CONTEMPORARY MEDICAL SCIENCE AND TECHNOLOGY AS A CHALLENGE TO MUSEUMS

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Content

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Inside/Out: Fetal Specimens through a 21st Century Lens

Enshrouded in glass and once again in glass vitrines, specimens for the scientist are stark reminders of life's material code. Suspended in time and put on display, corporeal flesh becomes a relic of its own history. In a nether world, perhaps reminiscent of death, yet without the degradation of time, the fetus floats in the pathos of insufficient sustenance: a neither here nor there but at once encased in liquids preserving its displaced existence. For a body or its tissue, or an organ or cell, scripted by performative unfolding, this once living matter is like a homeless refugee, whose maintenance relies on the kindness of strangers. In the mutability through time, such specimens speak simultaneously to ravishment and uniqueness as their failures to exist shift them into the domain of mortal countenance. However, they are more than biological entities. They have become, like the 20st century double helix, a cultural icon. The "never-born" continue to speak to cultural practices and social values of embryo collecting whose meanings evolve over time.[1].

[1] Lynn Morgan, *Icons of Life: A Cultural History of Human Embryos*

In zones of ambiguity, bodies and their parts float anonymously as mementos marking historical time. In an ocular joust, the observer assumes a pose, as details of his gaze achieve focus. Thoughts of definition enter and exit the viewer's consciousness until some determination of meaning, however tentative, is arrived at. What questions are provoked by once living matter enclosed in a glass veil? To go behind a veil is to transgress a hidden boundary. At the same time the veil becomes a mirror of our concealed selves, as we peek behind the curtain of inscrutable worlds. What purpose do these morphological specimens hold in scientific, artistic and museum contexts in the 21st century?

From the Latin, *specere*, meaning to look at, emerges two related, yet distinct words: spy and specimen. To observe carefully, to spy on nature's wonderfully "tangled bank" allows us to glimpse at history's bio-archive. With the practice of embryo collecting, hidden social dimensions operate within and are uncovered. For example, interracial coupling, eugenic directives and medical procedures used to extract embryos in "choice condition." [2] Specimens have the power to evoke both clinical and somatic responses while remaining a valuable addition to understanding life and its infinitely various forms. In the museum context, where history is reframed by objects on display virtual technologies overtake our experiences of the "real." Prior to medical museums dispersing their holdings, it is of the moment to utilize state of the art imaging in tandem with morphological specimens. The comprehension of images and their conceptual underpinnings is undergoing radical change, making corporeal artifacts a valuable resource.

Recently, MRI images have been employed to enhance information corralled by sonograms. By acute observation of fetal malformations, such imaging technologies provides scientists with close study to evaluate disturbances in the womb. Technical images, in the museum context offer another dimension in the discussion concerning the fetus as a cultural and political marker. Because *babies in bottles* has sparked debates about abortion and right-to-life politics, such imaging functions as a rebound to fundamentalist politics. Fetal images, as technology reveals, baby-like features go beyond a silhouette form to include disturbances within

University of California Press, 2009

[2] See Jeff Nisker, Francoise Baylis, Isabel Karpin, Caroliyn McLead and Roxanne Mykitiuk, *The Healthy Embryo: Social, Biomedical, Legal and Philosophical Perspectives* (Cambridge University Press, 2010)

morphological and genetic codes. It is through this expansion of the signification process, that a dialogue between both sides of the debate is thus made.

Regarding a fetus, it may appear to be a baby, however, the use of MRI technologies can explicitly show why the fetus is not viable at certain stages of development. How can such a coupling of molecular readouts and extant specimens communicate to the public where the lines between nature and culture criss-cross? As technology brings past into the present, this linking of artifacts and technological processes open alternative means to examine more fully the nature of nature. In this regard, what does the public fetus represent?

During my exhibition *The Glass Veil* at the Medizinhistorisches Museum der Charite, one administrator was quite upset with an image in the show. All of the images, were, in fact, from the museum's permanent collection. The image in question was of a fetus. Although the administrator had seen "the real" fetus many times, it was the enlarged reproduction that gave her pause. Was it the scale of the fetus that made it look like a baby? Or had she never quite seen the fetus in the same way? Pictures are created to generate meaning and as such are semiotic devices altering existing opinions. The fetus, a provocative icon in 21st century culture, is a marker of political issues and religious beliefs.

In the realm of scientific endeavors, objectivity (as a form of "truth to nature") is a goal driven by accuracy and precision. Nonetheless, in the natural world, even among its species and types, the uniqueness of individual entities make universal forms improbable. By comparing specimens with their molecular structures, unique degrees of flexibility are noted. Such medical collections provide comparative morphological models which act as teaching devices for diverse disciplines: anthropology, sociology, visual art, history of medicine and science itself. These collections also open dialogues between science and society, public policy options, and medical procedures.

Occupying a world of unimaginable repose, a fetus is a primal marvel. A mystery in itself, the fetus has come to represent life as a continuous cycle moving from birth to death, an unfolding of a single cell that has within its code an expiration date. In the United States, the fetus is a highly charged icon which has been employed to sell

Volvos,[3] wage political battles and to reflect on wonder. Fetuses were also exhibited in Gunter Von Hagen's controversial plastinated corpse show, *Bodyworlds*. They were sectioned off in their own separate room. These fetuses were not plastinated but instead were presented as *babies in bottles* at various stages of development, supposedly borrowed from historic collections, although no institutions were identified.

The fetus as medical specimen traces the history of scientific practices, including historically embedded cultural visions. The specimen, its preparation, its formal display and arrangement simultaneously functions as a scientific object and a cultural artifact. How are specimens posed? How does this figural articulation change over time? What are the ways in which dignity is preserved in specimen display, or in images of medical display, particularly in art and medical museum contexts?

This presentation will examine the above stated issues concerning the preserved embryo and fetus and their public display. Although embryo and fetal collecting in the United States began as a late 19th century practice, such collections in the United States were largely terminated in the 1960's. Embryos and fetuses, however, continue to be a taboo subject. The moral status of the embryo as "tissue material" is beset with a myriad of ethical claims. Should discarded embryos be employed as research tools from which to extract stem cells? Furthermore, research into mixed species embryos, cybrids, and even savior siblings creates further controversy. Scholarly investigation of the fetus and its social history continues to bring forth relevant findings. Nick Hopwood, Lynn Morgan and Sarah Franklin, to name a few scholars, continue to unravel the social consequences of fetal portrayals, acquisitions and specimens. Medical museums and their operative practices are acutely poised to become part of this discussion in the 21st century.

[3] Janelle S. Taylor, "The Public Foetus and the Family Car: From Abortion Politics to a Volvo Advertisement," *Science As Culture 3, Issue 4, 1993*, pages 601-618. In an advertisement for a Volvo, in Harper's Magazine in 1991, an image of a sonogram was employed as a means to sell cars.

Ken Arnold & Thomas Söderqvist

Museum Dogma 2010: A manifesto for making science, technology and medicine exhibitions

Fifteen years ago, Danish directors Lars von Trier and Thomas Vinterberg spearheaded Dogme95, a manifesto aimed at purifying the art of film-making. Refusing postproduction and avoiding unnecessary artifice in order to focus on the cinematic story and on the performances that embody it, its proponents believed that this would enable audiences to be more profoundly engaged and less likely to be distracted by the contrivances of over-production.

Since then, the idea of applying a similar discipline to other areas of creative art activity has occurred to many. Writers, theatre directors and other arts practitioners have all found inspiration in Dogme95's back-to-basics philosophy. It has also influenced other professional callings, such as, for example, English Language Training, where the plea to return to the fundamental practice of classes based on speaking and writing the language, rather than technological gimmicks and methodological innovations, has been taken up with evangelical zeal by many in the field.

In spite of the criticism that has been levelled against it, we have found inspiration in this classical "wow of chastity" in order to guide and sharpen the creative practice of specific concern to us, viz., how exhibition-making should be conducted in the world of science, technology and medicine. Could we translate the idea that 'props and sets' must not be brought onto a film set and that filming must be done on location? Actually, this was pretty easy to relocate in exhibition terms. Dogme95's determination that sounds in a film should not be produced apart from the visual aspect was also suggestive to us, as were the 'commandments' that filming must take place where the action takes place, that there should be no artificial lighting, and that the film takes place here and now. Some of their proposals prompted us fundamentally to disagree – for example, their insistence that the director of a film should not be credited. A number of the other rules that we have come up with more narrowly relate to exhibition making in the specific context we are concerned with.

A few words of disclaimer. These rules have been thought up and written hastily and published with almost indecent haste. They should therefore be read more in the spirit of deliberately provocative prompts for further discussion; this manifesto is not as a definitive set of working proposals, but a beta version, which will no doubt be modified and sharpened through challenge and feedback. It will also be apparent to anyone who knows the institutions at which we are based (Wellcome Collection in London and Medical Museion in Copenhagen) that exhibition projects over which we have ourselves presided have frequently not followed one or more of their own rules. Furthermore, the fact that these comments come almost reference-free should not be taken as implying that we think the ideas are purely our own. There are now vast bodies of literature on science communication, exhibition making, art history and museology, as well as other branches of cultural theory, which bears on this issue; we have read some of this literature and been influenced by it, and

we also have learned much from the exhibitions, events and museums we have been lucky enough to visit.

And now to our proposed rules for museums of science, technology and medicine:

1. Exhibition making should be based on the practice of research, *not* dissemination

Curators should use exhibitions to find things out (for themselves and for their visitors) and not just regurgitate and popularise what is already known. Good curators are, first and foremost, inspired and imaginative researchers, who find and then build on the investigative exploits of experts and colleagues, juxtaposing varied understandings about their chosen topic and/or exhibits, adding their own insights, and thereby gradually coming up with new ideas and perspectives. As such, they belong to the dispersed army of non-academic knowledge producers – akin to writers, engineers, theatre workers, commercial inventors, etc. The question of what type of knowledge is actually produced through their activity (not really new scientific or scholarly knowledge, but more than just passing comments and casual insights) is worthy of considerable further study and contemplation.

2. Never show ready-made science

Focus instead on the processes of science – that is science in the making, the praxis of science, the triumph of discovery and all the frustration and blind alleys explored along the way, the social and cultural processes of scientific ideas becoming accepted and embedded, etc. So when focussing on the work of scientists pay more attention to their work in the laboratory than on Nobel Prizes won. Also think carefully about whether there is a place in the exhibition for some sort of demonstration of core scientific principles germane to the theme – don't be wary of borrowing the best display techniques developed in science centres.

3. Exhibitions are inevitably multi-authored, and everyone involved should be clearly and properly credited

An exhibition's project team has worked hard on the show and deserves to be credited. Just recall how detailed the credits at the end of a film are – this is not a bad model for the panel in an exhibition that describes who did what. And actually, those responsible for the show not only need to take a bow; they also need to be held responsible for its contents and impact. The collaboration with experts, the role of graphic and 3-D design, the source of funding for the show, the institutional context, … all of these factors have a bearing on the final outcome, and it should be possible for exhibition visitors – should they wish– to find out about these influences.

4. Make your exhibitions for inquisitive adults, and then add layers and means for other audiences to engage with them

If you start at the opposite end of the spectrum (aiming at educationally under-achieving uder-14s say) it will be impossible to engage anyone else; and frankly you are unlike to engage your target audience in any case. Remember, many children and teenagers are keenly attracted to adult culture, but much fewer adults see the attraction of 'young' material. Never make exhibitions for educational purposes – other media and methods are much more effective. Its also worth bearing in mind that exhibitions are, by their nature, a 'childish' medium, bringing out playfulness in all of us. To deliberately focus on young audiences inevitably reaps diminishing returns.

5. Don't forget that ultimately visitors make their own exhibitions

The experience of visitors needs to be minutely considered: they will be on their feet, not interested in reading as much as the curators write, disinclined to look at the second object after the first, unable to read all but the simplest black fonts in large letters on white backgrounds and interested in aspects of a given topic that the curators might not even have come across. In this context its worth bearing in mind that upon opening an exhibition, the show is only a B-version – that is the second or third draft of an idea that will, through revision, reach maybe its eighth or ninth by the time of its closure. Exhibitions should be alive, and change is a vital part of life. Even in the most 'stable' of shows, lights will need adjusting, labels redrafting; an exhibit might even have to be removed or replaced. More radically, some exhibitions should be deliberately opened half-finished, or set up so that updates can be added half way through.

6. Remember that exhibitions are just the starting place for visitor engagement

Good exhibitions are really the point of departure for a longer journey or relationship. Judging the value of exhibitions therefore should only start with an analysis of how many people come, how long they spend in a show and what they say they think of it. On this basis alone, most exhibitions are foolishly expensive enterprises, particularly in these cash strapped times. Don't forget that, just occasionally, exhibitions can really change visitors' lives and this is worth a lot! But if effective, exhibitions can also bring in new objects to museums, or have an impact on recruitment, or add to shop sales, or increase the organisation's visibility and reputation, or provide a context for corporate celebrations, and so forth. There is a virtual avalanche of cultural capital that can flow from them, which should be considered and valued from the start.

7. Embrace the show-business aspects of exhibitions

Audiences come to exhibitions in their leisure time and deserve to be lifted out of themselves by these shows. They will respond to the drama of the best exhibits, displays, design, writing, lighting and so forth. Making sure that all of this is well attended to and given the greatest polish will enhance the presence of the objects and the impact of the ideas. Don't be ashamed to admit that making exhibitions is, in part, a matter putting on a show. Be as good as you can at your show-business.

8. Embrace the ephemeral nature of exhibitions

Catalogues, web-presences and filmed versions of exhibitions are all very well, but they will never come close to the actual experience of visiting a show. Far from being a cause for concern or regret, however, this is instead a crucially important part of their magic. Like good pieces of theatre or great musical performances, they gain much of their energy by being around for a short time and then disappearing. The fact that they are destined to vanish after a short while also gives their makers a degree of freedom (a licence) to experiment and be exuberantly daring. Grasp it!

9. Always involve a scientist in the project team; a technologist if the show is about technology.

Don't shy away from drawing on real expertise in interpreting a topic or some exhibits. But this is decidedly not to say that the aim of the exhibition is simply to give voice to the views of these experts. They are not, nor should they be the curators. Moreover, the scientists/technologists involved should not be the only experts on the project team. But it is vital that they are part of the team and that their perspectives (though maybe in the form of a challenge or struggle) are genuinely present in the final exhibition.

10. Make the exhibition true to the place where it is shown

The most acutely dogmatic approach here would be to insist that a show about the life and work of Mendel, say, should only be presented in Brno in the present Czech Republic; whereas an exhibition concerning the impact and influence of his work on genetics could be shown anywhere. The principle here is to remember that knowledge is 'situated' – the context in which we contemplate and acquire it can seem as important as the ideas or facts themselves. Exhibition makers therefore need to think hard about how to work with the 'place' of an exhibition. For example, what is lost in global touring exhibitions, in which the subject is detached from the local and situated circumstances. The resonance of the site of a show can be thought of as a series of concentric shells of significance: the country, the city, the venue, the room, and the set/design of an exhibition, even the showcases and the orientation of individual objects – all have a bearing on the meanings that audiences are likely to derive from exhibitions.

11. Always involve more than one sense – but refuse artificial sounds and odours

It is impossible for visitors to turn off their non-visual senses as they wander round an exhibition in any case – they will hear, touch and smell things no matter what. So make sure that some of the tactile, audio, or olfactory experiences of an exhibition are planned and curated. By and large, exhibitions work by teasing their visitors into thinking that they can get close enough to what they see to be able almost to touch it, while making sure they don't. But curators should also think carefully about how to introduce at least a few moments in the show when visitors are encouraged to touch something (most collections have duplicate objects that can be touched). More difficult is the idea of getting visitors sometimes to use their ears and noses while they go round exhibitions.

Refuse artifical sounds and odours, but try to find methods for enhancing the audio and olfactory qualities of the original objects..

12. Use no replicas or reproductions, just original artefacts, images and documents

Exhibitions should engage audiences with original material. If you have a topic to tackle or a point to make, but cannot illustrate it with original artefacts, images and documents, ask yourself if the medium of exhibitions is the best way to make the point. Of course, models and replicas of objects or reproductions of documents and books can be shown, but only if this is the point of showing them. The role of visual art raises special issues in this context, but reproductions of artworks should not be used either, unless somehow the work's natural medium is 'facsimile' – for example, digital photographs. The use of scientific and medical images also raises complicating questions for this dogma. What is the 'original' format of a microscopic image of cell? Most scientific images today are minted as digital data, and their final appearance almost invariably owes much to enhancements, pseudocolours, cropping etc. How this material should be displayed and labelled therefore needs very careful consideration, and frequently it is better to leave it out all together.

13. Leave out as much as possible

Almost invariably, less is more in exhibitions. Visitors will remember and enjoy looking at ten carefully chosen things more than a hundred that are reasonably well selected, and far, far more than a thousand things lazily uncovered via Google. In many ways, the most important aspect of an exhibition is its outer boundaries, which serve to keep out the mass of distractions that lie beyond it. In the digital era when *some* simulacrum of pretty much everything can be accessed anywhere and at any time, a core value of a museum exhibition is that it makes its point through displaying rather few original, material objects, painstakingly selected. In particular, try to restrict the digital aspect of exhibitions, and never ever introduce the internet – it will instantly deflate the show.

14. Avoid artificial lighting

Wherever possible, try to draw on natural light. Start with the light already available and build up from it. If you can, reveal the windows and keep the doors open. Let to the natural layout of the building be apparent, make it clear where (if absolutely necessary) you are introducing false walls. All this will enable visitors to keep a sense of where they are while they go round a show; and it will help make sure that the relationship between the exhibition and the place it is shown can also be kept firmly in mind. And don't fall into the trap of imagining that the background (the blank canvas) for an exhibition is either a neutral black box or a pristine white cube. Ideally a show should look and feel very different on a mid-summer morning to a November evening.

15. Don't be afraid to bend, break or reinvent these rules

Kerstin Hulter Åsberg

Uppsala Biomedical Center: A Mirror of Modern Biomedical History – How can it be displayed?

"Integrated integrity"

Uppsala Biomedical Center (BMC) was planned in the late 1950´s in order to gather the old preclinical institutions, all of which were growing rapidly due to the increasing number of students and due to new technology requiring better security, more effective laboratories etc. The center was created by the well-known Swedish architect, Paul Hedqvist (1895-1977) in close cooperation with Karl-Johan Öbrink (1918-1998), professor in physiology in Uppsala. Hedqvist and Öbrink had a vision of "integrated integrity", which meant that cooperation between different departments and researchers should be facilitated by all means, but no one should be forced to cooperate.

The construction started in 1968. In 1983, BMC was one of the largest research centers in Europe with more than 30 departments from 4 faculties and 2 universities situated in the very same building. Since then, BMC has been in a constant change: new walls and floors are added, departments and laboratories are moving around, and new research groups are created within BMC and today often also together with other research groups in Sweden and in other countries.

Today BMC harbors biomedical research and education in different life science areas such as biology, chemistry, medicine, pharmacy, and domestic sciences. The main part belongs to Uppsala University, but there are also units from the Swedish University of Agricultural Science and the Ludwig Institute for Cancer Research. More than 1500 persons are employed as researchers, teachers, technicians, administrators etc. and there are about 4000 students from all over the world.

Since 2009, I have been associated to the Department of Neuroscience at BMC as a senior lecturer in Medical history, and the first course in Medical history was carried out during spring 2010. In a future, a research work on the development of modern medicine will be initiated for students and teachers at the Faculty of Medicine and Pharmacy. Subjects for research and for a museum to be will concern the development of:

1. the different biomedical research fields in an international perspective,
2. the institutions and their education programs,
3. individuals and groups who have worked and studied at BMC,
4. the fascinating architecture and construction of the complex building with its old and new artifacts and design.

The research work will be facilitated by the many archives with documents, which are easily accessible. Artifacts have been collected and stored in locked rooms at BMC or at the **Museum of Medical History in Uppsala**. This museum was created by Lars Thorén (1921-2007), professor in surgery, who collected artifacts from all medical specialities up to our time. All this can be displayed in a multimedia environment within the BMC together with pictures and artifacts from older times. A suitable place for such a museum is the former library, which is situated in the middle of the center.

Questions to be discussed during the seminar

1. How can the story of the development of BMC be used as an illustrative example and a symbol for the development of modern biomedicine in Sweden and in the world?

2. How should such a story of BMC be told and displayed? Which questions have to be asked?

3. In the middle of the great building there is a 13 m high sculpture of a DNA-molecule made by the Swedish artist Bror Marklund (1907-1977), "possibly the largest and most spectacular double-helix sculpture" (1). How can this sculpture be used, as an emblem or a vision, for creating a modern biomedical museum within BMC?

4. In BMC, there are some savings from the old medical institutions in Uppsala, like anatomical objects and pharmocological collections from the 1900th century, which have been used for education and research purposes in those days. And there are some small "historical cupboards" with pictures and artifacts and a common theme of "Development":

    a. Development of drugs, of pharmacy and pharmacology

    b. Development of structural biology, with X-ray examples from proteins and virus

    c. Development of protein chemistry and different separation techniques

    d. Development of biomedical research findings to clinical products like hyaluronic acid (Healon), heparine, and PDGF

    Can these already existing "historical cupboards" be incorporated in a more general plan for a modern biomedical museum within BMC?

5. What has to be displayed in real life and in a tangible way, and what can be displayed virtually?

6. Are there similar museums in other countries?

Reference:

1. Hargittai I. "Something Has Doubled". Editorial. Leonardo,Vol. 36, No.2, pp. 95-96,2003

Wendy Atkinson & René Mornex

A Major Health Museum in Lyon

Introduction

Medical activities at the Hôtel-Dieu public hospital site in Lyon, France, began closing down in 2008 and by December 2010 will cease completely. They are being transferred to new or modernised hospitals on the periphery of Lyon. The Hospices Civils de Lyon(I), owners of the premises, and the Municipality of Lyon, governors of the public hospitals, faced with the impossibility of modernising the Hôtel-Dieu, have issued a call for proposals to renovate and reconvert the site into a luxury complex with hotel, shops and business facilities. Cultural amenities, such as a museum, are an option in the terms of reference. Much of the Hôtel-Dieu, which will remain hospital property, is a classified national monument(II) and part of Lyon's Unesco World Heritage Site(III). Consequently, maintenance of the historical architecture is an obligation. Tenders have already been submitted and the winning proposal will be announced in September 2010.

Initiated five years ago to regroup dispersed medical heritage, a project to create a major health museum in the restored Hôtel-Dieu is underway. Aiming to open in 2014, the museum will include the present Hôtel-Dieu museum, existing hospital, university and industrial collections and new collections from the twentieth and twenty-first centuries. The museum intends to reach a large public, develop innovative display techniques and present a variety of cultural and educational activities.

The future of the museum project is dependent on the results of the architectural project. If the winning proposal does not contain a health museum, no alternative location plans exist and it is probable that the present collections will go into storage.

In order to maximise the museum's chances, project-leader Professor René Mornex has embarked on an information campaign. Multimedia information and communication technology are being exploited to gain political and public support and secure funding for the museum project.

Origin of the Hôtel-Dieu hospital in Lyon

Lyon, ancient capital of the Gaules, and France's second economic and university centre, has a long health and medical tradition dating back to the early Middle Ages when hospitals were built to care for travellers and pilgrims. The Hôtel-Dieu, built on the west bank of the river Rhône, dates back to 1185. Between the eighteenth and early twentieth centuries the hospital, which covers 44 000 square metres, was the workplace of many famous doctors and surgeons and known for its technical innovations and training centre. Marc-Antoine Petit, Alexandre Lacassagne, Claude Martin, Etienne Destot, Mathieu Jaboulay and Leopold Ollier were among the doctors who developed experimental surgery, stomatology, prosthesis, radiology, forensic science and so on.

Existing collections

Hôtel-Dieu museum

A hospital museum was established in the Hôtel-Dieu in 1934. This was due, in part, to the destruction of the Charity Hospital, located further south on the west bank of the Rhône, and the need to preserve three rooms which had been classified national monument thanks to their exceptional architectural value. Situated in a 17th century hospital ward, creaking polished wooden floors and eight metre high ceilings give the museum its particular historical ambiance. The furniture, tapestries, paintings, medical, pharmaceutical and hospital artefacts on display are a tribute to the medical and industrial innovation associated with Lyon. Of equal importance is the heritage of the religious community, which cared for the sick for centuries, and Lyon citizens who generously co-funded hospital development.

Although this hospital museum is registered "Musée de France"(IV), and an inventory is being compiled of its 12 000-piece collection, there are very few twentieth century medical artefacts in the present collection. Modern exhibition techniques and computer technology are also absent.

Radiology collection

In 2003 the Hospices Civils de Lyon accepted an important collection of radiology artefacts and equipment gathered together by Albert Renaud(V) which, due to lack of display space, is in storage and only occasionally shown to the public. The collection is managed by an association, the Friends of the Albert Renaud Collection(VI). The scientific value and national importance of this material has been ascertained by the director of the Musée des Arts et Métiers, Serge Chambaud.

Claude Bernard Lyon 1 University collections

The Lyon Faculty of Medicine(VII) was created in 1877 and its first premises were located almost opposite the Hôtel-Dieu on the east bank of the Rhône on Quai Claude Bernard. In 1930, the Faculty moved to the Rockefeller site, opposite the Edouard Herriot pavilion hospital(VIII); the Faculty of Dentistry is located a short walk away on the Buire site. The area is home to three university museums: the Dentistry Museum, which was created by three university dental practitioners in 1978; the Anatomy Museum, based on Marc-Antoine Petit's 1880's collection; and the Museum of the History of Medicine and Pharmacy which was created by Alexandre Lacassagne in 1914. The museums are managed along different lines and each struggles to survive with limited resources and voluntary staff. No recent acquisitions have been made to the collections whose inventories are incomplete, or non-existent, and no modern display techniques are used. Finally, all three museums are threatened with closure; both faculties need extra teaching facilities and would like to reclaim the rooms the museums occupy. As a result, the Lyon 1 University is eager to unify its and the hospital's medical collections and firmly supports the health museum project.

Medical industry in Lyon and private collections

In order to cater for expanding hospital needs and health care, an important medical industry grew up within Lyon and the surrounding area. Major significance can be accredited to the steel industry, responsible for the design, manufacture and distribution of surgical instruments

which often bore the name of the surgeons that they were designed for. Thanks to this process doctors Paul Santy and Louis Paufique, respectively thoracic surgeon and ophthalmologist, became widely known for their innovations. From the early nineteenth century, Lyon became synonymous with the chemical industry(IX). Aspirin, vaccination and viral infection control are some of the City's contributions to present health care and many international laboratories have their headquarters in Lyon: BioMérieux, Pasteur-Sanofi, Aguettant and so on. Today, Lyon occupies a leading position in biotechnological, pharmacological and cancer research.

A small private museum, the Musée de Sciences Biologiques Dr Mérieux(X), was opened in 2008 in Marcy l'Etoile, just north of Lyon. It promotes the Mérieux heritage in biotechnology, genetic engineering, vaccination and infectious disease control. Very few artefacts are on display as the museum exploits posters, maps, photography, films, and interactive media.

Veterinary collections

In 1761, Claude Bourgelat, squire of Louis XV, created the world's first veterinary school in Lyon. It is now located in Marcy l'Etoile and its small Lesbre and Tagand Museum, only open to veterinary students, is a reminder of the links between animal and human medical sciences. In 1877, for example, Auguste Chauveau, professor of physiology and precursor in open-heart surgery, was both veterinary school director and professor at the newly opened Faculty of Medecine.

Although neither of these two museums are part of the major health museum project, they further illustrate the wealth of Lyon's medical heritage.

Major Health Museum Project

Master-minded in 2009 by Bruno Jacomy, chief curator of the Confluence Museum(XI), the Lyon health museum project is innovative and ambitious. The plan is for a national museum and the project is possibly unique in Europe(XII). It is envisaged that a mixture of historical, traditional and contemporary medical heritage, display techniques, renovation, conservation and preservation methods, depending on the age of the artefacts, will be developed. The museum will be housed in the iconic Hôtel-Dieu; a place of memory where a restored hospital ward will retrace the history and original functions of the site.

The collections will concentrate on six major themes: humanism (a Lyonnaise tradition), health personnel, the body, the hospital, instruments and medication. Artefacts will be drawn from the five existing hospital and university collections already mentioned – hospital, radiology, dentistry, anatomy and the history of medicine – and will constitute the base of a permanent exhibition. A full inventory of the some 30 000 pieces will be undertaken and attempts made to ascertain ownership of individual items. This permanent collection, much of which pre-dates 1960, will be augmented by contemporary artefacts, including lasers and ultrasound equipment for example, which bear witness to the past 50 years of medical innovation in Lyon.

The cultural and scientific programme will explore the complex history of medicine as it has evolved around the globe, from the ancient Greeks up to present times. Improvements in health care, the ever-growing use of science and technology and the ever-increasing tendency to adhere to international norms and regulations will be considered. There is such a rich and intriguing universe to explore and explain. Miniaturisation and automation of surgical instruments; digitalisation and intangible medical interventions; organ transplants; microscopic

surgery at a distance, by remote control or robot; mutations in hospital architecture designed to accommodate modern equipment; and transformation of health care practice are just some of the subjects that will be developed.

Conferences and scientific publications are planned to complement this programme and seminars will concentrate on medical history, inventions that established Lyon's reputation and present trends in medical and health sciences. More than a museum, it is intended that the project will serve as a resource centre and help bridge the gap between experts and public in search of a healthy lifestyle. It is hoped that the museum will comprehensively reach out to all publics: specialists, scholars, practitioners, students, citizens, ex-patients and their families and tourists; 100 000 visitors are expected each year.

Different discovery levels will integrate a wide variety of artefacts. Pedagogical supports will be available such as dioramas and the reconstruction of a denture work-bench, traditional cabinets and display cases, photography, posters, multimedia exhibits and animated sensorial demonstrations. Texture and matter should be part of the museum experience and exhibits will allow the visitor to touch, smell, hear and see parts of the human body, before disease or illness, during, after a medical intervention and recovery.

Programmed to open in 2014 the museum project has gained international, national and local support. Plans for the governing body, expected to take the form of a cooperative(XIII), are underway and potential members have already been invited to participate in the project. For the moment only local institutions have been approached but in the autumn, depending on the outcome of the Hôtel-Dieu restauration process, private parties will be contacted.

How will the museum incorporate new collections and fulfil its goals in contemporary museology?

Lyon is gradually realising the value of its rich industrial and technical heritage which is increasingly recognised as a core part of its identity and something to be proud of and preserved(XIV). The Confluence Museum, in collaboration with the Lyon 1 University and local industry, and along the guidelines of the national PATSTEC(XV) mission, plans to register and document recent scientific and technological, tangible and intangible, heritage. The health museum will maintain its links with the Lyon 1 University and the Confluence Museum and develop further links with medical practitioners and industrial partners, eager to participate in the museum project and donate equipment. This will enable the museum to continually update its collection and make new acquisitions.

The same partners will also provide a pool of experts for the educational programme. In order to extend the scope of its pedagogical outreach, the museum will develop partnerships with other regional, national and international academic and medical institutions. Special attention will be given to recent cancer research, virus control, vaccination, biotechnologies, micro and nanotechnologies and so on.

An international steering committee will oversee the scientific and cultural programme. Composed of museum and health experts, the members will advise on collections, make decisions about new acquisitions in accordance with the museum rationale, topics and design techniques. The interim committee(XVI), which met for the first time in September 2009, has already approved the museum project concept. The executive committee, consisting of

curators from the actual hospital and university museums, currently plays an important role in documenting and preserving the existing collections and mobilising for their unification.

How is information and communication technology used in promoting the museum project?

At the time of writing this paper, the future of a major health museum in Lyon depends on the way in which the Hôtel-Dieu will be renovated. Most importantly, perhaps, who will do it and how.

Determined to maximise the museum project's chances Professor René Mornex embarked on a public lobbying campaign with the support and input of the executive committee, the Friends of the Albert Renaud Collection and members of the revived Friends of the Hôtel-Dieu museum association(XVII).

A public meeting, held in the refectory of the Hôtel-Dieu in March 2010, with speakers René Mornex and Bruno Jacomy, was attended by more than 300 people. This resulted in a 100 new members of the Friends of the Hôtel-Dieu Museum association, received some media coverage and attracted medical practitioners to the cause; one doctor created an online petition(XVIII). The electronic signatures – 4 000 have already been collected – were presented to the Mayor of Lyon in July.

Encouraged by this success Professor Mornex, with the approval and funding of his partners, commissioned a film to present the collections and the museum project. The 30 minute-long documentary was shown to almost 450 people in June. It is a moving testimony to the commitment of the museum curators and their faith in the unification of existing collections in a Hôtel-Dieu major health museum. The film will be distributed in September to all members of the steering and executive committees as well as potential public and private partners.

In order to pursue the information campaign online a domain name in English and French has been registered with a European URL to signify the international nature of the project: www.musee-sante-Lyon.eu and www.health-museum-Lyon.eu. A future website will serve lobbying purposes: it will allow the sharing of information, mobilise support and raise funds. It will also act as a virtual museum, a window on the existing collections which will be inaccessible to the public during the Hôtel-Dieu renovation. Finally, in four years time, it is hoped that this website will evolve into the official website of the Major Health Museum in Lyon.

Notes and references

I Hospices Civils de Lyon: the Lyon public hospital services are the largest employer in Lyon and own several historical hospitals. Those that cannot be modernised are being sold, a fate common to many hospitals in other towns in France

II Built over several centuries, 80% of the Hôtel-Dieu is classified: all the 17th century buildings, the Pascalon Dome, the Large Dome, the Chapel, a part of the 18th and 19th century buildings including the refectory, the Small Dome, , the Soufflot façade (375 metres long) and all the roofs

III The centre of Lyon became a UNESCO World Heritage Site in 1998

IV The Musées de France law of 2002 stipulates that all museums wishing to be recognised as state museums must comply with specific content and management guidelines such as maintaining inventories

V Albert Renaud, 1923-1990, radiology commercial engineer, spent his professional life collecting lamps, tubes, X-ray units and electric-magnetic appliances

VI Presided by Pr René Mornex, this association funds much of the health museum campaign

VII The Faculty of Medicine is now part of Lyon's Claude Bernard Lyon 1 University (UCBL)

VIII Designed by the utopic Lyonnais architect, Tony Garnier, this pavilion hospital took 20 years to build and was the first university hospital of its kind

IX W ATKINSON: *Le patrimoine scientifique et technique contemporain: une boîte à outils pour sa sauvegarde*, October 2009 http://www.ensam.eu/fr/centres_et_instituts/centre_cluny/bibliotheque/ressources

X Run as an association, this private museum includes representatives of the town of Marcy l'Etoile, pharmaceutical firms (Sanofi Pasteur, BioMérieux, Mérial), and the Mérieux Foundation

XI Closed to the public since 2004, the Confluence Museum is a natural history museum whose collections date back to the 17th century. Its present concept associates material from human, earth, life and industrial sciences with questions of mankind and society

XII W ATKINSON : *Enquête préalable à la mise en place d'un musée de la santé à Lyon : un état des lieux*, May 2009. http://www.ensam.eu/fr/centres_et_instituts/centre_cluny/bibliotheque/ressources

XIII Etablissement public de coopération culturelle (EPCC) : this administrative structure enables public and private institutions to create and manage culturel amenities such as museums

XIV Interview with strategic and development department of Grand Lyon, the greater Lyon urban council, November 2009

XV Initiated at the University of Nantes in 2004, this national programme for documenting and recording contemporary scientific and technological heritage is coordinated by Musée des Arts et Métiers in Paris and managed by Catherine Cuenca

XVI Present members include Robert Bud, head curator of medical sciences, Science Museum London; Anne Nardin head curator of the Paris hospitals museum; Serge Chambaud, director of the Musée des Arts et Métiers; Jacques Poisat, expert in medical history and university professor

XVII Presided by Michel Nicholas, the Friends of the Hôtel-Dieu Museum association provide funds and logistic support for public meetings in relation to the health museum information campaign

XVIII The petition can be signed at: www.hoteldieudelyon.fr

Yin Chung Au

Seeing is communicating: possible roles of Med-Art in communicating contemporary scientific process with the general public in digital age

Thought experiment and democratising science

A conventional mission of museums is to preserve objects of the past and to evoke appreciations towards historical events represented by the objects. In this sense, historical process of science progress is naturally a long-standing theme. Also naturally, the progress of technoscience, or more precisely, impact of technoscience and its interaction with contemporary life, should be taken into account in the context of contemporary digitalisation. Herein challenges arise from the changing scales and appearance of historical objects – most masterpieces of significant biomedical improvement are microscopic scale, and the appearances of their relevant "artefacts", if macroscopic, are reduced to something lack of immediate emotion-eliciting effects, such as a bio-chip[4]. Lack of visibility and recognisiblity makes contemporary biomedical artefacts scarcely fulfil the *raison d'être* of museum in traditional sense, albeit narratives that contextualise the artefacts in the fabric of knowledge production might provide additional values[5].

However, thanks to digitalisation that challenges museum curators with microscopic scales, Sci-Art/ Med-Art has been sprouting, embodying the idea that scientific images are messages and inscriptions to be transformed and re-interpreted through various media. In a genetic way of speaking, Med-Art creations emerge from cross-linking and exchanging of information borne in biomedical artefacts, despite their extents of visibility. In a way, such creation has been practised in Sci-Fi production for a long time, where certain key concepts of biomedicine can be concretely visualised, and the visualisation would then be transformed and/ or converted in order to be incorporated into plots. When "elements in science" are talked about in Sci-Fi, it is the element to be extracted and converted, but not its direct contribution to revealing the truth, that concerns scriptwriters and producers. These elements are not necessarily situated within particular web of knowledge production as scientists know it. Therefore, they are free to be used as raw materials for thought experiment with no confinement in scientific routine.

Whether Sci-Fi conveys science-based imaginations or merely responds to some vague, "general" science fantasies remains controversial. However, science communicators should find that owing to Sci-Fi, there are two concepts to be implemented. First, using "snapshots of science" as raw materials of thought experiment has been successfully introduced to Sci-Art and not running the risk of shallowness. A certain number of Sci-Art work are produced by scientists, who appreciate aesthetic values implied in

[4] Soderqvist, Thomas, Adam Bencard, and Camilla Mordhorst. 2009. Between meaning culture and presence effects: contemporary biomedical objects as a challenge to museums. Studies In History and Philosophy of Science Part A 40, no. 4:431-438.

[5] Ibid.

science, or from collaborative art project with academia. Second, popular Sci-Fi producers appeal to audience with reflections on some social connections and emotions. This explains why Frankenstein-alikes never die on screen but evolve alongside progress in genetics and biotechnology. In the cases of Med-Art as shown below, it is also the connection between life experiences and the artwork that triggers emotional engagement with the displayed content. Whilst contemporary biomedicine increasingly seems to be a "buzz idea" that attracts popular science fans, one should keep in mind that the inter-subjective interactions might actually develop a long-term impact on the audience[6].

Recent studies show that computerised images displayed on traditional media have created potential routes to democratic science by engaging a wide range of groups[7]. Publicly accessible images provide room for re-contextualising and re-interpreting scientific information by a variety of audiences. Thus there enters inter-textuality of scientific images into the sight of communication studies and science studies[8]. Meanwhile, historical studies of science show that messages inscribed in image might pose higher independence from text in knowledge production, challenging traditional textualist view. Given their independence, can biomedical images on display go beyond the limitation to the end product of scientific investigation? Can they tell narratives about the dynamic process of knowledge production on the one hand, and on the other, induce re-interpretations by the audiences, leading to inter-subjective exchange?

In search of positive answers, I propose some discussions on communication role of biomedical artefacts on display, namely the role as *boundary object* amongst different arenas. One-on-one in-depth interviews with 1) curators of Med-Art, 2) biomedical practitioners, and 3) non-scientific professionals together suggest that Med-Art can elicit "implicit interactions" between the artefcts and different concerned groups. Interviews are Taiwan-based and benefiting from the fact that both digital Med-Art and science communication are in their infancy in Taiwan, leaving experiment on digital Med-Art as boundary object an untamed territory. The term "implicit interaction" is coined to refer to psychological, long-term effects of intersubjectivity between displayed artefacts and the audience. Such interaction is distinguished from physical interactions taking place immediately upon operating the artefacts. It is shown that intersubjectivity contributes to exchange not only between science and non-science, but also between esoteric and exoteric circles of particular science fields. Formation of esoteric and exoteric circles in biomedical sub-fields is a result of labour division, as well as disciplinary differentiation and fusion. Which attributes a web-like structure to decision-making process in contemporary technoscience, reshaping science communication to actions more than one-way flow of knowledge from science to non-science.

Present interviews suggest that audiences with diverse backgrounds possess autonomy of democratic attitudes towards biomedicine. The autonomy is obvious in Taiwan, where two-way science communication awaits development and the audiences did not encounter Med-Art with preconditions. As

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[6] For the hierarchical layers of social impact of science communication on the audience, as well as evaluation methods, see A. J. Friedman. (Ed.). 2008. Framework for Evaluating Impacts of Informal Science Education Projects [On-line]: National Science Foundation.

[7] Bernd Huppauf and Peter Weingart. 2007. Image in and of science. In Science Images and Popular Images of the Sciences, edited by Bernd Huppauf and Peter Weingart (New York: Routledge).

[8] L. Pauwels. 2006. A theoretical framework for accessing visual representational practices in knowlege building and science communication. In L.Pauwels (Ed.), Visual cutures of science (London: University Press of New England).

dialogues still happened through simply “seeing” digital Med-Art, I propose that it is possible for digital Med-Art to realise the spirit of web 2.0 by democratising biomedicine in, retrospectively, the latest stage of public understanding of science. Meanwhile, digital art may also be a solution to representing historical contingency in biomedical research.

Digitalised biomedicine, digitalised life

Digital technoscience have blurred the distinction between tangible and intangible in contemporary everyday life. In a wide range of life experiences, it does not require particular knowledge to interpret and acknowledge the “reality” conveyed by computer-aided representations: Visual memories of tangible things are consolidated in digital space. Such preserved memories seldom trigger doubts and serve as a basis of constructing our recognition of the past, whilst in this case, one thing could be considered as “material” in a pre-computer sense is the storage device. Through GPS one may believe that a street geographically remote does exist as shown on the screen. That is, one builds trust in the street's material existence grounding on seemingly non-material evidence. Meanwhile, the hidden architecture of everyday digital technologies remains black-boxed but simultaneously subject to public openness and not encrypted as science is. The black boxes do not obscure what is visibly comprehensible. Interpretations rather happen in an intuitive way than rely upon prior knowledge.

Contemporary biomedicine has also witnessed the blurred line between tangible and intangible. Routine practices in biomedical enterprise often involve operations at molecular or subtler level. Regarding history of science, computerisation of biomedical research can be seen as an extension of instrumentation that raises enquiries in scientific data as messages transferred – and transformed – via new media. Numerous literatures have thrown light on instrumentation in modern science, but how computerised instrumentation has situated contemporary biomedicine in the web of information communication is missing, except for science communication studies concerned about a broader range of sciences. Nowadays biomedical practitioners perceive their explored reality with technoscience that is more sophisticated than their home digital video, and facts extracted from the former merit higher power to change public worldview. However, in digital age, the way of generating, storing, and sharing scientific data does not fundamentally defer from the way employed by the world outside biomedical laboratory. When technoscience has re-shaped the form of collective memory of the public sphere, it has done the same to scientists whose collective memory is formed and preserved by their research programmes.

Nonetheless, unlike everyday visual technologies, there could be reluctance to open the black-boxed process of imaging and to publicly release knowledge that constitutes the interpretative framework of biomedical images. Reading and interpretation of biomedical images do not happen intuitively but on a more knowledge-driven basis. Usually, messages borne in biomedical images are not reaching the public sphere until translated and/ or reformatted. More importantly, images are presented in the public sphere as rather scientific results than process, rather fixed than fluid. Only scientists can retrieve meta-messages of biomedical images and designate meanings to them within laboratory walls. The dynamics of imagery in ongoing investigation is muted in non-expert circulation of scientific images. Even scientists might ignore the fact that unpublished meta-images are messages, being transferred,

reproduced, and interpreted from medium to medium[9], where images as epistemic objects would eventually be incorporated into a coherent system of explanation.

Asymmetry in access to the intermediate status of information between science and public is a norm in modern knowledge production. This resonates with asymmetries in assessment and reception of produced knowledge amongst social spheres. In the case of everyday visual technologies, one does not have to "conceive it right" before "perceiving it right", but he/ she would encounter difficulty in building conceptual and emotional connections with a PET (positron emission tomography) scan image of his/ her own body, if he/ she was not an insider. One could hardly find out "how they see through the body and locate the problem" but accept the scientifically-approved interpretations as unproblematic. Moreover, as mentioned above, black boxes in biomedical techniques exist at the interface not only between science and non-science but also amongst diverse biomedical subfields. To borrow languages from communication studies, when scientific images travel inter-contextually from medium (e. g. computer 1 in fMRI room) to medium (e. g. computer 2 at neuroscience laboratory), encoded messages are repeatedly decoded, interpreted and again encoded into another black box to be further transferred. This could be taken for granted by both scientists[10] and the public, albeit for different reasons.

To deal with the above asymmetries and neglected mechanisms of biomedical process, museums should give out narratives more than iconographic display of biomedical achievements. Let alone display instrument that the general audience – including the exoteric circle experts of a particular instrument – can by no means comprehend intuitively. Two-way communication must take place for the sake of actually situating contemporary, digitalised biomedicine in contemporary, digitalised life. New angles for understanding the practice and impact of biomedicine are to be inspired. A Med-Art curator pointed out during the interview, "The audience is not to be educated nor the terminal receiver of authorised knowledge."

Namely, the audience should be a source of interpretations of biomedicine *at work* and *in society*. The former calls for creative decoding and "re-encoding" messages of biomedical images, and the latter implies that the subjectivity of the audience – as individuals – is to be highlighted in museological arena.

Democratic biomedicine, unstable biomedicine

Highlighting the subjectivity of the audience, or intersubjectivity between the audience and the displayed artefacts, may be done either implicitly or explicitly. Interviews show that both ways are appealing to audience, as they reveal the possibilities that individuals are not merely objects of biomedical

[9] Interview with a professor of cellular and molecular biomedicine. Who brought up this fact to contrast the different attitudes towards "media" between pedagogy and biomedicine.

[10] Ibid; another two interviews with two physiologists who explore ischemia-reperfusion effects on rat intestines by fMRI. One of them is experienced in animal experiments and yet not feeling the need to get deeply-involved in fMRI imaging process. "They (the technicians) are the professionals." she said. "I only have some rough knowledge in the imaging technique." The other holds similar attitude and talked about her seeing ultrasound photographs of her baby in a hospital, "I entirely trusted the doctor as a professional. I might know a lot about my own project. But when it comes to ultrasound, he knows better about how to make and interpret the pictures – and comfort me with good results."

exploration but capable of having dialogues with the authority of biomedicine. For instances of explicit inter-subjectivity, it is noteworthy that in Taiwan, such appeal is significant: due to conventional belief in medical objects as symbolic of bad health, senior audience seldom appreciate display of body part images, medical device and so on. However, according to interviews, senior audience have shown strong interest in display of/ TV programming on Med-Art, including cadaver images (displayed vividly in plastic), animated intra-cellular physiology, "body farm" creations inspired by genetic recombination, as well as interactive game operated by a wheelchair equipped with digital device and wired to computer. To the elderly in Taiwan, a wheelchair is conventionally considered as a symbol of the underprivileged group and to be stayed away from. But at a Med-Art exhibition, local senior audience talked about the wheelchair game with each other like this: "this *video game* is so funny that you should come and try."[11] For another example, a retired science teacher, who had taken anti-depressants for a long period, responded to the curator that his anxiety about being "abnormal" was washed away by the idea that the boundary between "norm" and "abnormal" can be transcended.

Implicit inter-subjectivity engages the audience with less activeness. Despite the debates on McLuhan's spectrum of "hot" and "cool" media[12], I borrow the "cool media" definition and "light-through" metaphor to describe Med-Art that induces implicit idea exchange between the audience and the displayed artefacts. That is, it requires active engagement and imagination to project one's own life experiences onto the screen displaying a piece of Med-Art. Based on interviews, such projections and exchanges are obvious amongst audience who are often thought of "general experts". They are used to intellectual thinking and not reluctant to deal with high-tech concepts. Although the details of biomedical imaging seem to vague to them, they confidently leave the complicated technical details behind and associate information in the artefacts to their own experiences. Quoting from interviews, implicit inter-subjectivity took place when the audience encountered biomedical images that trigger "imaginations about how it was like when I was an embryo" or "contemporary instruments are actually media that represent specific perspectives for the 'truth' inside my oral cavity". A life science student, though familiar with anatomy of human brain, emotionally thought the CT (computerised tomography) scan image of a friend's brain of "amazing. *As seen on TV*". Another audience, who is also a Med-Art artist with life science background, addressed that Med-Art provides different ways of seeing and understanding science by extracting process and concepts from the seem-to-be unproblematic system of biomedical practice.

Amongst the potentials of Med-Art pointed out by present interviews, what is missing is exploration of historical fluidity in biomedicine. I suggest that such exploration cannot be restricted to introducing knowledge about frozen extractions of laboratory science. Instead, it can be inspired by preservation and display of process-based art, such as net-art. The reason to release biomedical process from merely "knowledge" is that, surprisingly, results from the interviews in some senses reverse a stereotyped manner of public understanding of science. The audiences have got engaged in their inter-subjective dialogues with biomedical concepts, without awaiting the flow of relevant knowledge from experts to their end. Implementation of "deficit model" or the idea "popularisation of science" might have

[11] Interview with the curator of the exhibition.

[12] Hamid van Koten. 2009. The digital image and the pleasure principle: the consumption of realism in the age ofsimulation. In Digital Visual Culture: Theory and Practice, edited by Anna Bentkowska-Kafel, Trish Cashen, and Hazel Gardiner (London: Intellect Books).

been a consequence of knowledge gradient in the past, but it seems not to equal the prerequisite to democratic science. Then, getting back to the topic on the challenges contemporary biomedicine brings onto museum, is the abovementioned spontaneous exchange all we need to respond to the challenges?

I would like to suggest that biomedical research process, as well as the developments, be definitely incorporated into museological narratives in Sci-Art format. These stories are science histories that the museums owe the audience, and the dynamic but not Whiggish narratives should be there to remind of that historical contingents still occur in contemporary context. Sci-Art or Med-Art is a creative way to 1) decode the information taken for granted in routine practice and 2) generate aesthetic and emotional responses to rational and objective science. A piece of Med-Art work can be a recombination of snapshots and fragments of the dynamic whole. It can be a vehicle for visualising ongoing research from non-insider's eye.

Experiments on displaying digital art have exemplify possible ways of collecting and displaying digitalised, microscopic biomedicine in artistic manner. Self-reflective representations of "digital art at work" did not spoil the allure of illusionary artwork but, to the contrary, enhanced the pleasure because sophisticated art skills are shown[13]. Meanwhile, it is addressed that net-art preservation could borrow some strategies from archaeological museums where fragments turn resembles of unstable, contingent activities[14]. To historians of science, it is not new to deal with science as human activity that interact with time and space. Scientific data and device act as rather transferable, epistemic objects in constructing explanations than documented remains of any closed questions. To scientists, instability also exists: documentation of data does not impede openness to future enquiries in present results. In the historical sense of scientific activity, it is always difficult to distinguish meta-data of particular research from the finalised version. Contingency should not be missing from museological narratives of science. When digitalisation offers approaches to capturing and re-contextualising biomedical data, and the real world is getting used to the blurring line between tangible and intangible, there seems to be no resistance to introduce digital Med-Art as an interdisciplinary solution in science museums.

[13] Ann-Sophie Lehmann. 2009. Invisible work: the representation of artistic practice in digital visual culture. In Digital Visual Culture: Theory and Practice, edited by Anna Bentkowska-Kafel, Trish Cashen, and Hazel Gardiner (Bristol: Intellect Books).

[14] Anne Laforet. 2009. Preservation of net art in museums. edited by Anna Bentkowska-Kafel, Trish Cashen, and Hazel Gardiner (Bristol: Intellect Books.)

Adam Bencard

Being molecular

Ken Arnold, Head of the Wellcome Collections, wrote a few years ago about the powers of medical history museums: "We feel medical history through its artifacts, not only, like everything else that has a third dimension, because that history tangibly engages another of our senses, but because many of those objects manage to reach inside us in a most discomforting way - often because they literally relate to our hidden inside." But one of the fundamental issues about putting biomedicine on display is that it often opens up a molecular interiority, which is confusing, abstract and ultimately extremely difficult to grasp, literally and figuratively.

In this presentation, I'd like to expand on the notion that the difficulties related to putting biomedicine on display is tied matters of scale and reference, and that this question of scale creates a need for a new conceptualization of the materiality of being. The hypothesis is that the communicative challenges posed by the modern biotechnologies lack of visibility and abstract nature are in part caused by these technologies lack of bodily reference. Where the objects from medical history used to point directly at the often very harsh treatment of the infected and suffering body, the new biomedical technologies do not reveal much of their use by their appearing due to their technological complexity and the sophisticated treatments procedure.

Man used to be 'the measure of all things', as Protagoras said, but the recent biomedical insight into "life itself" identifies, studies and manipulates nature on a level at which man's experience of his/ hers body seemingly is no longer a useful scale of reference. The change of scale from the molar – from the level of tissues and organs - to the molecular – the primal soup of proteins, enzymes and the host of molecules that make up life itself - has led to a loss of reference, which in turn makes the progress and possibilities of modern biomedicine opaque to us. The level on which modern biomedicine conceives of the body and acts upon it is seemingly immaterial, and thus our notions of materiality comes into question. The scale upon which biomedicine is based creates a potential rift between technological and scientific developments on the one hand and our lived experiences of the body on the other. This lack of bodily recognition with the biomedical body creates a distance towards biomedical objects.

The modern biomedical technologies are often invisible, abstract, diffuse, and complex, globally distributed, intangibles and non-visual. Or, more precisely, the materiality of the new

biotechnologies, their form and expression give no direct hint of what they are used for and how they work. This development is contrasted traditional historical medical instruments, where the objects visually and materially give clues to their use. As extensions of physical movement and scaled in relation to the human body, the lived bodily experience could directly be used as a way of understanding their former use and function. Traditional medical history has been told through its tools – the visceral reaction to a surgeon's knife or a cane for biting during surgery before anesthesia is immediate; the tool gives a glimpse of the forms of being associated with its use. But the biomedical industrial complex produces no objects that provoke such reactions; an MRI scanner might be an impressive looking piece of machinery, but it gives almost no sense of being other than perhaps a fleeting sense of claustrophobia.

Biomedicine engages with our bodies and selves on a level that is so far removed from what we have sensory accessibility to, as to be a completely different order of being. Its effects are felt and registered, be it the myriads of advances in biological psychiatry, molecular drugs or genetic therapy, but that which is affected in us is out of reach for any sensible appropriation of the world. The sheer gap between the level of our sensory appropriation of the world and the molecular level makes it exceedingly difficult to grasp any 'thingness' of the biomedical objects. We can show images of molecules or strands of DNA, but these images mean little to us as part of our lived, felt experience. They do not register as part of the world as we lived, and exits only as effects that trained experts have to explain to us is connected to this molecule or that chromosome. The handling of the biomedical object is often so complex that it involves a collective of subjects or a network of subjects and technological translations and processes that goes beyond the act of the individual.

The problem of the scale of biomedicine, then, and especially from the view of a public understanding and appropriation of medicine, is to make connections between the visual abstractions of a molecular world and the lived being of the modern individual. This is also the museological challenge for any museum institution wishing to engage with the biomedical reality – a reality that is increasingly becoming part of everyday clinical reality across the western world. How can we translate from the biomedical things (molecules) to the lived experience of molecular being?

What is needed, it seems to me, are philosophies about the material nature of the world that allows us to reconceptualize this new, molecular being. The disappearing of the object in biomedicine might seem like a good reason to abandon any debates of materiality, ontology, haptics, aesthetics and so forth, but in fact they simply sharpen the need for such debates – a fact highlighted by the steadily increasing body of work on materiality that is being produced in

the past five years or so. We are, it seems, at a moment in which questions about materiality and the relationship between human and world are being raised in new and urgent ways.

Asking 'what is an object and how do we relate to them?' is a question, that contains another question, namely 'who are we, and how do we relate to the world?' This is in part because any discussion of the physical qualities of objects is inherently a discussion of our tangled relationship to the world as such. The question of scale and biomedicine opens for new questions about our integration in the world and about the material constitution of human existence, a point Bruno Latour made recently: "Whereas at the time of ploughs we could only scratch the surface of the soil, we can now begin to fold ourselves into the molecular machinery of soil bacteria." (Bruno Latour, "It's development, stupid! or: How to Modernize Modernization"). We are, it seems, molecular beings through and through, and we need new philosophies that explore this materiality – and display practices that attempt to highlight it.

One possible philosophical tool in the attempt to explore molecular being is Deleuze and Guattaris concept of the body without organs. The body without organs is useful for the problem of molecular being for several reasons: First, it reconfigures the body as a thing as such. By describing a porous entity consisting of multiple levels of flows and fluxes, it approaches the scale-issue head on, claiming that we must actively embrace the molecular aspects of being, rather than the molar. Secondly, the notion of a body without organs that is a body not governed first and foremost by the logic of the organs, but rather by the fluctuations of molecular flows chimes well with our new fates as molecular beings. The body cannot be broken down into things that are different from one another, but is made from the same stuff in different configurations. Thirdly, the body without organs stresses connectivity across contexts, stressing flows that might as well move through molecular as through language. There are not any more 'correct' ways to allow the visitor to grapple with the issue of molecular being, what matters is only how the exhibit manages to resonate with the complex web that is the spectators sense of being.

The realization that the body is a molecular structure will only be accessible to the individual as a sense of being when that sense of being is reconfigured. As much as our senses are responsible for the ranges of our sensory appropriation of the world, we can still attune them to different channels and appropriate their inputs in different ways. Thus, if we think ourselves as a being that is not made up of a variety of different substances, but rather as a instantiation of a variation in a common substance, we experience our being differently – for the historian of medicine, this sort of reconfiguration of the sense of the body can be traced throughout the millennia, and each reconfiguration leads to new representations of modes of being. Today, most of us a hardwired to think of the body as a complex piece of anatomical machinery, a

conception that has a very specific history; but this conception is exactly what biomedicine is reconfiguring by engaging with life at the molecular level. A concept like the body without organs might possibly be a minute part of the verbalization of such a reconfiguration, whatever the status of its logical and conceptual coherency (other possible philosophical approaches to molecular being could be that of the so-called object-oriented ontology, promoted by Graham Harman and Levi Bryant. Jane Bennett's book Vibrant Matter is another example, as is recent works by Bruno Latour).

The question of scale transform into a question of being – and it seems to me that we, as museums of medical history – are potentially important players in the public engagement with the new molecular forms of being that biomedicine is producing all around us. We need exhibition practices that explore our existence as part of a material world (by showing science as a material, existential practice rather than an abstract knowledge production, for example). Putting molecular being on display means highlighting the common materiality of the world, expose a wider distribution of agency, and thus partake in a movement to reshape the self and its interests.

Danny Birchall

‘Medical London’, Flickr, and the photography of everyday medicine

The explosion of digital photography in the last ten years has had an enormous impact on the practice of taking pictures. Digital cameras have made possible the production of a vastly increased number of personal photographs while the internet has provided practically unbounded means of access and distribution through photo-sharing websites like Flickr.

In 2010 Wellcome Collection set up a Flickr pool on the theme of ‘Medical London’ as an extension of our existing off/online Medical London project. In itself, this is no innovation: as Romeo and Waterson have noted, the Flickr pool is “a well-established museum outreach genre”[1]. It is no accident that Flickr is the photo-sharing website of choice for cultural heritage institutions. Where Facebook situates photography in a social aspect and Google’s Picasa excels in desktop integration, Flickr, and Flickr users, emphasise the aesthetic content of photographs themselves.

However, outreach is usually as far as museums’ Flickr projects go. Success is frequently measured by quantitative criteria (participation, entries) rather than any critical or curatorial measure. Although Galani and Moschovi contend that “contemporary amateur photographs as generated and published through social media applications have increasingly captured the curatorial imagination”[2] this has so far mostly been limited to curators and exhibitors working in the area of photography itself. Though the “internet stew” of photo-sharing websites like Flickr may be exactly where “the museum’s curatorial function is sorely lacking” according to Fred Ritchin[3], few non-photographic museums seem to have considered in detail what they might take, examine or curate from Flickr itself.

If photography has become pervasive, medicine always has been: a constant part of our lives both personally and socially. Photography might also have a therapeutic aspect: preserving the moment of life forever, where medicine ultimately fails. The Medical London pool, offering a theme both concrete and open, offers an opportunity to see where photography and medicine intersect. It is sufficiently local to attract what might be a community; there are enough potential subjects to avoid

repetition. What follows is an attempt to use this pool to draw out some of the subjects, aesthetics and perspectives that might be of use to a medical museum in understanding and re-presenting everyday medicine. Six subject areas or possible approaches to the material are explored with examples.

In preparing this paper I've taken into account both the legal aspects of licensing on Flickr (only photos appropriately licensed or for which specific permission was given are included here: URLs for complete galleries are given alongside the pictures). I've also considered intentionality by only including images whose creators placed them in the pool, which suggests that they considered (however minimally) that the picture has a medical aspect, and can be understood by others in a medical context.

1. Objects

Through the Flickr pool we have access to images of objects which the museum does not possess. Pictures of hospital badges belonging to healthcare workers, medical instruments, charity boxes and large pieces of medical equipment have all been submitted to the pool. Where online we often consider a gallery of photographic images of objects to constitute meaningful access to our own collections, we might ask now whether it is possible to curate and present others' images of objects.

Tools, by David Edwards

flickr.com/photos/dhedwards/383835414

Queen Charlotte's Maternity Hospital, by Peter Maleczek

flickr.com/photos/backmanmal/3406961991

Don't worry it may never happen by Scott Keir

flickr.com/photos/protactinium/2460773841

Full objects gallery: flickr.com/photos/dannybirchall/galleries/72157624418132438

2. Location

Geospatial coordinates are an increasingly common property of photographs. Whether applied using Flickr's map tools, or added by a GPS-aware mobile device, many pictures in the Medical London pool include information about where they were taken. On the map below, each pink dot represents one of the images in the strip, plotted onto the place where it was taken. If embedded in a form accessible to a mobile device, the potential exists to turn the city itself into a museum of its own medical history: from every location we can access nearby significant buildings, objects and events.

Interactive map: www.flickr.com/groups/medicallondon/pool/map

3. Documenting surgery

David Edwards documented his own bunion surgery in February 2007. As podiatric surgeons worked on his foot, a student podiatrist took pictures using Edwards' camera. Here, the procedural becomes personal and while the foot remains the site of the operation, the subjectivity of the photography changes subtly: the pictures of the operation are authored by the patient.

Golden Foot, by David Edwards

flickr.com/photos/dhedwards/383835072

Suture, by David Edwards

flickr.com/photos/dhedwards/383837304

Drilling, by David Edwards

flickr.com/photos/dhedwards/383836668

Saw, by David Edwards

flickr.com/photos/dhedwards/383836236

To the bone, by David Edwards

flickr.com/photos/dhedwards/383836094

Screw, by David Edwards

flickr.com/photos/dhedwards/383836853

Full surgery gallery: flickr.com/photos/dannybirchall/galleries/72157624293420653

4. Protest

Medicine has a social dimension, and even socialised healthcare in Europe is not simply a static service in which medics provide care to patients. A restructuring of services can spark protests by both healthcare workers and the local community. Here, the Flickr pool helps to provide a record of the dynamics of a changing health service in London.

Whittington Hospital Protest, by Ruth Roxanne Board

flickr.com/photos/ruthroxanne/4472429753

Save our North Middlesex A&E! by Lynn Featherstone

flickr.com/photos/lynnefeatherstone/4157469687

Poly Clinic Is Not A Hospitial by Nina Jean

flickr.com/photos/nicasaurusrex/2313980668

Save Our NHS Demonstration by James M Thorne

flickr.com/photos/james_2005/285832459

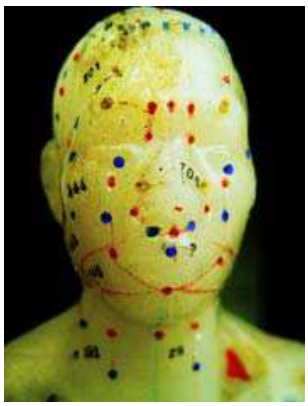
Save Our NHS Demonstration by James M Thorne

flickr.com/photos/james_2005/285831842

Full protest gallery: flickr.com/photos/dannybirchall/galleries/72157624293452317

5. Other cures

Living in a multicultural city reminds us that 'Western Medicine' is no longer a primarily geographical category. The evidence of Chinese medicine, herbalism, homeopathy and other cures is everywhere in street photography, sometimes deliberately, sometimes accidentally. The 'health food' store is a sight as common as a pharmacy; while all cures might not be equal or even reputable, they all form a part of a medical landscape.



Pinhead, by Simon Crubellier

flickr.com/photos/simoncrubellier/2403586689

Chinese Herbal Medicine, Mare Street E8, by Emily Webber

flickr.com/photos/emilywebber/3911871794

I thought it would be smaller, by Leighton Pritchard

flickr.com/photos/widdowquinn/3496406879

Full other cures gallery: flickr.com/photos/dannybirchall/galleries/72157624293477707

6. A new aesthetic: the empty hospital

The image of the hospital's interior is familiar: wide corridors interrupted by fire doors; staff in uniform, patients in gowns and visitors in everyday dress; trolleys and other medical equipment. In the Flickr pool, through a combination of artists, healthcare workers, and 'urban explorers' investigating abandoned buildings, we unexpectedly discover a new aesthetic. The hospital, its spacious areas now bare, takes on an eerie feeling, like an empty diorama.

Newham General Hospital by Matthew Coleman

flickr.com/photos/suburbanslice/2621617457

Entrance to the German Hospital 1988, by Chris Dorley-Brown

flickr.com/photos/chrisdb1/3400055544

Corridor, by Robert Priseman

flickr.com/photos/robertpriseman/4258405503

Into Light by Adam Slater

flickr.com/photos/slaterspeed/4344760120

Percival Pott ward, empty by David Edwards

flickr.com/photos/dhedwards/4521832758

Springfield Hospital, Corridor by Kent-Urbex

flickr.com/photos/kent-urbex/4489261077

Full empty hospitals gallery: flickr.com/photos/dannybirchall/galleries/72157624293406621

Having seen its variety and considered its content, we might usefully ask in what ways the Medical London Flickr pool materially differs from a traditional photographic archive. Firstly, it is ongoing and open, offering a wide variety of subjects and modes, and few restrictions on submissions. Secondly, it is multiply authored, by both amateur and professional photographers. Thirdly, it can be collaboratively curated: galleries selected from it like the ones above can be made by anyone. Lastly, linked only by a strong but mutable idea, 'Medical London' photographs are open to constant reinterpretation by the photographers, the museum and others. As a nascent community it has yet to (and may never) develop any shared senses of photographic priorities. But the most important aspect of the pool is its capacity to offer us surprises: to see new subjects, aesthetics and understandings in what is offered to us.

If we wish to re-present these surprises to our audiences, how might we integrate the medical Flickr pool into the medical museum itself? In one way we already have, simply by connecting its online content to our existing presence: we are already used to museum exhibitions and projects having many limbs. If we wished to physically integrate these images into the museum, we might install a screen that dynamically highlights recent additions to the pool, as the Denver Art Museum does[4]. Or we might display the winners of a competition hosted by Flickr and integrate comments from Flickr into gallery interpretations, as the National Maritime Museum has[5].

Flickr has already proved to be highly effective at attracting audience engagement with the subject matter and collections of the museum. The curatorial question for museums now is how to engage with what audiences have produced. For a medical museum in particular, the challenge is how to find

fresh perspectives from the mass of available material that we could loosely describe as ‘everyday medicine’. The ultimate result, however, will not be something that the museum has acquired, but rather something that it has fostered and shared.

Websites

www.flickr.com/groups/medicallondon

www.medicallondon.org

www.wellcomecollection.org

Acknowledgements

I would like to thank all the individually credited Flickr users for permission to use their photos in this paper, whether granted personally or through the use of Creative Commons licences.

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2 Galani, Areti and Moschovi, Alexandra (2010) ‘Trans/forming Museum Narratives: The Accommodation of "Photography 2.0" in Contemporary Exhibitions’ in Transforming Culture in the Digital Age International Conference 2010: Proceedings. Consulted July 12, 2010. http://dspace.utlib.ee/dspace/handle/10062/14768

3 Ritchin, Fred. *After Photography*. W. W. Norton & Co., 2008. p 115

4 ‘Progressive photography policy’, photograph on Flickr flickr.com/dannybirchall/4539113403

5 Romeo, F. and N. Waterson, 2010

Silvia Casini

Curating the Biomedical Archive-fever

One of my current research interests regards art-science cross-fertilizations and, more specifically, the use of brain imaging techniques in contemporary art practices. Scholarly literature has already pointed out how brain scans have contributed to redefine our cultural and biomedical identity (Dumit 2004; Vidal 2009). In my presentation I shall put forth - in a rather sketchy way - some reflections on the concepts of archive and presence related to brain scans and, more in general, to bioart, also showing some images and video extras from my curatorial work.

My doctoral research project examined the aesthetics of Magnetic Resonance Imaging (MRI), a scientific technique that generates images of the body (and particularly, the brain) for scientific and medical purposes. By using a variety of approaches and materials (artworks, exhibitions, scientific experiments, interviews with artists) I attempted to develop new methods and contexts relevant to the processes by which MRI is resituated in gallery spaces and cinematic environments. The methodology adopted is that of a cinematic montage where images are edited together and one against the other. I worked again and again with the same material (the brain scans I obtained in two different MRI examinations I underwent) with the goal of setting it in motion from one archive (the scientific laboratory) to the next (the editing suite) to end up with the art exhibition of MRI-based artworks by the Breton sculptor Marc Didou.[15] I became artist, video-maker, and then curator, adopting Andrea Fraser's strategy of changing role within the museum and art world (Fraser, 2005).

For the purpose of this workshop, I would like to focus on two concepts, the ARCHIVE and PRESENCE that are central to brain scans and their display in a museum or a gallery. I believe that these two concepts are of fundamental importance also when dealing with bioart.

5. First, the archive (and the museum as archive) needs to be re-thought as an impulse, as a biological passing condition which happens in our body, rather than as a physical place where things are

[15] Casini, Silvia. 2008. 'Magnetic Attractions: Sculpture, Magnetic Resonance Imaging and Cinema'. In *Marc Didou*. Exhibition Catalogue. 23 pages with colour plates. Publisher: The Naughton Gallery at Queen's, Belfast. The video of the exhibition is available at http://www.youtube.com/watch?v=f2P7M7jiz74. The display of Eco, one of Marc Didou's sculptures selected for the exhibition, had a controversial impact as I explain in a short paper available here: http://www.recirca.com/cgi-bin/mysql/show_item.cgi?post_id=5026&type=articles&ps=publish.

stored. How does the concept of the archive and that of the archive-fever operate in contemporary curatorial practices dealing with brain imaging techniques?

6. Second, to present a thing, to have something present here and now within a collection is the dream of any archive and also one important feature of art dealing with biomedicine. Many biomedical "objects", in fact, resist depiction (some of them can hardly be seen) and, therefore, display and presence too. Bioart or art that deals with biomedicine does not want to depict, portray or represent life, it wants to be life itself. The question of presence calls for the body present 'here and now'. Although often obliged to recur to ex-post documentation (mainly through video or photography), artists working in bioart want to stage biological processes that are perceived as "living". This is also the case with artists working brain imaging techniques. One of the problems of brain imaging techniques is to loose touch with the object it investigates (the cognitive processes of the brain).

THE ARCHIVE

The archive exists in two forms: firstly, as a physical space where artefacts and materials are collected and displayed according to certain criteria/rules in order to be accessible by visitors and users. Secondly, the archive poses the terms of discourse within a specific space, time and cultural location: it is 'the system that governs the appearance of statements' (Foucault, 1976: 129). Among the institutional articulations of power and knowledge relations, there are the institutions of the museum and art history (Bennett, 2005). In the archive objects are organised, divided and classified according to 'grids of knowledge', that is, according to the position they occupy in the space and in relation to the agents present in those spaces (for instance dealers, curators, artists).

The concept of archive, however, exists first as a drive, as an energy operating within those same places (Derrida, 1997). Whether intended as a physical space or as an ensemble of rules, the archive is characterised not by the set of things collected within it, but rather by the things left out or still to be archived. The link between loss, absence and archive is highlighted by Derrida's notion of 'archive-fever'.[16]

[16] There are a number of films which managed to visually represent the archive-fever related to the museum. Resnais, Alain *Toute la mémoire du monde*. France (1956); Resnais, Alain and Marker, Chris *Les statues meurent aussi*. France (1953); Sughrue, John and Madden, Paul *The Louvre: a Golden Prison*. USA (1964).

The archive is like a living organism which can suffer from an illness or weakness, and consequently, needs to find measures to protect itself against the aggression of external agents. As madness is sometimes necessary in order to be able to cope with unbearable events, fever is a mechanism adopted by the organism in order to preserve healthiness.

The archive escapes a panoptical seeing. A fixed spatial and temporal point of view from which one can get hold of the archive is impossible or, better, it is possible only from the outside, if one stays out of the archive. Once entered, the archive becomes a labyrinth threatened by its own components and by time. Similarly, MRI is threatened independently from the archive in which it is stored. In the laboratory, MRI is threatened by contingencies which have to do with time: the bodies of the patient/experimental subject in need to be kept still; the parameters used to set up the MRI scanner; the time-lapse which does not allow a perfect translation of the inner processes into outside readable data.

PRESENCE

The desire for instantaneous presence and an archival aspiration characterise modern and postmodern technologies of representation (photography, chronophotography, television, digital imaging and also medical imaging techniques). The struggle for instantaneity is in tension with the archival historicizing impulse. In the modern era the obsession with instantaneity, with movement, with the metaphor of 'flux and flow', cohabits with the desire of archiving presence. But what can be archived immediately looses its presence (the present), entering the past and exhibiting absence.

As Mary Ann Doane argues: "The fascination with an impossible instantaneity is still with us, perhaps even more insistently, corroborated by a continuing chain of new technologies of representation that seem to put instantaneity more fully within our grasp" (2002: p. 106). This is the contradiction at work in bioart too: the impossible dream of giving museum visitors a direct, immediate encounter with the 'here and now' of the living. Brain imaging techniques are deeply concerned with the problematic of the archivability of time, with the temporal resolution of the scans.[17]

The concept of the archive as a living organism offers the possibility to think about the body undergoing an MRI as an archive of sensations, facts, impressions. In this respect, artists understood that

[17] Through brain imaging techniques such as fMRI scientists have shown that the brain of a subject activates even in the absence of a physical stimulus but only in the presence of the memory of it, or of the imaging of it, or of the viewing of it in another subject (Rose, 2005: 273).

what is really at stake with brain imaging techniques is not so much the fact that the images produced are the results of a complex manipulation of data thanks to computer software, but rather the fact that brain scans present and, simultaneously, efface the body they imagine. Brain scans are not copies of the internal processes of the brain, but rather their *emanation*. Neuro-based art, then, does not so much depends on information technologies, but rather on the disciplines of the living, biology, genetics, neurobiology. Brain scans and bioart, more generally, intrigue the general public by seek to challenge the relations between the artist, her display, the recipient and the socio-economic context in which this art intervenes.

THE CURATORIAL WORK

The video created after the two examinations, *265 Looping Snapshots*, muses on the experience of undergoing an MRI as a voluntary experimental subject.[18] It is not designed as an informative guide on MRI, nor does it stand on its own, rather it should be kept open and constantly reworked through. The video seeks to explore the way MRI images function once lined up in the editing suite. It focuses on the role played by MRI sound, on notions of surveillance, on memories triggered by the repetition of a simple movement like 'raise your hand'.

The body in the video is geometrised, projected in a slide-show format, and even cut-up through framing. The eyes, the hand, the fingers, all parts that the brain scan did not image, appear in the video. These organs are frozen in gestures by framing and filmed in close-up, so that each of these gestures (the blink of the eye, the raising of a finger, the movement of a wrist) becomes visible. Framed as if they were not belonging to a body, turned into close-ups like faces, these gestures (like MRI images) recall the poses of Muybridge's photographic sequences, where the duration of an action is arrested into discrete instants and, thus, rendered measurable. But what do these poses express? The poses are haunted, again, by what has been left-out of the laboratory, that is, the body of the experimental subject which remains to be photographed, resisting and insisting on the margins of the MRI image. In Marc Didou's exhibition too, the body appears again: thanks to the curved mirror viewers walk through the sculpture backwards, facing what might have been its starting point: the physical body of the artist.

My curatorial attempt which was not limited to the actual setting up of the exhibition, but started already within the scientific laboratory, was to constantly re-configure the existing material (brain scans), creating new patterns, associations, oppositions. To change role, passing from being an experimental

[18] Casini, Silvia. 2008. *265 Looping Snapshots* (9 min.). DVD enclosed in *The Journal of Media Practice*. Vol. 9:3.

subject within the lab, through being a video-maker at the editing suite, to re-work this material into the exhibition I curated, helped me to highlight the fluidity of each archive, to observe how in the passing the objects to be archived (the brain scans) were constantly transformed.

In this respect, the model is that of the collage-montage experiments undertaken by avant-garde movements of the 1920s (Cubism, Constructivism, Surrealism, Dada) in art, film and photography: "this manner of presentation was a way of thinking whereby linearity, causation, consequence and transparency were displaced by the vagaries of the multi-directional and by mechanisms of memory, dream, association, the unconscious, serialisation, repetition, simultaneity, lack of finish and conclusiveness and a confounding of the logical by the poetic" (Rohdie, 2008)[19]. The collage-montage principle along with the shift in roles obliges the curator to revise former categories, classifications, pathways such that no work or object or text had an immutable and definite place.

Despite the importance of contemporary reflections on distributed curatorial expertise and participatory museums to envisage a new model for museums (Museum 2.0), I believe that we need to set these "new" models back into the avant-garde practices of the last century (in particular, the 1920s that have inspired also artists and filmmakers of the successive decades). This period might still offer us the conceptual apparatus for re-thinking curatorship and exhibiting practices, despite we as curators still do not have - luckily - a ready-to-use road-map capable of driving us along the way. To seek refuge in past artistic practices, as I am doing here, can be a sign of a condition (the archive-fever, again) experienced by curators who are increasingly challenged by tecnoscientific objects - think for example about genetics, about the use of nanotechnologies in organisms, etc. – that cannot be easily archived.

[19] The collage-montage principle applied to museums is explored also more recently by Godard and Miéville in their *The Old Place – Some Notes Regarding the Arts at the Fall of the Twentieth Century.* Franc-USA (1998), a film commissioned by MoMa where the authors expose the dialectics between distant and close shared by stars and images. Stars are close to one another in constellations although they depart one from the other driven by laws of physics. Similarly, disparate thoughts come together to form images. It is in the gaps, in the interstices between two images, two thoughts, two shots that connections can nurture. For instance, in a sequence of the film, Monet (art) is brought close to poppies (nature), to a song from war (politics and history), to refugees striving to make a living on the fringes, to the image and the noise of a motorway (the landscape of modernity). See http://dailymotion.virgilio.it/video/xd3s1k_the-old-place-extrait_shortfilms.

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Judy M. Chelnik

The Challenges of Collecting Contemporary Medical Science and Technology at the Smithsonian Institution_

The Smithsonian Institution's National Museum of American History is tasked with collecting the history of medicine and in particular the medical heritage of the United States. Yet, the increasingly fast paced world of current medical technology provides museums with a variety of challenging dilemmas.

Compared to steel blades and ivory handled surgical instruments of centuries past, contemporary medical science and technology is often perceived as a series of "large black boxes"; not very compelling and difficult to explain to museum visitors. As technology becomes larger and sometimes smaller, the never ending quest to find space to store new acquisitions and how to exhibit nano particles are ongoing issues.

Whether a medical museum is part of a university like the Medical Museum here at the University of Copenhagen, a collection within a larger museum complex such as the Smithsonian's National Museum of American History, or a stand-alone museum such as Museum Boerhaave in Leiden, we all share the same concerns and issues about collecting contemporary medical science and technology.

A cursory look at the literature of collecting for museums reveals a fair amount has been written on the subject. It is however frustrating that most of the essays and monographs focus almost exclusively on the collecting philosophies within the disciplines of the decorative arts or natural history. Only occasionally are medical and technological artifacts specifically discussed. Over the years medical history curators have created a vocabulary and nomenclature to with the disciplines own unique requirements and terminology.

We are also confronted with an interesting collecting juxtaposition. Much of the big bulky diagnostic and gene altering equipment of the late twentieth century has been created to manipulate some of the smallest known particles and turn them in to life saving therapies. Large artifacts take up space and nano-medicine is just on the threshold of becoming reality. Aside from following the latest scientific news releases we are left to guess which medical breakthroughs will change the direction of medicine and alter future technologies which may or may not become standard treatments. As we acquire new artifacts how do we know what we are collecting today will be historically significant ten or twenty years from now?

This presentation begins by discussing some of the collecting issues all medical museums are confronted with as we head further into the twenty-first century. Next will be a review of some the collecting techniques we have found useful at the Smithsonian and, finally I will argue that there are many compelling contemporary collecting opportunities and not all of them are black boxes.

Collecting challenges:

* Experimental equipment seldom is saved for posterity, more often than not it is thrown away or it is cannibalized for the next prototype. One of the great loses to medical history is John Gibbon's original heart lung-machine. Gibbons and his team dismantled the original to make another heart-lung machine. Recently I spoke with Dr. William DeVries, the heart surgeon who implanted the first permanent artificial heart. DeVries confessed in the aftermath of the emotionally charged and physically grueling 112 days of Barney Clark's, he burned the diary he had been keeping of Clark's life as the first human to receive a total artificial heart, the surgical team and the media circus surrounding the entire event. While the circumstances were different both acts were deliberate and the outcome is the loss of significant moments in the history of cardiology. Inventors simply do not always think to save prototypes or documentation which might demonstrate the development or the thought process behind the invention. Perhaps even more disconcerting is the disinterest among some in the medical community to their own history.

* The advent of disposable medical equipment in the 1960's and 1970's made from flimsy material, pharmaceuticals with precise expiration dates, paper examination gowns that do not hold up through an entire examination volumes about the state of medicine, the economy, the environment and society in the United States during this period of time. Use something once such as a syringe and the object gets throw away. There is a vast difference between your Great Grandmother' ceramic bedpan and the blue plastic one-patient disposable kind found in today's hospitals.

* Inherent vices, the deterioration of material due to the instability of the very materials an object is made from; materials the medical world depends on for any number of reasons, such as plastic and rubber, cause innumerable conservation problems.

Ordinary and not so ordinary medical equipment such as cannula, hearing aids, eyeglasses or the transport carrier of David the Bubble Boy are doomed from the moment of their creation. Isolating these objects in a sterile temperature and humidity controlled environment which may or may not preserve them is beyond impractical. Plastics and rubber either become sticky, develop a white-powder substance or become brittle and harden into fossils. Should we be collecting objects which have such a short shelf life? Should we collect artifacts which are in such bad shape it would take thousands of dollars to make them ready for exhibition? What is the cost to the other objects in the collection?

* Collecting from corporations and living donors present different challenges and difficulties when trying to collect contemporary medical science and technology. Differences between the goals and expectations of the donor and those of the can and often do create conflicts of interest. The exhibition of a single object from a major corporation is often construed as nothing short of free advertising for the company. The donor may want to put restrictions on the gift or see the donation as an opportunity to participate in the intellectual content of the exhibition. Most donor's

corporations or individuals are thrilled to have their objects accepted for donation. Yet there are those who want to dictate the terms of the loan and how its history is recorded.

* One of the most common issues museums confront when collecting contemporary medical technology is the black box syndrome. The standard complaint for several decades now has been that the black box with its ubiquitous, square-shaped, nondescript switches, wires, plastic, circuitry and micro chips are difficult to interpret and esthetically unappealing to the casual museum visitor. Indeed, this is often the case. Our challenge is to find ways in which to make these devices more interesting. Perhaps the answer lies in the way we collect artifacts.

Then there is the dilemma of size which in fact is hardly a new issue, but perhaps one of the greatest obstacles we face. The search for more space to store objects is constant. We never seem to have enough space for our collections or the expansion of collections.

As we are all aware prototypes tend to start out life larger than its progeny. Electrocardiograms are a classic example of medical instrumentation shrinking in size over successive decades. A contemporary example is the blood cell separator used for the separation of human blood cells from patients to donors. The Smithsonian has several examples of cell separators which document the evolution from the first commercial unit built in 1969, to the machine used in the first gene therapy experiment and subsequently to a small blue enameled steel tabletop model manufactured in 1973 the Fenwal Company by the American Instrument Division of Baxter-Travenol.

Even if all museums had ample space, the funds to properly take care of objects are most likely not available. Building new storage facilities or renting warehouse space is extremely costly. We have to ask ourselves, why are we collecting this particular object, and is it worth collecting?

Collecting Experiences:

So how do make the most responsible collecting decisions? Within a museum setting collecting artifacts is an evolving process where collecting philosophies can change as well as its mission to

reflect contemporary goals. This was the case in 1981, when the National Museum of History and Technology changed its name to the National Museum of American History. The focus of the museum became cultural rather than technological. The Division of Medicine also changed its focus to concentrate almost exclusively on the history of American medicine.

During this same period the medical collections began to change the way it acquired artifacts from the wholesale collecting of everything that came its way to greater selectivity and more thoughtful collecting practices. This is clearly reflected in two different decades separated by twenty years. In the ten year period between 1980 and 1989, the medical collections acquired approximately 57 acquisitions per year. In contrast, only 20 acquisitions per year were acquired between the years 2000 to 2009. Not surprisingly, these figures directly correlate to the acquisition activity of the NMAH during the same two periods.

We acquire artifacts in a variety of ways; the most common being passive collecting. The majority of artifacts find their way into the collections when donors make contact with the museum usually through a telephone call or email. There are those occasions when artifacts are actively sought out for an exhibition or a specific collecting initiative. Yet, another avenue for collecting comes from thoughtful colleagues who have donated various items including trifocal lenses, an artificial hip, wigs, dentures, a knee brace and this custom made plastic helmet for infants who have developed palgiocepaly (misshapen head) while sleeping on their backs.

Collaboration: Ways to go about collecting: Small Beginnings / Project Bionics

There are collecting initiatives which require more thought and a great deal more work on the part of the curator. The following examples are a collecting model which is more structured and has proven to be very successful and enormously satisfying.

This first example is a small finite collection of artifacts which are not terribly glamorous but an important component of medical history in the past thirty years. In 2006, a cross-unit museum team traveled to Southern California to document the inventions of Sharon Rogone, a determined

neonatal nurse turned inventor and entrepreneur whose company Small Beginnings was created to fill a special niche for the hospitals tiniest patients.

The team of three included a historian of medicine, an archivist and a historian of invention whose goal was to collect artifacts and archival material related to Rogone's company. Founded in 1998, Small Beginnings manufactures phototherapy masks, drainage tubes and pacifiers for premature infants. Our goal was to collect and document the artifacts of a woman inventor, her struggles with the invention and patenting processes through production and distribution. In addition we were able to collect contracts with distributors, product advertisement, patent and trademark files. Lastly we conducted oral interviews with Ragone and two of her partners trying to capture the invention process and the culture of the NICU.

PROJECT BIONICS:

The second example is Project Bionics. Established in 1998, Project Bionics, was a collaborative venture comprised of three disparate organizations, the Smithsonian's Division of Medicine and Science, the Division of History of the National Library of Medicine and the American Society of Artificial Internal Organs which came together to preserve the history of artificial organs. The collaboration brought together an interesting group of stake holders, historians, archivists, physicians, engineers and scientists whose goal was to collect and preserve the history of artificial organs and their documentation.

Since its beginning Project Bionics has acquired some of the most significant artifacts and archival material documenting the history of artificial organs. The artifacts include artificial hearts and assist devices, kidneys, heart-lung machines, and a prototype artificial lung. The documents most of which reside in the Archives of the National Library of Medicine include documents and interviews pioneer inventors, surgeons and scientists including Willim Kolff, Adrian Kantrowitz, Robert Jarvik, Clarence Dennis, John Watson and most recently William DeVries.

We conscientiously strove to capture as many aspects of the artificial organ program in the United States to including invention, surgery manufacturing as well as the impact of the sensational procedure as it relates to the patients.

Additionally Project Bionics published a listing of artificial organ collections housed in museums in the United States, Europe and Japan. Besides the limited bound edition the list can be found online at the History Division of the National Library of Medicine.

Conclusion:

The types of artifacts we collect and the way in which we collect has indeed changed but one constant theme has prevailed, collecting contemporary medical technology is not new to the Smithsonian Institution. From its inception more than 100 years ago, the curators of the Medical Collections have actively sought out and collected cutting edge medicine.

The National Museum of American History chooses to collect the history of medicine and in particular America's medical heritage, however, we cannot collect everything nor is it necessary we do so. As collecting policies have changed curators have become more discerning in what we acquire. The medical collection does not need one of everything. Nor is it necessary acquire everything that is offered for donation. Gone are the days of acquiring entire collections acquired by a single individual which may possibly show historical chronology but often lacks historical and intellectual content. It is far more important to selectively acquire objects which document the historical significance of medical technology. Large black boxes cannot simply be ignored. It could be argued that Claude Beck's prototype defibrillator, a wooden box with a simple on–off light switch is the 1947 version of the black box. Who is to say that the objects we consider today to be black boxes may one day in fact be the curiosities of the future.

Our challenge lies in thinking creatively about what it is we are collecting and to find complimentary artifacts to enhance the black box which seems to have stifled curators. If an artifact is historically important and therefore worth collecting, no matter how esthetically unpleasing we as museum professionals should make every effort to find a way for that artifact to be preserved.

Roger Cooter & Claudia Stein

Visual Things and Universal Meanings: Aids Posters, the Politics of Globalization, and History

Among striking developments in history writing towards the end of the twentieth century were the moves to the spatial and the visual in the re-construction of historical consciousness. 'Global history', accelerated through American hype on 'globalization', and 'visual culture studies' propelled by society's increasing reliance on visual communications, became fashionable projects. 'Global history,' grounded in contemporary economics and pitched in part in reaction to Western parochialism, came seriously to challenge nationalistic and structuralist approaches to history. At the same time, the 'pictorial turn', with its epistemological claim for vision as the prime sense in knowledge production, came to defy not only conventional history of art, but the status and value of the discipline of history itself. Wrestling with these turns proved enormously productive. In the history of medicine it led to foregrounding disease in its global dimension, revivifying, at the same time as challenging, older narratives on the 'world wide' spread of disease. In the history of science it led to heightened attention to visual representations in struggles over the production of scientific knowledge and authority. Both turnings did more than merely provide historians with exciting new conceptual frameworks for comprehending the past. As illustrated through the contemporaneous growth of a literature on the history of material objects in all their global distribution, they also helped broaden the range of objects deemed worthy of historical attention.

This paper [which we can only abstract here] draws on these moves in relation to one particular material object both 'global' and visual: the Aids poster. The worldwide production of these objects from the mid-1980s hugely reinvigorated the whole genre of the health poster. Indeed, according to one expert, Aids posters restored the poster genre as a whole to its original function as a communications medium. Certainly, as never before was so much money, aesthetic effort, and psychological marketing put into this particular media on the part of voluntary bodies, national governments, and international health agencies. Our concern, however, is with the wider conceptual frameworks that were mobilized to make these objects meaningful. In the 1980s and 1990s, as we have outlined elsewhere [*Medizinhistorisches Journal*, 42, 2007], a cohort of Western intellectuals concerned themselves with them along with other representations of Aids in order to talk about the politics of identity. Those concerns, in turn, were linked to broader ones emerging at the time over the rights of citizens to equal access to health care, the privatization of medicine, and the role of the international pharmaceutical industry in the commercialization of health care. In this paper we focus on another aspect of these ephemeral mass-produced objects: not their 'active life' on the streets and in the corridors of learning, but their 'afterlife' when they were turned into items to be collected, exchanged, and stored in museums and archives. It is well known that the social life of material objects in such places is not the same as that of their initial culture of production, circulation, and consumption. Museums and archives, like other depositories for images and artifacts, have particular collecting agendas and particular institutional and intellectual traditions into which new acquisitions are fitted. They also inhabit the present, embracing wider conceptual contexts that serve further to shape the organization and meaning of their artifacts.

Here, we explore one such 'afterlife' for Aids posters: an exhibition entitled 'Against Aids: Posters from Around the World', which was held at the *Museum für Kunst und Gewerbe* in Hamburg (hereafter *MKG-H*) between February and April 2006 – a museum hosting one of Germany's largest and most prestigious poster collections. We do not seek to make causal claims for the 'importance' or 'impact' of the exhibition; our interest in it is, rather, as an illustration of the more general trend towards the 'global' rearrangement of material in museums by the twenty-first century. The *MKG-H* was founded in 1877 by Justus Brinkmann in a spirit of aesthetic modernism and German nationalism. It was intended as a place to celebrate 'the people's' arts and crafts, much like the South Kensington Museum in London, which was established in 1852 and renamed the Victoria and Albert Museum in 1899 at the height of British jingoism. As at the *MKG-H,* so at the Victoria and Albert Museum over the past few decades, objects have been reorganized for exhibitions accenting 'the global'.

The representation of Aids posters at the Hamburg exhibition provides us with a means to discuss the politics of such 'global assemblages.' On the one hand, it permits us to draw out the inherent contradictions and tensions that can be involved in any such institutional mobilization of the concept of 'the unity of the globe'. On the other, it allows us to underline important continuities hidden under the more apparent or insisted upon 'discontinuities' between national and global discourses, and between modern and postmodern politics of aesthetics – continuities rooted, we argue, in *shared* aesthetics values. As important, the example permits us to reflect on how the discourse of the global affects the work of historians using material objects in their constructions of historical consciousness. As these aims and objectives should suggest, we are not concerned here with how viewers might have responded to the images or to the exhibition as a whole (an almost impossible task in any case given the uniqueness of individual psychology and experience). Nor are we interested in providing a walk-through critique of the exhibition; our main interest is in the historical context of the Museum and how this bears on the politics of aesthetics implicated in its exhibition of Aids posters.

The Hamburg Exhibition

'Against Aids: Posters from Around the World' was a modest, low-budget affair. Primarily, it was staged in order to exploit the Museum's recent acquisition of over 1000 Aids posters from a private dealer, a purchase that enabled it to join the club of institutions harboring such collections. […] It was through the display of these posters in particular that the exhibition sought to exemplify regional variety and similarities in aesthetic styles. […] How people interacted with Aids posters during the images' 'active life' on the streets (on buses, billboards, underground trains, and so on), and how the power and fear of Aids operated in relation to identity were not a part of the Hamburg show. Through the literal framing of the posters, their hanging according to the conventions of art galleries, their arrangement, and the choice of them in terms of the quality of their visual language (Bildersprache), the organizers denuded them of the local contexts in which they were created and in which they were engaged with politically, intellectually, and emotionally. […] At local, national, and transnational levels 'Against Aids: Posters from Around the World' can be seen to have effaced the individual history of the objects on display through a particular universalizing and seemingly neutral kind of aestheticization. At a closer look, however, it both appropriated them into an old script (a local and fondly-held modernist epistemology of viewing and aesthetics) and a new one -- globalization. By collapsing two decades of national histories into a singular and would-be unified world fight against Aids, the history of Aids was visually construed in terms of this new global subjectivity. Not only were particular constructions of the recent past left out (the local

struggles around these objects) but, so too, the construction of the present (the global media industry's selling of itself through the attack on Aids as a 'global problem'). Thereby, 'globalization' was not only made 'real' or made 'true' through aesthetic representation of an ostensibly international struggle against Aids, but by this same conceit was both medically re-appropriated and humanized – no matter that over the meaning of 'globalization' there has been little agreement, let alone consensus on it as a 'good thing.' […]

Conclusion

Our concern in this paper has been with a particular moment in the history of Aids posters: not that of their initial 'public' life on the streets, or in pubs and gay clubs, doctors offices, and so on, but their 'afterlife' in places where they might be displayed or stored. Through the analysis of an exhibition at one such afterlife location our intention has not been that of negative dismissal, nor critique for the sake of it. Nor has it been merely to expose how these often strikingly visual objects aimed at protecting individual health had their meaning changed through appropriation into a conceptual framework different from that of their initial contexts of production and consumption. More interesting to us are the intrinsic and unremitting links between these visual objects and wider politics, or how the visual is inherently a part of the latter.

While it might have been supposed that Aids posters came to political rest once they were retired, categorized, catalogued and stored according to the principles of collecting institutions, the Hamburg exhibition proves otherwise. In fact, as collector's items they entered a space that was no less political than when they were on the streets in the 1980s and 1990s, and when they were appropriated to Western discourses on postmodern identity and on the role of the visual in the cultural negotiation of the self. It could hardly be otherwise, for simply by entering such a 'retirement home' they necessarily became a part of the institutional agenda of the MKG-H. In effect, here, as elsewhere, they were 'framed' in agenda-serving classificatory narratives embedded in bricks and mortar. Indeed, from the moment such objects become collectors' items and are stored and/or displayed as artifacts they become epistemologically loaded through the very process of objectification.

The MKG-H demonstrates that these collecting agendas and the accompanying aesthetic guidelines often have deep historical roots. But what the analysis of its 2006 exhibition of Aids posters also shows is that old and seemingly apolitical agendas (invented to express specific national political interests) are neither lost nor rendered innocuous in the contemporary world. Rather, they come to serve new political frameworks linked to the world of today's visitors – a world in which aesthetics is the dominant means to a politics constituted on little more than the idea that 'if it looks good go with it' (an outlook now as pervasive in the practice of science as in the arts of government and museum display). Crucially, this new politics is sustained through, and for, the absenting of critique; not today the critical outlook entertained by Susan Sontag and other pre-postmodern intellectuals, that visual representations (and popular posters in particular) covered-up or cloaked lurking ideologies. Postmodernists, unconcerned with that view for the most part, in effect opened the space for the new politics of aesthetics that cloaks something different: the idea of aesthetics as void of political intention. The Hamburg exhibition of Aids posters was in fact an early example of the coming-to-reign of these politics, with the visual alone being the vehicle for understanding and creating a ('global') community without distinction. Whereas for Brinkmann in the nineteenth century, aesthetics (in art) could be consciously used for the political purpose of populist democracy, with aesthetics and politics in clearly separate spheres, for the inheritors of his institution in Hamburg aesthetics (unbeknownst to them) became the politics, not simple a means to it. Ironically, their arrival at these politics – their unknowing performance of them through the exhibition -- was via adherence to Brinkmann's legacy. Through that, Brinkman's original political agenda was emptied of its original political purpose. Installed in its place were the politics of the appearance of political un-intention. Thus did an aesthetic concept born in the nineteenth century to serve nationalistic purposes come to operate for the political work of educating national citizens to global citizenship.

What does this mean for historians working with material objects stored in global-tending museums and archives and who are themselves now operating within a global framework? Since material objects have no meaning without a framework, and are framed in being collected, the simple answer is that historians have to take into account the afterlives of such objects as much as the object's original lives. Would that it were quite that simple, though. Harder is the problem of the historian's own place in 'the global framework', which in many respects is not unlike that of the material object in the global-aspiring museum (and very much like that of the curators of such exhibitions). Whether avowed explicitly in 'global history', or embraced implicitly in the practice of history writing in contemporary culture, 'the global' operates politically and epistemologically. Just as global history's predecessor 'world history' is now perceived by some of its originators as having been a product of, and agent for, its Cold War moment, so for our own times dominated as they are by multi-national corporations and abiding politicians, the take up of global themes in history writing is widely recognized as providing, at the very least, legitimacy to a globalization discourse, even if, as is often the case, the historian's immediate object is the far from reactionary one of provincializing the West and critiquing its hegemony. Of course, for some historians 'the global' does politically more, overtly serving as a rhetorical strategy for the re-coherence of the discipline of history itself after its pummeling by poststructuralists, deconstructionists, and other fragmenting postmodern forces over the past thirty years or more. To this end, what could serve better as a re-unifying device than the holizing connective metaphor of the globe? Thus the global provides a new grand narrative -- a universalizing tool -- with which to put the meta-narrative of history back together again. Although seemingly mindless of one of postmodernism's cautions, that totalizing worldviews can lead to totalitarianism, these historians seek more-or-less intentionally what the curators of the MKG-H performed innocently through their exhibition of Aids posters. In doing so, these historians also share company with certain art historians anxious to revive older agendas – a means (as bluntly put by one of them) to counter the 'deconstructive criticism of historical culture' proposed by 'self-serving postmodern academics' who treat the past as 'a sour land over which to exercise present concerns and anxieties'. Yet neither global history nor visual culture studies need necessarily lead in this direction. To see the global as a discourse tied politically to institutionally specific agendas (such as the aesthetics entertained at the MKG-H in 2006) offers the possibility to take an alternative political position, or at least to liberate its historical study from such agendas.

Nevertheless, in terms of the less-visible shaping of historical knowledge production, the global framework can never be other than 'world-making' as opposed to being simply historically descriptive. No matter how hard we try to stick to the recovery of some truth of how the world came to be globally conceived (past or present), our knowledge productions implicitly reproduce and foster the unifying construct. Just as with material objects (or words or images) there is no meaning to historical events outside the conceptual frameworks we wittingly or unwittingly apply to them. In short, there exists no resting place for history writing; it is always already fashioned *and fashioning*. Like creating a museum exhibition of posters to aestheticize the 'global' nature of Aids, the business of contributing to a global history of anything entails, by that very act, the politics of constructing a necessarily partial representation of the past'. History writing, too, in other words, as a product of its time, cannot avoid making up historical consciousness.

This paper cannot escape the charge that it too contributes to this process merely by discussing an event that was conceptualized in 'global' terms. It might even be seen to compound the problem by drawing attention to spaces where, a priori, the historian is already politically and epistemologically implicated: the museum and the archive. However, in doing so it has sought to move the discussion beyond the tired call for attending to historical contexts, especially of material objects globally attributed. Our purpose has been to encourage historians to an awareness of their own immediate entanglements in history's constructedness -- the constructedness of the present mediated in history writing as much as through

aesthetic assemblages of 'the global.' The historian Aruf Dirlik, critically inquiring into the point of writing world history, has observed that 'an awareness of the variety of world histories that have been constructed at different times and in different places … [must cause] any world historian worthy of the name [to] … be uncommonly aware of the constructedness of the past.' Similarly, we submit, all historians need be reflective on their contributions to the present -- to a culture given to re-enchantment through 'the global'. Quite how we should historicize material objects of the sort discussed in this paper may be open to debate; what is not is the necessity to historicize our own historical projects. Otherwise we move perilously close to becoming blind participants in the historically-fashioned spaces where memory is increasingly naturalized and neutralized through universalized and universalizing concepts mediated aesthetically. We end up, as it were, naïve viewers of the exhibition at Hamburg: as blind to the nature of the new post- postmodern politics of aesthetics, as to the modernist would-be universal humanity that 'the global' unwittingly espouses through those politics.

In our 8 minutes we want to talk about the consequences of what we have done-- the consequences for the historian. What do we gain by knowing something of the difficulties involved in screening and analyzing a museum exhibition such as this? What is the purpose of history here? Is the job of the historian simply to reveal the different value systems and epistemic virtues involved? Where does the value system of the historian come in? These are the kinds of questions we want to raise in self-reflection on our paper.

Nina Czegledy

At the intersection of Art and Medicine

In the beginning of the 20th century, faith in progress and scientific discovery had primary influence on both artists and scientists. As a result of this belief, a conviction that a scientific spirit forms part of a new artistic synthesis emerged raising expectations for a fundamental shift to gradually demolish the separation between the arts and the sciences by providing a new platform for interaction and dissemination. This position was in accordance with modernist theories including experimentation of the early twentieth century, by seeking innovative directions to chart a new, contemporary landscape in art, science and emerging technologies. Today, when the boundaries between specialties of knowledge become increasingly blurred, an investigation of some aspects of this theme is especially timely particularly as the dissemination of the results of these collaborations has the potential to create new knowledge, new ideas and processes beneficial to both fields. Despite these obvious benefits, exhibitions of the art and science projects –as outlined in the followings - remain frequently difficult.

Over the last century some of the earlier expectations concerning interdisciplinary efforts became a reality; today we witness far more cross-disciplinary collaborations than a couple decades ago. This is perhaps best exemplified by BioArt, which in part is facilitated by the spectacular advances of medicine and biotechnology. BioArt is an art practice in which the medium is living matter and the works of art are produced mostly in medical laboratories and/or artists' studios. Bio-artists use materials that blur the traditional distinctions between science and art (BioArt). Notwithstanding the visible progress in developing cross-disciplinary projects – presentation opportunities (especially museum or art festival presentations) continue to be dismal. The reluctance to show such intricate projects in a traditional institute might be due to the complexity of technical requirements, as indeed several of these projects require high technology, oftentimes unavailable in art institutions. Sustainability of the art works as well as rapid technical obsolescence are other institutional deterrents The lack of enthusiasm by these venues however extends to low-tech, analog art & science works as well. To illustrate these points I would like to present examples from my own art & science and technology practice, especially a case study concerning an analog anatomical art project.

The background: Digital imaging technologies in medicine were implemented in the 1970's, but until recently in human history, the body was solely viewed through the naked eye or (since the 17th century) via elementary mechanical magnification. Both of these sources of visualization traditionally carried limited possibilities for reproduction and, moreover, manipulation (Czegledy&Czegledy2000). While the currently available sophisticated technologies offer an entirely novel visual access to the human body, the time honored dialogue between analog representation of the body and medical imagery should not be forgotten. Anatomical visualization, dating back hundreds of years, flourished since the eighteenth century contributing to the growing prestige of medical education. It is obvious that the interior of the human body is difficult to visualize – in fact we have only an imperfect knowledge of the inner world of our own body - thus it remains mysterious and amazing. Yet the artistic value of anatomical artwork has been traditionally under valued. The failure of appreciation continues to this day.

Nearly ten years ago, during my curatorial work while researching historical materials for the *Digital Bodies, Virtual Spectacles* international touring project (Digital Bodies), I have discovered at the University of Toronto an amazing collection of anatomical art dating back to the last century. Before proceeding with the story of this discovery, a few words should be told about *Digital Bodies, Virtual Spectacles.* The project focused on the changing perceptions of the human body examining the relationship between art and biotechnology exploring the shifting notions surrounding body perceptions, material realities, and current forms of visualization. The project utilized low technology and involved the active participation of medical scientists. The novelty of this art & science & technology project in the late nineties (including easy audience access to the on site and on line events) secured invitations from international museum venues on its tour.

A selection of the anatomical artworks from the University of Toronto collection were included in the *Digital Bodies, Virtual Spectacles* project. The origin of this collection is closely linked to the history of Canadian medical illustration dating back to 1941 when Dr. J.C.B. Grant (1886-1973) from the University of Toronto, approached the Philadelphia publisher Williams and Wilkins to initiate an indigenously produced unique anatomical atlas. Grant took with him to the publisher drawings by his team of highly skilled medical artists working in the *Art as Applied to Medicine* program at the University of Toronto. The anatomist succeeded with his publishing proposal, and *Grant's Atlas of Anatomy,* first published in 1943, has had a worldwide impact remaining in print to this day (Agur). Almost all of the illustrators of the original 6 editions who contributed to the atlas were female. The two main illustrators, Dorothy Chubb and Nancy Joy were both incredibly adept artists who were able to use a wide variety of techniques. The pen and ink drawings, the carbon dust works used by these artists are exquisite, scientifically accurate and of astounding craftsmanship. It is important to note that due to new technical tools this is a practically lost art form. The brilliant drawings -on the threshold of art and medicine- confirmed that the anatomical artist, in addition to his/her scientific knowledge, the mastery of the body as a functional system and an expert eye is also required to decide on the most appropriate interpretation.

On the discovery of the remarkable anatomical art collection, I began negotiations with Prof. Nick Woolridge himself an illustrator and currently director of the Division of Biomedical Communications, University of Toronto for a loan to exhibit, for the first time ever, a selection of these medical artworks. The selection was shown publicly in 1999, within the framework of the *Intimate Perceptions* exhibition, forming part of the Digital Bodies project at the InterAccess Electronic Media Art Center in Toronto. This introductory historical material demonstrated my curatorial conviction: to provide a historical context as a crucial benchmark for contemporary art. The original scientific representations from the last century, elegantly complimented the contemporary reflections on the human body as revealed in the exhibited artworks and all of the online and onsite events of the project.

The key initiative prompting the *Digital Bodies, Virtual Spectacles* project was indebted to the magnitude of major advances in biomedicine and biomedical visualization causing a significant change in the common perception of the human body. From prehistoric representations to contemporary art the nude human body has an eloquent place in art history and has been celebrated throughout the ages by magnificent examples crowding museum displays, books, films and lately the Internet. The consideration of genuine anatomical representation however is another matter. While based on factual scientific information, anatomical visualization is rather personal, often beautiful yet sometimes frightful or grotesque. It is

frequently termed “bizarre” and presentations of these works are often slated into controversial quasi-scientific exhibitions. Of course there have been some outstanding exceptions such as the *Spectacular Bodies: The Art and Science of the Human Body from Leonardo to Now* show at the Hayward Gallery in 2001 and others (Spectacular Bodies). *Ars Medica: Medical Illustration through the Ages,* another example of excellent anatomical print reproductions was shown at the Thomas Fisher Rare Book Library University of Toronto in 2006 (Ars Medica).

Recently within the framework of a collaborative research grant aimed at the systematic organization, archiving, development of preservation strategies, digitization and indexing the art works, I had an opportunity to re-examine this remarkable collection. It became evident that while Grant’s Atlas remains of great scholarly value, there is simply no comparison between the elegant, intricate style of the originals and the printed reproductions. The drawings are simply magnificent and prompted me to return to my original curatorial goal to exhibit a comprehensive selection of these works.

This quest is also prompted by a current trend to examine issues of visual memory and the relationship between memory and the archiving of written and visual scientific material. Another tendency to be examined is concerned with social reflections, conveying political and societal criticism through the combination of artistic and scientific processes. Lately a critical discourse including these new forms of artistic expressions emerged, generated by artists working through scientific concepts. As a consequence a re-examination and re-evaluation of archival art material – partly due to digitization- is now in process. Yet, despite this process and the praise heaped on exhibition proposals including the historical, medical and aesthetic significance of the artworks in the University of Toronto collection, - it seems to be difficult to find committed venues. Why? Partly because - apart from spectacular, extravagant projects such as Body Worlds – moderate analog works based on science seem to be rarely exhibited in sizeable contemporary venues. This difficulty raises a few questions. The original art works date back about fifty years. Is this material then historical, but not sufficiently historical? Is it obligatory to situate it within a complex socially reflective structure? Is it necessary to include a comparative contemporary perspective?

The exhibition project is still in progress. While the exhibition material on the intersection of art and medicine is exquisite and scientifically accurate, there are no clear-cut answers yet for the questions listed above. In conclusion it seems that improved communication and a broader endorsement of traditional and contemporary art and science projects by exhibition venues, including museums remains a crucial issue.

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John R. Durant

Preserving the Material Culture of Contemporary Life Science and Technology

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Museum professionals know well that much of the material culture of recent and contemporary science and technology (S&T) is at grave risk of being lost to posterity. The reason for this is simply stated: There are relatively few specialist museums of S&T around the world; and only a small sub-set among these specialist museums have made or are currently making serious efforts to collect recent and contemporary material. To the combined efforts of this handful of museums must be added the important work of a number of other public and private institutions (e.g., Government military and civil R&D organizations; and science-based corporations), together with the activities of private collectors; however, the collecting activities of organizations such as these tend to be highly selective and to exclude major areas of civil R&D (including, e.g., most or all of contemporary bio-medical science).

Nobody really knows the true extent (nationally, and internationally) of the combined collecting effort in the field of recent and contemporary S&T. However, it is abundantly clear that there is a serious mismatch between the scale and significance of contemporary S&T, on the one hand, and the scale and significance of the collecting activity that is currently attempting to preserve a material record of this activity, on the other. To be blunt: with only a few notable exceptions - including aerospace and computing, but *not* (I would suggest) most bio-medical science – much recent and contemporary S&T is being collected either inadequately or not at all. As a result, both Europe and the United States (not to speak of other world regions) are in serious danger of losing major parts of their cultural heritage.

There is a double price to be paid for this failure to preserve an adequate record of the material culture of recent and contemporary S&T: now, and into the future. Now, the efforts of museums in the larger field of public engagement with S&T are hampered by lack of a sufficiently strong set of working relationships with current S&T research;[20] and into the future, there is the gloomy prospect that future generations may lack some of the key resources required for an adequate historical understanding of what is by any meaningful measure a truly extraordinary period of scientific and technological innovation. Awareness of this collective failure weighs on those of us who work in specialist museums of S&T like a professional guilty conscience.

At first sight, the challenge of confronting this failure seems dauntingly large. As Thomas Soderqvist has observed, "[N]ot even giants like Deutsches Museum, Science Museum in London, or the Smithsonian in Washington, D.C., have the staff, time, and money to embark on a systematic (or even a systematically selective) acquisition program that covers all of contemporary science, technology, and medicine."[21] In response to this challenge, Soderqvist urges "that we should, as a rule, say 'Yes, please' when we get a

[20] Public engagement with research is an area of active interest in the S&T museum world; see e.g., D. Chittenden, G. Farmelo & B. Lewenstein (Eds), Creating Connections: Museums and the Public Understanding of Current Research, Altamira Press, Walnut Creek, CA, 2004.

chance to collect visual, material, and textual objects from contemporary laboratories and storage rooms." [22]. More radically, he argues for a radical redefinition of the roles of both the museum (through the notion of "museum 2.0") and the curator (through his concept of "distributed curatorial expertise"). Also, he recommends a more cooperative approach among museums. "Except for occasional collaborative projects at the interpersonal level", he observes, "museums of science, technology, and medicine do not have a tradition of working closely together. Museums act as if they are international competitors rather than collaborators and as if each is in principle responsible for the preservation of the entire scientific, technological, and medical heritage. And because this is in practice impossible…the failure to live up to the principle leads to…defeatism".[23]

I agree wholeheartedly with Soderqvist's observations. Indeed, I offer this paper on the challenge of collecting the material culture of recent and contemporary bio-medical science as a constructive response to his challenge to the museum community to do better in this area. The starting-point for my comments here is the need to get beyond what might be termed globalized lamentation to some sort of realistic plan of action. Globally speaking, as we've seen, the problem of creating an adequate record of recent and contemporary S&T is immense: clearly, it greatly exceeds the capacity of even the largest individual institution acting alone; indeed, it may even exceed the capacity of all the specialist museums of science and technology in the world combined. Considered generally and in the abstract, then, it's perfectly possible that the problem is literally insurmountable. But this, of course, shouldn't deter us from doing what we can where can. Here, as elsewhere in life, the best should not be allowed to become the enemy of the merely good.

I suggest, therefore, that in this area we resist counsels of perfection, and with them all general schemes that involve mobilizing the museum community *en masse* in some kind of Soviet-style curatorial Five Year Plan. Such plans, I believe, are doomed to failure; and failure is not what we need. Instead, I believe we should start where we are and look about to see what we're already relatively well placed to do. By "we" here, I mean museums that hold (and acquire) S&T collections. This subset of institutions includes a few very large national museums (e.g., the Deutsches Museum in Munich, and the Science Museum in London), rather more medium-large regional museums (e.g., the Chicago Museum of Science and Industry, and the Manchester Museum of Science and Industry), and a lot of (generally smaller) regional and local museums of all kinds. Among the generally smaller museums are many university museums, and these are of particular interest to me – not merely because I happen to work in one, but because by virtue of their institutional location university museums often have close connectivity into the worlds of contemporary S&T.

Connectivity with the scientific and engineering communities is critical to the success of any serious contemporary collecting policy. The MIT Museum may be taken as a case in point. The mission of the Museum is "Making research and innovation accessible to all". This mission is pursued by collecting across the wide range of MIT's research and teaching interests, and by organizing exhibitions and public programs

[21] Thomas Soderqvist, "The Participatory Museum and Distributed Curatorial Expertise", manuscript (2010), p. 8.

[22] Ibid, p. 3.

[23] Ibid, p.8.

for key target audiences. The collecting role involves the Museum in cultivating precisely the kind of "distributed curatorial expertise" that is advocated by Soderqvist: simply put, it would be impossible for us to do our job without engaging a wide range of MIT faculty and staff in the process of identifying material suitable for collection and display; and – tantalizingly – we live with an abundance of potential riches that generally far exceeds our handling capacity. As a result, and notwithstanding our admittedly limited resources – a senior curatorial staff of just 3, and a total Museum staff of around 25 – we benefit from a steady flow of new acquisitions, including - occasionally - material representative of contemporary or near-contemporary science.

The inclusion of the word "occasionally" in the last sentence is intended to point up one of the real problems we face, particularly in the area of the biomedical sciences: many scientists and engineers have a more or less intuitive understanding of the importance of public outreach (and thus are willing to cooperate with us, at least so far as exhibitions and educational programs are concerned); but in my experience, at least, far fewer of them recognize the potential significance of their work from a curatorial point of view. So far as I can tell, many bio-medical scientists simply don't think much about the heritage value of their own material culture. Of course, they're keenly aware of the need to publish the results of their work; and they're equally jealous of their professional reputations. But very often they fail to see anything beyond immediate utility in the physical resources – the experimental apparatus and equipment, the images, traces and recordings, the laboratory notebooks, the analytical and computational hardware and software, etc. – that are constitutive parts of their professional work.

An anecdote will perhaps serve to make this point. Shortly after I joined the MIT Museum in 2005, I received a phone call from an engineering consultant who had been involved in genomics research at MIT in the 1990s, but who had subsequently lost touch with the field. "Whatever happened", he asked, "to the Genomatron?" Unable to answer his question, I called a senior scientific administrator at the Broad Institute of MIT and Harvard who I happened to know, and put the consultant's question to him: "Alan, whatever happened to the Genomatron?" There was a long pause, and then Alan said something like: "Oh, *that* thing…it filled a whole room, and it was taken to pieces long ago; but I think we may have a piece or two of it lying around somewhere…. Why on earth do you want to know about it? It never really worked!" For a brief period during the late-1990s, the Genomatron represented the state of the art in gene sequencing technologies. But quite soon newer, smaller and faster sequencers were introduced; and immediately, the Genomatron ceased to be of any interest. Preoccupied with the next stages in their fast-paced and furiously competitive investigations, busy genomics researchers simply brushed the Genomatron aside and moved on to the next new thing.

There is good reason to suppose that this anecdotal experience is reflective of wider attitudes, not least among bio-medical scientists (I'm reminded here of the fact that the single most important artifact in the history of molecular biology – Crick and Watson's famous double helical model of DNA – was not preserved for posterity[24]); and this being so, there is an obvious difficulty associated with Soderqvist's injunction to us

[24] Soraya de Chadarevian writes, **"**Once the object of intense discussion but soon superseded by more refined models built at King's College London, [the original Crick and Watson model] slowly fell to pieces and was eventually disassembled. Twenty years after it was first constructed, some of its pieces resurfaced at Bristol. By that time, the value attached to the original incarnation of the double helix had changed substantially, and the Science Museum in London commissioned a replica of the model, with

to adopt a "Yes, please!" policy in the area of contemporary collecting: we may find that there are not too many offers around for us to gratefully accept! If scientists don't recognize that the material culture of their professional lives is of potential value to posterity, then they're unlikely to come forward of their own accord with candidate artifacts from their laboratories for our museums to acquire. This is definitely an issue at MIT. So far as I can tell, many of the life science and technology objects that we should probably be collecting are at risk of moving straight from the laboratory bench to the waste disposal unit. If we're lucky, key objects may simply be left to gather dust in cupboards and storage facilities; but either way, there's not much of a queue of eager scientists outside my office door waiting to donate choice artifacts to the Museum.

All of this points to the need for us to adopt a pro-active contemporary collecting strategy. By a pro-active collecting strategy, I mean a strategy that commits us to going out and actively searching for collectable material, as well as one that actively publicizes itself within the relevant research communities, with a view to raising awareness among researchers themselves of the heritage significance of their work. Proactive collecting requires the cultivation of effective working relationships with scientists and engineers, and the willingness to "take a bet" on the relative value of particular research and/or researchers. It may also, as I shall suggest below, require us to find creative ways of discreetly incentivizing busy researchers to collaborate with us in securing a meaningful record of their work for posterity. One powerful way of being proactive is to work with scientists and engineers on outreach projects, and another is to collaborate in larger, multi-site collecting initiatives.

One example of a pro-active collecting initiative is the MIT Museum's current collaboration with the Koch Institute (KI) of Integrative Cancer Research at MIT. The KI is a new institute, currently under construction, that brings together cancer biologists and biological engineers with a view to undertaking clinically relevant research.[25] Part of the ground floor of the KI is to be a gallery showcasing the work of the Institute to the general public, and the MIT Museum is working with the KI to create this gallery. In the course of researching the gallery contents, we've been impressed by the potential for creating an exhibition of contemporary bio-medical research images. Images created by cell and molecular biologists can be eloquent, evocative and even startlingly beautiful. The Wellcome Image Awards is a well-established initiative that incentivizes researchers to submit images created in the course of their research to an archival database by offering the opportunity for submitted images to be considered for inclusion in an annual exhibition in central London.[26]

We've decided to develop an image gallery as part of the KI Gallery. By collaborating with the Wellcome Trust in both the collection and the display of bio-medical images, we hope to engage an expanding circle of bio-medical researchers in an initiative that will greatly extend both the range of image collecting and the reach of exhibited images - in the UK, in the USA and (in due course, we hope) elsewhere. To be frank, one of our aims in creating an image gallery as part of the KI gallery is to use this initiative as a way of incentivizing MIT life scientists and technologists to collaborate with us in a simultaneous collecting and

some of the original parts built into it.", de Choderavian, "Relics, Replicas and Commemorations", Endeavour, 27, Issue 2 (June 2003), pp. 75-79 (Abstract).

[25] For further information, see: http://web.mit.edu/ki/

[26] For further information, see: http://www.wellcomeimageawards.org/default.aspx

outreach initiative. Though these are early days in the life of this particular project, it seems that some MIT researchers whose work involves the creation of bio-medical images are genuinely interested in the possibility that their images might be prominently displayed in a public gallery; and of course collaboration with the Wellcome Image Awards in London brings with it the possibility for international exposure of their work.

"Born digital" images are, I believe, an important ingredient in an effective collecting policy for contemporary life sciences and technology. However, it is also important that we find ways of collecting conventional artifacts that bear witness to key themes in contemporary bio-medical science. Here, I am interested in exploring the possibilities for other kinds of collaboration – not least, between university museums with overlapping collecting interests. For example, through the 1990s and early 2000s, the Human Genome Project (HGP) was perhaps the largest collaborative research program to date in biology. MIT contributed importantly to this project, notably through the work of Eric Lander at the Whitehead Institute/MIT Center for Human Genomics (created in 1990). Throughout the 1990s and early 2000s, Lander and his colleagues worked collaboratively – through the US National Center for Human Genome Research at the National Institutes of Health, and internationally through the coordinating efforts of the Human Genome Organization.[27]

As I've already indicated, the HGP depended crucially on the development of ever more sophisticated sequencing technologies, as well as on the burgeoning field of bioinformatics. Here, I suggest, is an immediate and important challenge for our community: can we secure a meaningful record of archives and artifacts from this signal – and signally important - project? In thinking about this challenge from the point of view of MIT, it seems obvious to me that if we're to have any chance of success here we must mimic the project whose history we seek to preserve by collaborating both nationally and internationally. Having originally trained in Cambridge England, home to the Sanger Institute (the UK hub for human genomics), and now working in Cambridge Massachusetts, home to the Whitehead and the Broad Institutes (the US hub for human genomics), I find it tantalizing to contemplate the prospect of a transatlantic collaboration among archiving and collecting institutions, to capture and preserve key materials from the field of genomics research, past and present. Who knows, but perhaps an effort along these lines might even capture the imaginations (and hence the support) of busy genomics researchers internationally?

In summary: to be true to their fundamental purposes, museums of science and technology must embrace recent and contemporary science as well as with the science of previous periods. I do not pretend that this is an easy task. It will be made at least bearable if we abandon perfectionism, and concentrate on doing what we can where we can. For those of us who work in university museums, this must mean starting with our own university research communities. We need to reach out to our scientific colleagues, and to persuade them (if they need it – and they do!) that their work deserves to be preserved not only through the formal publishing process but also through appropriate archiving and collecting. In seeking to engage our scientific colleagues as partners in such efforts, we should take advantage of natural synergies between collecting and outreach wherever they may exist; and we should also take a leaf out of the book of the scientists themselves, by cultivating the kinds of collaborative networks amongst museums that are suited to the purpose of preserving the more signal accomplishments of global science.

[27] See Victor Mcelheny, Drawing the Map of Life: Inside the Human Genome Project, Basic Books, New York, 2010.

Joanna Ebenstein

The Private, Curious, and Niche Collection: What They can Teach Us About Exhibiting New Medicine

At this congress, we gather to discuss ways in which medical museums might successfully approach contemporary medicine with its artifacts that defy traditional display and collection methodologies. It is my conviction that by looking to pre-modern displays as well as private and otherwise quirky or niche collections--the kind I have made it my aim to visit, study, and document in my work with Morbid Anatomy--museums could find useful strategies to reinvigorate display, engage viewers in new ways, draw in new visitors, make medical museum more relevant, and bring to life contemporary medicine on display.

Small museums, private collections, and untouched early museums have a charm and affect all their own. They amaze, inspire and delight; They thrill and incite curiosity; They invite participation and a direct, multi-layered encounter with artifacts; They confuse contemporary disciplinary boundaries. In the recent New York Times article "The Thrill of Science, Tamed by Agendas"--which became something on an internet meme among science museum types--Edward Rothstein lamented the rise of the blockbuster-focused contemporary commercial science museum and advocated for a return to the principles of the small or pre-modern museum, praising institutions such as The Wellcome Collection and the Boston Science Museum whose exhibits are inspired by cabinets of curiosity and other non-traditional museum displays.

Curiosity--the prime organizing principle of such early collections--is a catalytic agent, a human emotion, a prime scientific motivator which has gotten a bad name over the past 150 years or so. Curiosity often gets dropped from the curatorial mix in the name of truth telling, sober-minded science, and linear, discipline-obeying, simple stories. It is my conviction that curiosity and wonder could be an excellent way to seduce visitors into an emotional encounter with the history of medicine, and, ultimately, to want to learn and know more. Early museums, private collections, and small untouched museums can offer us valuable instruction in this arena.

The relationship between private or arcane museums and public collections is a charged and complex one. Yesterday's cabinet is, or has contributed to, today's institution. Today's private collector is tomorrow's museum benefactor, or, in some cases, founder. Medical collections are no different, though the private genesis is perhaps even further hidden, obscured by notions of science and its agents as divorced from human concerns and agency, as truth-telling and somehow above human drives and desires. Indeed, science uses collections as a source of knowledge production and a form or knowledge communication, but that--as with any form of collection--is not the whole story.

The Anatomical Venus--centerpiece of many university, medical school, and popular anatomical collections--is a wonderful example of the rich variety of meanings an artifact can express. Gentleman's

collectible, unrivaled medical teaching tool, curiosity for the cabinet. Beautiful, useful, educational, yes, but also conflicted, flickering on many provocative edges: art and science, life and death, eros and thanatos, body and soul, science and magic.

Where does that leave the viewer? And the curator? In an institutional context, a curator is often forced to choose a single approach, one agreed upon by committee, one that tells an institutionally advanced story. The private collection--or the collection essentially unchanged since its inception, such as Teylers Musuem in The Netherlands--is not bound by contemporary limitations of single meanings, story, edification, narrative, divided disciplines. These overlooked collections, instead, are allowed to bristle with semiotic promiscuity, to play along the edges of the subtle and personal, to deal in allusion, and juxtaposition, arranged by choices aesthetic and suggestive rather than edifying.

When cabinets of curiosity, the forefathers of the modern science museum, were assembled, art, science, and mysticism co-mingled with ease; To engage visitors on the topic of contemporary medicine--with its paradigm-bending wonders and terrors that still reside for many in the non-linear, non-rational world of emotions and imagination--a return to this multi-disciplinarity and open-ended exploration could well be a productive strategy. The implications of contemporary medicine thrill, terrify, and engage not just medical historians and specialists, but also the general public. That hot new ism post-humanism revolves around the notion of the technologically-enhanced post-biological body made possible or being promised as a possibility by modern medicine and technology. Some fear these new technologies, seeing them as going “too far,” as the hubris of man playing God; others embrace the idea of the potential of a new kind of humanity free of body with all its fragility, its animal needs, and its haunting shadow of death. But either way, the response is a passionate ,emotional, and curious one. Ideas of contemporary medicine have the potential to challenge our notions of what it is--or what it has historically meant--to be human, commanding emotional engagement and inspiring new philosophies. With the proper displays, curators could meaningfully tap into these strong and passionate emotions--as did early collections--to engage viewers in an imaginative reckoning of these new technologies.

Advances and possibilities inherent in contemporary medicine and neurobiology transcend the disciplines of medicine and the history of medicine, and are being meaningfully grappled with by a wide variety of disciplines, such as the literature, science fiction, the arts, poetry, cultural theory (ie. Post Humanism), film, and philosophy, to name just a few; These other disciplines could be meaningfully re-introduced into the museum environment, their perspectives, works, and findings included in and influencing exhibitions and illuminating artifacts. In such a way, medical museums could join forces with other disciplines in grappling with important and profound questions raised by contemporary medicine, such as: How do the advances in modern medicine effect our sense of identity and corporeality? Where does the personality reside, as advances in neurobiology--as well as social psychology--complicate our ideas of self-hood, free will, and autonomous individuality? What will the future human being look like? What is the future of the non-augmented human body?

By bringing the work of other disciplines into the medical museum, curators could help articulate and explore the anxieties and potentials of these new technologies without necessarily providing solutions, answers, or linear narratives, while also engaging curiosity and wonder to bring enigmatic artifacts to life. For example, visual artists could be commissioned to depict the invisible-to-the-naked-eye drama of nano-technology and the body. Science fiction writers might be tapped to create alternative exhibition labels or write Frankenstein-like fictional responses to new medicine. Cultural theorists might be invited to debate Utopian vs Dystopian futures suggested by new technology--for example, what would really happen if we could vanquish death?--while cultural historians could be invited to contextualize the long history of the human desire to transcend the body and defeat death in myth, religion, and now science and medicine. This could provide medical museums with the opportunity to increase their relevance by becoming centers of a kind of cross-disciplinary discussion of new medicine and its implications; it might also bring new audiences to the museum, not to mention invigorating the display of difficult to exhibit artifacts.

In this way, perhaps museums could become important sites of engagement and inquiry into deeper questions and ethical issues that new medical science and technologies bring to the fore, committed to moderating the hyperbole and misunderstandings which often characterize portrayals of contemporary medicine in the popular media. In order to explore a topic such as contemporary medicine--one whose story is still being written, with many questions still to be explored and implications to be grasped, and one whose artifacts are more fascinating for their implications than their materiality--the open-ended, associative, multi-disciplinary, exploratory and curiosity-engaging methods of early collections could well be an ideal strategy with which to draw the public in and make medical museums relevant and important to the community.

James M. Edmonson

Collection plan for endoscopy, documenting the period 1996-2011

The Dittrick Museum is home to the largest and most comprehensive collection of endoscopes in North America. In 1989 we received the archives and instruments of the American Society for Gastrointestinal Endoscopy (ASGE), which marked their 50th anniversary in 1991. Receipt of the collection and the Society's anniversary prompted a succession of publications, exhibitions, and lectures. But after a while, the enthusiasm waned and the ASGE historical interest declined, perhaps because an older generation of endoscopists feted each other in these celebrations, while younger (and presumably more innovative) practitioners turned from history to confront challenges and opportunities developing in their fields. We at the Dittrick turned to other projects as well. But this year we have mounted a renewed effort to update this important collection. Renovation of our permanent museum exhibit gallery devoted to diagnostic instruments prompted this decision (an that renovation was in turn motivated by a nationally important collection of diagnostic instruments donated by M. Donald Blaufox, M.D.). Our plan is to document innovation in endoscopy over the past fifteen years, identify key technical developments, and acquire representative instruments, and interview leading figures in the field. In this program we are collaborating with Michael V. Sivak, Jr., M.D., pioneer in videoendoscopy and past chair of the Division of Gastroenterology of University Hospitals of Cleveland, and innovator in endoscopy techniques and procedures Jeffrey Ponsky, M.D., Chairman of the Department of Surgery at University Hospitals of Cleveland.

For orientation, it may be helpful to briefly review the four major periods of technical development in endoscopy: 1) rigid endoscopes, 1806-1932; 2) semiflexible endoscopes, 1932-57; 3) fiberoptic, 1957-1990s; and 4) videoendoscopy, 1983 to present. In each period or era, consensus emerged that a plateau of technical development had been reached and dramatic breakthroughs would be few. These assumptions would be proved wrong again and again.

During the rigid instrument era, the introduction of the incandescent "mignon" lamp (1886) comprised a noted improvement, but optics and illumination limited successful instrumentation. Endoscopes remained a rarely-used diagnostic tool, and seldom served therapeutic purpose.

The semi-flexible endoscope era, also referred to as the Rudolf Schindler era, witnessed marked improvement of optics and greater range of use, including the advent of biopsy forceps. Innovation improved instruments incrementally, and the major advance comprised Schindler's success in

"mainstreaming" endoscopy into the routine practice of gastroenterology. Surgical applications also started to emerge, though hesitantly.

The unanticipated advance of fiberoptic endoscopy, pioneered by Basil Hirschowitz, changed everything. Fiberscopes facilitated visualization of increasingly remote portions of the body and dramatically lessened patient discomfort. Although originating in gastrointestinal endoscopy, fiberoptic technology rapidly found application in colonoscopy, laparoscopy, and related fields, with significant surgical applications emerging in the 1970s (polyp removal, cannulation of the pancreas and bile duct, &c). This was a fairly heady and productive phase of endoscope development, with major roles being played by Olympus, Machida, Fujinon, Wolf, and Storz.

Then, almost as suddenly as the advent of fiberoptics, a radically new technology, video endoscopy, sent technical development spinning. The Welch Allen Company, a traditional American maker of otoscopes, pioneered videoendoscope design in the United States in 1983. But they were soon eclipsed by Fujinon, who launched the first commercially available videoendoscope in 1985, and by Wolf, who introduced the first digital CCD (charge-coupled device) endocamera in 1986. This field progressed steadily until around 2000, when further technical development accelerated innovations and applications in endoscopy across a wide front. Documenting what transpired in the past decade is the ongoing focus of our collection development plan.

Looking around in 2010, at least in the field of gastrointestinal endoscopy, one sees an array of technologies and procedures that followed on the heels of video endoscopy, and more importantly, the mating of the computer to endoscopic instruments. In addition to gastrointestinal endoscopes proper, one can add the following: capsule endoscopy, virtual colonoscopy, stenting and dilation devices, ERCP devices, biopsy forceps, polypectomy snares and fine needle aspiration devices, foreign-body retrieval devices, hemostasis devices, anti-reflux devices and enteral feeding devices. We are presently documenting these new technologies and trying to determine what to acquire as museum objects.[28]

As we survey this field yet other dramatic changes in endoscopic practice may be observed and considered for documentation, at least in the experience of medicine as it is practiced in the United States. Patients in America, according to the insightful commentator Atul Gawande, get "more of

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Companies to be researched include Aesculap Surgical, Boston Scientific, Conmed, Covidien, Ethicon- Endo, Fujinon, Given Imaging, Karl Storz, Lumenis, Olympus Optical, Pentax, Richard Wolf, Smith & Nephew, Stryker, and Welch Allyn.

pretty much everything—more diagnostic testing, more hospital treatment, more surgery, more home care. The primary cause of extreme costs is, very simply, the across-the-board overuse of medicine."[29] This is true in the domain of endoscopy as much and even more so than in many other area of medicine and surgery. It is driven by a variety of factors including, but not limited to, patient demography and epidemiology. Market analysts usually point to an aging population with unhealthy lifestyle, leading to a demand for more endoscopy. A December 2008 analysis, for example, projected future worldwide endoscopy market expansion driven by these factors:

> Growth in this market [for endoscopy] encompasses many areas, with surgery being the majority of the increase. Cancer is one of leading reasons for surgery with more than 1 million new cases of colon/rectum cancer reported each year around the world. Obesity is another reason for growth. More and more people worldwide are turning to gastric bypass (bariatric surgery) and gastric banding to aide in their weight loss, thus increasing the need for gastrointestinal endoscopy. These exploratory procedures are done both pre-operatively and post-operatively to identify possible risks during these bariatric procedures. Many of these surgeries are done laparoscopically, which is also a form of endoscopy.[30]

On the other side of the equation, market analysts have recently cited cost-saving advantages and improved patient outcome as key factors driving the demand for minimally invasive surgery and other endoscopic procedures:

> The aggressive focus on controlling healthcare costs has resulted in growing demand for less expensive and minimally invasive procedures. Given the escalating opportunities and demand for MIES [minimally invasive endoscopic surgery] procedures, several medical equipment manufacturers are concentrating on developing sophisticated highly functional products/processes. Endoscopy systems occupy a unique position in the total medical device market with applications extended to several areas in medical surgery, particularly in cancer. Endoscopic procedures are less risky, less painful, and involve lesser patient recovery period, when compared to traditional methods. Laparoscopy, bariatric surgery, and arthroscopy are rapidly growing segments, occupying a significant share in the global endoscopy market.[31]

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29 Atul Gawande, The cost conundrum: What a Texas town can teach us about health care. *The New Yorker* June 1, 2009

30 The World Market for Gastrointestinal Endoscopy Equipment Dec 2008 http://www.visionshopsters.com/product/1620/The-World-Market-for-Gastrointestinal-Endoscopy-Equipment.html

I would propose that endoscopy is spurred by innovations that are transcendent, by which I mean a few key advances – digital imaging, robotic surgery technology, &c – that can be applied across a spectrum of otherwise disparate surgical domains previously pursued as distinct and separate medical specialties. But one may also explain the success of endoscopy in certain areas as being driven by equipment makers' marketing strategy, on the one hand, and by consumer -- excuse, me, patient -- demand on the other. In 2001 the market research firm Frost & Sullivan signaled that endoscopy companies could build new relationships to maximize the market potential of their products:

> "Future market success is dependent on the use of superior marketing and management strategies that build customer relationships," says Frost & Sullivan Medical Device Industry Analyst Charlie Whelan. "Market competitors must differentiate themselves, based on the variety of nontangible benefits they offer customers, and not just on their products' quality. Using a sales message backed with evidence showing how endoscopes and their systems benefit patients, surgeons, and the facility's bottom line, manufacturers can position themselves as problem-solvers rather than merely product providers," says Whelan.[32]

Examples of the success of this building of new customer relationships may be seen in direct-to-patient marketing of technologies and procedures, augmenting the frequency of elective surgery or more high tech forms of surgery. Two examples will illustrate this impact: gastric banding via endoscopic surgery, and robotic surgery for prostate cancer. Even for those accustomed to television and print (and web) advertising of pharmaceuticals, this new cultivation of consumer medical demand is alarming.

Gastric banding.

It has been said that obesity is the third great epidemic of the 21st century, after malaria and tuberculosis. Endoscopy offers a surgical way to deal with obesity when behavior modification fails. One popular alternative to bariatric surgery (to reduce stomach capacity) is gastric banding,

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World Market for Endoscopy Systems Global Industry Analysts, Inc. June 2007
http://medical.presslib.com/medical-products/541095.htm

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US Endoscopy Market: Endoscope Manufacturers Employ Novel Strategies in Race for Profitability. April 2001

http://www.accessmylibrary.com/coms2/summary_0286-2025390_ITM

an approach that originated in Sweden in 1985. Gastric banding underwent clinical trials in the United States in 1995, leading to FDA approval by the FDA in 2001. Since that time LAP-BAND® adjustable gastric banding system by Allergan and the REALIZE® gastric band by Ethicon have emerged as leading variants of this technology. Whatever the merits of each product, much of their success may be attributed to cultivation of patient loyalty. On their respective websites[33] prospective candidates for gastric banding may learn more about the technology, the experience of satisfied customers, and are invited to join advocates (or rather, the support group?) for each system. The effort here is clearly to cultivate product loyalty and patient identity associated with the gastric band technology.

Robotic surgery

In the United States, robotic surgery moved forward significantly in 2000 when the FDA approved the da Vinci Surgical System[34] for adult and pediatric use in urologic surgery, general laparoscopic surgery, gynecologic laparoscopic surgery, and general non-cardiovascular thoracoscopic surgery. Since then, it has caught on dramatically in certain sectors, notably prostrate surgery. In the past eight years it has gone from under 10% to around 90% of prostrate surgeries in the United States. [35] And yet there are no statistics that demonstrate that robotic surgery is any more safe or effective than conventional laparoscopic surery (who knew that laparoscopic surgery would be considered "traditional" and low tech?). We do know that it is correspondingly more expensive, requiring

33 http://www.lapbandtalk.com/; http://www.realize.com/dtcf/pages/realize-mysuccess-sign-up.htm

34 Manufactured by Intuitive Surgical. http://www.intuitivesurgical.com/index.aspx See CNN report on robotic surgery, 13 Feb 2010: http://www.intuitivesurgical.com/corporate/newsroom/videos/video_newsmedia_cnn_sunjaygupta.aspx

35 **Robotic surgery drives healthcare costs Biomedicine on Display Feb 2010**

http://www.corporeality.net/museion/2010/02/26/robotic-surgery-drives-healthcare-costs/

significant capital expenditure ($1.4 million per unit, plus technical support and training; over 1100 units worldwide today). Such expenditures (or “investments”) incentivize use, particularly when the surgeons are the investors. And the numbers involved are significant: one in six men will face prostate cancer in America. So, in the United States at least, marketing hype drives the spread of endoscopic and robotic surgery, as much as patient well being. Understanding and documenting this trend is just as important as knowing what to collect for the medical museum of today and tomorrow, for it explains how we adopt and use medical technologies.

Jim Garretts

Bringing William Astbury into the 21st Century – the Thackray Museum and the Astbury Centre for Structural Molecular Biology in partnership

The Thackray Museum, together with Leeds University Library, has received one of the *Local Heroes* Scheme awards from the Royal Society to celebrate its Fellows during 2010 and has chosen William Astbury, Professor of Biomolecular Structure at the University of Leeds. *Hair Splitting Images – How William Astbury's X-Ray Vision Changed the World* is an exhibition at the Thackray Museum from 26 June 2010 until 2 January 2011. The project is also supported by the Leeds Philosophical and Literary Society, the Thackray Medical Research Trust and the British Society for the History of Science.

One of the exhibition's objectives is to show how Astbury's work remains important both now and in the future. It addresses such issues through collaboration with the Astbury Centre for Structural Molecular Biology at the University of Leeds, which carries out international quality research in all aspects of structural molecular biology. Its members work in biological sciences, physical sciences, engineering and medicine. The Astbury Centre is playing a key role in the project, giving visitors of all ages physical and intellectual access to a wide range of complex ideas, providing opportunities to visit research laboratories and encouraging stimulating debate.

William Astbury – a brief overview

William Astbury became a Lecturer in Textile Physics and Director of the Textile Physics Laboratory in the Department of Textile Industries at the University of Leeds in 1928. His expertise in X-Ray diffraction photography and his analysis of the images created led him to develop X-ray crystallography techniques in order to be able to propose molecular structures for compounds more complex than crystals, notably biological materials.

William Astbury was interested in determining the molecular structures of fibrous proteins such as keratin, which occurs in hair, wool and throughout the natural world. In 1931, he and his student Alexander Street took X-ray diffraction photographs of keratin, both in its natural state and when it was stretched. The pictures were very different, suggesting that the molecular structure had radically altered. The two forms identified were called 'alpha' and 'beta'; Astbury and Street made the very important observation that the molecules were highly folded in the 'alpha' state, but were stretched out in the 'beta' state. Although the molecular structures they subsequently proposed were not strictly accurate, their work enabled Linus Pauling, Robert Corey and Herman Branson to confirm in 1951 that the shape for the 'alpha' form of keratin and other proteins is helical. Indeed, Pauling referred to this model as the 'alpha helix', retaining Astbury's original nomenclature. Moreover, Astbury's observation of transitions in fibrous proteins between alpha and beta forms remains relevant today, since several neurological diseases are linked to similar transitions in brain proteins.

In 1937, William recruited a new research assistant called Florence Bell. Her post-graduate thesis, completed at Leeds in 1939, was called *X-ray and Related Studies of the Structure of the Proteins and Nucleic acids*. Nucleic acids carry the genetic information which is vital to successful reproduction of living organisms, but this was not known at that time. The most familiar nucleic acid is deoxyribonucleic acid, more commonly known as DNA.

Florence and William took the first X-ray diffraction photographs of DNA in 1938 and proposed a molecular structure for it, which became known as the 'Pile of Pennies' model. Although this theory proved to be incorrect; it became the basis for the work by Francis Crick and James Watson which enabled the definitive 'Double Helix' model to be calculated in 1953.

What does *Hair Splitting Images – How William Astbury's X-Ray Vision Changed the World* seek to achieve*?*

It is important to recognise that the exhibition is not an attempt to teach museum visitors all about X-ray crystallography. This branch of science is highly complex and those who come to the exhibition with that degree of understanding will not need the exhibition to explain such sophisticated ideas to them. However, what *is* important for the visitor to grasp is that:

- X-ray crystallography is a technique used to predict molecular structures
- Astbury was able to use this method to identify the structures of compounds more complex than those for which the technique was originally intended
- Astbury was a pioneer and that science is a progressive process. The fact that his conclusions proved to be incorrect and that the answers to problems he was trying to solve often took other scientists over fifteen years to discover is illustrative of what scientific enquiry is all about.
- The Astbury Centre for Structural Molecular Biology is a leading research institution. It remains at the University of Leeds where Astbury also worked and perpetuates his reputation by naming itself after him. Its members come from University Departments in Physics, Chemistry, Biological sciences and Molecular Medicine. Research topics are undertaken here by approximately two hundred and fifty researchers, including Structural Biology, Molecular Biophysics, Bionanoscience, Chemical Biology and Molecular Interactions in Cells. The Centre's research leaders hold grants totalling almost £50 million.

Why link William Astbury to the twenty-first century?

The world inhabited by William Astbury and his circle was totally different from today and visitors to the exhibition will have the opportunity to see the work currently being undertaken at the Astbury Centre for Structural Molecular Biology. They will be able to see the laboratories and meet researchers. The Science Clubs that are being held at the museum and at the Astbury Centre for Structural Molecular Biology over five weeks in July and August 2010 will give participants the opportunity to find out:

e. How scientific experiments are conducted

f. About wool as an example of one of Astbury's areas of study

g. How to make a pin-hole camera and understand the principles of photography

h. Globular proteins

i. How to 'make' DNA.

However, it is important that they do this against the historical backdrop that the exhibition offers and to grasp a sense of what William Astbury's scientific environment was like. There were no computers; all notes were hand-written or produced on typewriters. William Astbury's X-ray camera (on display in the exhibition) had only limited lead sheeting to protect the user. Scientific enquiry only advances because of that which has gone before; someone has an idea, a hypothesis is proposed and this is then tested by experimentation. The hypothesis becomes continually refined in the light of the experimental evidence gained. For example, scientists after Astbury were able to improve upon his theories by varying the angle of incidence of the X-ray beam (Astbury always had the beam aimed at 90 degrees to the test sample) to gain additional analytical information, or by using a wider piece of photographic film that enabled them to 'capture' additional data from more widely diffracted X-rays.

How to link William Astbury to the twenty-first century?

The Astbury Centre for Structural Molecular Biology is an ideal way to impart the notion that William's work did not die with him in 1961, but rather that his work is both continuing in the present and will do so into the future. The exhibition layout is designed to guide the visitor around the gallery in a clockwise rotation, engaging with the exhibition's narrative in a chronological manner. Display panels about the Astbury Centre have therefore been deliberately placed at the 'end' of the exhibition, so that by the time that visitors are looking at them, they will already have 'met' William. They will know what he looked like, they will have heard him giving lectures and they will have had the chance to see audio-visual clips on a touch-screen monitor featuring interviews with those who knew him personally. The exhibition also contains many of William's quotations, which help to create an accurate impression of his remarkable personality. The Astbury Centre's logo, which includes a diagrammatic representation of the 'alpha' to 'beta' protein transmission, can therefore be easily explained at this point as the ideas behind the design will have already been explained on previous panels. The exhibition has also taken care to select examples of the Astbury Centre's very wide-ranging scope of research which clearly link to the work that William Astbury was doing almost a century earlier. For example, Astbury's X-ray observations have contributed to our understanding of amyloid protein fibres, which can be observed in patients suffering from many diseases that affect the nervous system, such as such as Alzheimer's disease and Parkinson's disease. Amyloids are also important for human health; they are involved in skin colouring and in the 'storage' of hormones.

Research into amyloid disease is one of the major projects in the Astbury Centre today and is a particularly good example of how William's 'legacy' continues.

How does *Hair Splitting Images – How William Astbury's X-Ray Vision Changed the World* link to contemporary biomedicine?

There are large molecular models of keratin in both 'alpha' (unstretched) and 'beta' (stretched) forms on display. It is explained that keratin is present in many aspects of the natural world, such as hair, wool, porcupines' quills, cows' horns, birds' feathers, reptiles' scales and whalebone. Visitors can understand not only just how complex these biological compounds are, but can also count the carbon, oxygen, nitrogen and hydrogen atoms to see that the same numbers of atoms are present in two very differently shaped molecules. They can also 'pick out' the helical pattern of the 'alpha' form.

Visitors also have the opportunity to construct a model of DNA as an interactive exercise. They learn about cytosine, guanine, adenine, thymine, 'sugars' and 'phosphates' in order to build a 'double helix' DNA strand.

The exhibition also refers to increasing demands on Astbury's research department from the medical profession after he had acquired an electron microscope from America in 1944. At that time it was one of only seven in the country. Electron microscopy proved particularly useful in medical research, especially areas relating to rheumatism and dentistry, as it gave very accurate images of collagen, the fibre-like protein found in bones and teeth.

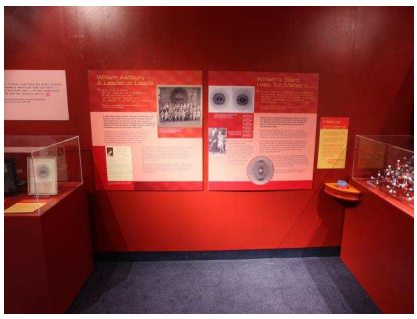
The sense of scale of the 'molecular world' is also explained; distances between the atoms in the large molecular models are in reality only tenths of millionths of millimetres in length. This gives the visitor an insight into contemporary biomedical research and a sense of appreciation of how today's scientists are able to achieve major advances in cellular knowledge within an environment that is completely invisible to the naked eye.

Images:

Part of the William Astbury exhibition at the Thackray Museum, Leeds, United Kingdom. One of the cameras that Astbury used to take X-ray diffraction photographs is in the display case on the left-hand side of the picture. Picture credit: Chris Foster.

The *Make Your Own DNA* interactive in the William Astbury exhibition at the Thackray Museum, Leeds, United Kingdom. Picture credit: Chris Foster.

The section of the William Astbury exhibition devoted to the Astbury Centre for Structural Molecular Biology. Picture credit: Chris Foster.



Part of the William Astbury exhibition at the Thackray Museum, Leeds, United Kingdom. Picture credit: Chris Foster.

The *Make Your Own DNA* interactive in the William Astbury exhibition at the Thackray Museum, Leeds, United Kingdom. Picture credit: Chris Foster.

Scientists from the University of Leeds trying out the *Make Your Own DNA* interactive in the William Astbury exhibition at the Thackray Museum, Leeds, United Kingdom. From left to right, Dr Bruce Turnbull, Professor Alan Berry, Professor Sheena Radford (Deputy Director of the Astbury Centre for Structural Molecular Biology) and Dr Stephanie McBurney. Picture credit: Chris Foster.

Professor Sheena Radford, Deputy Director of the Astbury Centre for Structural Molecular Biology, at the William Astbury exhibition. She is beside a display case containing molecular models of keratin. Picture credit: Chris Foster.

Karen Ingham

Medicine, Materiality and Museology: collaborations between art, medicine and the museum space

Let me begin by stating that the observations I make are based on my experience as a visual artist, writer and academic working with history of medicine museums and medical spaces for the past decade. For much of this time I have engaged with various digital practices, through production and dissemination, and these technologies have impacted on both the subject and context of the works produced. I frequently work through site-specific, collaborative intervention. These interventions are designed to provoke interdisciplinary discourse across the visual arts, biomedicine and the museum space, and engage the public in understanding both historical and contemporary issues of biomedical investigation and epistemology. A key element of this discourse is the complex and at times contentious process of interpretation, a loaded term that connotes quite different meanings for each participant. For the artist the challenge of working site-specifically in response to a particular medical collection or space is quite different to hanging work on the gallery wall, and as Graham Sullivan (4:2005) notes: "The contemporary artist these days is part theorist, performer, producer, installer, writer, entertainer, and shaman, who creates in material, matter, media, text and time, all of which take shape in real, simulated and virtual worlds". The museum curator is also expected to fulfil a number of overlapping roles and in negotiation with the artist, museum staff, and trustees must find a way of allowing artistic integrity and imagination to find expression without over shadowing or compromising the collection in question. This brings me to the thrust of the workshop: how do digital technologies influence these processes of creation, negotiation, interpretation, and dissemination. For the purposes of this presentation I am suggesting that we re-frame the question somewhat to reflect the role of digital technologies at the intersection of biomedicine, the visual arts, and the museums sector. The technologies themselves are neutral – artists and scientists both use digital technology. Digital editing tools such as Photoshop are often used to select and accentuate a particular neuron or dendritic structure, with the resulting images equally at home in the art gallery or in journals such as New Scientist (see for example the work of Susan Aldworth or Andrew Carnie and visit the web archive for the Wellcome Trust's exhibition 'Truth and Beauty'). Even highly specialist technologies such as electron scanning microscopy and fMRI are used by artist's working in collaboration with colleagues in the life sciences. These technologies allow access to previously inaccessible areas of the body such as the inner brain, which can now be seen alive and functioning leading to neuroscientists making the kind of claims about 'revealing the self' that were once the preserve of artists.

So what do we mean by materiality in this context? Materiality refers to the physical and material substance – the thing itself – but for historians and archivists it also refers to the medium used to store and transmit the object. This storage is increasingly digital and the digitisation of medical and museum collections has created greater accessibility to what were hitherto exclusive collections. But for the artist materiality has a much broader meaning and is bound to representational discourses of the real and the virtual, discourses that are becoming increasingly important for the museums sector where digital technology is creating the opportunity for not only greater democratisation of medical collections but also more opportunity for artistic intervention and subsequent public dissemination. In order to broaden discussion around these issues I will show examples from collaborative artworks that demonstrate these processes and dialogues and have, where available, inserted web-links for the reader to refer to at the end of the paper. I will mainly use examples from my own practice-led research, not because I think them exemplary but because they demonstrate first hand experience of the research, production and dissemination processes.

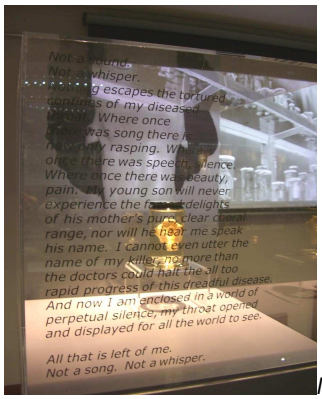
Narrative Remains (Ingham 2009) made in collaboration with the Wellcome Trust and The Royal College of Surgeons Hunterian Museum in London investigates post-mortem narration of anonymised body parts and asks if the legacy of historical remains can be used as a teaching and philosophical aid to understanding 21st century notions of embodiment within the medical museum teaching space. The project made full use of digital technology via film, photography, print and web publications and social networking sites, in order to bring subjectivity back into the medical museum space. One of the comments in the visitors book, from an MA student in Museum and Gallery Education, states: *"I know yours was an art piece, but I think it served an interpretive role for visitors . . . I always feel a bit freaked out at the Hunterian, as much as I love it, and the way you brought subjectivity into that clinical environment seemed really important. I wish it would be up permanently."* Also addressed is the question: "How can museums contribute to medical teaching and research and how can their collections stimulate the use of physical objects in the humanities and social sciences?" The director, Simon Chaplin, and I jointly presented papers at several conferences, medical, museological and art, accompanied by joint screenings of the film, and contributed essays to the print publication. The project is now part of the Hunterian's web archive. Another project, also supported by the Wellcome Trust that worked in this way was *Anatomy Lessons* (Ingham 2004/5), which addressed the question of "how to use both the visual and non-visual in curatorial practice".

In the case of *Anatomy Lessons* the artworks (digital photography and film) were exhibited back in their site of origin - working dissecting rooms and medical museums that are normally off limits to the public. The smell, feel, and atmosphere of these oft misunderstood spaces worked as powerfully, if not more so, than the artworks themselves.

An artist whose practice addresses many of the questions in this workshop is Susan Aldworth. Her installation *Matter into Imagination* (2006) http://www.thegarret.org.uk/aldworth.htm shown at The Old Operating Theatre Museum in London's east end and in various medical teaching museums in Britain, combines fine-art printmaking with molecular images of the brain bringing contemporary art into dialogue within the medical museology. Digital technologies such as computer assisted design and fMRI and SEM imaging are crucial tools for the artist. Neuropsychologist Paul Broks (2008:18) says of her work: *"Do we need more pictures of the brain? For Aldworth, such images, the real and the hyper real, the photographic and the digital, are deeply provocative but serve only to intensify the core ambiguities that drive her work."* *Seeds of Memory* (Ingham 2006) also brings contemporary neuroscience into dialogue with historical collections and with the role of the non-visual (smell and touch), while *Vanitas: Seed-Head* (Ingham 2005) used participatory web technologies for an installation in Amsterdam's historic Waag Theatre of Anatomy (normally closed to the public), which developed from discussions with neuroscientist Prof. Kevin Fox. Without access to these web based digital technologies the exhibition and contextualizing elements would have had far less public impact.

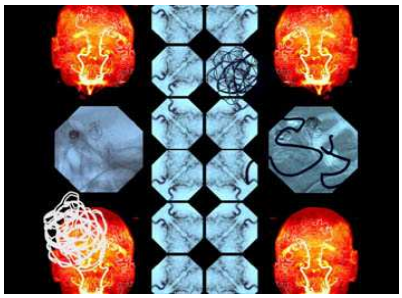
I want to conclude with*Theatres of Memory/Flux*, a developmental project with University College London's Francis Galton Collection (important in the history of forensics, biometrics, genetics and psychology). The collection is off-limits to the public except for research but working with curator Natasha McEnroe we hope to use digital technology to develop a web exhibition that will make the collection more accessible and more vivid in terms of re-presenting the past in the present. The project explores how many of Galton's discoveries are still of relevance today and uses biometric scanning technologies and microscopic biological imaging (in this case of the brain) to prompt questions about classification, typology, and individuality.

I suggest that it is this re-positioning of the historical within the contemporary, of the digital within the analogue, and the layering of past and present, that is considerably enhanced through interdisciplinary collaboration.



Narrative Remains (Ingham 2009) http://www.kareningham.org.uk/narrative-remains.html

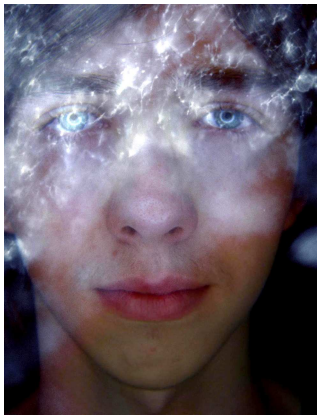

Anatomy Lessons (Ingham 2004/5) http://www.kareningham.org.uk/anatomy-lessons.html


Going Native in 'Matter into Imagination' (Susan Aldworth 2006)
http://www.susanaldworth.com


Seeds of Memory (Ingham and the Cardiff Neuroscience Research Group 2006)

http://www.kareningham.org.uk/seeds-of-memory.html


Vanitas: Seed-Head (Ingham 2005) http://www.kareningham.org.uk/vanitas.html

 *Theatres of Memory/Flux* (Ingham in progress)

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Sullivan, G. (2005) *Art Practice As Research: Inquiry in the Visual Arts*, California and London: Sage Publications.

Wellcome Trust Truth and Beauty Exhibition (2002): http://www.wellcome.ac.uk/News/2002/Features/WTD004698.htm

Ramunas Kondratas

The use of new media in medical history museums

It's not news to anyone that we live in the 'Digital Age'. The advent of digital technology has provided a host of new opportunities for museums and other educational institutions around the globe to make their collections and holdings accessible to millions through the World Wide Web. New media and new technologies are changing the ways in which historians do their work and are providing new tools for curators, collections managers, museum educators, and others to document their collections and then to disseminate that information widely in many different formats: web sites, web exhibits, web catalogs, digital collections, electronic books and articles, and so forth. Digital history is an important new methodology in our field.

Medical history museums should embrace digital history and make good use of these new tools, as much as their resources allow. As an example, I would like to share with you my own work in producing videohistories that document the development of biomedical instrumentation in the latter half of the 20th and the beginning of the 21st centuries; more specifically, some of the results of my most recent project to document the history of the ultracentrifuge.

Why video?

Photographs and sound recordings have been used to obtain documentary evidence for research since the 19th century. But as film and video became available, anthropologists, ethnologists, and folklorists pioneered the use of moving images (visual anthropology) as a research tool. One needs only to mention the work of Franz Boas, Margaret Mead, and Gregory Bateson.

Film and video capture not only visual images and sound but very importantly **motion** (dance, ritual, gestures, moving machinery, and machine parts) and **expressions** (character, speech patterns, moods, and personalities). Video works best when recording the interaction of people with objects, places, or other people; when capturing personality and emotions ('body language'); and, when describing a process or documenting the function of artifacts. Video provides **context** for the objects. Artifacts in our collections have been taken out of their contexts and thus offer us only fragments of their original meaning and purpose. Poor documentation and poor authentication often make them unreliable as historical evidence. Video shot on site – at laboratories, hospitals, manufacturing and assembly plants, and other workplaces – helps retain the context. Abstract concepts are better left for audio or written texts. Audio is also best for long, "talking head" interviews.

The amount of detail that can be captured on videotape of the workings of fine scientific instruments is really amazing. Now, with the advent of 3-d technologies, we can even rotate our objects and view them from almost all possible angles. If properly and carefully done, much valuable information will be preserved for future historians of science and technology and other interested researchers. For keepers of collections this may minimize the importance of preserving only instruments in fine working order or lessen the agony of loosing or damaging a key working part of the instrument over the years. In the case of prototypes, the videotape may be the only

blueprint or instruction manual showing the instruments in action with comments by the inventors or makers.

Equally, if not more important, videohistory gives one insight into the people who made and used these instruments. In this way "humanizing" what many people consider "black boxes". New information can be gained from these interviews about the various struggles, conflicts, failed attempts, wrong paths taken as well as successes and brilliant insights associated with science and scientific technology. This kind of information is getting harder and harder to find from traditional sources. Scientific papers for the most part have become sanitized and formulaic. Laboratory notebooks are not always kept. Much important information and preliminary ideas or findings are exchanged over the phone or computer lines, even over lunch or at coffee break, and this data is not usually preserved. Audiotaped oral history and by extension videohistory thus take on a more important role in documenting late 20th and 21st century science and technology.

Documentation strategies

I became involved with videohistory as part of the Smithsonian Videohistory Program (SVP) – a five-year (1986-1992) experiment funded by the Alfred P. Sloan Foundation of New York to document American twentieth century science and technology using video and to test video as a tool for historical documentation and research.

Documentation strategies varied according to each project's objectives: to document how the space sciences emerged as a tool-building culture (scientific instruments for rockets) within the national security state; to document the nature of contemporary robotics engineering; to document the operation of historically significant automatic watchmaking machinery threatened with extinction; or to document the sites and artifacts and to group interview some of the participants in the Manhattan Project to build the atomic bomb.

I wanted to document the birth and life of important biomedical instruments, especially those which spawned new technologies and made possible such huge and important scientific undertakings as the Human Genome Project. My strategy was rather simple: to document how one goes from idea or concept to prototype to commercial model and then how that commercial model functions *in situ* – in the laboratory, clinic, hospital, physician's office, or other workplace.

By the end of the fifth year of the Sloan experiment (1991), 18 historians had created over 250 hours of tape on 22 different subjects. The tapes, transcripts, finding aids, and supporting materials, including reviews, tape logs, production notes, and reports have been deposited in the Smithsonian Institution Archives, and are open to researchers.

I was so convinced of the utility of this new documentation tool that I continued to produce videohistories after the completion of the SVP with funds that I raised, mostly from instrument makers. A complete list of my films and videohistories can be found at the end of this paper.

The case of the ultracentrifuge

My last videohistory (2007) tried to document the history of the ultracentrifuge in the United States. The ability to sediment/separate substances from a solution using high order fields of gravity has had a revolutionary effect on biochemistry and molecular biology. The ultracentrifuge was key in

predicting the size and shape of tobacco mosaic virus; in isolating the pure polio virus – a necessary step in the development of a vaccine; and in the brilliant study of the replication of DNA in *E. Coli* by Matthew Meselson and Franklin. W. Stahl that has been called "the most beautiful experiment in biology."

The history of the ultracentrifuge is essentially a Swedish story with a significant American twist. The noted Swedish chemist Theodor Svedberg (1926 Nobel Prize in chemistry) and colleagues (notably Arne Tiselius and Kai O. Pedersen) in Uppsala developed and constructed the oil-turbine ultracentrifuge, while in the United States the American physicist Jesse Beams and his student Edward G. Pickels designed and built optical air-driven ultracentrifuges, which were simpler to construct and operate than the oil-turbine ones. Pickels was lured away from the Rockefeller Institute for Medical Research in New York to California to join Maurice Hanafin and others in forming the **Sp**ecialized **In**struments **Co**rporation (SPINCO or Spinco) to manufacture ultracentrifuges (analytical and preparative).

My videohistory is essentially the story of Spinco and the analytical scientific instruments they developed, with the primary focus on the ultracentrifuge. The first Model E Analytical Centrifuge was delivered to a laboratory in Berkeley, CA in 1948. This was the model later used in polio research and in the Meselson-Stahl experiment. It was so successful that it was noticed by the chemist, inventor, and instrument-maker Arnold O. Beckman. In 1955, Spinco became a division of Beckman Instruments, Inc. (later of Beckman Coulter, Inc.).

Videotaping took place over a five-day period in early March 2007, including three days at the Spinco plant in Palo Alto (CA) and one day at the Beckman Coulter headquarters and museum in Fullerton (CA). As fate and irony would have it, I learned after filming arrangements were already made that the Spinco plant, which had been in operation in California for 60 years, would close later that year and be moved to Indianapolis (IN). This was the last opportunity to film the old plant at work. Scenes include a tour of the centrifuge manufacturing facility where each stage of assembly and testing was described by current employees, a group interview with a development team, and twenty individual interviews about their work with Spinco retirees. A highlight of the interviews was Prof. Howard K. Schachman, biochemist at the University of California, Berkeley, who was the 'godfather' of Spinco as well as a long-time collaborator and associate. He spoke of the early days of analytical centrifugation and the work he did with Edward Pickels, a co-founder of Spinco. In Fullerton (CA) we filmed interviews with former Spinco and Beckman executives, who had supervised and guided work on the ultracentrifuges, and a tour of the Beckman Museum, where most of the early instruments made by Beckman are displayed.

Films and videohistories by R. Kondratas

7. Script and interviews for a 28-min. documentary film on homeopathy entitled *Reunions: Memories of an American Experience* (Gustaf Tafel, manufacturer of homeopathic remedies), produced by the Smithsonian Office of Telecommunications (1979).
8. Helped direct and did all the interviews for a 60-min. documentary film/videotape on the production of Seidlitz Powders at Garfield and Co. in Edison, N.J. (1980).
9. Interviews with the physicians, nurses, and mother of David, "the Bubble Boy," who had severe combined immune deficiency disease, lived almost all of his life in a germ free bubble, and died after a bone marrow transplant in Houston, Texas in 1984; 5 hrs. (1986).

10. Interview with Dr. John Wild, a pioneer in the development of diagnostic medical ultrasound technology, and a detailed description of his many inventions, in Minneapolis, Minn.; 3 hrs. (1987).
11. The development, operation, commercial manufacture, and laboratory application of a DNA sequencer, from prototype to production model. Interviews with Dr. Leroy Hood and his team at the California Institute of Technology in Pasadena, Calif.; at Applied Biosystems, Inc. in Foster City, Calif.; and at Dr. Craig Venter's Laboratory of Molecular and Cellular Neurobiology at the National Institutes of Health in Rockville, Md.; 10 hrs. (1988–1990).
12. The development of instrumentation for medical imaging and biomedical research, as illustrated by the career and activities of Dr. Robert Ledley, President of Georgetown University's National Biomedical Research Foundation, with particular emphasis on the invention of the whole body CT scanner; the development of X-ray CT and other medical imaging techniques at Georgetown University Medical Center, with an emphasis on current X-ray CT operations. 8 hrs. video, 4.5 hours audio (1989).
13. Interview with V. Kudracev, a retired NIH engineer, about the history of MRI imaging; 1 hr. video, 3.5 hrs. audio (1989).
14. History of the cell sorter and the development of flow cytometry instrumentation. Interviews with Professors Leonard and Lenore Herzenberg at Stanford University in Palo Alto, Calif.; with Prof. Leonard Herzenberg in the AIDS exhibition at the National Museum of Health and Medicine in Washington, D.C.; with Drs. Boris Rotman, Marvin van Dilla, and Mack Fulwyler at Brown University in Providence, R.I.; and at Becton Dickinson Immunocytometry Systems in San Jose, Calif.; 10 hrs. video and 10 hrs. audio (1990-91).
15. Documentation of the sequencing of the smallpox virus genome before destruction of the last samples of live virus in the United States and Russia. Interviews with Drs. Craig Venter and Brian Mahy and their research team at the Laboratory of Molecular and Cellular Neurobiology at the National Institutes of Health in Rockville , Md.; 4 hrs. video (1991).
16. Completed a 30-minute edited videohistory program documenting the history of the cell sorter (1992).
17. History of the development of PCR (Polymerase Chain Reaction) technology and instrumentation. Interviews with inventor and Nobel Prize winner Kary Mullis and the research scientists at Cetus, Inc., in Emeryville, Calif., who were the early developers of this technology and the PCR instrument. Documented the building and marketing of this technology and instrumentation by the Perkin-Elmer Corporation in Norwalk, Conn., and the continuing development and applications of PCR technology by research scientists at Roche Molecular Systems, Inc. in Alameda, Calif..; 9 hrs. video, 10 hrs. audio (1992–93).
18. History of computed medical sonography. Interviews in Mountain View, Calif. with Samuel Maslak, the founder and CEO of Acuson Corporation, and Nelson Wright, one of the chief engineers, among others, who helped develop the Acuson 128 scanner and introduced it in 1983 as a pioneering example of the application of computers to form real-time ultrasound images. In 1996 they introduced the Sequoia 512 system, which for the first time used both phase and amplitude information from sound waves to produce fine-quality images with much more diagnostic information. Documented the assembly of the Acuson 128 and Sequoia 512 scanners as well as issues regarding patenting and marketing of these instruments; 12 hrs. video, 10 hrs. audio (1996).
19. History of artificial heart development, especially the Jarvik-7, and of left ventricular devices (L-VADS). Interview with inventor Robert Jarvik in his office in New York City

and at his very large conference table on which many of the hearts and l-vads that he worked on were displayed; 4 hrs. video (2006).

20. History of the ultracentrifuge in the United States. Interviews in Palo Alto, CA with many current and retired staff of the Spinco Division of Beckman Coulter, Inc (Fullerton, CA) and a tour of the manufacturing facility and display of old ultracentrifuges, starting with the Model E. Spinco was the first to successfully produce ultracentrifuges in the U.S. Especially interesting interview with biochemist Prof. Howard K. Schachman of the University of California, Berkeley, who was the 'godfather' of Spinco and long-time collaborator and associate. Interviews in Fullerton, CA with former Spinco and Beckman executives, who had supervised and guided work on the ultracentrifuges, and filming in the Beckman Museum of some of the first instruments made by Beckman; 13 hrs. video; (2007).

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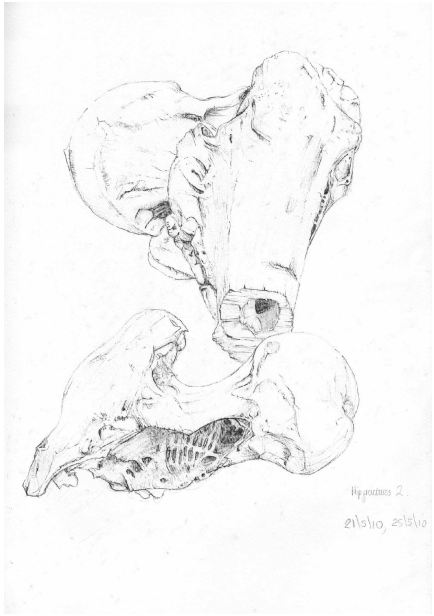
Lucy Lyons

What am I looking at?

How can museums communicate medical information to people? How much do visitors understand and how do we know what they understand? In this paper I will discuss a model that is not new or currently popular within museums which is able to show the insights and journey of understanding gained by the visitor.

This involves examining how the old fashioned art of looking at objects can be sometimes overlooked in favour of other models and technologies and demonstrates how drawing as an activity both locates the object as central to communicating information and to the process of seeing and understanding, and allows viewers to gain their own subjective insights through participation rather than through the passive receipt of information.



Can this way of investigating an artefact benefit the researcher, the curator and the museum visitor? The claim here is not that this methodology can work for all people all of the time. It is subjective so cannot possibly hope to achieve this. What it can do is offer a participatory method of investigating an object. This allows a wider and more diverse range of information to be found by those unfamiliar with an object being observed and new, fresh insights are revealed to those already familiar with an artefact being investigated. Beyond recording the object, the activity of drawing evidences the level of and specificity of understanding the viewer has of the object as their knowledge deepens and grows.

Current research will be outlined showing the benefits of experiencing actual artefacts rather than virtual and textual information alone. This will be discussed within the context of a description of an experience as a visitor to a ‘Science Centre’.

Using evidence from workshops run in the Medical Musieon over the past 6 months, I will conclude that a model where a viewer is allowed to gain better understanding of an object and is encouraged to actively seek out knowledge offers a different and often richer experience than one that is based on the viewer being told facts and information within a purely educational museum setting that does not make use of actual objects. Feedback used comes from workshops with those from science as well as non-science backgrounds and with academics as well as with students.

Robert Martensen

Integrating the Physical and Virtual in Exhibitions, Archives, and Historical Research

In museums of science and medicine, a 'one size fits all' approach doesn't apply. Each institution cobbles together its programs based on its own universe of collections, values and interests, staff members, patrons, spaces, and other factors. This presentation addresses three conference themes in the context of the Office of History at the National Institutes of Health (USA).

1) How can museums use older collections together with new acquisitions from contemporary medicine? NIH museum collecting began in the 1980s and concentrates on objects from the post war period with some memorabilia from NIH predecessor agencies that date to the late 19th c. Many objects are laboratory instruments from the 1950s to the present, including prototypes of early biomedical computers, biochemical models, chemical analysis machines, and other scientific/technical objects. A few PowerPoint slides from two exhibits currently in development suggest how the Office of History is incorporating these materials. One exhibit focuses on the career of Marshall Nirenberg, a scientist who received a Nobel Prize for his elucidation of RNA. The other exhibit traces the development of prosthetic heart valves from the 1940s to the present.

2: What acquisition methods allow museums to keep up with developments in contemporary biomedicine? The amount of historically significant material that large organizations generate is staggering. NIH has an annual budget of approximately $30 billion (USD) divided between 'intramural' research, most of which is conducted by government staff in Bethesda, MD, and 'extramural' research that takes place in US universities and research groups around the world. In order to provide an historical record of one new extramural program—Clinical Translational Science Awards (CTSAs)—the Office of History has begun a program to 'crawl' and preserve the web pages of the 40+ CTSAs currently operating in the U.S. Some PowerPoint slides illustrate the archival program.

3: How can curatorial work in museums draw on scholarship in the humanities and social sciences? Beginning in 2008, the Office of History expanded its post-doctoral fellowship program through partnerships with individual institutes of NIH. Post-doctoral fellows in history and social studies of science are generally funded for two years, during which 80% of their time is devoted to their own research projects on the history of a biomedical topic in which NIH has played a significant role or the administrative history of NIH. 20% of their time is spent in service work in the Office of History. Currently, the Office of History has seven Fellows in residence, and this presentation briefly outlines their topics and modes of participation in Museum and Archival activities.

Stella Mason

Medical museums, contemporary medicine and the casual visitor

Background

When I left the Hunterian Museum at the Royal College of Surgeons in 2007 I was aware that the displays telling the story of surgery since 1960 were incomplete two years after the museum re-opened. There were a number of reasons for this delay:

21. Staff were not subject specialists in this period;
22. Difficulty in identifying key surgeons and technicians to help with each specialist area;
23. Surgeons in current practice were unable to devote enough time to the museum;
24. Key developments in the story did not translate to suitable display objects and what were the key developments anyway;
25. Difficulty in collecting current material.

This was a new reality for us but it is probably quite common across medical museums. We are more comfortable displaying medical history. Our collections are mostly from the 19th and early 20th centuries and randomly acquired over time rather than selected as we have to do when we collect contemporary material. We are not usually medically qualified ourselves but historians so we feel happier dealing with the past. Modern objects are unwieldy or unattractive, the science is more complex and we need professional help to understand the science before we present the stories to our visitors. Furthermore we are under pressure from our boards and committees; doctors like new things and are keen for us to show the latest treatment or piece of technology as they think that it will make the museum more 'relevant'. I think this is an issue not only for medical museums. Art museums tend to segregate past from present but military museums face the same challenges as medical museums. They aim to bring their visitors close to troops fighting remote foreign wars by showing computer warfare and a desert hut but the effect is to diminish the activity to kit and uniforms.

Project

I wanted to investigate this further by asking what our visitors thought and the reasons why they visit medical museums in the first place. Over the summer I have been speaking to visitors in the Thackray Museum, Leeds, (where I am a trustee) and my former museum, the Hunterian Museum in London. Questions have covered three main areas: motivation for visit; the visit and background and experience of

the visitor. At time of writing I have managed to speak to 55 visitors but hope to speak to more before September. Even from this small sample a number trends have emerged. This is not a scientific study and surveying over the summer has skewed the evidence with less school parties and more overseas visitors. I wanted to speak to the 'casual' visitor who came on their own initiative. With all these caveats I still think that the results show that there is something to consider.

First, I will give a brief description of the museums I used. The Thackray Museum, located in a former workhouse adjacent to St James Hospital, was founded in 1995 with a core collection of surgical instruments made by the Thackray Company. Significant collections have been added since, e.g. Wilkinson Collection of drug jars and the Stevens' collection of hearing aids. It is the largest medical museum in UK outside the Science Museum in London. It was designed as an education venue and key displays include: a Leeds Street in 1842, an amputation scene and having a baby. The permanent displays finish in 1995 but the Life Zone, a gallery for families and primary school children about the functions of the body, and a semi-permanent gallery sponsored by de Puy showing replacement 'body parts' have been added. The Hunterian Museum, located in the centre of the Royal College of Surgeons of England, displays the surviving collection of John Hunter, an 18th century anatomist and surgeon. Around the human and animal specimens there are supporting displays explaining Hunter's life and times and further displays show the main surgical developments since the 18th century and the development of surgical instruments. The Thackray Museum has around 80,000 visitors each year and charges an admission fee while the Hunterian Museum has 45,000 visitors and is free.

Results

The results are divided into evidence resulting from asking a series of set questions and then an anecdotal section where I outline visitors' ideas and feedback. I only spoke to those who had seen all around the museums.

Motivation	%
Personal interest	45
Recommendation (word of mouth or media)	20
Other (including 20% for exam revision)	35
Visit	
First visit	80
Visited other medical museums	25
Expected to see modern medicine	40
Remembered the contemporary displays	50

Remembered the historical displays	50
About the visitor	
Medical professional or in training	30
Related to or knows a medical professional	55
Extensive hospital/health experience	5
None at all	10
Regularly watch popular medical dramas (soaps)	55
Do not seek medical information	20
Male	30
Female	70
Under 16	18
16-25	23
26-35	17
36-45	15
46-55	7
56-65	13
66-75	2
Over 75	2
No age given	3
White British	66
Black British	14
Overseas	20

My discussions with visitors focussed on their interest in contemporary medicine, their views of the displays in the museums and ideas on what other subjects they would like to see presented in the

museums. There were differences between visitors to the two museums. Students revising for the History of Medicine exam were exclusive to the Thackray while only visitors to the Hunterian Museum visited other medical museums, principally the Old Operating Theatre Museum and the Wellcome Collection, both in London. The Hunterian Museum received more overseas visitors as one would expect in London but the Thackray Museum had more displays of contemporary medicine which made more impact on visitors. Most visitors had some connection with the medical world and consequently wanted to see subjects such as health economics, medical ethics and basic healthcare covered. They seemed to echo our boards in wanting to turn the medical museum into a public health education centre. All the students at the Thackray Museum and many other young visitors only wanted to see the displays on 19th century medicine and public health. A high proportion of all visitors (20%) were not interested in current health issues although those that were showed a healthy lack of trust in websites other then BBC or National Health Service (NHS) direct and their own General Practitioner. It was unsurprising to find out that most visitors admitted to watching popular medical dramas (soaps), for both the dramatic content and for the medical environment. First time visitors found it quite difficult to comment on what they had seen especially in the Hunterian Museum where the mass of animal and human specimens was overpowering. Although there were significantly more female than male visitors, young men were interested in the 'having a baby' area in the Thackray Museum and the display of foetuses in the Hunterian Museum. Visitors remembered the interactive units such as in the life zone at the Thackray and the operation videos and keyhole surgery activity in the Hunterian but not any detail about the displays. However, the horrors of the past treatments, diseases and doctors were vividly recalled.

Further thoughts

Can we assume that with 85% of visitors having some kind of connection with the medical world, we are preaching to the converted and satisfying our key stakeholders rather than challenging and informing our general visitors? People are surrounded by medical information from the media. Snippets from medical journals are placed out of context in tabloid newspapers. TV broadcasts sensational medical dramas and grotesque documentaries side by side with serious programmes and health studies. Where do medical museums sit within this overload? I am sure that special exhibitions and events relating to current medicine, carefully planned for target audiences with modest learning outcomes, do have a place in our museums, but, from this small encounter, I would suggest that visitors adopt a general museum approach and glide through the displays as they would any other museum. Displays showing current practice help to put our historic collections into context but our museums should not be a comprehensive source of up-to date medical information.

Sniff Andersen Nexø

Showing fetal realities: Visibility, display, performance.

"Light-footed dancing steps" – "Giggler in mother's womb" – "Baby week 38 plays the guitar. A small germ with music in the body" – "A tiny boxer" – "Holding hands" – all titles assigned to 3D and 4D ultrasound visualisations of foetuses in the womb displayed on the internet by Danish ultrasound clinics.[36] Since around 2000, an increasing number of clinics offer so called *luxury* or *reassurance* scans as a supplement to the free scans for visible signs of disease or malformation offered by the public health care system.[37] For what corresponds to a little less than 200 Euros, expecting women/couples can acquire scanning and take-home images of their unborn when they like – and many do so one or more times during a pregnancy.

Reflecting on this development brings about the simple question dealt with in this short paper, as well as in *Reality Show* – one of the installations of *Split + Splice*: What are we looking at?

Showing I: Making Baby visible

[show (verb): be, allow, or cause to be visible][38]

The dissemination of ultrasound pregnancy scanning and imagery into lay practices coincides with the availability of new scanning technologies adding depth and movement to the images of the unborn. Whereas professional and specialised skills were prerequisite to translating the flat contours of early ultrasound visualisations into useful information about fetal development, the 3rd and 4th dimensions added along with improved hard- and software have provided present-day ultrasound images with a close resemblance to the more familiar ones of photography and film. This has significantly increased their interpretability even for lay people and turned them into a marketable good and contributed to their

36 Ultrasound clinic texts from www.scanningsjordemoderen.dk, www.graviditetsklinik.dk (August 19, 2008). All translations from Danish internet sites by author.

37 www.esph.dk; www.graviditetsklinik.dk; both August 19, 2008. *"Reassurance scan"*, in Danish *"tryghedsscanning"*, is a term also frequently used by pregnant women in internet fora, see for instance www.min-mave.dk/debatten (August 19, 2008). The first private clinic entirely dedicated to pregnancy scanning, Scanningsklinikken, opened in 2004.

38 Dictionary definitions in this text are from Oxford English Dictionary and Oxford Thesaurus Dictionary, both at http://ordbog.gyldendal.dk

dispersion throughout the public realm: Modern ultrasound appear to reveal a hitherto hidden reality not only to the experts, but also to the parents-to-be. As one clinic puts it:

> *"Hello in there.*
> *If you have once been ultrasound-scanned and have seen with your own eyes the incipient new life budding inside the womb – you're sold! The experience is entirely inexpressible. […] Also, many would like to share these early peeps at the small new family member with their close ones."*[39]

One way of sharing the acquired vision is to bring home a 'family video' or the 'first pictures of Baby' for the 'family album' – standard practices of any pregnancy scanning clinic.

Browsing some of the many internet fora for pregnant women confirms that ultrasound customers, too, perceive of the technology as a way of seeing the real. As one woman expresses it: *"it is fantastic to have seen your child as if you were holding it in your arms".*[40] Another focuses on what she experiences as a photographic documentation of what she saw: *"It is really a portrait of him taken from my belly!"*[41]

Although most private clinics do inform that pregnancy scanning in some (rare) cases may result in unhappy findings, marketing emphasis is not surprisingly on the overwhelming emotional experience and potential transformation awaiting their customers: Ultrasound images will enable the prospective parents to 'be along from the very beginning', to recognise individual and family features in the child, to be close to, and even get to know their child before birth.[42] Again, this is confirmed by customers exchanging scanning experiences on the net: *"Wow, I fell madly in love with him, he's simply too gorgeous. I could gaze in at him forever and ever!"*[43]

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39 www.scanning-graviditet.dk (August 19, 2008).

40 www.min-mave.dk/debatten (August 19, 2008)

41 www.navlestreng.dk/ekspertblogs/post-view/LISETTEogPIA/34 (August 19, 2008)

42 www.esph.dk; www.babyscanning.dk; www.jordemoderensscanningsklinik.dk (all on August 19, 2008).

43 www.sitecenter.dk/mrd/nss-folder/3dscanning/ (August 19, 2008)

In other words, the very visibility created by ultrasound technology may have – and is expected to have – affective consequences such as feelings of presence, closeness and bonding, as it has long been argued in the medical literature.[44] It may, in essence, perform the foetus as a physical reality that parents can practically and emotionally relate to.

Titles given to the displayed visualisations, as quoted in the introduction, further stress that what is made visible is not only a living body, but a 'someone' in the womb – someone already provided with a unique personhood and individual talents.

In sum, professionals and lay persons tend to refer to ultrasound visualisation as a kind of peep-show rendering the womb transparent and allowing the spectator to *actually see* and hence get to know the foetus-person inside the body, real-time.

Showing II: Displaying visualisation practices

[show (verb): put on display in an exhibition]

The ultrasound images circulating in private and public space today are highly mediated visualisations generated from the assembly and digital transformation of data produced by the reflected echoes of bundles of ultrasonic sound waves – a technique in some ways different from the touching and handling of foetal bodies 'in the flesh' necessary to produce the drawings, models, tables and histological slides that proceeded it. It has been argued that a corporeal foetal body has been substituted by a de-materialised and hyperreal one that has over time come to seem "natural" to us.[45] However, even the familiarity of such a corporeal foetal body was already the result of visual as well as (con)textual mediation performed by generations of scientists in close corporation with artists and modellers.

The technology of 'peeping in' did not emerge out of the blue. It is merely the latest instantiation of how, for centuries, scientists and other professionals have developed ways of making the content of the pregnant womb visible to the outside world. Without these earlier visualisations of the foetal body, there would probably have been no customers recognising what they see in today's 2, 3 and 4D ultrasound images as 'their child'.

It is exactly the connectedness of foetal visualisations in a longer historical perspective that I sought to explore in *Reality Show*. The installation consisted of five pairs of display cases each separated by double mirrored shields. Each pair presented on the 'back' side a particular historical foetal visualisation – and on the 'front' side elements of the technical apparatus used to produce this kind of visualisation.[46]

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For a recent example, see Michelle M., Edwards, Fei Wang, Tapas Tejura, Alpa Patel, Sharon Majewski, Alan E. Donnenfeld: Maternal reactions to two-dimensional compared to three-dimensional foetal ultrasonography. Journal of Psychosomatic Obstetrics & Gynecology, 31(2), 2010, pp. 53-59.

45

Lynn Morgan: Materializing the Fetal Body, Or, What Are Those Corpses Doing in Biology's Basement? In: Lynn Morgan and Meredith Michaels (eds): Fetal Subjects, Feminist Positions, University of Pennsylvania Press, 1999, p. 58. In the same book, Barbara Duden in The Fetus on the Farther Shore (p. 24) makes a similar point when describing contemporary pregnancy as a "disembodied realization of an optical imputation" produced in the virtual spaces of ultrasound screens, potentially reducing women's subjectivity to mere virtuality.

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Working chronologically 'backwards', the five visualisations were:

- A 2007 digital file looping on a small screen, showing part of a 4D ultrasound scan of a foetus around week 13. Below this four Polaroid photos of two-dimensional B-mode images from the 1970s.[47]
- An embryological *Normentafel* from anatomistWilhelm His' 1882 *Anatomie menschlicher Embryonen*, showing 'normal' embryological development from weeks 2 to 9 of gestation.
- Two obstetrical wax reliefs from early 19th Century showing a female body opened by dissection, and a 9 month foetus in the uterus.
- A fully developed foetal specimen from the teratological Saxtorph Collection at the Museion (specimen undated, collection established and extended 1771 to c1950).
- And an engraving of triplets from anatomist Thomas Bartholin's *Neu-verbesserte Künstliche Zerlegung des Menschlichen Leibes*, 1677.

The visualisations were chosen to draw attention to *what* is made visible – and *how* the visualisations have been produced. Some examples of the first (*what*): The *normal* foetus of the wax table, the norm for progress in foetal *development* of the His table, the *extraordinary* triplet pregnancy of Bartholin's book and the (perhaps?) *pathological* specimen of the Saxtorph Collection are astonishing in their own capacities. At the same time, they invite to reflection on the ambiguous content and purpose of modern ultrasound scanning: This is a technology where reassurance and luxury meets risk assessment and diagnostics. The unforgettable experiences of scanning customers may potentially be remembered not for the belief that everything is normal in Baby's first picture – bur for increased risk estimates, the finding of malformations, and for troubled decisions as to whether the pregnancy should continue or be terminated. The table of developmental norms may also remind us that the surveillance of normal foetal development performed in ultrasound clinics today rely on various sets of norms that are in themselves scientific artefacts based on the collection, preparation and systematisation of uncountable foetal specimen and data.[48] From yet another perspective, the absence of the pregnant body in all but one of the visualisations is conspicuous, as it has been argued in much feminist literature on the medicalisation of pregnancy.[49]

I stress 'technical elements of', recognising that apparatus in a foucauldian sense is a much wider concept that might include not only 'things', but relations, institutions, ideas etc.

47

The file was curated for *Split + Splice* from the Ultrasound Clinic at the National Hospital in Copenhagen thanks to the kind cooperation of professor Ann Tabor, and the Polaroid photos kindly lent to Museion by doctor Fleming Jensen, Gentofte Hospital. The other visualisations, as well as most instruments etc, were already in the Museion collections.

48

Donna Haraway (among others) has argued that scientific facts, too, are artifacts produced in human-material practices . Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. Feminist Studies, 14(3), 1988, pp. 575-599.

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On the *how* side of the installation, in brief, the Bartholin triplets were connected with drawing and engraving tools. Chemicals and instruments for preservation of human material accompanied the Saxtorph specimen. Dissection instruments next to wax and modelling tools related to the wax tables. Microscope, microtome and histological slides demonstrated the making of His' table of norms. And a simple A-mode ultrasound apparatus supported by two graphical representations of the basic functionality of ultrasound were opposite to the ultrasound visualisations.

Whereas the five visualisations were invisible from the 'front' side of the installation, the double-mirrored shields made it possible to see both the visualisation and, behind it, the technical means of its production.

Showing III: Performing foetuses

[showing (noun): the action of showing something, or the fact of being shown; the way in which something is argued or represented; performance]

Why place these elements of the visualization technologies as the first perspective visible when entering the room? As written in the room panel and the exhibition manual: "'Seeing' depends on elaborate visualization instruments designed to display the vitality of the body. Dead or alive, it is opened, divided, and sliced; traced and mapped; criss-crossed by lightbeams and soundwaves. Only then can the mediated 'parts' be reassembled, this time in images…". Countless working hours, instruments, and materials, a variety of highly specialised scientific, technical and artistic skills and, probably, a considerable amount of failure have been invested in processing female and embryonic/foetal bodies in order to produce something that could, and can, be seen by professionals and lay people. This is the kind of labour that has shaped the present knowledge and recognition of the content of the pregnant womb. The foetuses we live with today, as Barbara Duden puts it, were first conceived not in the womb, but in visualizing technologies.[50]

Thus, by dragging the tools to the forefront, I wished to stress exactly the producted-ness of each of these five ways of 'seeing' – and, accordingly, to postpone the focus on the particular kinds of bodies that could be seen on the other side of the screens: The foetuses performed in data, ink, wax and flesh.

The primate of vision/visibility in the production of truth and objectivity is a well-researched subject.[51] Seeing, it has been convincingly argued, is a highly mediated practice – and mediation in foetal imagery has not become less complex with 3 and 4D ultrasound scanning. My ambition, however, is not to dismantle the reality of the foetuses made visible. Rather, my inspiration and theoretical basis for working with *Split + Splice* and with this installation is drawn from the turn towards *performativity*, as it has been developed by a.o. Annemarie Mol, and closer related to this particular topic by Donna Haraway and Karen Barad. Barad in particular has worked extensively and critically with what she defines as *representationalism*: the cognitive

See for instance Barbara Duden: Disembodying Women: Perspectives on Pregnancy and the Unborn. Harvard University Press, 1993; Rayna Rapp: Real time is prime time: The role of the sonogram in the age of mechanical reproduction. In G. Downey et al (eds.): Cyborgs and Citadels: Anthropological Interventions into Technomedicine. University of Washington Press, 1998

50 Duden, 1999, p. 16.

51 See for instance Lorraine Daston and Peter Galison: The Image of Objectivity. Representations, No. 40, (Special Issue: Seeing Science), 1992, pp. 81-128. And Haraway: Situated Knowledges.

divide in Western culture between the object seen, the subject looking, the visualisation in image or text, and the apparatus of its making. Barad suggests the alternative *agential realism*, an analytical approach that does not dissolve objects into discourse, but turns its attention to the ways in which phenomena are performed in material-semiotic intra-actions co-constituting all partaking elements.[52]

In Barad's reading, the ultrasound image on the screen in pregnancy scanning refers not to any foetal object per se, but to a particular phenomenon *"constituted in the intra-action of the object (commonly referred to as the 'fetus') and the agencies of observation"*.[53] Phenomena do not (pre)exist, they occur. This approach allows matter and bodies – transducers, screens, foetuses, pregnant women – to be significant and active in the world, yet denies them the status of objective referents (the real real) of which the visualisations can only be more or less accurate representations.

Reality Show is, of course, in itself a phenomenon in this sense: A performance in which images, instruments, showcases, texts – and I – intra-acted in the constitution of what "showing foetal realities" could be about. I remain more doubtful whether visitors too became engaged in this particular performance, or rather intra-acted with the installation in so many different ways, if at all. The difficulties in making objects talk in the museum mirror the challenge in the theoretical turn from discourse to performance and materialisation.

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Karen Barad: 'Getting real: technoscientific practices and the materialization of reality'. In: Differences: A Journal of Feminist Cultural Studies 10(2), 1998, pp. 87-128. See also Agential Realism: Feminist Interventions in Understanding Scientific Practices," in *The Science Studies Reader*, edited by Mario Biagioli, NY: Routledge Press, 1998; and Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter. In: Signs. Journal of Women in Culture and Society, 2003.

53

Barad, 1998, p. 101.

Kim Sawchuk

Biotourism and Biomediation

In 2008 the Canadian news covered the story of the adoption, in several local hospitals, of the Given Imaging Corporation's, PillCam ESO, a camera you swallow like a pill that is used to examine the intestinal tract. Originally developed for military application by a team of Israeli scientists, this miniature camera takes fourteen pictures per second as it travels through a subject's inner recesses on its twenty-minute voyage. Approximately 2,600 images in total are beamed, wirelessly, to a miniature computer strapped to the body of the wearer. Once the camera's journey is complete, the images are then downloaded onto another computer, where they are pieced together for analysis, interpretation, and cross-verification with other data such as blood and urine analyses (http://www.givenimaging.com).

This diagnostic technology, and its transformation into a headline news story, \ is emblematic of a phenomenon I have described, in a series of essays on art, medicine, technology, popular culture and the body as biotourism. In biotourism audiences are given a chance to experience the cultural fantasy of travel into the contours of "inner space," either their own or that of someone else. In the art world, installations such as Mona Hatoum's *Corps étranger,* set up a compelling and disturbing journey through her intestinal recesses that places the visitor not only into close vicinity with her nether-regions, but into a collusion with the technologies of visualization that make this act of seeing possible.

The study of biotourism has been premised on four vectors of analysis, that exist in various combinations in these locations and across media sites: scale (whereby the miniature is turned into the gigantic, inverting the relationship between the microcosmic and the macrocosmic); space (in particular, as the configuration of inner space as a landscape or territory for fictive travel and exploration); movement (the ways that travel through this bioscape is staged diegetically); and affect (usually expressed in terms of the sublime or the grotesque) (Sawchuk 2000).

These spaces, part of the "recessive body" beyond the purview of our daily gaze (Leder) may be familiar, drawing upon a history of representations from both figurative art and gross anatomy. In the world of "biotechnomedicine" (Dumit, 2004), The Visible Human Project's ghostly "revenants" (Waldby, 2000) may be produced by complex scanning procedures and computer simulations to provide scientists with the means to "fly through" a three-dimensional rendering of a corpse, but the forms and navigational systems still bear a history of depiction of the anatomical body. In other cases, journeys through these bioscapes may present the exceedingly abstract and unfamiliar image-traces of micro-molecular processes that seem disconnected from what we *know*, or think we know as a body.

Biotouristic narratives traverse both the spaces of production of "technobiomedicine" and the often unruly fictional renderings of our anxieties and longings towards these formal scientific practices in popular culture and the media, including television, movies, news, magazines, and advertising. The bioscape represented culls from the history of technological mediation of the body: a "get milk" advertisement shamelessly may depict an x-ray of the bones of a human drinking milk, while a highway billboard from a few years back presented a colour image of a cancer cell with the subtitle "dangerous beauty" in an effort by the Canadian Cancer Society to instigate awareness and raise funds.

Travels through the body is, likewise, a staple mode of representation in museums, science centres, galleries, and other exhibition spaces. Here I have documented how curators and artists have attempted to render two-dimensional images of the bioscape into a three-dimensional haptic experience for visitors. Most often this has entailed an ongoing encounter with the anatomical body, as in The Franklin Institute Science Museum in Philadelphia's "walk through heart" a plastic simulation of a the chambers of the heart complete with soundtrack. In these displays exceedingly familiar, and highly symbolic and iconic anatomical structures (the heart, the brain) are enlarged, exaggerated and corporeal relations are inverted for pedagogical purposes. There is often a lesson, delivered in admonitory tones, about the individual's responsibility to achieve good health at the same time as moving through the body tries to engage and entertain these same visitors.

What is typically absent from the displays is a discussion of how science produces representations for different purposes, and how they "act" or "perform" in different context. The study of biotourism is not only the study of the modalities of scientific representations of the movement through bodies but a consideration of the technologies that produce bodies in science as well as the different "styles of thought" associated with different communities of practice, to quote Ludwik Fleck. Turning attention from biotourism to biomediation entails foregrounding the technical apparatus of image production and display, not to present a story of the triumph of technology, but to comprehend the practices that give rise to new bodies beyond the anatomical and physiological.

This has repercussions for the display of science and technologies within museums. This is an approach to the present that takes into account the persistence of 'older modalities' for thinking and experiencing bodies in these shifting conditions of intellectual and cultural production. Change within these domains never happens in one fell swoop or evenly, as my previous examples indicate. We might ask why the anatomical body, from Günther Van Hagen's parade of plastinates to the recurrent exhibitions of the history of anatomy, continue to fascinates and draw visitors to galleries and museums. Is it because there is a nostalgia for this body, one that is comprehensible, familiar, seemingly more tactile, hugely affective, yet waning in importance in terms of scientific exploration and explanation? Why the persistence of these familiar corporeal tropes when, as Nikolas Rose has argued, the contemporary biomedical body began to emerge when "life itself" was molecularized and "conceived on a different scale", a transition that has been in motion for well over 70 years? As he explains, "in the 1930s, biology came to visualize life in terms of phenomenon at the sub-microscopic region– between 10^{-6} and 10^{-7} cm." (44) As he suggests one of the "keys" to the contemporary "biopolitics of life lies in the new molecular scale on which life is envisaged and acted upon." (82). If this is the case then it is critical, as the mandate for this symposium suggests, that we contemplate the politics of life at this register, and find new ways to publicly display these shifts in a manner that is compelling to the public.

One of the other possibilities is to take the vernacular ways that we understand life, and the history of media representations, as an important part of the display culture of science: to bring the popular forms they take into the gallery, museum and science centre as a part of culture, and as a key part of the process of the mediation of science and technology I the public realm, that can be put on display as artifact and object alongside of more "official" and accurate renderings of scientific imaging: in other words, to bring the role of critical media studies into the gallery and the museum.

Conceptulaly, thie involves not only a consideration of biotourism, but biomediation and where the emphasis is on the term "media" and the many modes, twists and turns whereby media forms intersect and collide to create out modern sensibility towards our self-understanding as embodied beings. Thinking not

only of what is presented, but the complex processes by which, as Viviane Sobchack writes, we come to chart how "each technology not only differently mediates our figurations of bodily existence but also constitutes them" (136). As materialities of human communication the media we use have not only "historically *symbolized* but also historically constituted a radical alteration of the forms of our culture's previous temporal and spatial consciousness and of our bodily sense of existential "presence" to the world, to ourselves and to others." (136)

It also entails new forms of collaborations, and considering the researcher less as a "biotourist" travelling through these spaces, and instead as "embedded," implicated and invested, at a practical level, within "biotechnoscience" a position that is compelling, but which also has its pitfalls. In establishing these collaborative connections, the role of the cultural theorist is transformed. Rather than occupying the position of moral high ground, from the outside, one is brought into the processes and practices of mediation in a manner that invites collusion and an immanent engagement with these domains.

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Thomas Schnalke

Dissolving matters. The end of all medical museums' games?

In our medical and medical historical museums we offer narratives. Following certain roads of arguing, perspectives and approaches these stories take our visitors through defined historical spaces – in room and time. Willingly or unwillingly, we always tell our stories from a current point of view. With each exhibition we also want to reflect on medicine and want to make our audiences understand medicine or medical relations of today, not the least to see what the developments might bring tomorrow. However, what happens if the object of medical practice and research disappears from the visible, as it seems to be the case in the beginning of the 21st century? Medical matters seem to dissolve exponentially into the highly artificial worlds of molecular laboratories and of the omnipresent computer. Enhanced images from functional NMR-machines or PET-scanners have turned hearts and brains into representations of the representation of the real thing. What we see in the end is the virtual blur of some algorithmically organized bytes and bites. Macroscopic human organs and tissues have the reputation of prehistoric dinosaurs of an early natural scientific era in medical research. Since quite a while, genetic and epigenetic

phenomena attract the utmost interest in modern labs. *Signal transduction* and *synthetic biology* are only two of a set of the mystical-miraculous terms that fuel and define the current platforms of action: Biomedical research has reached the nano, atomar and even hicks realms of investigating organic life. The protagonists and observers are mostly thrilled by the clicking noise of a gigantic invisible Lego world that seems to overtune the confusion in all the combinations and re-combinations that are tried out in endless studies in the lab.

In stating this, we have to ask: Have we lost grounds for our narratives? Have we lost the focus of what we want to keep and store, investigate, address, and show in our museums? I don't think so! On the contrary, I believe that modern developments in medicine bear the chance for transition, renovation, and innovation in our medical museums. There is the potential to shape and sharpen the profiles of collecting, of performing research with our medical objects and of generating new and evocative concepts for our exhibitions.

Some museums, like the Medical Museion in Copenhagen, are already on their way for quite some time to find new shores in this process. As another example I want to present the turn we have taken in the Berlin Museum of Medical History at the Charité. In the beginning, we had to face the obvious fact that the fragmentation, minimization and final disappearance of the real visible medical object is a process that started much earlier than the launch of modern biomedical research in molecular labs some 60 years ago. In our permanent presentation this becomes clearly evident in our Rudolf Virchow show-room filled with some 750 dry and wet pathological specimens. There is an anatomical matrix layed out in that hall that was originally furbished around 1900. Each show case presents an addressed organ, heart or brain for instance, or a larger functional unit, like the respiratory or the gastro-intestinal tract. First, some normally developed structures are shown in specimens, models, and illustrations. Then quite a number of preparations indicate various diseases, until the viewer is finally confronted with impressive organic objects that present one characteristic disease that is typical for the respected organ: in case of the heart – the heart attack, in case of the liver – the liver cirrhosis.

In their rationally arranged density these specimens, carefully preserved and transformed into highly informative *images*, present clear signs of pathological alterations or trauma. In addition, however, they also always show adjacent healthy tissues to a degree, that an organ can be recognized in its morphologic unit, even by an observer's eye that is not medically trained at all. However, next to the surfaces and edges of these objects that are set free from their original internal body context, beyond the specimens on their solid stands or in their shiny jars, there are empty spaces. Here, in these intermediary vacuum zones something obviously starts to be missing. In fact, almost everything is missing here, everything that makes

a human being aside from the pure morphology of the fixed body structure: psychologically, emotionally, socially, culturally, politically, religiously … - but also merely organically. Withdrawing the eyes from these terrifying black wholes between the objects and re-resting the view onto the solid organs, our irritation only grows. Also here, on and within the pores and niches of an organ we can't by far find all and everything that could be said about a human being who once lived as a person in and with the seen body part. Really and truly, there is mighty little there. Almost nothing. Surely, some dried body formations pose beautifully and melancholically. Quite a few organs are floating silently and meditatively in their jars like some fishes in the aquarium. So what? These specimens have lost all features of life and living. No signs of pain, suffering, dying and death are inscribed into their surfaces anymore. No traces that point to the effects of aging or to any alterations indicating the detrimental consequences of a suddenly erupting or a chronically developing disease. Nothing! No cry! There is an ultimate silence in this room. To quite an extent, the human body has already disappeared in this historical show-room.

What shall we do? Give up? Give in and agree that a medical and medical historical museum focussing in its displays on the development of human body images has reached the end of the presentable? Close the museum and look for another job? Again: No! This would be a fatal consequence and would mean to leave out on a unique chance. What we need to do here, I think, is looking for new doors to be pushed open to find new ways of collecting, investigating and performing. We have to begin our trip into the medical museum's future with recognizing and accepting the fact that each and every exhibition at any times – like every text in an article or a book – produces or reproduces a narrative with smaller and larger gaps, leaks and wholes. I want to propose to actively turn to these empty spaces, to discover them as productive zones in between, and to use them explicitly for the introduction of new perspectives. Taking that route might emphasize in the first place that there is something missing here, but can secondly also provide us with comments and creative ideas for transcribing our narratives well into the complex present and the puzzling future.

Since the fall of 2009, we have turned these thoughts into a series of exhibitions that are labelled as *interventions*. We invited and still invite artists and curators to intervene with their shows in two core rooms of the Berlin Museum of Medical History at the Charité: in the ruinous former Rudolf Virchow lecture hall and/or in the heart piece of our permanent presentation: the show-room with our pathological specimens. The American artist Suzanne Anker was the first in the row. Under the poetic title *The Glass Veil* she presented two work groups in the lecture hall ruine: close-up photographs from our specimens in the show-cases next door in large size formats. The artist's eye focussed on some bizarre, as well as highly graceful neighbourhoods in these landscapes of arranged organic artefacts. Her second piece formed an

installation of parasuits hung upside down from the 9.30 meter high ceiling of the former lecture hall. The ropes were clamped onto the iron bars that stick out of the bare concrete ceiling and point down to the viewer. Suzanne Anker used bright white, gaze-like cloth for her parasuits, forming peaceful clouds to contrast the somehow still bleeding wounds of the bomb hit building … what a metaphor!

In the specimen show-room, between the showcases the young Berlin artist Frank Schäpel presented specimen portraits. Schäpel had created meticulously carried out oil paintings of some of the objects in our depot and on display in an almost old masterly way. The motives were banned in life size on shiny copper plates, so that the viewers saw their own reflections in the cleft canyons of a skull or the labyrinthine windings of a brain.

The Berlin architect and journalist Uta von Debschitz in the same room presented a large number of reproductions from pictures that illustrators around the highly influential medical popularisator in the Weimar Republic Fritz Kahn had created. These ingenious iconic analogies of the living human body machine and the world of real machines and architectures, as well as electrical, transportational, and communicational devices especially pointed to the modes of movement that all the tacidly frozen specimens in the show-cases nearby were missing. Again and again they made us ask the question: What is, what makes life?

The Berlin photographer Thomas Bruns has yet performed the closest invasion. For his subtle photogramms of organic formations he opened the show-cases, pushed some specimens aside or even took some of them out. The title of his intervention not only indicated a personal note in his work, but also addressed the core issue of all medical action, at times also of some general social and cultural discourses, and in the end also of our medical museological debates at this conference: *Reanimation*.

Back to the lecture hall: The Munich sound artist Kalle Laar has recently realized an audio project. From a series of some 20 vinyl records produced in the 1960s and early 1970s under the series' title *Die Stimme des Arztes* (The Voice of the Physician), Laar has mixed a provocative collage of stunning statements of highly influential German protagonists of the medical establishment. The artist also blended in some of the classical music that the celebrities had chosen to color their thoughts originally. In the empty space of the naked lecture hall ruine these voices from the off reveal a lot about the outdated habit and status of patriarch physicians from a time that is not so far away.

The latest intervention may be regarded as the ethically most radical one. The Berlin artist Rainer Maria Matysik is presenting three of his work groups. The first one contains so-called post evolutionary sculptures. Imagining what forms of organic life a lab based evolution could bring forward, Matysik has

modelled huge and colourful creatures, pop art from a distance, frightening zombies when you get closer and look twice. Three examples of these objects are on display in the lecture hall ruin. Other, much smaller pieces of art are presented in the specimen hall. *Beyond the human* is the title for the whole show. Matysik had a piece of his own skin taken and made to divide and grow in a Charité associated lab. The resulting layers of skin were fixed and shaped by the artist in certain formations. As little sculptures they are now on display next to the historical specimens pointing to the crucial current shifts in medical research and practice. They make us think more about the core features of current laboratory fantasies – design and manipulation – and the associated message: Everything is possible and nothing will be the same!

Although our interventions are open to curators and artists, it is mostly artists who seem to take a chance on this format. So, will art lead us the way? Will artists be our saviours? On these questions I will focus in my oral presentation.

Morten A. Skydgaard

The exhibition *The incomplete Child:* Boundaries of the Body and the Guest.

The exhibition *The incomplete Child* (Danish "Det uperfekte barn") showed the deviant body and evoked both fascination and horror. It told the story of children with inborn physical deformities from the perspective of history, art, science and society.

In this paper, I describe the exhibition and our intentions. I then investigate how different representations of deformed bodies and disabled people affected the audience and how the different displays acted as an interconnected whole. The paper will draw on responses from secondary school students, whom we invited to comment on the exhibition.[54]

The exhibition

The incomplete Child was held at The Steno Museum in Aarhus from September 2008 to February 2009. It complemented another exhibition called *Egg* (2007-) that reflects upon technology and human reproduction by telling the story of abortion, contraception, artificial insemination and cloning. Another debated reproductive technology, prenatal diagnostics, threatens a minority of people with inborn physical deformities in our society. Thus, our purpose with the exhibition *The incomplete Child* was to investigate the deviant body in its own right, place it in the lime-light, and reflect upon the double role of technology. On the one hand, modern aids for handicapped, e.g. elevators, transportation and communicative tools, have given people with a physical handicap much more independence and opportunities of self-expression. On the other hand, prenatal diagnostics threatens this minority, because parents can choose not to have them.

At the level of exhibition making, we aim at using different kinds of objects and media in our exhibitions. In *The incomplete Child* we displayed real foetuses, sculptures, objects, art photos and films. Visitors could test the latest things in disability aids, e.g. an eye-controlled computer, drive a high-quality wheelchair in the foyer, and were asked about their opinion on a case of selective abortion.

[54] 29 students, ages 16 to 17, visited the exhibition between 12 to 30 minutes and afterwards gave a written response to the exhibition ranging from half a page to two pages (75-450 words). Five questions were handed out to the students who could choose to use them or not (1. How did the exhibition taken as a whole affect you? Did something attract you? Were you repelled by something? How do you think adults would experience the exhibition? Did the exhibition change your view on handicapped people?)

In the centre of the exhibition, the visitors encountered Heidi Guthmann Birck's sculptures of deformed foetuses and newborn babies that showed a number of known deformities from a cleft palate to more extensive congenital malformations.[55] The sculptures were naturalistic representations of real foetuses, although not mere copies. In some sculptures the bodily features had been remodeled and aestheticized, e.g. the posture of the foetus, its facial expression, the position of the arms and legs. The sculptures were made out of burnt clay and placed like butterflies on a metal bar.

In a circle around the sculptures, the exhibition gave a broad picture of inborn physical deformities arranged around four themes: "Wondrous Explanations" investigated the parallels between inborn physical deformities and mythological figures like Cyclops and mermaids; "From Isolation to Integration" told the history of handicapped people in modern society and the development of disability aids; "Six Important Weeks" treated the recent history of inborn deformities focusing on Thalidomide, alcohol and the discovery of the vulnerability of the foetus in early pregnancy; and finally, "To choose or not to choose" explored on the one hand, the choices of nowadays parents confronted with an increasing number of detectable foetal defects, and voiced on the other hand, the critique of prenatal screening programmes by The National Association for Down Syndrome in Denmark.

In addition, an adjacent film room presented personal accounts of disabled people and their feelings, wishes and points of view in relation to themselves and society. The visitors met "Ulrich", who is enthusiastic about mountain climbing and dreams about being the first handicapped to climb Mount Everest, and "Karsten", who despite being born with no arms performed several of his duties as a director of an institution for disabled with his feet. People with severe spasticity and chondrodysplasia were also depicted.

The disgust and beauty of human deformity

None of the school students were unmoved by the exhibition as a whole and the vast majority found it "frightening", "repellent" as well as "interesting", "good" and "beautiful". The feeling of ambivalence was a recurrent characteristic, here expressed by a girl of seventeen: "I think it was an amazing exhibition. It was very beautiful in some way, but also very repellent."[56]

In a quiet corner of the exhibition two real human foetuses in alcohol were displayed. One was both a Cyclops and a mermaid syndrome, the other a Janus head. Although the foetuses comprised a minor

[55] Heidi Guthmann Birck had worked in medical collections of foetuses at the Berliner Medizinhistorisches Museum der Charité and at the Medical Museion, Copenhagen.

[56] Student no. 13

part of the exhibition, they evoked strong and, in a few cases, negative visitor responses. One girl commented that is was unethical to exhibit real foetuses, as "everybody deserves a dignified dead or funeral".[57] Despite these frequent feelings of disgust, several students responded that the foetuses nevertheless deserved to be in the exhibition, because they represented the real world and thereby made the exhibition more "trustworthy".[58]

The teenagers were also moved by the sculptures that were frightening as well as fascinating, although explicit negative responses were absent. Instead, the sculptures evoked sympathy expressed as sorrow or anguish: "If I saw a newborn with the deformities seen in the sculptures, I would begin to cry, I think. I am so sorry for these babies."[59] In spite of the strong feelings, the sculptures invited the students to investigate these representations of the human body and interpret them primarily as illustrations of human deformity.

The sculptures were also valued as pieces of art and "beautiful" craftsmanship. One girl explained that "In the way you display these figures, they all become children that you could love. They are beautiful, every one of them, in their deformity".[60]

The third element of the exhibition that evoked strong responses was the film room. The students were generally impressed by the personal lives of people with severe handicap presented in the film room. "It was cool to see that they could live a normal life despite of their deformities and that they fought so much for what they wanted", as one girl responded.[61] The responses revealed that several teenagers did not know that people with severe handicap could have a good life and manage to live a normal life in many ways.

Personal meaning making and interconnected exhibits

It is characteristic that the sculptures, foetuses and films attracted the visitors in different ways. Each of the displays was singled out as the favorite element of the exhibition. Some enjoyed the films, others were fascinated by the reality of the authentic foetuses and others again were caught by the tangibility of the sculptures.

[57] Student no. 9

[58] Student no. 7

[59] Student no. 10

[60] Students no. 15 and 13

[61] Student no. 10

It is also characteristic that the different elements of the exhibition acted as an interrelated whole. The authentic foetuses underlined that the sculptures were not only "product of the imagination of an artist". The personal stories from the films influenced how the students reflected upon reproductive technologies, e.g. the choice between bringing up children with severe handicaps and having an abortion, or the striving for perfection among nowadays parents who ought to "think twice before they choose to have an abortion of a child because of insignificant deformities", as one boy responded.[62]

Finally, when asked if the exhibition had changed their idea of handicapped people, a smaller number of the students responded positively. One girl replied that the exhibition had "changed my view on handicapped and I will be careful about what I think and say about them without knowing them".[63]

Conclusion

None of the teenagers were unmoved by the exhibition and its different displays that affected the visitors individually. One of the lessons learned was that a variety of displays secured a good museum experience for the audience and gave rise to a multitude of reflections upon human deformity, the life as a handicapped and the dilemmas of prenatal diagnostics.

Art, here in the form of sculptures, obviously seduced one part of the visitors to investigate an area of life that is secret, difficult to access and associated with taboos. In this respect, Guthmann Birck's wish to expose the beauty of human deformity succeeded.

Finally, the visitor study also points towards the interconnectedness of the exhibits. The different displays acted as complementary elements, for example when the foetuses and personal stories about disabled people supported the naturalistic dimension of the sculptures and reconnected art to the "real" world.

[62] Student no. 4

[63] Student no. 13

Yves Thomas & Catherine Cuenca

Multimedia contributions to contemporary medical museology

The medical instruments of the last 50 years have 2 main features. Firstly, most of these objects appear as black or grey boxes, rather obscure and austere, and secondly, most of the inventors, creators, developers and users of these instruments are still alive today, so can be interviewed. Moreover, involved biological processes of new medicine are now concerned with nanoscience, which is more difficult to exhibit and explain.

So, virtual elements are an indispensable addition to real objects and exhibitions in museums and the digital or virtual can contribute to bringing a human dimension to these objects, offering better and more efficient explanations. It also provides insights into the corresponding innovation processes, and into the gestures of researchers, physicians and surgeons.

With these ideas in mind, for the last 10 years, we have been designing and developing several kinds of structured multimedia products:

-through “researcher stories”, backed up by the objects used or created, we show the roles played and work undertaken by researchers and clinicians (from pure biological research up to clinics). For example, in collaboration with the participants in this scientific and technical evolution, we have explained how cancer-fighting nuclear medicine is developing, from external radiotherapy to internal radio-immunotherapy by using radioactively charged antibodies to target residual microscopic tumors. In addition, we show how, since the 1990s, this same nuclear medicine has brought about improvements in imaging quality in oncology and progressively in cardiology, thanks to advances in Positron Emission Tomography (PET) associated with a scanner.

-by telling “research lab stories”, we describe how innovative individuals and transverse teams of different skills (from physicians to researchers in signal processing) can work together over time and use increasingly effective instruments in order to develop new therapies. For example, studies in the micro-circulation of blood require new instruments, and adapted methodology and innovative algorithms in signal processing. Another example concerns training surgeons in renal transplants: previously, this was taught by assisting experienced surgeons as they actually performed surgery, but now students learn by carrying out real transplants on pigs.

-through "innovation stories", we explain that between the individual discovery of a new instrument and the actual commercial success of that innovation, there can be decades of collaboration between numerous specialists in manufacturing, instrumentation, advertising and management. For example, the invention of progressive lenses for correcting presbyopia occurred in around 1950 but it was not till around 3 decades later that the innovative Varilux lenses came into general usage and were widely adopted by wearers of bifocal glasses.

This mission, these tools and thee products based on ICT have created and continue to create at least 3 types of usage: patrimonial, scientific and cultural. The patrimonial usage, for asset protection, comes from the computer-based groupwork tool that we have developed in France (the Patstec web site) and which at least temporarily, allows us to preserve real objects *in situ*. The scientific usage is based on the audio and video archives mentioned previously, which show and explain the creations of inventions and innovations, interaction between researchers and objects and research procedures and professions, and generally speaking the sociology of research. Finally, the cultural usage concerns both teaching, that relies more and more on digital documents, and the broadcasting of scientific and technical culture that has to adapt to the new behaviour of a young public faced with ICT. This last usage should be backed up by assistants as the content is inevitably a little difficult.

As the principal target is high school students, these assistants are notably the high school teachers but can also be museum staff. And if, up to now, we have had DVD Roms as technical supports, today, with the generalization of web sites including streaming videos, we are now working on short duration summary videos that can be used inside museums or outside on web sites to prepare a museum visit, or follow up on one.

With the growing Internet Of Things (IOT), we can personify objects, by giving them intelligence and communication capacity. This refers to a unified way of identifying elements of digital information (website URLS) and physical elements by RFIS (Radio Frequency Identification Systems) chips and Bluetooth. It is a bridge between the physical and the virtual worlds: it is a new Internet which, via normalized and unified electronic identification systems and wireless mobile devices, will allow us to identify directly and unambiguously digital entities and physical objects. This in turn lets us retrieve, store, transfer and process the associated data with smooth continuity between the physical and virtual worlds.

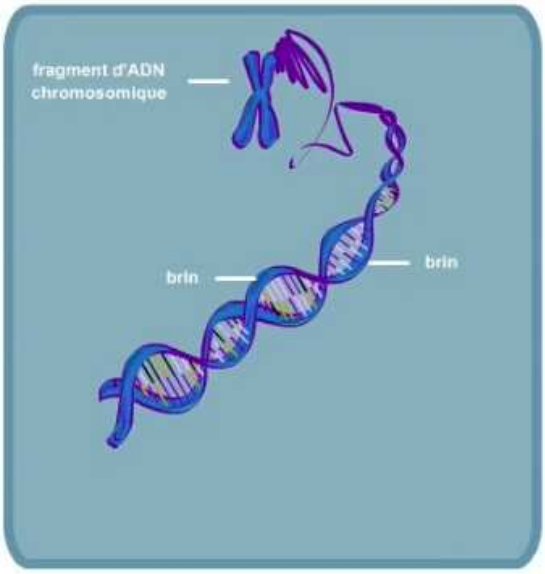
We can imagine at least two uses of these new technologies in museums. Firstly, by simple use of a smartphone, the visitor to a real modern science and technology museum, in a personalized way and through multimedia information, view the objects on display and put them in perspective and in a dynamic context. Secondly, taking a different perspective, an Internet user could view an online exhibition and use a webcam to view the real objects as they are exposed in a real museum anywhere in the world.

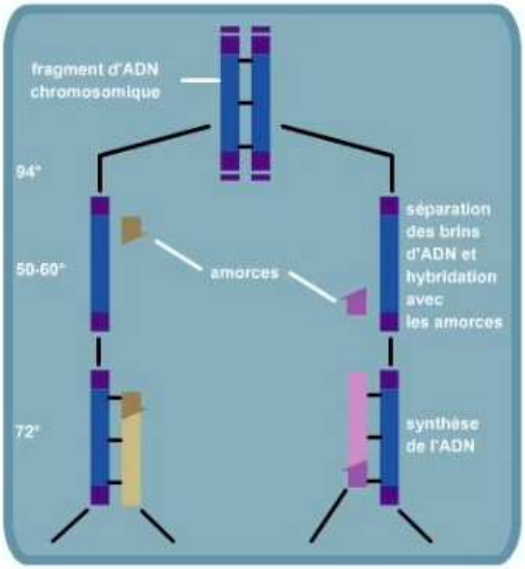
So it is clear the technology is here with all types of cutting edge communication tools (Web 2.0, smartphones, iPads, etc.) according to the latest fashion, but the most important aspect is the quality, effectiveness and relevance of the content developed. This is why we need to develop more and more the stories behind contemporary research and innovations, using living participants and illustrate them in a highly pedagogical manner, despite the short length of the videos (a necessary evil in today's culture of instant gratification).

To sum up, the digital or virtual contributes to bringing a human dimension to material components, which are naturally inanimate, austere and relatively obscure. Although some observers often complain of disembodiment, saying that the virtual cannot replace the material of a real museum (despite the abundance of "Do not touch" signs!). With the advent of the sensory Internet, the user will even be able to « touch » these real objects!

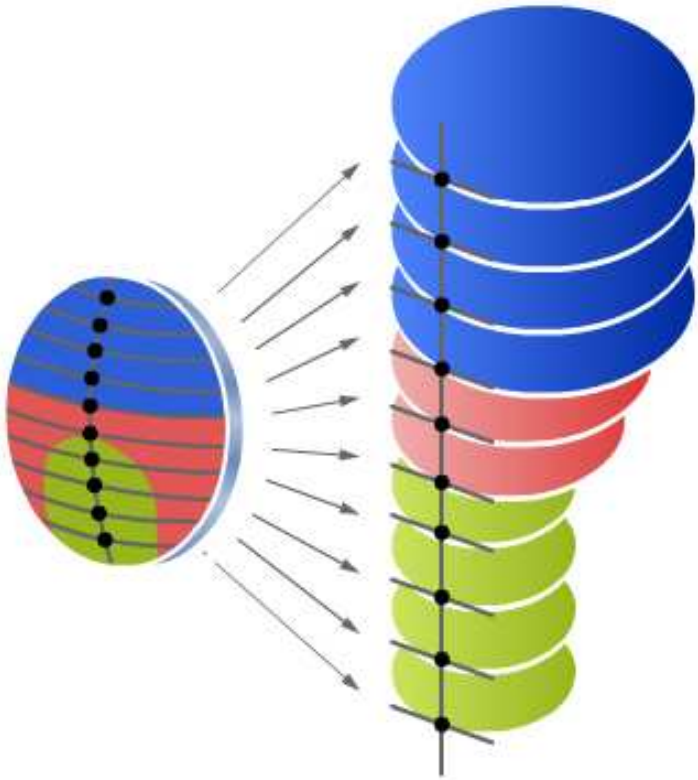
The Patstec site welcome page

A Gamma Camera





PCR animation



Some progressive lens animation

Some blood microcirculation study

Henrik Treimo

Invisible World

Idea and execution

In 2009 we opened the exhibition Invisible world. In the preparation we were driven by curiosity about what we could detect and learn about scientific imaging and its relation to a wider culture. The final result turned out to be a more narrowed focused exhibition on scientific imaging.

Colourful and esthetically pleasing images of cells, parts of cells and videos from intracellular processes are easy to find these days – actually they are hard to avoid. Images or models of bodily parts and processes produced by advanced techniques (combinations of microscopes and computers) are used to discover new things and to diagnose, present scientific findings (communication between scientists), to explain and communicate biological processes at a micro level to the public, and promote and sell science in general. As an example, one out of three pages of the journal *Nature,* in 2008, showed aesthetically enhanced images or models of the microcosm.

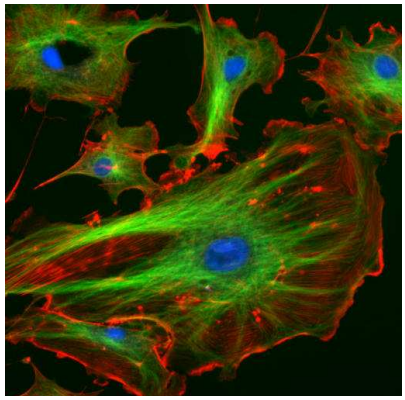
to cover

Microscopy techniques and ways of processing images of the objects under study have proliferated the last few decades and has become an integrated and essential part of the research process across most scientific disciplines. The news is not so much that science makes use of

visualizing techniques to see and discover and understand things, the news is the scale and possibilities when it comes to wide spread use in all disciplines applied to increasingly more topics of inquiry.

The two general motivations for making this particular exhibition were that scientific visualization and the use of images in the research process as well as in diagnostics have increased enormously the last few decades, and secondly that we are faced with a wide range of images of this type thanks to the increased abilities to broadcast them. One can say that scientific visualization and its results are crossing the boundaries between science and the public – transcending what Emily Martin has termed the walls of the scientific citadel.[64] The images are influence by the culture outside, and the images influence upon the world outside science. There are reasons to believe that images of the invisible will do something with our understanding of our body and nature in general. A specifically interesting question these new visualizing technologies and practices raise, is what these kinds of images actually represent?

Images of very tiny objects such as cells, no bigger than 0,000001 mm, and their interior cannot be seen with the naked eye. The fact is that for most of the images at this level we don't know what things actually look like. We do have to transfer authority to the technology, such as for example confocal laser scanning microscopes. These microscopes have the ability to acquire in-focus images from selected depths. Images are acquired point-by-point and reconstructed with a computer, allowing three-dimensional reconstructions of topologically-complex objects. And images we have seen confirm this. But then again, what we see in these images is only two or three things (very seldom more). Here is an example of an image, randomly picked from Wikipedia: It shows the eukaryotic cytoskeleton, with actin filaments shown in red, microtubules in green, and the nuclei are in blue.



In one way this image represent cells, but it only refers to natural objects in a very particular way. This becomes evident if you look into the production process. Behind every image there is a lot of laboratory work, creative efforts and amounts of technically advanced equipment. The colours in the picture are for sure not the same as those inside the body. Because, inside our body, at this level, there are no colours. So there is a gap between "what things really look like" and these highly artificial objects. The colours depend on the fluorescent markers chosen to be placed into the particular cell. Sometimes colours are chosen for aesthetical reasons, or, which often is the case, in accordance with disciplinary conventions (cell nuclei are most often blue). Colours might also be chosen to make good contrast – to highlight something. Also, in some cases, colours cannot be chosen at all because the only marker that will bind to a specific protein will give, for example, green fluorescence under a confocal microscope.

It is also good to know that, what the images show, are only two or three components of the cell. Tens of thousands of other components in the cells are invisible. And not a least, as the

[64] Emily Martin, "The *citadel*, the *rhizome*, and the string figure", in Asdal, Brenna and Moser (ed), *Teknovitenskapelige kulturer,* 2001: 293-306. Oslo

neuroscientist Richard Wingate put it in an interview figuring in the exhibition: "What is actually invisible in these pictures is the enormous amount of technical apparatus and computer processing that is required to generate a final image". So what kind of image of a cell is this then? What do the images represent?

These questions touch upon the very essence of all scientific activity, as science and scientific facts and findings are the result of a series of representational practices. The controversial question concerning these statements is not whether science is a series of representations, but *what the representations represent*. In one corner one may find the realists saying; it represents natural properties. In the other corner one may find the extreme social constructivists saying; representations merely reflect cultural ideas and states of mind. We think the truth is somewhere in between here, agreeing with sociologists of science such as Pauwel and Michal Lynch.[65]

We were theoretically inspired by studies within the field of science and technology studies. In this field science is studied as practice and work, more or less like any other activity.[66] With this theoretical backdrop we worked along the two following statements concerning scientific representation: 1) "Any technique or medium, however sophisticated and advanced, at best can provide some highly mediated renderings of [a] presumed reality" (Luc Pauwel, 2006: viii). 2) "[...] a mere object approach [to scientific representations] [...], which would devote all attention to the representation as a free-standing product of scientific labour, is inadequate. And essential for this approach is that "each visual representation should be linked with its context of production" (ibid: 21).

We made a preliminary description of the exhibition and contacted scientists using images and/or imaging technology in Norway and in London. We conducted short field works in an anthropological sense. By this, we got to know the scientists and they became interested in the project. This was our way to approach this complex field, to get an understanding of the production context and of what imaging technology is useful for, as well as what the limitations are. We were particularly interested in how this was perceived by the scientists and to get theirs point of view.[67]

From the very beginning we cooperated with Piotr Zamecznik, whom is an artist and an experienced exhibition designer. We wanted to create an exhibition were scientific work and its products were presented along with the scientists' own perceptions of it. It was our intention to make the scientists speak, not at all entirely on their premises, but as a dialog – with us and with the visitors. This is our understanding of bringing science and scientists into the exhibition.

Final exhibition concept

This quite open ended strategy slightly turned us a bit off track from where we thought we would go when we started out. We had to admit that we did neither have space nor time to follow up all our initial questions, concerning for example the relation between scientific imaging and the wider

[65] As in Luc Pauwel (Ed) *Visual cultures of science*, 2006

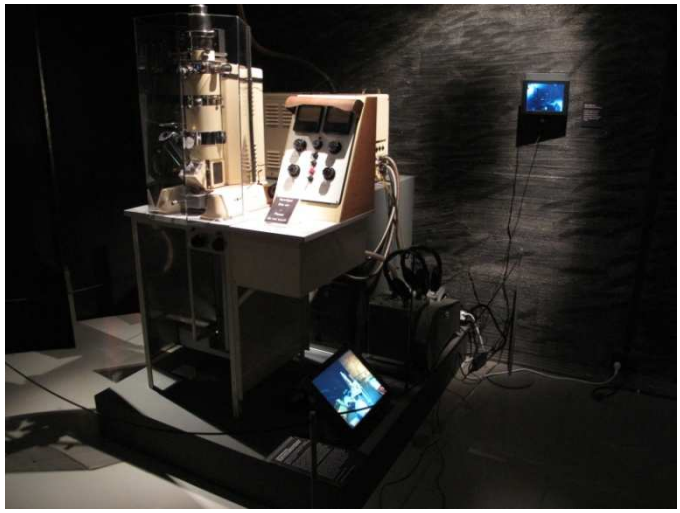
[66] More specifically the ethno methodologically approach within science and technology studies (Michal Lynch) and a form of symbolic interactionism (Susan Leigh Star, Johan Fujimura, J.R Griesemer), where attention is paid to observation and analysis of scientific practice, the work being done between the visible and invisible.

[67] This strategy or way of approaching the topic was not something we just decided out of the blue, as we are both trained in interpretative disciplines (literature studies and anthropology of science and technology).

culture. Although some elements touch upon this aspect, such as the installation about imaging awards, and also the DNA-stairway, which is made to tell the story about how a grey image, made by an x-ray crystallography, has turned into what Martin Kemp has called a Mona Lisa of modern biology.[68] The exhibition became more focused, and we ended up with an introduction to scientific imaging in general and a room for reflection upon what we actually see when the invisible is represented in colourful and thoroughly constructed images. In addition we made a brief introduction to the history of scientific visualization by exhibiting a few key objects. An early light microscope was exhibited, as well as a mobile x-ray apparatus, an early electron microscope, a product catalog for fluorescent probes used for confocal microscopy, and a particle accelerator was represented through a lead glass calorimeter. Our intention was that these few objects should play the role as anchor for short texts were we should give the audience a way into the field of scientific visualization.

By arranging the microscope devices in a linear way, we tried to illustrate what seems to be a quite general point. When things get smaller the technology you need to see gets bigger. In addition, this arrangement could illustrate a general point about translation of things which are too small to be seen by the unaided human eye. Referring to Pauwels, “one has to rely on – and thus transfer authority to – the machine in order to chart often unknown territory”[69].

Some of the texts were made in cooperation with the scientists. For the electron microscope (EM) we made a digital story together with the scientist whom worked with this precise microscope. The microscope, a Tesla BS 242 table microscope, bought from Czechoslovakia by the University of Oslo in 1958, was the first EM used for scientific purpose in Norway. When it first arrived it was set up and managed by a young research assistant, Bjørn Johannesen, and used in a lab for neuroanatomy. During one of our fieldtrips we managed by coincidence to come across this man, today a professor emeritus. He took part in the restoration of the microscope, and as we worked together we made audio recordings all the way and photo documented the process. We also found that a promoting video for the Tesla microscope came along with the instrument in 1958. So together it became an installation in the exhibition, rather than an object with a text.



[68] Martin Kemp, 2003: ”The Mona Lisa of modern science”, in Clayton and Dennis (Ed), *50 Years of DNA*: 2003: 102–106

[69] Luc Pauwels, 2006:9

We also present other scientists in video interviews and audio recordings, and we made a documentary film together with a molecular imaging laboratory in Bergen. The documentary lasts for about 15 minutes and takes you through the process of making images by electron microscopy and confocal microscopy, concerning a brain tumor in a rat. We visited the laboratory a couple of times and stayed there for a week to make the film. We insisted on filming all the work, which was a lot, to illustrate the amount of preparations, choices, technical processes and all the equipment needed to produce such images. Visitors who see the whole film understand that the images are not necessarily reflections of natural objects and relationships.

Alex Tyrrell

New voices: what can co-curation bring to a contemporary medical gallery?

What happened when a group of teenagers were invited to curate their own display about contemporary biomedical science? In the Science Museum's *Who am I?* gallery, a group of young people worked with museum staff to produce an object rich display as part of this gallery's major redevelopment.

The group brought objects from older collections to life in new ways and their choices of contemporary objects led to new acquisitions. By combining digital content with traditional textual, visual and tangible objects, they created an innovative display.

This paper shares some of the experience gathered as part of this project, attempting to explore what the introduction of audience voices can bring to a contemporary medical gallery and to discuss the challenges of collaborating in this way.

The overarching aims for this project were to integrate young people's views about contemporary science into the *Who am I?* gallery, to feature contemporary science content on gallery that is more relevant for other young people and to innovate new ways of working with audiences. It was a pilot project to develop new ways of working with audiences to co-curate content. The Science Museum has a track-record of involving non-visiting groups in consultation to make Science Museum cultural products (events, exhibitions) more relevant and appealing to them. This is particularly important as London is so diverse, with people from different cultural, socioeconomic and ethnic backgrounds.

For the young people involved, the aim was that they would be given a voice, listened to, empowered to express their opinions and supported in producing a high-quality final product for the gallery. The experience would build their confidence and develop skills and develop a positive attitude towards science; science careers and the Science Museum.

Who am I? is the Science Museum's flagship gallery about biomedical science and explores genetics and brain science through the theme of identity. It recently underwent a significant redevelopment to reflect advances in the biomedical research and reopened in June 2010. Evaluation with focus groups demonstrated that the themes covered in *Who am I?* engage young people, in particular emotions, memories, sexual attraction, inherited talents and the nature/nurture debate.

The young people involved in the project were recruited through a community gatekeeper, someone who worked as a youth group leader and who could help us begin and sustain relationships with the group. The young people committed to a relationship with the Science Museum (meeting every Saturday afternoon for a 12 week programme. Sessions varied enormously but involved the group exploring the latest biomedical

research, selecting their topic, interviewing scientists, selecting objects and making animations. They took part in a text writing workshop, presented their ideas to the gallery design team and documented their experiences throughout with Flip cameras.

Evaluation has shown that this experience has offered a lot to the young people involved, including a greater appreciation and interest in science, increased confidence and social skills. But what benefits did this collaboration bring to the gallery and its visitors?

A fresh approach

The group selected the topic of sleeping and dreaming because they felt it resonated with everyone, and was relevant. They brought an honest and fresh perspective to the content that existing Museum staff might not have achieved. They constantly challenged our processes and approaches, for example, veering away from using objects as a method of engagement at least initially, and pushing to leave their distinctive mark on how these objects were described: 'Why can't we put a joke on a label?'

They decided to focus on what is known about sleeping and dreaming, using the questions that they would like answered on the topic as stimulus. This differs from other displays within the gallery (those curated by museum staff) where the approach would normally be to focus more on where the current research is, or what the most engaging narratives are.

The young people wanted to look at historical and cultural content too. Their need to make it their content relevant meant that focussing purely on contemporary science research became very limiting. Although in this case we broadened the content to include historical and cultural stories, it is worth mentioning that the young people liked contemporary science because they liked the uncertainty of not having all of the answers: 'The experience made me very curious, with more questions.'

When it came to interpreting the objects, the group split into smaller groups to research each object. They were encouraged to act as journalists, reporting on each object while being filmed as if in front of an audience. The group as a whole watched these recordings, discussed what they found most interesting or thought-provoking and the interpretation was devised from these conversations.

A personal story

The group's voice does not reflect scientific consensus, they took scientific knowledge and research and commented on it, applying it to their own experiences and understanding. This potentially allowed the Science Museum to say things that it might not have been able to otherwise, for example in this label interpreting Sigmund Freud's *Interpretation of Dreams*:

Oranges, onions, trees... Sigmund Freud thought objects signified emotions in our dreams. Freud's ideas are still influential. But one sleep expert told us that dream analysis without knowing about the person who is dreaming is 'total rubbish'.

Because the display was curated by a group, there was a need to reflect the different voices in that group. Most visibly, this is demonstrated in their names and ages being printed on the labels. The ability to include lots of different takes on a topic brings a richness to the display.

The group enjoyed applying their own personal knowledge to the topic; they wanted to find out what their own dreams meant, what happens when you take stimulant drugs and so on. They constantly made links back to weird and wonderful experiences from their own lives, weaving this into the types of questions they chose to ask scientists, and so this content appears in the object labels and interactive terminal.

Displaying their voices in the gallery is a way of demonstrating that everyone can have an opinion on scientists and scientific research. In a way they validate the idea with visitors that it's alright to ask these questions and to challenge science. This is particularly pertinent for contemporary science where dialogue and debate around issues is so actively encouraged.

What were the challenges?

Being challenged is interesting and can create new ways of doing things, but for the Museum, this was often difficult, especially as the young people had no concept of the restrictions of time, money, and acceptability to our visitors. For example, this group's initial ideas for web based games or immersive experiences were not feasible with the programme and resources we had available. In this pilot project, we restricted the group from the beginning by asking them to work with objects and to create a gallery-based display. There is an often fine balance between innovating and knowing what can be reasonably achieved.

The need to apply the same scientific rigour to the content as the rest of the gallery meant involving experts and attempting to engage the young people with Museum. Many of the young people were more interested in the arts than in science and throughout, it was hard to excite them about new research, or what scientists had to say. Probably due to their age, they brought limited knowledge of what was happening in current scientific research - science news just isn't really part of their lives. It was difficult to have meaningful dialogue with the group about why certain things such as expert checking of text, was necessary or why labels needed to be only 30 words long.

The Museum team had to work very hard to identify contemporary science objects that were interesting or exciting enough to engage the group; objects were often quickly dismissed based upon their appearance, although other objects, such as a dolphin's brain, immediately captured their attention.

To summarise, co-curating content in this way brought added richness and variety to this gallery about human identity. It made it appear more 'human.' Introducing new voices – the voices of the audience – to the interpretation achieved fresh and unexpected routes into the content that seem to resonate with a wider audience.

Whilst working in this way is not without its challenges, in this project it achieved a high-quality product that enhanced the gallery as a whole. The impact that the project had on the young people taking part was

significant. Evaluation has shown that they felt proud of their achievements, were more confident and acquired new skills. They had a deeper appreciation of science and a warm relationship with the Science Museum:

'I would like to explore the Science Museum more. I've got respect for most science teachers. I wish I'd listened more for school work. It was fun messing round, finding things out in research.'

Nurin Veis

How do we tell the story of the cochlear implant?

What is the cochlear implant/bionic ear?

The cochlear implant, or bionic ear, was developed in Australia in the 1970s and is considered an everyday part of contemporary medicine along with pacemakers, knee replacements and breast implants. It is an electronic device that is implanted into the head behind the ear of a person who is hearing impaired. When used with a microphone and speech processor it electrically stimulates the auditory nerve resulting in a person being able to hear sound.

It is the result of pioneering research commenced by Professor Graeme Clark in the late 1960s at the University of Melbourne's Department of Otolaryngology. The prototype multiple-electrode bionic ear was implanted in the first adult in 1978.

The bionic ear was commercially developed by the Australian firm Cochlear Limited. The first device for clinical trial world-wide was implanted in 1982. International trials established that it was safe and effective and it was approved by the US Food and Drug Administration in 1985, the first multiple-electrode bionic ear to be approved by any world regulatory body.

In 1985, the team implanted the first child with a multiple-electrode bionic ear. It was developed and manufactured by Cochlear Limited in co-operation with The University of Melbourne and The Bionic Ear Institute.
Research work on the bionic ear required collaboration between many fields. They include auditory neurobiology, auditory physiology and perception, bionics programming, psychology and neuro-engineering.

What is the cochlear implant/bionic ear collection?

In 2010 Museum Victoria acquired over 200 objects and archives that outline the development, prototyping and fine-tuning of the cochlear implant. Some additional artefacts have also been lodged with the Powerhouse Museum, the National Museum of Australia and the National Film and Sound Archive.

How do we research and display the cochlear implant/bionic ear collection?

The primary curatorial question is how do we display this collection in a way that accurately describes the detailed multi-disciplinary technology yet at the same time fulfils visitors' expectations for an engaging and uplifting museum experience? Museum visitors are now more and more geared towards the block-buster exhibition. They expect to see spectacular objects and anticipate an emotionally charged experience. Which stories would be told and in what format? Is a static museum display the most rewarding way to tell the multi-faceted story of the bionic ear to a very diverse museum audience?

Visitor response to a past display

In 2001 a small display was dedicated to the bionic ear within the broader theme of Melbourne medical research in an exhibition entitled *Medical Melbourne*. It featured a display of artefacts with text panels highlighting the significance of the innovation.

Audience research revealed that in general visitors were most interested in information related to the impact of a discovery on society and least interested in how much money research scientists earn. The results are detailed below.

	% YES	% NO
Impact of their discovery on society	94	6
Controversies involved in research	87	13
Mistakes made in pursuing the 'discovery'	84	16
Their personal storey – what motivated them	78	22
Recognition received for their discovery	76	24
Other types of work they have been involved with	75	26
Training completed to become a scientist	56	45
How much money they earn	21	79

When asked what they could remember about the exhibition *Medical Melbourne* only 11% of visitors could specifically name the bionic ear display amongst other stories such as an MRI machine, cancer research and IVF technology. Visitors found the specific information interesting and worthwhile but were essentially looking for a museum experience that is more spectacular and engaging.

What visitors are looking for in an exhibition

An exhibition that is currently on display in the Mind and Body Gallery at Melbourne Museum is *The Mind: Enter the Labyrinth*. It is based on sensory and exploratory experiences – addressing the science of the mind while also taking a historical perspective of mental health, bringing together psychology, psychiatry and neuroscience. Visitors willingly engage with the theatrically immersive nature of the exhibition. They enjoy the interactive components and also take time to look at artefacts and read the text panels. The average time spent in the exhibition is 37 minutes.

Essentially the display experience at Museum Victoria is primarily concerned with contextualising and inspiring. Museum Victoria visitors in general are looking for a relevant and inspiring experience. They want a few wide-ranging facts that are correct and authoritative and they do not want detail. However, a

museum education audience requires more facts and detail and this can be provided as an online component. Another group is the museum research audience who primarily operate at a tertiary level. They want unlimited research information. The dilemma is how to provide for all these audiences.

Alternatives to an exhibition

Perhaps a display in a large multi-disciplinary museum is not the best way to tell the stories of the bionic ear. A small engaging display will appeal to a boutique audience however other alternatives should be explored.

The collection will eventually go online with some basic information about each artefact as well as an image. But how can we capture the imagination of a broader audience? The details of the workings of the cochlear implant have limited appeal to a broad museum audience. A possible online experience could explore the broader context of hearing in general; problems with hearing, how hearing can be damaged, how we hear music, what hearing aids do to our appreciation of music, and whether you can dance if you don't hear music.

Researching visitors expectations of alternatives

We are currently in the process of testing a possible mobile phone immersive project that would communicate with text, images, moving image, sound and events at specific locations. The project would feature the bionic ear collection, highlighting its international significance and pointing out that it is located at your local museum.

Audience research outcomes will determine whether this might be one of many ways to tell the story of the cochlear implant.

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