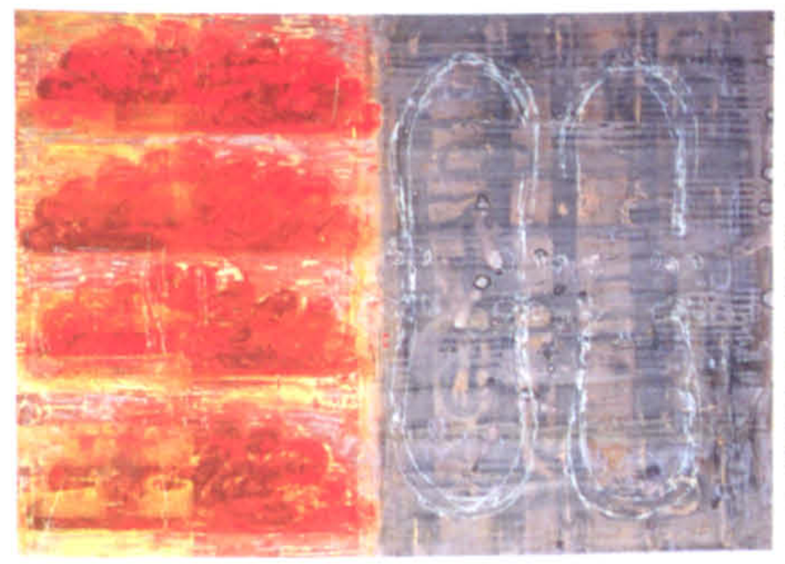
The change in working methods, whether by conditions dictated by practice-led research or by instinct is unclear; what is evident however is that the scale of the new work has been important. The small scale 'test' - as an arranged methodological observation - did not engage or question enough the subtle interaction between an 'environmentally sensitive' evolving procedural vocabulary and the systematic visual inquiry associated with the imagery. A scaling up of the work makes the task more difficult in 'testing' Jon's theories (visual and practice-based) against established boundaries.



"Six Degrees of Separation #2", 1995, 118cm x 120cm, screen-mono print - water-



"Obedience to Universal Reason #3", 1995, 75 cm x 108 cm, screen-mono print - water-based media.



"Lifelike", 1995, 75 cm x 108 cm, screen mono print - water-based media.

Working on a collaborative basis - between the Gray's School of Art and Peacock Printmakers in Aberdeen, and workshops in other art colleges and community groups, nationally and internationally - has helped give breadth to the project. At the same time, Jon's work can be seen in these terms, of experiment and experience which has revealed the importance of how a rigorous inquiry within printmaking practice can benefit not only one's own practice but the wider field of printmaking as a whole.

LENNOX DUNBAR, ARSA

Subject leader - Printmaking
June, 1996

JON *PENGELLY*

Artists Statement

This work aims to question, visually and practically, the notion that 'safe' practice may limit an evolving and creative vocabulary in printmaking. As part of a Ph.D submission the work represents the culmination of a systematic 'environmentally sensitive' revealuation of my printmaking practice. This restructuring has evolved through the development of a body of printed art works, which incorporates intrinsically safe printmaking practice as a means of achieving; a sustainable (environmentally sensitive), visually intriguing (idiosyncratic) and diverse range of printmaking practices.

Selected exhibitions

1994	Verein Berliner Künstler Gallery, Berlin, *Four Aberdeen Artists*
1994	Selected Work from Society of Scottish Artists Pier Arts Centre, Orkney
1993	Bradford National Open Print Exhibition
1990	National Printmaking Festival, Bristol.
1990	150 Years of Printmaking at the Royal College of Art, Barbican, London.
1989	Royal College of Art, Gulbenkian Gallery
1988	Cité des Arts International, Paris, group show
1987	Printmakers' Council, National Print Exhibition, London
1987	International Graphic Arts Foundation, New York
	Also exhibits regularly with Aberdeen Artists' Society, Scottish Society of Artists, and Royal Scottish Academy Summer Show

Qualifications

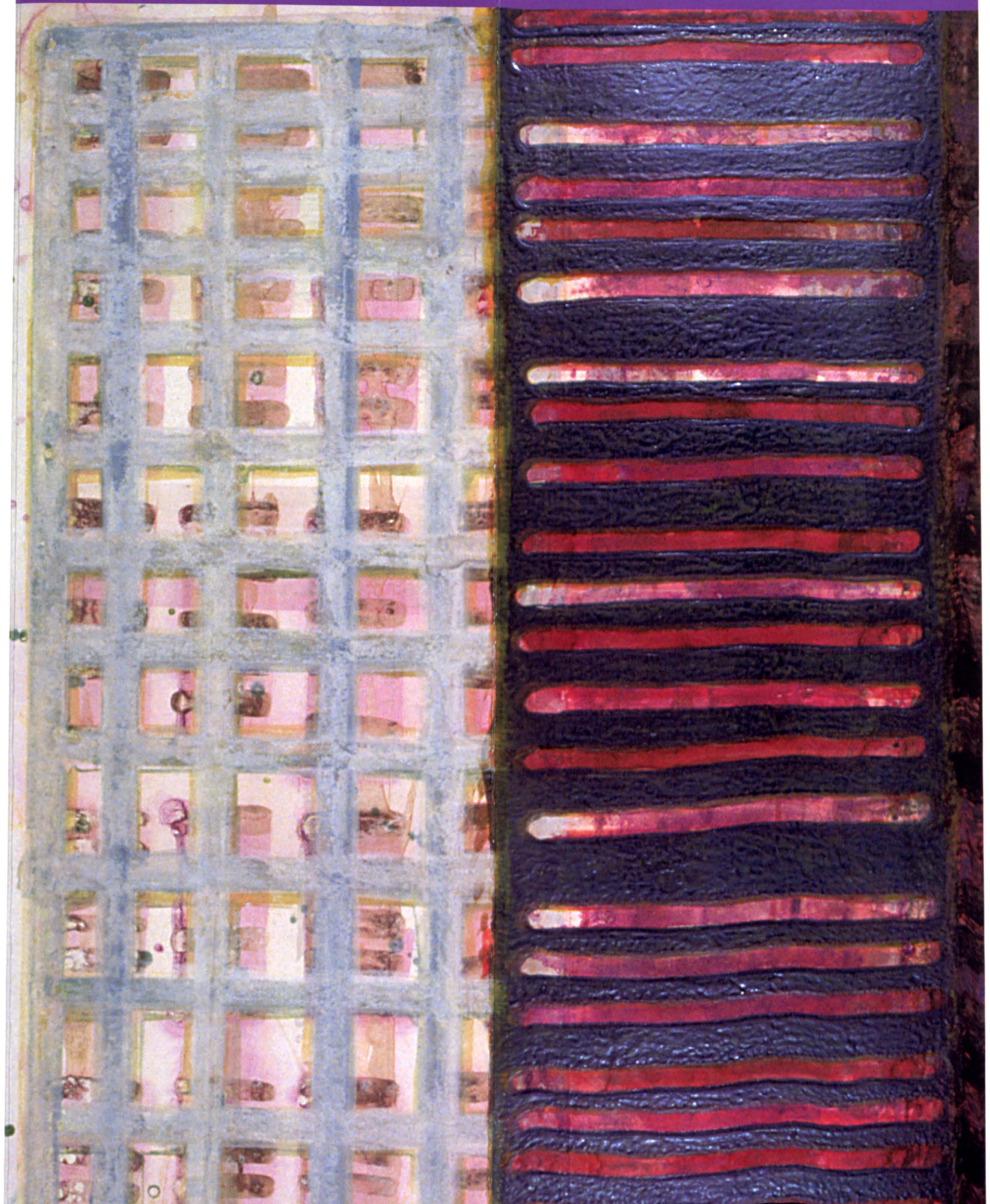
1987-1989	**MA** Printmaking, Royal College of Art
1983-1986	**BA** Hons Fine Art, Printmaking, West Surrey College of Art and Design

Academic Experience

1995-96	Part time lecturer (0.4) at Gray's School of Art, RGU, Aberdeen
1992-95	Research Student and ad-hoc Lecturer Gray's School of Art, RGU, Aberdeen
	Visiting lecturer at various colleges in UK

Awards and Collections

1996	Lorwick House Printmaking Residency, Cumbria
1989	Abraham and Lillian Rosenburg Foundation Purchase Prize, New York
1988	RCA Paris Studio, Cité des Arts International
	Grampian Hospitals Art Trust



It gives me great pleasure to be able to write this catalogue introduction for Jon Pengelly's exhibition, which is part of his submission for the award of Ph.D. Since 1988, Gray's School of Art has been registering students for higher degrees by research. The requirement to present artworks/artefacts clearly related to a written thesis as part of the submission for M.Phil./Ph.D reflects the School's belief that:

- research in Art & Design should stem from practice (and feed back into practice);
- that all our research students should be artists and designers, with a commitment and enthusiasm for their own field of practice which sustains their research, and ensures that the research is undertaken from an informed and sensitive perspective.

Within the Art & Design higher education sector Gray's has a growing international reputation for research. The establishment of the Centre for Research in Art & Design (CRiAD) in 1993 has provided the School with a physical and intellectual resource for staff and students. A 'critical mass' of designated research personnel are in post: a Reader, a Public Output/International Co-ordinator, postdoctoral Research Fellows, Research Assistants, and a number of full- and part-time Research Students (some funded, as Jon's was, by the EPSRC with external collaborations).

The main themes of research activity are:

- Visual Arts Practices
- New Technology / Multimedia
- Environmental / Sustainable Practices

In this latter area Jon Pengelly's research -

'Environmentally Sensitive Printmaking: A Framework for Safe Practice' -

has made a very significant strategic contribution. In many ways he has been a model research student, but first and foremost a professional printmaker.

Throughout his studentship Jon has continued to develop as an artist, given the opportunity offered to broaden his professional practice. This commitment has also extended to teaching, and has been instrumental in introducing safer workshop practices not only to our students, but also to local, national and international print workshops. Jon's research will certainly help to extend Gray's School of Art's reputation as an international centre for high quality practice-led research in Art & Design.

DR CAROLE GRAY
Reader in Art & Design
Gray's School of Art
June, 1996

Linear Morphological Framework - Intaglio & Etching

Printing Matrix	**Metal**	Copper 18 Gauge ('Traditional')	Copper Other	Copper Roofing	Mild Steel 18 Gauge ('Traditional')	Steel Shim	Stainless Steel	Zinc Pure (Jet-plate)	Zinc (Mix-Titanium)	Zinc Roofing	Aluminium	Aluminium (Litho)	Magnesium	Silver	Brass	Low Melt Casting Metal
	Non-Metal Matrix	Acrylic Sheet	Poly-Carbonate Sheet	Nylon Sheet	Perspex Sheet	Cardboard	Linoleum / Floor Covering	Wood Natural Grain	Wood Processed (MDF-Ply)	Plaster	Latex	Rtv -Silicon Rubber	Silver Card (Dry Point)			
	Plate Thickness	< 0.5 Mm Shim Stock	< 1.0 Mm Roofing	< 1.5 Mm	< 2.0 Mm	< 3.0 Mm	< 5.0 Mm									
	Plate Area Shape	One Plate <Press Wide <Press Long	One Plate Max Press Wide/Long	One Plate Max Wide >Press Long	Two Plate <Press Wide <Press Long	Two Plate Max Wide/Long	Two Plate Max Wide >Press Long	Multi-Plate <Press Wide <Press Long	Multi-Plate Max Wide/Long	Multi-Plate Max Wide >Press Long	Irregular Plate	Multiple Plate Irregular	Irregular Plate (Jig-Saw)			
Print Matrix Preparation	**Degreasing Print Matrix**	Whiting Powder / Water	Whiting Powder / Ammonia	Screen-Print Degreasing Agent	French Chalk -Only	Household Cleaner	Citrus Cleaner	Rubber Thing	Speed-Strip							
Image & Texture	**Ground**	Hard Ground (Dedicated)	Soft Ground (Dedicated)	Beeswax	Wax Crayon	Spray Paint (Enamel)	Oil Paint	Acrylic Paint	Straw Hat Varnish	Asphaltum	Stop Out Varnish	Acrylic Floor Covering	Hunt/Speed Screen Filler	Paint Stick	Acrylic Varnish	W-B Screen Ink
Direct	**Direct - Surface Line Texture**	Dry Point	Mezzotint Rocker	Etching Dry Point Needle	Scraper /Burnisher	Roulette Cross Hatch	Roulette Random Dot	Engraved Line	Any Sharp Object	Sand Paper						
	Line -Texture Direct Negative	Wax Crayon	Oil Paint	Screen Ink -Solvent	Screen Ink -Water-based	Acrylic Medium	Acid Resist Pen	Pencil - Graphite	Oil Based Medium	Acrylic Medium	Oil Bar					
	Line/Texture 'Collograph'	Gesso	Gesso-Carbor-Undum	Enamel Paint	Enamel Paint Carbor-Undum	PVA	Shellac	Hunt Speed Ball Filler	Plastic Padding	Epoxy Resin						
Indirect	**Aquatint / Half-Tone**	Resin Power	Bitumen Powder	Liquid 'Resin' Aquatint	Spray Enamel Paint	Sand Paper Via Ground	Foam Rubber Via Soft Ground	Flour Of Sulphur /Olive Oil	Air Brush / Solvent Ground	Air Brush / Water Based Ground	Diffuser Water Based Ground	Diffuser Spirit Based Ground	Spray Bandage	White Aquatint		
	Photo-Graphic Image	Kodak Photo Resist-KPR	Pre-Coated Jet Plate (Zinc)	Screen Print W-B Image	Screen Print Solvent Ink Image	Cad Cut Film	Screen Emulsion As Coating	Capillary Film	Riston Film	R.S. Photo-Resist Spray	Gelatine Dichromate	Gum Arabic Dichromate	Photo Copy Print	Counter Print Wet Ink	Neg Copy From Thermal Wax	Ink Jet Onto Plate
	Etching Medium	Acetic Acid	Citric Acid	Ferric Chloride	Nitric Acid	Phosphoric Acid	Hydrofluoric Acid	Hydrochloric Acid	Dutch Mordant	Water	Sand Blasting	Caustic Soda	Electrolysis	Electro-Plating		
Printing Ink	**Ink Type**	Linseed Oil & Pigment -Pre-Mixed	Linseed Oil & Pigment -Artists Mixed	Litho Ink: (Resins, Drying Oils, Pigments)	Litho Ink: Veg/Soya Based -Non VOC	UV Photo-Reactive Ink	W-B Block Printing Inks, Acrylic	Water-Colour	W-B: Block Printing, Glycerine	Catalyst Two Part	Silicon Ink:					
	Ink Drying Thickening	Magnesium	Easy Wipe	Charcoal	Dryers	Silicon -Thixotropic Power	Etching Oil -Long	Etching Oil - Medium	Etching Oil - Short	Fumed Silicate						
	Inking Method	Intaglio One Colour	A La Poupee	Surface Rolled One Colour	Intaglio And Surface Roll	Viscosity >One Colour	Intaglio & Viscosity >One Colour	Transfer Counter Print	UN-Inked Embossing	Chine Collé						
Printing Process	**Printing Method**	Roller Intaglio Press	Vertical: Hydraulic Press,	Vertical Manual Platen Press	Non-Press: Casting Techniques	Vacuum Pressure										
	Intaglio Embossing Layer	Non 'Casting Paper Pulp'	Felts: Wool Woven	Felts: Wool Pressed	Nylon 'Lining' Fabric	Foam Rubber	Foam Rubber: Combination	Wet Suit Rubber								
	Print Matrix Dimensions	<Press Wide <Press Long	<Press Wide >Press Long 'tiled'	>Press Wide >Press Long-Tiled												
	Intaglio Image Depth	<Intaglio Printable Depth	>Intaglio Printable Depth	3-D Print Matrix 'Casting'												
Cleaning	**Cleaning Medium**	White Spirit	Methylated Spirit	Xylene	Turpentine	Turpentine Substitute	Screen Wash	Retarder	Spray Solvent	Cellulose Thinners	Fine Detail Thinners	Water Cold	Water Hot	Detergent	Water Detergent	

Linear Morphological Framework - Screen Printing

Screen Type	**Degreasing Screen Matrix**	None	Hot Water Only	Vinegar	Citric Acid Dilute	Whiting / French Chalk	Dilute Caustic Solution	Abrasive Cleaner	Household cleaner	Dedicated De-Greasing Solution					
	Stencil medium	Pocher Stencil	Japanise 'hair' stencil	Perforated metal Sheet	Performed Plastic Sheet	Cotton Organdie	'Net-Curtain' material	Nylon mesh	Polyester mesh	Stainless Steel	Copper mesh				
	Mesh Size [per inch]	< 50	< 75	< 100	< 125	< 150	< 175	< 200	< 225	< 250					
	Mesh Type	Mono-filament	Multi-filament	Calendored	Semi-Calendered										
	Mesh Colour / Weight	White	Yellow	Orange	Red	S- fine	T - Normal	MD - Heavy Duty							
Stencil Type	**Direct - Hand Painted**	Water Resist Filler -Negative	Water Resist Filler Blue Filler -Positive	Water Resist Filler Floor Cleaner-Positive	Blue Filler - Negative, Positive	Acrylic Floor Polish - Negative	Water Resist Filler, Household Cleaner -Positive	Wax Resist-Negative	Red Filler - Negative, Positive	Water Resist Filler, Tuche' Wash Out - Positive	Water Resist Filler, Sugar Lift Solusion - Positive	Pva - Negative, Positive	Acylic Paint - Negative, Positive	Blue Filler, Tuche' Wash Out - Positive	Shellac-Negative, Positive
	Indirect -Hand Made	Paper Cut [inks as adhesive	!Wax Film [heat as adhesive]	Gelatine Film [water as adhesive]	Gelatine Film - Screen Filler 'Positive '	Airbrush filler over paper Stencil 'positive'	Airbrush Over Stencil Blue Filler -Positive	PlasticFilm Cut Stencil	French Chalk Static 'positive'	Water Resist Filler	Wax Rubbing - Water Resist Filler Positive	Relief Counter Print - Water Resist	Relief Counter Print - Solvent Resist	Acrlyic floor polish	Acrylic Varnish
	Photo-Mechanical	Direct Pva - Dichromate Sensitized	Direct Diazo Emulsion	Single component photopolymer	Direct Capillary Film	Indirect Capillary Film	Gelatine Dicromate Sensitised Film	CAD Cut Indirect Film							
	Exposing Photo-Mechanical	Sun Light	Photoflood Bulb	Sunlamp	Uv Light Bulb - COntact Frame	Uv Light Bulb - Vacuum Frame	Carbon Arc Exposure Unit	Laser printing direct onto screen							
	Developing Photo-Mechanical	Cold Water	Warm Water	Peroxcide											
Printing Medium	**Solvent Based**	Paper board thin film ink	Fabric co-solvent emulsions	Long oil stoving enamels	catalytic two part	UV curring inks									
	Water Based	Wallpaper Starch Paste	Acylic Gell	Acrylic Solution	Acrylic Emulsion	Acrylic Co -Solvent Emulsion	Water Soluable Gum Base	Casesin Based	Glycerine based						
	Printing Method	Monoprint Single Colour	Mono-Print Multi Colour	Single Colour single printing	Blended Colours single printing	Multiple Single Colours	Wet On Wet 'thick film'								
	Reducing Retarding Medium	Water	Ethylene propylene Glycol	Acylic Retarding Gell	Acylic Liquid Varnish	Gylcerine	Natural Gums	Liquid Acylic Floor Polish	Methylated Spirit	Acrylic Polish Remover	Turpentine	Low Odour Mineral Spirits	Ethylene/ Propylene Glycol	Xylene	Screen Wash
	Drying Method	Air Dry	Forced Air Dry Ossilating Fan	Forced Air Dry Warm Fan	Forced Air Dry - Tunel	UV - Curing	Catalist								
	Workspace Ventilation	Non - Unventilated	Open Windows - Ambiant	Vent-Axia Fans - Dilution	General Extraction	Dedicated hoods									
Cleaning Process	**Removing Ink Residue**	Cold Water	Warm Water	Warm Water Detergent Mixture	Pressurised Water	Household Cleaner	Acrylic Polish Remover	Detergent	White Spirit	Low Odour Mineral Spirit	Acetone Cellulose Thinners	Paraffin - Dispenser	Dedicated Ink Thinners	Citrus Based Solvent (D-Linonene)	Borax (Sodium Tetraborate)
	Removing Direct/Indirect Stencil	Pressurised Cold Water	Hot Water	Acrylic Floor Polish Remover	Household Cleaner (Mr Muscle)	Bleach	Citrus Turps (D.Linonene)	Methylated Spirits	White Spirit	Low Odour Mineral Spirit	Dedicated Ink Thinners	Xylene			
	Removing Photo Stencil	Hot Water	Bleach	Dedicated Stencil Cleaner	Methylated Spirits	Citrus Stencil Cleaner	Paint Stripper								
	Removing Print 'haze'	No Attempt To Remove Haze	Detergent	Alcalyin 'Household' cleaner	Pressurised Water Jet	Haze Remover Water-Based	Screen Wash Pressure Wash	Dedicated Caustic Paste	Borax						
	Container Used For Clean Agent	Plunger Container	Squeezy Bottle	Dispencing Safety Can	Spray Container										
	Disposal Of Wash Out Residue	Untreated Into Sewerage System	Grease And Gravity Trapped	Solvent Wash out - Collected For Disposal	Evaporation Of Residue - Collected	All Washout Residue Collected									

Linearer Morphological Framework - Relief and Surface Printing

Substrate	**Substrate Medium**	Paper- Art	Paper -Non-Art	Paper Non Cellulose	Perspex	Vinyl	Plastic (Vacuum)	Glass	Metal- Ferric	Metal- Non-ferrous	Corrugated Board	Wood-Sheet, Ply, MDF	Linoleum	Silicon Rubber	Sheet Nylon
	Paper (Cellulose)	100% Cotton Linters	100% Cotton Rag	100% Wood Pulp	Cartage Paper	Acid Free Paper	Non Acid Free	Coated Paper	Cast Pulp Paper	Plastic Coated	Corrugated	Board	Wall Paper	Gampi	Tyvec Plastic Paper
	Type Of Size Used	Calcium Carbonate	Rabbit Skin	Natural	Synthetic	Tub Sized	Surface Sizing								
	Treatment Of Sizing	Internal - Heavy	Internal- Medium	Internal- Little	Surface - Heavy	Surface- Medium	Surface-Little	No Sizing							
	Paper Weight	< 100 G/M	< 200 G/M	< 300 G/M	< 400 G/M	< 500 G/M	< 600 G/M	< 800 G/M	< 1000 G/M	Cast Paper					
Print Matrix	**Printing Block**	Wood Plank (Hardwood)	Wood Plank (Softwood)	Plywood	Wood End-Grain	Particle Board (MDF)	Linoleum	Copper	Steel	Aluminium	Magnesium	Perspex	Acrylic Sheet	Cardboard	Cast Plaster
	Print Matrix Dimensions	<Press Width & Length	<Press Width >Press Length	>Press Width >Press Length	Multiple Block Jig-Saw	not Restrictive To press Size	Casting not restricted.								
Image Transfer	**Transfer Drawn**	Directly Onto Block	Transfer-Rub Back	Carbon Paper	Rouge Paper	Counter Print									
	Photo Mechanical	Photocopy - (Rubbing)	Screen Direct [solvent]	Screen Direct [W-B]	Gelatine Dichromate	Indirect Film Capillary	Screen print emulsion								
Block/Image Production	**Direct Cutting**	Gouges European	Gouges Japanese	Engraving Tool Various	Wire Brush	Hand Held Rasp	Sand Paper	Mezzotint Tool	hand held Jig-Saw						
	Chemical etching	Caustic Soda	Acetic Acid	Citric Acid	Sand Blasting	Pressurised Water	Laser								
	Relief Surface	Plaster - Objects	PVA - Objects	Gesso - Objects	Silicon Sealant	Found Objects	Cardboard	Shellac	Acrylic Paint	Oil Paint	Plastic Wood	Plastic Padding	Wood Glue Catalytic		
	Machine Cutting	Engraving Vibro-Tool	Engraving Circular	Electric Drill	Routing Machine	Electric Jig Saw	C.A.D. Routing	C.A.D. Jig Saw							
	Machine Mark making	Wire Brush Shaped	Drills Bits Various	Shaped Grinding Bits	Wood Rasp Shaped	Saw Blades (Jig-Saw)									
	Photo Methods	Screen Print	Screen Print Sand Blast	Pressurised W-B Resist	Screen Print Caustic Etch	Gelatine Dichromate	Capillary Film	Riston Film	Flexographic plate						
Printing Medium	**Ink Type**	Linseed & Pigment	Acrylic Polymer	Glycerine Pigment	Water colour & rice starch	Lithographic	Lithographic Veg/Soya	Flexographic [acrylic]	Photo-Reactive	W-B Acrylic Emulsion	Silicon Catalyst Ink:				
	Ink Additive	Magnesium	Dedicated Dryers	Easy Wipe	Charcoal	Dryers	Thixotopic Silicon Power	Linseed Oil - Short	Linseed Oil - Medium	Linseed Oil - Long- Short	Petroleum Jelly	KY Jelly	Acrylic Paint /Medium	Glycerine	
	Inking Method	One Colour Surface	>One Colour intaglio	Single Block many Colour	Jig-Saw Block many Colour	many Colour Viscosity	Intaglio / Surface Roll	A La Poupee Surface Roll	Counter Print	non-Inked Embossing	Chine Colle				
Printing Method	**Non-Press Printing**	Printed With Hand/Palm	Standing On Block	Barren bamboo	Teflon Barren	Ball-Bearing Barren	Casting								
	Printing Press	Albion Planten Type	Etching Roller Press	Hydraulic Press vertical	Roller Off-Set Press	Direct Press Lithographic									
	Packing Blankets	paper packing	Felt Blanket	Dressmaking Fabric	Foam Rubber:	Foam Rubber:	Wet Suit Rubber	No Blankets: Paper Pulp							
Cleaning - Universal	**Cleaning**	White Spirit	Turpentine	Turpentine Substitute	Xylene	Screen Wash	Mentholated Spirit	Paraffin	Cellulose Thinners	Cold Water	Water Hot	Water / Detergent	Floor Polish cleaner		
	Roller Cleaning	White Spirit	Turpentine	Turpentine Substitute	Xylene	Screen Wash	Mentholated Spirit	Cellulose Thinners	Acetone (Ketone)	Cold Water	Hot Water	Detergent	Floor Polish cleaner		