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PARALLELS AND CONNECTIONS: EMERGING TRENDS IN CERAMIC AND GLASS DESIGN RESEARCH

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ABSTRACT:

A growing trend in the ceramic and glass design sector is the development of new research methods that blend haptic and tacit skills of 'designer makers' with approaches from other fields such as; science, engineering, industry, and computing. Such approaches often involve establishing multi-layered collaborative research strategies. This paper offers case studies from a new emerging research community that have a number of parallels and interesting connections for design practice. It brings collaborative design research trends together to form tentative models for potential application in other allied design research areas and suggests new collaborative research strategies that utilize communities with overlapping interests. This practical application of real world design examples has generated new realms for collaborative research methods, by blending art and science, forging industry-academia partnerships, and improving contact between sectors.

1. INTRODUCTION

Since the transition of polytechnics to 'new universities' in the UK in 1991, research as a parallel activity to learning and teaching has become an important aspect of the agenda in the art and design subjects that tend to reside in those institutions. Importantly, research offers alternative funding sources, such as 'The Arts and Humanities Research Council' (AHRC), for the development of new knowledge in subject areas. The five yearly audit of research quality, 'The Research Assessment Exercise' (RAE), taking place this year in the UK, also impacts on university funding. In this context, research is seen as an important activity for income generation. Perhaps more importantly, it is also valued as the vehicle to advance curriculum development and so develop the subject. This also has a bearing kudos and consequently student recruitment – often the biggest generator of university income.

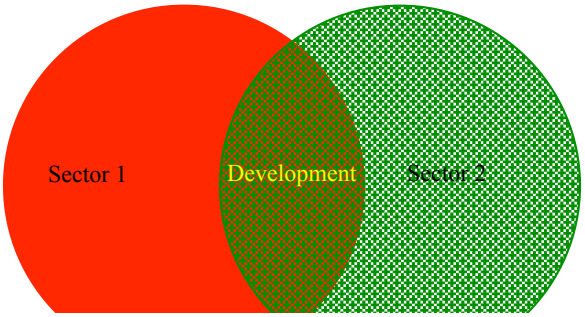
This paper offers a focused perspective in the area of glass and ceramics, in particular respect to the emerging research community at the University of Sunderland. These case studies are given as examples of how the blending of subject areas and overlapping of interests might initiate avenues for the generation of new knowledge and consequently the development of the sector. Before describing these real world examples in more detail, a tentative generic model is proposed.

2. A MODEL FOR SECTOR DEVELOPMENT

This section advocates a simple model that might be considered as a strategy for developing a sector or subject area. In this context, the term 'developing' is used to indicate a number of ways in which the sector or subject area might be: changed, grown or refreshed. Consequently, the area is likely to be more: innovative, original and creative. In turn, one might then expect the sector to be considered more impressive and successful to others, thus enhancing the potential for further development.

The model advocated can be visualised as a Venn diagram.

Fig. 1 A simple visual model for sector development



Each circle represents a sector or subject area - one of which might be design related. In the case of the examples given below in this paper, it might be useful to think of the red circle as representing an area of the ceramic or glass design sector that will involve the haptic manipulation of either clay or glass to create the makers' designs. The green circle might be another area of art and design or an entirely different field, such as science, engineering, or computing. Both fields are likely to comprise of specific approaches, techniques, histories, assumptions, and methodologies that influence professional practice. If strategies can be developed to initiate overlaps between the sectors, then new areas for development might emerge. This may evolve from individual creative needs or interest, specific research projects, or the demands of a commissioned brief. This 'Boolean' approach of blending fields (i.e. sector 1 *and* sector 2) could be extended to include three or more areas. The development focus is always the interface between the areas.

The Venn diagram is also a very simple, yet effective, method for locating the field, which might be the research context, audience, or market for a particular original contribution to knowledge, product, or design. It is not suggested that visualising the design/research process is new (see Gray and Malins 2004), but that an active strategy of linking subject areas for the development of one or both might be advantageous in certain sectors. Where a number of similar projects start to develop in the overlapping areas between sectors, the potential for the development of a new sector emerges. This new community might in turn be linked to another sector to generate new research and so on. The work of Yrjö Engeström on 'Activity Theory and Expansive Design' provides a detailed theoretical perspective and visual model for this kind of development. This paper will focus on some specific real world emerging trends, which might in time be developed into a more complex theoretical model.

The model proposed above is a simplification of what is actually emerging in the research community described in this paper. It has to be said that in most of the examples given, the development area as shown by the overlapping circles is perhaps more likely to advantage one sector over the other. This need not be a problem, as long as strategy can be maintained for knowledge, experience, or approaches from one sector to be applied to the other. In reality this might involve a financial transaction from one sector to the other to buy collaboration. For example, a researcher in glass or ceramic design might pay for a materials scientist to assist in the particular problems that they have located. The payment may, of course, be given in kind or the collaboration may emerge out of interest in the subject without payment. Within the university context, mutually beneficial collaboration might emerge from a form of self-interest; for example, promotion or the imperative to develop research projects in subject areas. For example, two members of academic staff from different departments might choose to supervise a research student together to enhance their respective

departments and also their own CVs. Again, this need not be seen as a problem but perhaps as an advantage in driving the exchange.

In certain cases, the potential for an equal exchange between sectors can emerge. These examples offer the potential for both areas to be enriched by the exchange of ideas and approaches and therefore might said to more closely relate to the diagram given in Fig 1. In these cases the development area might form a focused area of research in its own right. An example of this is given below in 3.4.4.

3. CASE STUDIES FROM A NEW EMERGING RESEARCH COMMUNITY

This section offers examples of how the above model is emerging in the field of ceramics and glass. Although these case studies have evolved from postgraduate education it is important to make clear that all involve professionals who have used the context of a university department to advance their professional practice and in turn offer new insights for others.

The field of glass and ceramics in this context tends to combine 'hands on' making skills, which involve a degree of tacit understanding of materials and processes combined with the instincts of the designer (see Pye 1995). Mass production is rarely a key criterion, but a design brief and context is often a governing factor. This type of work, which might be 'one off', blends making and design, hence the term 'designer maker', often used in this sector. This type of maker typically operates a studio for the production of their work. This leads to the other common terms of 'studio glass' or 'studio ceramics'.

Both these areas of 'studio glass' and 'studio ceramics' operate within a structure of specific support mechanisms, interest groups, connoisseurs, and vehicles of dissemination. Of course, this could be said of other sectors, however, glass and ceramics are in certain aspects very self-referential and insular. This could be said to be limiting development in some areas. Therefore the model recommended above, is especially useful as a strategy to refresh these areas. This is not to say that these areas can only advance by 'borrowing' from other sectors but that the blending of approaches may lead to advances.

Before considering the specific case studies that may have parallels and connections to other design sectors, it is useful to describe the framework from which these projects have evolved. Although this is an education context it might be that professional groups could initiate similar strategies.

3.1 AN EXAMPLE OF A FRAMEWORK FOR SECTOR DEVELOPMENT: GLASS AND CERAMICS AT THE UNIVERSITY OF SUNDERLAND

The Glass and Ceramics department at the University of Sunderland is based in the National Glass Centre. It has been teaching glass and ceramics for around 28 years and in the last four years has seen a substantial development in facilities with over £1 million of external funding. This has enabled the installation of a broad range of equipment including: a water-jet cutter, a large kiln for glass, and print making equipment. Some of this new equipment has formed the catalyst for the generation of research groups. The department hosts some 100 students from Foundation Studies to PhD level. The curriculum is divided into four broad areas: Kiln Glass, Hot Glass, Architectural Glass, and Ceramics. Although interconnected these strands also form the focus for research.

Five years ago it was considered important to refresh the subject area in order to make best use of the substantial resource that was available. A new head of department, Prof Peter Davies, who had considerable experience from the visual arts and administration sector, led these developments. Many of the case studies given have emerged from the MA Glass programme, which has been led by the author of this paper since early 2003. His background can be seen in terms of the 'Boolean-like' model given above as he studied: Illustration *and* Ceramics *and* Glass *and* Printmaking. If one thinks of each area as a circle in a Venn diagram the overlap between the sectors creates an unusual focus, which has been used to develop new research areas (further considered below). This background has also led to a strategy of actively recruiting for the MA Glass programme (and now the new MA Ceramics programme validated in 2006) from diverse sectors, as well as the more traditional glass and ceramics routes. This has resulted in individuals from Graphic Design, Illustration, Fine Art, Architecture, Engineering, Jewelry Design, Photography, Television Design, Interior Design, Product Design, and Printmaking joining the programme in order to advance their professional practice

Fig 2. Jewellery by Hong Kong based designer Cicy Ching. Silver and glass. This is an example of jewellery designer who joined MA Glass at Sunderland so that she could integrate glass into her designs.

through the medium of glass (and now ceramics). After five years of this approach there is now a cohort of graduates who are impacting on the profession in diverse ways. In addition, there is an emerging community of research students who are undertaking projects that conform to the above model.

3.3 MATERIALS AND PROCESS AS A CATALIST FOR DESIGN

Some new research projects require the development of a greater understanding of the materials and processes needed to realize designs in glass and ceramics. Collaborations between the fields of design, industry and science can aid this. In such cases the haptic and tacit skills of the maker, with an intimate understanding of the materials that they are working with, are essential and should not be underestimated. These 'hands on' making skills often emerge over many years of practice to form an approach whereby the design of an object and its making are symbiotic and parallel activities. This is especially the case in ceramics and glass, which often demand a high level of control in order to achieve the required results. The ability to understand and control materials and process can be described in terms of tacit knowledge, in that is understood but not openly expressed. From this experience, designer makers are often able to identify problems, issues, or new opportunities that might form the focus for a development in their practice. Some may choose to explore this in the confines of their own studio, whereas others might welcome the structure and support of a formal research programme. In these cases, the potential benefits move from an individual focus to a broader level that will offer new knowledge that others can utilise.

In order to produce this communicable knowledge that others can use, these researchers/designer makers (as they now become) must find ways to translate their unspoken understandings into more explicit knowledge. In some cases they will need to gain a more explicit insight into the materials and processes that they can control, but do not necessarily understand. In other instances, they might not have full control of a material or process and therefore need to gain more understanding to achieve a greater predictability of outcome. In both cases the borrowing or blending of approaches from materials science can illuminate and advance the tacit elements. This should not be seen as a substitute for the 'hands on' experience of the designer maker but as a support mechanism. It is also important that the overall aims of the project – usually to advance knowledge in the designer maker sector – are not deflected by a 'science' agenda. The following case studies offer examples of this approach.

3.3.1 APPLIED AND RESIDUAL SURFACE COATINGS ON GLASS: THE DEVELOPMENT AND CREATIVE USE OF NEW METHODS TO CREATE IMAGES IN GLASS.

Fig 2. 'Elegiac figure'. Glass test piece by Jenny Antonio.

Jenny Antonio, a glass artist/designer is based in Edinburgh, is in the second year of a part time PhD. Jenny has discovered that if she removes the tin coating on the surface of industrially manufactured float glass (window glass), then free-forms it in the kiln, the glass develops a slight curvature of the surface where the tin has been removed thus creating an image in the glass. The phenomena, known as 'tin-bloom', which was discovered through practical work in the studio, has great potential in Jenny's own practice as a vehicle for expressing memory and loss, but also offers a new a aesthetic for other artists and designers. For example, architectural glass designers might use the method where it could be integrated into the fabric of buildings to offer subtle modulations of surface design. The projection of light through the glass is also offering the potential for graphic imagery to be reflected onto other surfaces. Again this might be used as a form of intervention in the architectural context.

Although Jenny had developed an element of control over the process through a period of 'trail and error', it was important that she developed a more in-depth understanding of what was causing the phenomenon. In order to do this a collaborative industry-academia partnership was initiated. This involved Jenny working with a mathematical modeler from the float glass industry. A dialogue was developed which helped Jenny to gain a better control of process in order to express her creative goals. This was not merely a process of the scientist telling Jenny why certain phenomenon occurred but more a two-way exchange driven by aesthetic and creative goals. This dialogue initiated more practical testing and the gradual extending of control and possible aesthetic language. It is also important to say that the 'tin-bloom' effect is considered to be a fault in the industry and also by many glass designers. Much research is devoted to its eradication whereas this research shows how this might now be controlled and utilized.

3.3.2 POSSIBILITIES FOR THE CREATIVE USE OF LOW EMISSIVITY GLASS BY SURFACE COATING MANIPULATION WITHIN AN ARCHITECTURAL CONTEXT.

Eileen Leatherland is in the first year of a part time MPhil project focused on architectural glass design. She has discovered that the manipulation of the surface coatings of certain types of glass under various firing conditions can produce a range of iridescent surface effects. Like Jenny Antonio, her project has firstly focused on developing a working methodology to control this 'palette' of effects. She is also in contact with materials technology specialists to gain a basic understanding of why these effects occur. The ultimate aim is to use the methods and effects that she develops to produce a model of creative practice in the form of a body of artwork. It is hoped that Eileen's work may offer alternatives to the rather expensive coated glass, such as diachroic. This example and the one above show a potential 'embryo' research area that could emerge focused on the design potential of the manipulation of glass surface coatings.

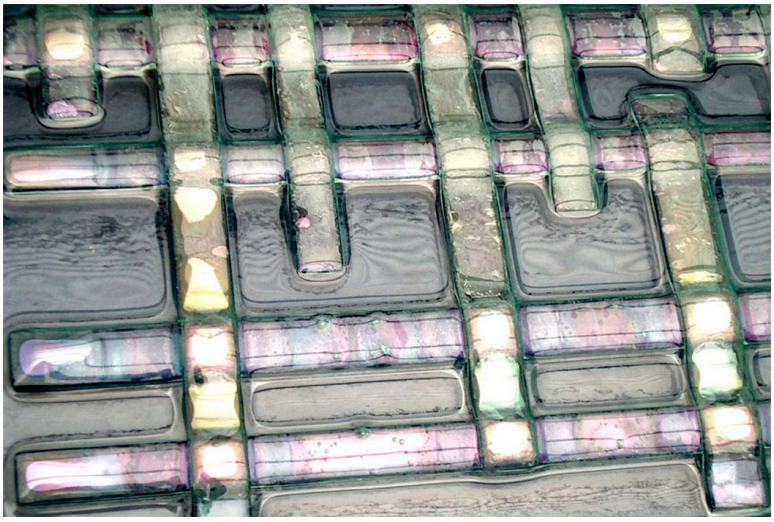


Fig 3. An early test piece by Eileen Leatherland

3.3.3 THE COMBINATION OF GLASS AND CERAMICS, WITH AN EMPHASIS ON LIGHT AS A MEANS OF EXPRESSION IN ARTISTIC STUDIO PRACTICE.

Jessamy Kelly is a former designer for Edinburgh Crystal who has recently set up her own glass and ceramics design business. She is also in her second year of a part time PhD. Jessamy is unusual in that she is working in the overlap between the areas of glass and ceramics. Although, often connected by their similar approaches the two materials are rarely physically combined. Like Antonio and Leatherland above, Jessamy is also utilizing

Fig 4. 'Balance'. Jessamy Kelly. Ceramic and Glass

the material science sector. Therefore, if one were to visualize her project using a Venn diagram one would see three overlapping circles: Glass *and* Ceramics *and* Materials Science. The input of a material scientist is used to help Jessamy gain a better compatibility of the glass and ceramics together. In Jessamy's case the conventional notion of compatibility is being extended as she is often using the aesthetic potential of incompatibility to create a new form of visual language in her glass and ceramic designs. For example, the cracking of the glass and ceramics surfaces when combined caused by the different coefficient of expansion are offering new kinds of visual effects. The material science input is useful in helping to control this and maintain the integrity of the structure.

3.4 OVERLAPPING SECTORS TO GENERATE NEW DESIGN POTENTIAL

The above examples of research projects emerged directly from an intimate understanding of materials and processes and used aspects of materials science as a support. The case studies in this section are similar in that they have evolved from designer maker experience and some also involve aspects of materials science. However, these examples also blend the tacit knowledge of the maker in ceramic and glass with approaches from other areas – some art and design related and others more diverse. For example, combining knowledge from different sectors of design and manufacturing is proving a beneficial strategy to offer exciting new potential for designers.

3.4.1 GLASS *AND* ENGINEERING

Anthony Pollock is unusual, as he is a designer that has strategically entered glass design from the radically different sector of industrial engineering. Over ten years in industry as a Senior Designer for metal castings and structures in an earth moving machinery company resulted in substantial knowledge of casting design and processes. A part time MA in Glass developed artistic principles relating to kiln formed glass casting. From this

overlap of sectors, Anthony has identified new glass design potential through the development of glass-casting approaches based on metal casting methodologies. He is exploring this interface through a part-time PhD that will extend the range of possible forms (realizable within studio glass casting) that would previously have been thought unattainable.

Fig 3. Anthony Pollock preparing a wax model to cast in glass

3.4.2 GLASS *AND* WATER-JET CUTTING

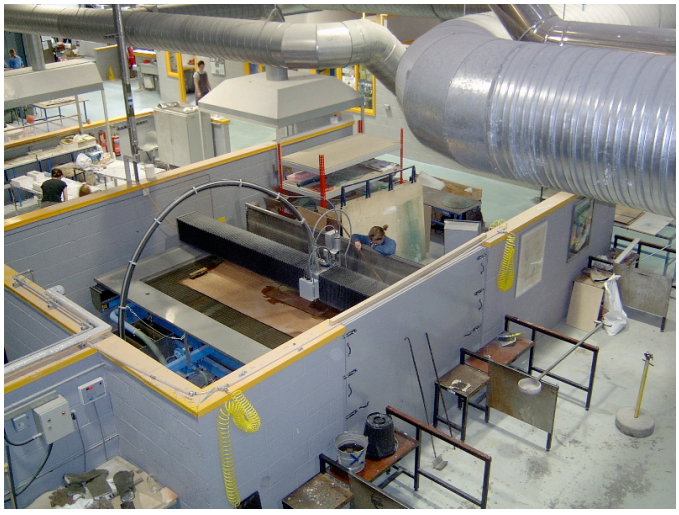


Fig 4. Water-jet cutter at the University of Sunderland

Dr Vanessa Cutler is an architectural glass designer who started to explore the potential of water-jet cutting in her practice. A water-jet cutting machine, linked to a computer design programme, can cut almost any material with high-pressure water and abrasive grit. Although some basic cutting of glass had been undertaken, no in-depth analysis of appropriate methods and creative potential for glass designers was available. In order to locate the possible potential of this overlap between an industrial technology and a material, Vanessa worked closely with a materials

scientist to develop a series of standardized tests to explore the parameters of various types of cutting in glass. This standardized approach involved operations like piercing, surface milling, and cutting curves and inspired the development of a substantial body of new glass designs that could not have been achieved through any other means. Vanessa has used this approach to develop architectural design projects as well more domestic scale ranges (Fig 5).

Fig 5. 'Finger tips – pink'. Vanessa Cutler. Water-jet cut blown glass. This design combines traditional high skill glass blowing techniques with the industrial water-jet cutting process.

3.4.3 CERAMICS *AND* TOURISM

Fig 6. 'Highland cow teapot' by Fiona Thompson

The model of linking sectors does not have to focus on the development of new materials and processes but can also link theory and practice in contrasting areas. Fiona Thompson is a designer maker of ceramics, whose work focuses on themes of travel. Having worked professionally for a number of years, Fiona wanted to advance her practice in terms of both theory and practice. To do this she embarked on an MPhil project entitled, 'The signifiers of tourism expressed through ceramic practice'. This project is supervised by the author of this paper in the Arts and Design area and Professor Kevin Hannam from the Tourism area. Fiona is developing a body of ceramic artworks using photography

and print for the surface designs that communicate aspects of travel and tourism. She will set this work in a critical context by placing the practice not only in the field of ceramics but also in relation to tourism theory. The latter is likely to both parallel and inform the development of the artworks. The resulting body of ceramics artworks and design will contribute to the long history of ceramics as carriers of meaning focused on travel and place. In addition it is hoped that the works might also offer a visual model that is useful for the explanation of some aspects of tourism theory and literature.

3.4.4 GLASS *AND* PRINT

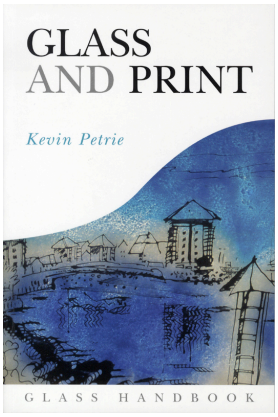


Fig 6. 'Glass and Print' book by Kevin Petrie

The author of this paper has worked closely with the development and supervision of all the examples given and his research has to a certain extent provided a model for all. This research has recently focused on the overlap between two distinct areas of creative practice: Glassmaking *and* Printmaking. Building on his contributions to the field of Ceramics *and* Print (water-based transfer printing), he has defined 'glass and print' as a hitherto unarticulated research area in the creative arts. His outputs, including the book 'Glass and Print' (Petrie 2006), provide coherent historical contextualisation, international contemporary case studies, and new creative approaches to benefit professional practice.

The latter has combined inter-disciplinary practice-based approaches from the fields of printmaking and glassmaking to develop potential new methods of combining imagery with glass. The term 'Integrated Glass Printing' has been developed to describe a number of methods that involve the kiln forming of glass frits (powders) or sheets into print derived moulds. This new method of working combines industrial print technology (flexography) with kiln formed glass approaches to create pieces where the printed image and the glass form are physically integrated. This allows for the production of glass sheets or objects in which the 'printed' designs and glass surface are fully integrated thus offering a new aesthetic for both glassmaking and printmaking. 'Integrated Glass Drawing' is a parallel process in which a direct drawing into plaster creates a mould in which glass is cast. Both approaches offer additional aesthetic potential to more conventional printing or drawing on paper. The glass substrate allows for the transmission of light though the image to supplement the tonal values of the work. The fact that the glass can be molded also offers the potential for a relief surface in the piece. An integrated glass piece can also be re-formed to translate the 2D object into 3D.

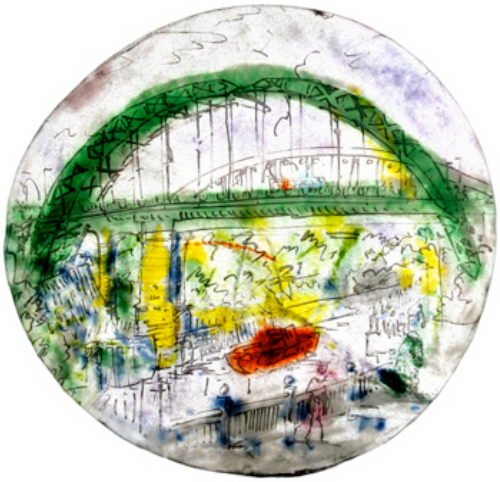


Fig 7. 'The Wearmouth Bridge' by Kevin Petrie. Integrated Glass Print glass dish. Diameter 50cm. Collection of Dan Klein and Allan Poole

This development focus is very similar to the visualization shown in Fig 1 above, as the exchange of approaches and therefore benefits between the two sectors of glass and print are equal. This is now being extended to include aspects of more sectors (imagine the addition of more circles to the diagram). The recent 'Time Lines' project involves a residency at the twin churches of St Peter's Monkwearmouth and St Paul's Jarrow in association with Bede's World, a museum of Saxon life. The churches (c AD 680) are the sites of the earliest coloured glass in Western Europe and short listed for UNESCO World Heritage Site status. The twin monastery of Monkwearmouth-Jarrow was the home of 'The venerable St Bede' (AD 673-735) known as 'The Father of English History'.

This project is focused on developing a body of drawings and glass designs for exhibition in the churches and museum that link the areas of illustration/drawing *and* glass *and* print *and* landscape. These artworks will aim to reflect the contemporary life of these historic sites but will also reference their historic past. All works will be produced directly on site using drawing – with some later developed into glassworks. This approach will capture brief fleeting moments, with the goal of making visual and 'fixing' something of the nature of sites, which have evolved over many hundreds of years. A key research aspect in order to realise the project, is the development of methods of combining direct drawing in the landscape with glass. This approach will be used

Fig 8. 'Bede's World farm' by Kevin Petrie. Pastel on paper. Part of the 'Time Lines' project that links illustration/drawing *and* glass *and* print *and* landscape'.

to create glass dishes with integrated drawn designs for display in the windows of the churches - highly suitable contexts for what might be termed 'a modern form of stained glass'. This work will form a platform for the introduction of a new strand focused on 'landscape and light', which will be developed in future projects.

Glass and print as a research focus is likely to develop at the University of Sunderland with the installation of a new print facility in the Glass and Ceramics department in the last two years. The appointment of a Research Councils UK Academic Fellow, Jeffrey Sarmiento, has led to developments in the area of cast glass and print that complements Dr Petrie's research. It is also planned to develop PhD projects, including an AHRC funded project, in the area in the coming year. This offers an example of how an individual's research focus that links areas can lead to a rationale to develop the equipment infrastructure which in turn encourages new staff appointments that will lead to the development of a sector and new research avenues.

3.5 COMBINING THE TACIT AND VIRTUAL AS A TOOL FOR DESIGN

The computer linked to hand skills is also a rapidly developing area for design research. Many of the examples already given above utilizes the computer as tool for design. The water-jet cut work of Dr Cutler is a notable example. However, this section outlines a project that attempts to link traditional craft skills with the Internet to create a model for collaborative design.

3.5.1 COLLABORATIVE STAINED GLASS DESIGN AND THE INTERNET

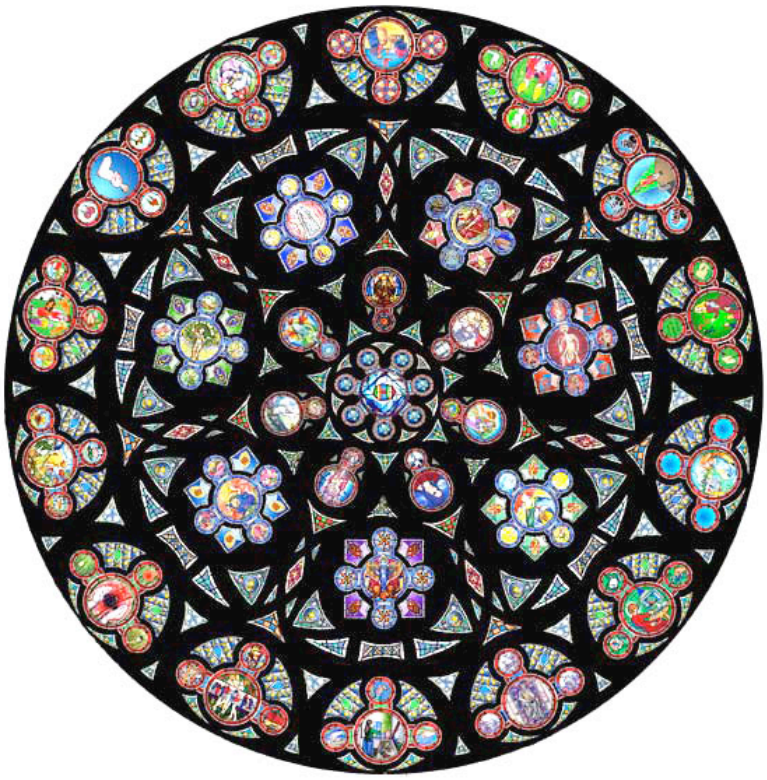


Fig 9. Delia Whitbread. Rose Window design produced collaboratively over the Internet.

Dr Delia Whitbread has worked for many years as a professional stained glass designer and educator. In her professional practice as a designer Delia has utilized what might be termed 'the traditional' tacit skills of the glass artist. For example, drawing of 'cartoon' designs for windows, cutting glass, painting glass and leading the glass. This individual practice led her to develop the idea of locating strategies for collaboration in the stained glass design field. She devised a project that would focus on images of women and be based on the medieval rose windows seen in the gothic cathedrals of the west such as Chartres in France. She then developed a geometric template in which different artists would produce the designs for different sections. The project was started twenty years ago and was originally destined to be a postal art project. The advent of the Internet and developments in computers led Delia to focus the project through a PhD project that aimed to offer a model for collaborative Internet based projects Delia developed a website with a number of development tools to aid the collaborative design process (see http://www.wombrose.co.uk/). This included instructions on how the artist might translate the principles of traditional stained glass design into their artworks. It also included chat rooms where on line 'design meetings' could take place with artists and designs from around the world to debate the final designs. Although the project encountered some problems of communication because of differing time zones it succeeded in developing a new virtual stained glass window, which has been projected on a number of occasions. This virtual work relates very successfully to the stained glass paradigm from which it emerged and could in theory be made in glass. This project provides the field with a detailed model of strategies (and pitfalls) of this type of collaborative design process.

4. CONCLUDING COMMENTS

This paper has shown some examples of a growing trend in the ceramic and glass design sector where new research methods blend haptic and tacit skills of 'designer makers' with approaches from other fields such as; science, engineering, industry, and computing. Such approaches often involve establishing multi-layered collaborative research strategies driven by creative practice. The case studies exemplify a new emerging research community where the tentative model given is proving successful. This might be applied to other sectors in order stimulate alternative research directions. Within the glass and ceramics design sector new directions are already emerging in post-graduate studies with some forming future higher degree research projects. For example, Ceramics *and* calligraphy, Glass *and* Electronic Design, Glass *and* Film, Ceramics *and* Animation, and Glass *and* Performance.

The 'parallels and connections' between sectors described in this paper offer a starting point for the development of more theoretical models in the particular ceramics and glass area, that it is hoped will in time link with similar developments in other fields.

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