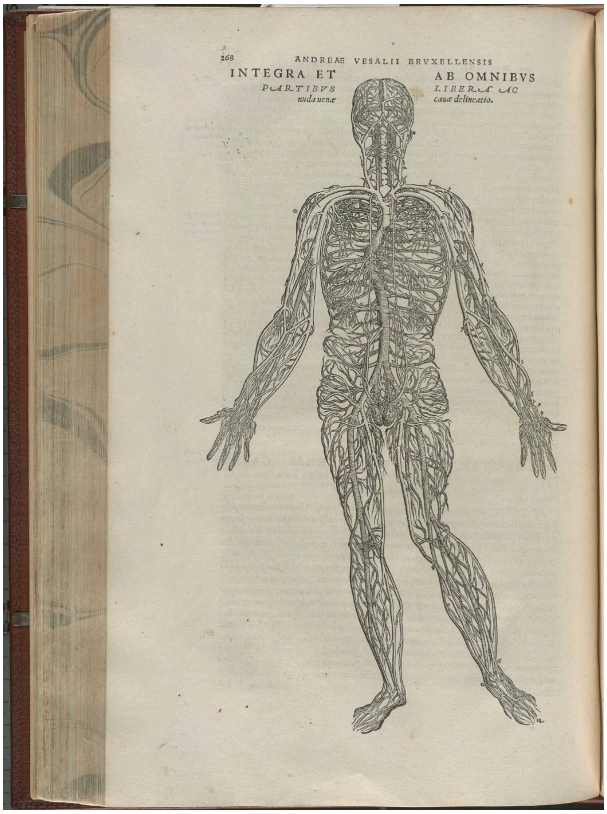
The New Monstrous: Digital Bodies, Genomic Arts and Aesthetics.[1]

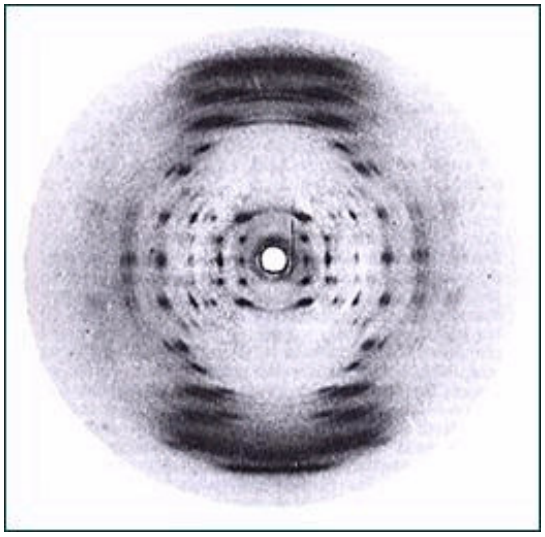
By Pramod K. Nayar

Current developments in digital technology, genome sequencing, and information and communications technology (ICTs) have produced new forms of art that appropriate, utilize and (occasionally) subvert these technologies.

Artists have always responded to developments in science, just as science has taken recourse to art and visual representations, from Andreas Vesalius' 1543 anatomy text, *De Humani Corporis Fabrica Libri Septem* to the first visuals of the famous double helix by Rosalind Franklin in 1953.



Visual 1: From Vesalius 1543 Anatomy text



Visual 2: Rosalind Franklin's 1953 photograph of DNA

[1] This article is dedicated to Professor Sudhakar Marathe, teacher and friend.

In the early 20th century European abstractionists like Piet Mondrian and Wassily Kandinsky generated visual icons of the splitting of the atom. Mark Rothko and Barnett Newman reacted to the atom bomb. Andy Warhol and Robert Rauschenberg incorporated inventions like the electric chair and X-rays in their art. And now artists use genetics, one of the most critical sciences in human history (not least for the controversies).

My proposition here is that genetics is *mediated* for popular consumption, at least in the West, by not only visualizing techniques and technologies but that genetics becomes the stuff of daily dreams and debates through artistic forms. That is, genetics is mediated through forms of visual representation in what I propose is a new iconology. Highly respected journals like *Nature* and *The Lancet* publish articles about visual art. Martin Kemp writes a column on science and art in *Nature*. The Wellcome Trust – a science funding organization, has organized a 'sci-art' program to encourage collaborative work between artists and scientists. Future-directed genomic art projects such as SymbioticA and Tissue Culture and Art (established at the University of Western Australia's School of Anatomy and Human Biology by cell biologist Miranda Grounds, neuroscientist Stuart Bunt and artist Oron Catts) are also 'monstrous' in the sense that they occupy the space between categories (subject/object, art/biology, organic/computer-generated) that might just be about the future.

'New media', for this purpose, is the technology of representation that works with genetics and genetic concepts. The study of media entails a study of its forms and means of representation – speech, print, images, code. The new iconology is about picturing science while producing art, and having art forms that are informed by scientific developments, theories and images. It is about transcoding science, the biomedical body into art, as we shall see. This transcoding calls for a new aesthetic.

Images used by artists build on certain archetypal forms (monsters, for example), themes (mainly identity) and techniques (montage and collage). Technologies that work with developments in genetics or anatomic medicine are principally visualizing techniques.

In what follows I look at two interrelated dimensions: technology that represents the body in particular ways, and artistic forms that mediate genetic concepts.

(i) The Digital Human

Once upon a time 'digital' meant things to do with toes and fingers…
The Visible Human Project of the National Library of Medicine, USA, is an attempt to provide a digitized anatomical atlas of the human body. The project has sectioned the human body, photographed it, and stored it as digitized data. As the visual demonstrates, there is also a fly-through, where one can go *through* the human body, without, of course encountering any messy situations of blood and gore. This has proved to be hugely successful as an educational tool in anatomy classes. It is now available commercially, and several images circulate on the World Wide Web.

Download HERE

Visual 3: Visible Human Project: Flythrough the Human Body[2]

The Centre for Human Simulation at Colorado has also digitized the human body.

Click to VIEW

Visual 4: Simulations from the Centre for Human Simulations: Rotating Heart and Torso[3]

What the CHS does is to cause the digitally constructed, chip-driven 'heart' or lungs' to simulate physiology, and even disease, so that the processes can be studied better. The images in 3D and virtual reality models – which the CHS compares to flight simulation – are meant as educational devices. They are akin to

[2] "From head to toe: an animated trip through the Visible Human male cryosections" *National Library of Medicine* [U.S] http://www.nlm.nih.gov/research/visible/visible_gallery.html, March 15, 2007.
[3] *Centre for Human Simulations: University of Colorado* http://www.uchsc.edu/sm/chs/gallery/animate/animation.html, March 15 2007

what W. J. T. Mitchell terms 'perceptual images' – 'haunt[ing] the border between physical and psychological … where physiologists, neurologists, psychologists, art historians, and students of optics find themselves collaborating with philosophers and literary critics'.[4] Studies of the digital human are, in Bruno Latour's terms, iconophilic because, in sharp contrast to idolatory that seizes on the visual itself, it emphasizes the *movement* of the image from one form to another, to the trans-formation, and the in-formation of the image itself: the body transcoded by technology into the computer code and by art into aesthetic codes.[5] Medical visualization technology and the digital human projects are ways of perceiving and representing the body – that is, they are about *images.* Digitization overcomes the problem of viewpoint. When converted into the digital format, transmitted and reconstructed elsewhere to *produce* an anatomy – and where numbers represent tissues and cells – the steps of this transformation of the image are lost.

These are examples of 'transcoding'. Transcoding, as Lev Manovich defines it, is the process of translating something into another format. For instance, cultural categories and concepts are 'substituted … by new ones which derive from the computer's ontology, epistemology, pragmatics'.[6] In this case the body is transcoded into the language of genetics and computers, with the result we have digital humans, bioinformatics, computational biology and, not the least, genomic art.

The Digital Human projects are basically new ways of discovering, seeing, exhibiting and analyzing the body. In order to understand the significance of the digital human, we need to look at the history of medical imaging. The X-ray was introduced as a means of medical diagnosis in the 1890s, and was treated with

[4] W.J.T. Mitchell, *Iconology: Image, Text, Ideology* (Chicago and London: U of Chicago P, 1986), 10.
[5] Bruno Latour, 'How to be Iconophilic in Art, Science, and Religion?', In Caroline A. Jones and Peter Galison (eds) *Picturing Science, Producing Art* (New York and London: Routledge, 1998), 418-440.
[6] Lev Manovich, *The Language of New Media* (Cambridge, MA: MIT, 2001), 64.

awe and fear. The practitioners were believed to have some supernatural power which enabled them to look into the body. The ultrasound (actually ultrasonography) imaged internal structures of the body. The difference of course is that X-rays worked with dense (hard) structures, while ultrasound worked with softer organs. Obstetrics was the scene of the greatest impact of ultrasound, because it enabled the actual sighting of the foetus. The new visualization technologies enable the body to be laid bare without the cutting open. Visualization technology transforms the body itself into a visual medium.

As Sturken and Cartwright have demonstrated, these are not simply medical or scientific images, but also cultural ones.[7] There are cultural assumptions that inform the technology, the medical image and the interpretations of the image. The Stanford Visible Female, for instance, describes the images as that of a 'normal' woman – in this case of a woman in the child-bearing age. Thus, only a woman in the reproductive age is 'normal', as feminist critics have pointed out.[8] Similarly technologies of reproduction, as Sarah Franklin has persuasively argued, embed their own cultural politics.[9] Parents begin to 'bond with' their child well before its birth through ultrasound scans. Magnetic Resource Imaging and ultrasounds are now projected as part of health care as well as to evoke the authority of scientific knowledge. What is important is that the boundaries between the medical and the personal are blurred here. The biomedical image takes on the 'aura' of a portrait, a document of the baby as a *social* being. In 1984 Bernard Nathanson made a videotape called *The Silent Scream*, wherein he showed 'real-time' ultra-sound images of a 12-week old foetus. He stated that the images converted him to anti-abortionism because they revealed to him that what

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[7] Marita Sturken and Lisa Cartwright, *Practices of Looking: An Introduction to Visual Culture* (Oxford: Oxford UP, 2001), 292.

[8] Julie Doyle and Kate O' Riordan, 'Virtually Visible: Female Cyberbodies and the Medical Imagination', in Mary Flanagan and Austin Booth (eds), *Reload: Rethinking Women + Cyberculture* (Cambridge, MA: MIT, 2002), 239-260.

[9] Sarah Franklin, *Embodied Progress: A Cultural Account of Assisted Conception*. (London and New York: Routledge, 1997); Valerie Hartouni, 'Containing Women: Reproductive Discourse in the 1980s', In Constance Penley and Andrew Ross (eds), *Technoculture* (Minneapolis: U of Minnesota P, 1991), 27-56.

he saw on screen was a 'living unborn child'. The foetus thus becomes a 'person' when viewed thus. That is, medical imaging has non-medical – or cultural – functions (see especially the work of Rosalind Petchesky and Janelle Taylor on foetal images in public culture[10]). The fact that these images can be used to sell industrial products – as in the Volvo advertisement – suggests a movement of the image from one form to another. There is a seduction by the medical image too.

These technologies, as we can see, use particular notions of the body. Eugene Thacker defines biomedia as the 'technical recontextualization of biological components and processes'[11], where the body is a medium and *where the media themselves are indistinguishable from the biological body*. The transcoded body here needs to be understood in two ways – as a biological, molecular, a species body *and* as a body that is compiled through modes of visualization, modeling, datasets (where we have interdisciplinarity - biological computing, computational biology). It is what Mark Hansen terms 'body-in-code' (not, mind you the informational, informatized body popularized by William Gibson's *Neuromancer* and other cyberpunk texts as 'data made flesh), a body submitted to and constituted by an unavoidable and empowering technical deterritorialization, a body whose embodiment is increasingly realized in conjunction with technics.[12] The body's creative power and potential is expanded through the 'new interactional possibilities offered by the coded programs of "artificial reality" '.[13]

What is important is that the 'media' and 'technology' employed here never stops seeing the body as biological, even as it creates novel contexts for biological elements and processes.

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[10] Rosalind Petchesky, 'Foetal Images: The Power of Visual Culture in the Politics of Reproduction', in Michelle Stanworth (ed) *Reproductive Technologies: Gender, Motherhood and Medicine* (Minneapolis: U of Minnesota P, 1987); Janelle Sue Taylor, 'Of Sonograms and Baby Prams: Prenatal Diagnosis, Pregnancy, and Consumption', *Feminist Studies,* 26.2 (2000): 391-418; 'The Public Fetus and the Family Car: From Abortion Politics to a Volvo Advertisement', *Public Culture,* 4.2 (1992): 67-80.
[11] Eugene Thacker, *Biomedia* (Minneapolis: U of Minnesota P, 2004), 13.
[12] Mark BN Hansen, *Bodies in Code: Interfaces with Digital Media* (London and New York: Routledge, 2006), 20.
[13] Hansen, 38.

(ii) Genomic Art

The Chimera is a fire-breathing she-monster from Greek mythology, with the body of a goat, the head of a lion and the tail of a serpent. This monster transcends species boundaries. Other examples of chimeras include: the centaur, the sphinx, the minotaur and the griffon. What is interesting is that these boundary-breaking creatures have now become reality, in the laboratory rather than in mythology.

Scientists are now able to create more efficient animals for food or medicine: transgenic pigs for low-cholesterol meat, human genes in cows for them to produce more milk, mice created to produce human blood proteins. Artists have responded to these new developments in transgenic sciences.

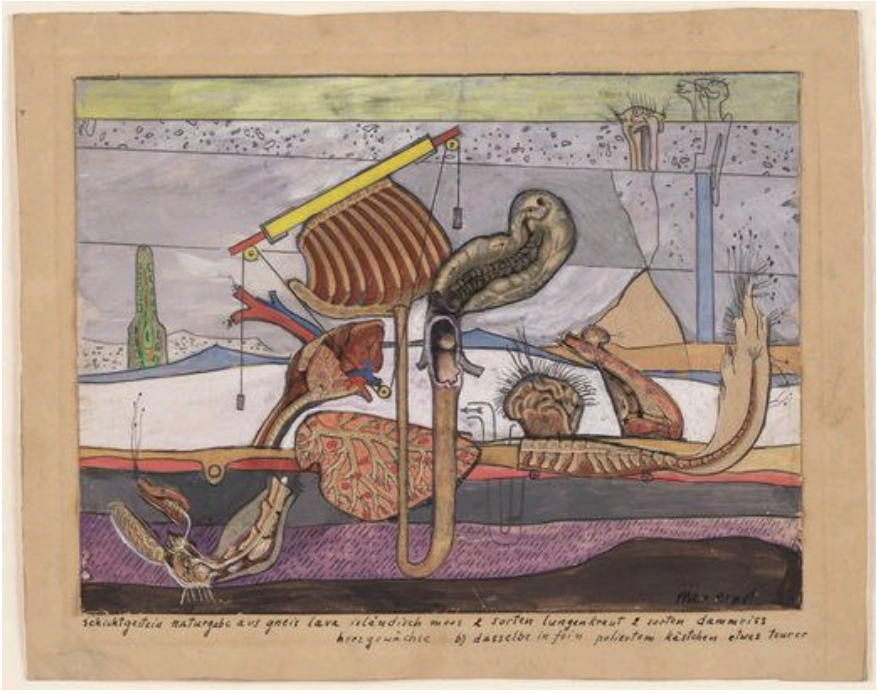
In 2000 the Exit Art Gallery at New York[14] focused on the artistic possibilities of biocybernetics (the combination of computer technology and biological science that makes cloning and genetic engineering possible). Alexis Rockman's *The Field* (2000) depicted a soybean field that shows recognizable plants and animals, and speculated on how they might look in future (the collection of Rockman's and others' work was exhibited under the title 'Paradise Now', emphasizing the temporal dimension). These are transgenic art forms, blurring the boundaries between human, animal and vegetable, transcoding these bodies into something else altogether (see pages 8 & 9). These show chimeras – organisms made from cells and tissues from two or more species (the term was first used to describe species crossover under laboratory conditions in 1968). It is important to note that chimeras have traditionally been regarded as monstrous because they blur species boundaries and categories. In the 17th century artists like Charles le Brun presented animal-like human portraits. HG Wells' *The Island of Dr Moreau* (1896) described, famously, such chimeras, or what he called 'beast men':

[14] <www.genomicart.org>. 15 March 2007.

The disproportion between the legs of these creatures and the length of their bodies … the forward carriage of the head and the clumsy and inhuman curvature of the spine … the deformity in their faces almost all of which were prognathous, malformed about the ears, with large and protuberant noses … each preserved the quality of its particular species: the human mark distorted but did not hide the leopard, the ox, or the sow.

These creatures, in Leslie Fiedler's terms, 'straddle the line between us and our animal brothers'.[15] That is, they disturb the 'natural' boundary between species.

In the heyday of modernism artists like Max Ernst (*Stratified Rocks, Nature's Gift of Gneiss Lava*, 1920) represented extravagant organisms that were hybrid species.

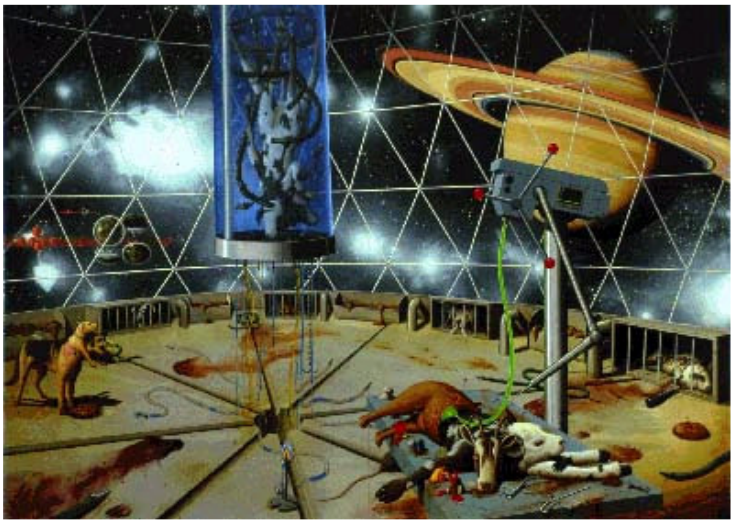


Visual 5: Max Ernst - *Stratified Rocks, Nature's Gift of Gneiss Lava*

And of course the comic book character, Spiderman, was a student who was bitten by a bioengineered spider. Thus what Rockman is doing in *The Field* has a history.

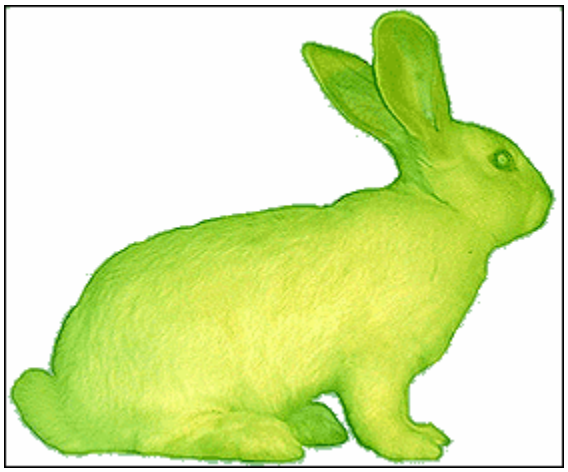
[15] Leslie Fiedler, *Freaks: Myths and Images of the Secret Self* (New York: Anchor, 1993), 168.

Visual 6: Rockman -The Field



Visual 7: Alexis Rockman - Biosphere

Bryan Crockett's *Oncomouse* is about the first genetically patented transgenic lab mouse. In 1986 geneticist David Ow combined tobacco and firefly genes to produce plants that glowed in the dark. In 2000 the Oregon Regional Primate Center created a rhesus monkey that carried GFP (green fluorescent protein), and was thus a bioluminescent monkey. The best example of transgenic art is Eduardo Kac's. His installation *Genesis 1999* is described as 'transgenic art linked to the internet'. It is about gene transfer from one organism to another so that unique living beings are created. Kac's Rabbit 'Alba' is a fluorescent one. Kac has argued that purposeless play is at the heart of his aesthetic gesture.



Visual 8: Eduardo Kac - GFP Bunny

Laura Stein's *Smiley Tomato* suggests that we should be able to produce fruits and vegetables with smiley faces. Ronald Jones' life-size sculpture of the genetic structure of cancer is about modeling and simulation in medicine. The organization Art to the Nth Power (at www.artn.com) describes various such art forms. Larry Miller of genomic licencing fame installed the portraits of 11 living artists in linear arrangement, alongside their DNA samples. The question Miller asks may be summarized thus: 'is artistic talent in the genes'? I think the question links science and art in a particularly interesting way. Further, as Edward Shanken has argued, genetic engineering preformed by artists like Kac 'interrogates the limits of knowledge and consciousness to plumb the depths of the human condition'.[16] In all these cases the body is, in Andrew Ross' terms, a 'switching system, with no purely organic identity'.[17] It is this final boundary between the organic and the inorganic that is central to transgenic science and art. It transcodes the body as a computer code, even as artists transcode both, the body and the computer code, into something else altogether.

It is useful to remember that genetics and cloning are not just meant to create identical twins or siblings. They contain the possibility of producing an improved

[16] Qtd. in Suzanne Anker and Dorothy Nelkin, *The Molecular Gaze: Art in the Genetic Age* (New York: Cold Spring Harbor Laboratory P, 2004), 95.
[17] Andrew Ross, *Strange Weather* (London: Versus, 1991), 151-53.

and upgraded model. This has nothing to do with the science or with the methodology: it has to do with culture. The decision to produce enhanced bodies – in terms of immunity, looks, capacities – is often governed by social values attached to these.

(iii) The Monstrous Sublime

Both medical technology and the forms of genomic art are about images, as I have demonstrated. In this section I outline the essential configurations of an aesthetic that enables us to 'comprehend' the various dimensions of this new iconology. This new aesthetic is as much to do with the objects under observation – genomic art – as with cultural anxieties about categories (human/non-human, human/machine). I propose that genomic art, with its future imperatives and its category-defying dimensions demands an aesthetic that is rooted in the blurring of categories.

I propose an aesthetic of the 'monstrous sublime'. I must hasten to add that the term 'monstrous' is not meant to suggest mere deviance. I take recourse to the term because the implications of its etymologies are useful for describing the new arts. 'Monster' is linked to 'monstrum' meaning omen, portent, or sign and 'monere', which means 'to warn'. However, it also indicates the malformed and the grotesque (the birth of deformed animals/human babies were seen as portents in early modern Europe, when the term was first used[18]). There is, therefore, a certain *revelatory* and *futuristic* imperative in the term itself. I have argued elsewhere that the new forms of technology, arts and identity can be best described by an aesthetic of boundarilessness, vastness, incomprehensible numbers that invoke awe and fear, horror and fascination: in short, the sublime.[19]

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[18] For a history of the monstrous in European thought see M.H. Huet, *Monstrous Imagination* (Cambridge, MA: Harvard UP, 1993), Lorraine Daston and Katharine Park *Wonders and the Order of Nature 1150-1750* (New York: Zone, 1998) and A.W. Bates, 'Good, Common, Regular, and Orderly: Early Modern Classifications of Monstrous Births', *Social History of Medicine*, 18.2 (2005): 141-158.

[19] Nayar, 'The Informatic Sublime: Identity in the Posthuman Age'. In Santosh Gupta, Prafulla C. Kar and Parul Dave Mukherjee (eds) *Rethinking Modernity* (New Delhi: Pencraft, 2004), 192-207.

Together, the monstrous and the sublime may help us unravel the aesthetic implications of new forms of biotech-art.

I suggest that both medical images and genomic art have to do with three major functions – the explicatory-explanatory, the exhibitionary, and the monstrous – *each* of which has an aesthetic component. What is important, in the age of digital imaging, is the *crossover* between the three functions: what is exhibited as art is often an example of medical imaging. And medical imaging often takes recourse to the language, form and stylization of art in order to produce its effect. Thus the discourse of science slips into the language of art, even as it posits its 'scientificity'.

The Explicatory: Medical imaging technologies function as explicatory-explanatory technologies. They unravel the processes of life – the physiology, anatomy and pathology of the human body. The body itself is a vehicle for scientific information. As the visuals show, the image penetrates the human body in order to bring to the surface what lies beneath. Genomics is about discovering the secrets of life. When Watson and Crick discovered the genetic code, what they did was to explicate the causal factors for human development, behaviour and form.

However, it is not enough to present the body or the organ or the pathology as a mere image that explains. The image must be re-presented in the best possible way. That is, it has an aesthetic component of arrangement, brightness and tone, among other things. For instance, realism is integral to medical imaging – it must be as close to the original as possible. There should be an 'anatomic realism' (as John Madden put it in his 1958 *Atlas of Technics in Surgery*[20]) of the images. The digital human breaks up the human body into sections for greater *clarity* of viewing. The 'increasing transparency' which the CHS image of the thigh muscle in the clip, is not merely about a medical image, but about a medical image that is

[20] Qtd. in Peter Galison, 'Judgment against Objectivity', in Caroline A. Jones and Peter Galison (eds) *Picturing Science, Producing Art* (Routledge: New York and London, 1998), 327-359. Quoted from p. 346.

presented in a certain way. Surely there is something to be said that surgery is performed in an 'operating *theatre*'?

In genomic art, the artifact combines within itself the medical image with the aesthetic element. For instance, Ron Jones' life size representation of a cancer gene transforms a pathological condition into an artifact, or perhaps I should say an art-*effect*. It transforms a symbol of death into art. What it does is to bring one of the most advanced technologies of medical biology into the realm of art. Here the curious feature is that the symbolism of a mutated, altered chromosome 13 is available only to the trained scientific eye. To the common viewer, this does not carry connotations of mortality, until one reads the legend and the description beneath the display.

However, even genomic *art* produces the explicatory. Much of genomic art is based on a science that requires explication. Thus the write-up accompanying the artifact – the parergon, or outwork – often explains the genetic mechanisms behind the symbol. For instance, Crockett's installation, or any of the exhibits in Genomic Art Gallery (www.genomicart.org) are accompanied by detailed descriptions. The motif or byline to the Gallery reads: 'Visualists and Artists Interpreting the Human Genome'. Thus this form of art is also about interpretation, about framing a pathology. Medicine aestheticizes its images, and genomic art scienticizes art.

The Exhibitionary

What I am calling the 'exhibitionary' is basically the spectacularization of the very small and the very large. What contemporary medical imaging technology does is to make the move from nano- to giga-, from the invisible to the hypervisible, with the aid of visual prostheses. Surgery itself can be performed at the level of the cell. Virtual Reality Assisted Surgery Program enables the surgeon to cut without a body: the ultimate spectacle, surely? The entire apparatus of medical imaging is part of an exhibitionary complex, it involves the 'transfer of

objects and bodies from the enclosed and private domains in which they had previously been displayed … into progressively more open and public arenas', to adapt Tony Bennett's definition.[21] With surgeries available for viewing online, we have moved the performance out of the room – the operating theatre – into a public domain.

The medical image of a body (now sliced into less than a millimeter thick, photographed, digitized) is an exhibition of the internal body. It turns the body inside out, as the newest exhibition in this line, Gunther von Hagens' 'Body Worlds', www.bodyworlds.com, actually does). When it comes to genes and chromosomes, it literally inflates the smallest component of the human into a visual treat. What this means is that medical technologies have the power to bring to the surface the invisibles that constitute us (some of us may recall Muthiah Muralitharan, wired and jacked in, with his body movements being recorded to understand *how* – anatomically, physiologically, he delivers his 'doosra'). Exhibitions of the genetic code are the ultimate spectacle, shifting from the most private and guarded collection – the body, open to the surgeon only – to the public domain. In fact the stated aim of several of such projects – the Visible Human, the Human Genome Project – is to make the secrets of life 'public domain data', though, as various critics (Fatima Jackson, Evelyn Fox Keller, among others, have pointed out the social and cultural implications of these projects are enormous[22]). My particular interest here is the way in which the digitized anatomy/physiology spectacularizes the human form: devoid of the messy gore and physiological functions – a clean entertainment, coming soon to a screen near you. Simulated surgery and human simulation technologies are the most anti-septic spectacles of

[21] Tony Bennett, *The Birth of the Museum: History, Theory, Politics* (London and New York: Routledge, 1999), 61.

[22] Evelyn Fox Keller, 'Nature, Nurture, and the Human Genome Project', in Daniel J. Kevles and Lroy Hood (eds) *Scientific and Social Issues in the Human Genome Project* (Cambridge, MA: Harvard UP, 1992), 281-299; Fatimah L. Jackson, 'African-American responses to the Human Genome Project', *Public Understanding of Science* 8.3 (1999): 181-191; and 'The Human Genome Project and the African American Community: Race, Diversity, and American Science', in Raymond A. Zilinskas and Peter J. Balint (eds) *The Human Genome Project and Minority Communities: Ethical, Social, and Political Dilemmas* (Westport, Conn.: Praeger, 2001), 35-52.

the human body. What you do get are *simulations* of the physiological processes: blood circulation, heart-beats, facial expressions and others. Spectacularization is as integral to the aesthetics of surgery today, as always (one recalls that dissections were public spectacles in early modern Europe). It is surely salutary that the commercially available dataset of the digital human from Springer-Verlag describes its as 'an anatomical atlas … in 36 interactive *scenes*'. The Visible Human replicates the human body, outside of age, sexuality or maternity, in a true copy, to be infinitely, endlessly reproduced. This renders, I suggest, the exhibition into a wholly new aesthetic.

In the case of genomic art, the modified animals and plants are basically exhibitions and renderings of the processes of evolution, growth and decay. The only comparable image-making is of space photographs published in newspapers. These photographs of planets or astronomical phenomena often have a legend beneath them: an 'artist's rendering'. Using the digital data that is transmitted, the artists provide an image. So what image is this: scientific or artistic? Genomic art is about the aesthetization of the ultimate secret processes of the human body. The deformity or perfect forms represented here are attempts to show possibilities.

The Monstrous

I have proposed that the 'monstrous' is about portents and omens. The effect and implications of these new images do not stop here. What the images tell us – especially after the doctor has explained it to us – is the course our *future* life will take (surely it is not coincidental that the Human Genome Project's newsletter is called '*Genomes to Life*', suggesting a movement?). Dissections, one recalls, are about cutting up the dead to comprehend the living. We need to remember that genetic testing for future disorders is not very far off. Scientists claim that genetic marker kits that identify potential conditions and diseases will be available for as little as $100. In the USA the Equal Employment Opportunity Commission has prohibited discrimination on the basis of genetic make-up.

Genomic art establishes anomalous, non-natural forms, even when they have natural functions (such as the third ear, which was used by the artist Stelarc). The Pig Wings project from this group calls attention to this aspect in its opening statements:

> Rhetoric surrounding the development of new biological technologies make us wonder if pigs could fly one day. If pigs could fly, what shape their wings will take? The Pig Wings project presents the first use of living pig tissue to construct and grow winged shaped semi-living objects.
>
> (www.tca.uwa.edu.au/pig)

The deformed, modified animals in Bryan Crockett, Eduardo Kac and Alexis Rockman are monstrous in the sense that they are *potential* (virtual actually means potential, awaiting actualization: so virtual life is life awaiting corpo-*realisation*) forms. They are future-directed in that they reveal what is possible through cloning and genetic manipulation. Rockman's *The Field* is about evolution: what *form* will these animals and plants take a few decades from now? The 'monstrous', as I use it, is not necessarily a pejorative term. It may refer to the deviation from accepted standards of beauty. But then beauty is not inherent in an object, it is ascribed, as an attribute, and therefore a cultural condition. Some forms are more valuable than others. One tends to associate the very term 'aesthetics' with beauty: is there an aesthetic of ugliness? Stein's smiley tomato is an aesthetic rendering of the genetic process: why can we not have aesthetically appealing vegetables?

The 'monstrous' in medical imaging and genomic art is an icon that directs our attention toward the future: it reveals the possibilities of new forms. It reveals to the eye the inner workings that *can* lead to these forms. The work of artists such as Kac and Stein is about the *monstrous*. It is not necessarily dystopian, though it combines death and life in an ambiguous way, leading Catherine Waldby to term it a 'digital uncanny'.[23] Indeed it is uncanny because it seems to be familiar while it is not. There is a sense of the ghostly in the artifacts we see, something that we

[23] Catherine Waldby, 'Revenants: The Visible Human Project and the Digital Uncanny', *Body and Society* 3.1 (1997): 1-16.

can recognize and other elements that we cannot. This means the monstrous in contemporary art is an attempt to create a new rationality that reflects the breaking of the older one, where questions of borders and identities are irrelevant. They also represent – in the true tradition of the monstrous – a cultural anxiety about what the 'human' is.

The Sublime: And what does the genetic monstrous have to do with the sublime? The sublime, theorized by Edmund Burke and Immanuel Kant in the 18th century and revived in different versions by Jean-François Lyotard (1994), Vincent Mosca (2004) and others in the 20th century, is the aesthetic of awe, of the infinite and the incomprehensible. I have already suggested that medical imaging and genomic art reveal and exhibit things that are invisible to the eye. The images point at some remote – deep inside the human body – phenomena, they designate a reality and help us see things that are invisible. Simply put, the images *move*.

These imaging technologies are also matters of scale: from the nano- to the giga-. They seek to expand, infinitely, what is beyond apprehension and comprehension. It collapses the body's inside/outside boundaries – a feature of the sublime – as the body-abject, the object of both horror and fascination.

What I am terming the monstrous sublime is the aesthetic of expansion-extension, the exhibition of something that is a warning, a portent of the shape of things to come, as the cover of *Time* magazine (1993) – with the 'new face of America' – a computer-generated picture culled from many racial types – suggests. It is the vivid imagining of a world through the ever-improved copying of life-forms, as Rockman's work suggests. Genetics – on any scale – qualifies as sublime because of various highlights:

> 1) In terms of sheer numbers, with the millions of databases and chemicals, it is beyond comprehension (a kind of mathematical sublime),
>
> 2) In terms of effect – inducing awe,

> 3) In projects that deal with entire racial genotypes – such as the Human Genome Project – are sublime in that they seek to explicate and capture the future of the entire humankind,
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> 4) In genomic research – and representation, as I have shown – is about breaking down borders: between man and animals, plants and animals, man and chemicals/minerals, the inside and outside.

The dialectic between the analogical and digital – the script of the DNA code and the visible human it produces (elsewhere) – is also monstrous because the potential to (re)produce, re-duplicate the human in the future is theoretically endless. The number of times one can get the Visible Human dataset to run on the desktop is a monstrous sublime because it has this incomprehensible potential, for as Lyotard points out, the infinite, is not 'comprehensible' as a whole.[24] (There is also a boundary-breaking, transnational, globalizing incomprehensibility about capitalism in the 20th century, Lyotard argues, which renders global capitalism also sublime. Incidentally, Eugene Thacker also argues that biotechnology and globalization are linked because 'a "biotech industry [is] unthinkable without a globalizing context'. Thacker in fact terms the biotech revolution the 'global genome'. Hence the sublime is not simply about aesthetics and art but about the globalizing nature and context of genetic engineering itself[25]).

Biocybernetic art, as W.J.T. Mitchell argues, is 'conceptual art' because 'the object of mimesis is the invisibility of the genetic revolution, its inaccessibility to representation … with rumours of mutations and monsters'.[26] More significantly, one is 'picturing science' to 'produce art', for instance in the Kenneth Eward visualizations of DNA. It is only in the realm of art, perhaps, that such monstrosities can be imagined. What Mitchell does *not* say is that one cannot perceive either genomic art or the medical images from sonography and X-rays

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[24] Jean-François Lyotard, *Lessons on the Analytic of the Sublime* (Kant's "Critique of Judgement", §§ 23-29), Tr. Elizabeth Rottenberg (Stanford: Stanford UP, 1994), 112.
[25] Lyotard, *Lessons on the Analytic of the Sublime*; Eugene Thacker, *The Global Genome: Biotechnology, Politics, and Culture* (Cambridge, MA: MIT, 2005), xvii-xviii.
[26] W.J.T. Mitchell, 'The Work of Art in the Age of Biocybernetic Reproduction', *Modernism/Modernity* 10. 3 (2003): 481-500.

without an awareness of this potential for the monstrous. Mutations, monsters, accidents are the imaginative outworks for interpreting such art. Science Fiction is the parergon to genomic art.

I describe 'genesthetics' (as Larry Miller terms the aesthetics of the gene), as the monstrous sublime because genomic research and art collapse – or have the potential to collapse – borders. Oncomouse represents such a monstrous sublime. Here the mouse is transgenic, and is built with a human genetic formula that makes it susceptible to cancer. The sublime induces pain physiologically because it makes us strain to see that which cannot be comprehended. But then one does peer closely – very closely – through the microscope, at the screen, and so on. With genetics it is possible to collapse categories. It must be remembered that classificatory regimes and categories are integral to aesthetics (the grotesque, for instance, thrives on 'species confusion' and breakdown of categories, as Geoffrey Galt Harpham has demonstrated[27]). In both cases the dissolution of bodies/borders marks 'it' differently. In genomic art – as the visual material reveals – the animal-plant-human borders become permeable: each can take on the form, function, feature of even the utterly alien *other*. The shape-changing feature of transgenic art and the computer-generated simulations of body functions are both 'monstrous'. Out of these forms of art emerges the shape (and size, and gender and race) of the future. This shape of the future (biology) is best described in Evelyn Fox Keller's words: 'a radically transformed intra- and intercellular bestiary will require accommodation in the new order of things, and it will include numerous elements defying classification in the traditional categories of animate and inanimate'.[28]

[27] Geoffrey Galt Harpham, *On the Grotesque: Strategies of Contradiction in Art and Literature* (New Jersey: Princeton UP, 1982).
[28] Evelyn Fox Keller, *The Century of the Gene* (Cambridge, MA: Harvard UP, 2000), 9-10.