The Traffic in Cyberanatomies: Sex/Gender/Sexualities in Local and Global Formations

LISA JEAN MOORE and ADELE E. CLARKE

Body Society 2001; 7; 57
DOI: 10.1177/1357034X01007001003

The Traffic in Cyberanatomies: Sex/Gender/Sexualities in Local and Global Formations

LISA JEAN MOORE AND ADELE E. CLARKE

> I argue for the need to recognize, and act upon, the occurrence of a profound and comprehensive intellectual revolution. This overturning affects all branches of daily life and even the more arcane reaches of humanistic and scientific research and practice. Simply put, it is the radical shift underway since the eighteenth century from a text-based to a visually-dependent culture. (Stafford, 1991: xviii)

> ... the polymorphous term consumption ... is discussed here in terms of processes of commodification, spectatorship, commercial exchanges, and social welfare reforms, processes that involve the desire for and sale, purchase, and use of durable and nondurable goods, collective services, and images. (de Grazia, 1996: 3–4)

Very common destinations on the information superhighway are human genitalia sites offering internal and external anatomical representations as they have never been seen before – high-resolution, realistic images in bright colors with moveable labels, multiple angles and motion pictures – all in your own home or office at the click of a mouse. We analyze such cyberanatomies, produced and distributed through computer-mediated technologies, on the Internet, CD-ROMs and user-controlled video equipment – from medical school sites to on-line pornography.

In social/cultural studies of science, technology and medicine, there has been considerable interest in representation over the past decade. Visual images have been distinctively useful in the construction of the kinds of objectivities central to modern Western sciences. Daston and Galison (1992) argue, for example, that the aim of scientific illustration is graphic depiction where objectivity is represented

Body & Society © 2001 SAGE Publications (London, Thousand Oaks and New Delhi),
Vol. 7(1): 57–96
[1357–034X(200103)7:1;57–96;020180]

in singularity. Scientific accuracy has been constructed historically as the ability to create the one singular representation of a given phenomenon which fully 'captures' it. This is accomplished by normalization, standardization, deletion of range of variation or difference, and deletion of the mediation of the observer. Such simplifications, Star (1983: 117) argues, seem objective because they delete discussion of actual concrete practices, the nitty-gritty work of science: 'The search for this rendition of objective representation was a moral as much as a technical quest.'

Cartography, botany and anatomy were the first image-based sciences. Latour (1986) has called the capacity of certain representations to be shared widely and yet sustain their referents 'immutable mobility'. Many immutable mobiles such as maps have had the power to transform the world (Law, 1986). In Western science, technology and medicine, representations transport theories widely and quickly, if not unproblematically, across genres of difference. Latour (1986) further argues that inscriptions and their devices are mobilized to recruit allies and construct networks. Historically, the emergent discipline of anatomy certainly abetted medical specialization by inscribing regions and systems of the body as distinctive (e.g. Blake, 1980; Stevens, 1971) and such inscriptions were and clearly remain disciplinary devices (Foucault, 1977). Star and Griesemer (1989) take up the dynamics through which some objects become mutable mobiles, when the same object is brought into different arenas and its flexibility allows it to be inscribed with local meaning by different social worlds and used for local purposes. They term such flexible entities 'boundary objects'. Anatomies can (and we believe should) be viewed as *both* immutable and mutable. They travel 'as they are' and that may well be consequential, but meanings ascribed and usages may also vary widely across local cultural/political/historical/economic formations.

Feminist analyses of the work of images in science begin from both different and similar premises. What is different is taking sex, gender and sexuality seriously and placing them centrally (Braidotti, 1997). What is similar is that both feminists and others examine how the activities of scientists are organized, produced and manufactured as products of 'objective' knowledge. Distinctively, feminists further ask how visual images may benefit science and scientists and/or disadvantage women. For example, Ludmilla Jordanova (1989) argues that visual images produced by anatomists and the biomedical sciences more generally have been *constitutive* of the categories of gender and actively mapped these categories on to living bodies. The power of these sciences to thereby *naturalize* hierarchical social relations is considerable because of their privileged epistemological position as 'official' knowledge. Anatomy in particular, she finds, is a science of transgression by invasion and public display. The mutual constituitiveness of

sciences and sexes/genders/sexualities is a key feminist concern (e.g. Haraway, 1997).

We use the term sex/gender/sexualities to signal that these categories are both difficult to distinguish and routinely blurred not only in popular culture but also in biomedicine and academia (e.g. Fishman et al., 1999; Grosz, 1994). We assume here that sex/gender/sexualities as well as racial and other formations are socio-historical constructs, varied and distinctive in their specificities across times, places and cultures (Omi and Winant, 1986). This is particularly salient for an understanding of the linkages among sex/gender/sexualities and globalization because, as Doreen Massey has argued (1994: 177–8), 'Geography in its various guises influences the cultural formation of particular genders and gender relations . . . [G]eography matters to gender'. For example, Massey's research documented different masculinities and femininities in four different parts of the United Kingdom at the same historical time. To these 'could be added the high-technology-professional patriarchal gender relations being put in place right now in Cambridge – that is, in one of the symbolic sectors and places of "the future"', not unlike those in cyberanatomies.

What this means for our project is multifold. In many sites of consumption, cyberanatomies will be newly exported and imported cultural objects. Cyberanatomies are products produced through local (gender, racial, cultural and other) formations, distributed through global formations, consumed locally and interpreted through (probably quite different) local formations. What kinds of differences will it make to the digital construction of sex/gender/sexualities if a cyberanatomy is produced in MultiMedia Gulch in San Francisco or by ADAM in Atlanta, Georgia? What kinds of differences will it make to the reading of it if it is consumed in Peoria or Pretoria?

> At one level, it is the evaluation of globalization that is itself at stake. Is it a matter of transnational domination and uniformity or, on the other hand, the source of the liberation of local culture from hidebound state and national forms? (Jameson, 1998: xiii)

What are additional possibilities and likely complications? We return to this point in conclusion.

Anatomies are ruled by conventions. We use the term conventions here in both art historical and sociological senses. In art history, they are sets of practices characteristic of particular regimes of representation; conventions constitute historicizations of practices. Sociologically, Becker (1982) has argued that conventions are products of pragmatic situations, aesthetics and interactional networks. For example, in the past century and a half since the art market developed, most paintings physically fit within the spaces of galleries, museums and (large) private

homes. Aesthetically they also 'fit' particular market niches. Similarly, Latour (1986, 1988) has used the term 'regimes of (re)presentation' to refer to paradigmatically different framings, such as sacred compared to secular art, which can be historical or contemporaneous. Within the sciences, then, disciplinary and specialty conventions develop over time into regimes of interconnected assumptions – paradigms of specialty representation. There have been many 'regimes of (re)presentation' in anatomy (Clarke and Moore, in prep.).

Our substantive analyses of specific cyberanatomies in this article need to be understood through these key theoretical frames: feminist discourse and related analyses of sciences and technologies, globalization theory, and digital visual cultures as remediation. Through discourse and disciplinary analyses of a now very wide array of sciences and technologies, feminist scholars have elucidated the 'othering' and racialization of women, girls, females, the feminine and many if not most aspects of bodies, including gender, sexualities and reproduction since the Renaissance,[1] including in anatomy. Yet precisely because anatomy is *not* cutting edge biomedical science and has supposedly been comparatively stable, its constructions are more vivid. As feminist scholars, we seek to challenge and change such discourses. But let us clarify: we do not believe people are dopes or dupes of discursive constructions who need 'accurate' representations to locate their sites of embodied pleasure. We are pragmatists, trusting in concrete practices and often studying them as well as discursive/textual representations (e.g. Casper and Moore, 1995; Clarke, 1998; Moore, 1997). Practices often make us more hopeful than texts (Lock and Kaufert, 1998), and we believe many/most women and some/many men would/will 'discover' what is usually called the clitoris regardless of its relative 'absence' in cyber(or other)anatomies.[2]

But discourses are nevertheless consequential. 'They are at one level always already a "play of signs"; yet at the same time, they are a 'real, effective presence' (Bolter and Grusin, 1999: 19). And some discourses are more consequential than others. In cultures and sites where knowledges about sex, sexuality, gender and reproduction are considered 'immodest' and/or illegitimate, discourses of both scientific and popular anatomies vibrate culturally, key sites for contestation (Clarke, 1990, 1998). We seek to challenge and change those discourses by problematizing the representations of (mostly female) genitalia and pleasures.

Embodiment, despite over a decade of attention to 'the body', remains as conceptually problematic as it is riveting. One of the most interesting aspects of this vast discourse is how difficult it is to talk (or write) about embodiment – corporeality – and its consequences and implications, how little shared vocabulary exists (e.g. Martin, 1987). This is, of course, no accident, as the 'scientific revolution' of modernity was predicated on the denial of embodiment (e.g.

Haraway, 1997; Hayles, 1999; Oreskes, 1996; Potter, forthcoming). The science of the past few centuries which required disembodied knowers and producers of knowledge (constituted through the erasure of bodies, actual work practices and the messiness of life itself) produced very partial official knowledges, particularly stunted about embodiment in general and sexual, gendered, raced embodiments in particular.[3] Most anatomies are, ironically, exemplars of such approaches. With Hayles (1999: 5), we 'view the present moment as a critical juncture when interventions might be made to keep disembodiment from being rewritten, once again, into prevailing concepts of subjectivity'.

'[T]he concept of globalization reflects the sense of an immense enlargement of world communication, as well as of the horizon of a world market, both of which seem far more tangible and immediate than in earlier stages of modernity' (Jameson, 1998: xi). The term globalization is used in a number of ways.[4] Here we seek to highlight and problematize how such distributional processes can legitimate 'the westernization of the world, obscuring cultural differences and struggles', and obscuring the imperialisms of domination by overdeveloped countries and multinational corporations (Cvetkovich and Kellner, 1997: 2–3). We are especially concerned with the globalization of Western biomedicine, quickly becoming one of the major transnational megacorporate webs on the planet – the Biomedical Technoservice Complex™ (Clarke et al., 2000; Haraway, 1997). This huge and growing political/economic/cultural sector relies on particular discursive assumptions about bodies, persons and populations that 'should be' tacitly accepted for the sector to flourish.[5] A standard human body can also become discursively hegemonic and global in that anatomical representations create the universal standard body while erasing both the range of variation of human bodies and making invisible the very work of standardizing bodies.

In viewing digital visual cultures as what Bolter and Grusin (1999: 14–15) term 'remediation', we attempt to specify some of their historically cumulative, paradoxical and contradictory aspects. The remediation argument is that new visual technologies such as computer graphics and the World-Wide Web:

> . . . are doing exactly what their predecessors have done: presenting themselves as refashioned and improved versions of other media. Digital visual media can best be understood through the ways in which they honor, rival and revise linear-perspective painting, photography, film, television, and print.

For our argument, focus is on re-media-ted continuities with older visual cultures – the importation of hierarchical, stratified cultural baggage regarding sex, sexuality and gender that older media cultures carry, and that remains unquestioned in new media reconfigurations. That is, due to the newness of the mechanisms of delivery (e.g. the Internet or CD-ROMs), it *appears* as if the images and labels and

meanings embedded in these representations are new and innovative which they usually are *not*. Thus, through inserting old anatomies into new, fast, interactive tools, old messages about women's bodies, sexuality and reproductive purpose are reinscribed yet again.

Globalization raises issues of anatomical cultural imperialism afresh. The United States remains the center/core of production for distribution to the peripheries. Every minute of the day and night, someone, somewhere on the planet, is watching a Hollywood movie (Morley and Robins, 1995: 220). The USA imports only 1–2 percent of its own television broadcast output and exports more than the rest of the world combined. The USA's pre-eminence is even greater in prime-time fictional and news programming (Morley and Robins, 1995: 223). The *New York Times* called the Internet 'the First Global Colony', noting that its economics and culture 'feel awfully American' (Lohr, 2000: 1). Educational materials – most especially biomedical materials – travel similarly. There is a 'symbiosis between scientific and popular imaging technologies. The culture and technological history of film and television repeatedly overlap and intersect with the culture and history of scientific and biomedical imaging' (Treichler et al., 1998: 3).

Certainly the role North American medical education has taken globally vis-a-vis the education of physicians, nurses and other health professionals over the past century echoes that of the media. Moreover, since the 1960s, the cultural power of US media has been largely, though not fully, subordinated to transnational corporate authority. US cultural styles and techniques have become transnationalized, not a situation promoting semiotic democracy (Schiller cited in Morley and Robins, 1995: 225). While anatomies have always traveled widely, and could even be called the poster children of biomedicine or 'model (im)mutable mobiles', recent shifts in sites of production of much anatomical knowledge reposition such anatomies. That is, through distribution of distinctively Western anatomies, Western bodies are about to represent global bodies globally. Further, such anatomies are directed at specific market niches (ranging from medical subspecialty training tools to 'family'-oriented reference products) anticipated to expand greatly. All of these theoretical concerns are manifest in the genital anatomies project.

The Genital Anatomies Project

> ... medical technologies are better encompassed by Foucault's (1979) term 'technologies of power', forms of rational, material practice which are indissociable from the exercise of power over embodied subjects. The effect of technologies of power is to organize and exploit the materiality of the body in the interests of both social order and the generation of certain kinds of knowledge ... (Waldby, 1997: 228)

This article is part of a larger project, begun in the early 1990s, examining representations of human genitalia in anatomies since the Middle Ages. We have framed six major regimes of (largely textual) anatomical representation: medievalist, Renaissance realist, anatomical hyper-realist, biomedical abstractionist (including computer generations), feminist abstractionist and cyberspacialist. For cyberanatomies, 'the medium is [the key feature of] the message' (McLuhan and Fiore, 1967). We are interested in what is happening to human genitalia in this global rush of re-representation.

We use the term *genital* as our generic term to designate 'what's down there' for specific historico-political reasons. Labels hold power: whether the areas of the body where the clitoris and penis lie are labeled genital, sexual or reproductive anatomy, or some combination thereof, is highly consequential (cf. Gardetto, 1992; Kulish, 1991; Park, 1997). Genital is thus closest to a regional term whilst the terms sex, sexual, generative and reproductive become our *analytic* categories.

Within texts (i.e. books) or textual objects (i.e. CD-ROMs), images are typically accompanied by labels and narratives, especially but not only in the sciences. Each can be manipulated vis-a-vis the others to foreground or background different elements. Often they work together and are mutually reinforcing. The relations amongst images, labels and narratives have been our major analytic focus. We analyze how anatomists represented, labeled and narrated the various 'male and female parts', focusing especially on what (if anything) counted as 'the clitoris'. Our general conclusions to date are as follows:

- Narratives and images often work together to render a discourse of size as synonymous with physical superiority.
- In terms of image and/or labeling, the female may or may not have a clitoris while the male always has a penis.
- When present, the clitoris is often presented as homologous (arising from the same embryonic cells) to the penis, but never vice versa.
- Clitoral agency or purpose (capacity for sensation and action such as engorgement) is rarely addressed while the actions of the penis form a lively central narrative.
- Narratives of orgasm pertain solely to the penis except in explicitly feminist anatomies.
- The common scientific convention of singularity/unity of representation and omission of variation holds sway for both males and females; we call this *anatomical essentialism*.[6]
- In most anatomies, conventions of heterosexualization inextricably link sexual

function with reproductive function in narratives and often through visual representation of pregnancy.

Here we continue this project, asking a classical anthropological question: how are anatomies cultured in (global) cyberspace? How have these bodily representations been re-mediated, re-situated and re-constituted in this new (mostly Western) digitalized world? Here, instead of looking only at the genitalia per se, and daring to look long and hard, we look also at 'The Big Picture' (Park, 1952; Strauss, 1987). Cyberanatomies draw upon a wide array of regimes of representation as resources. As part of the strategy of hypermediation, multiple regimes typically appear in the same product. We include anatomies intended for both popular and medical audiences, taking the diversities among anatomies very seriously. We analyze the conventions of anatomical representation, comparing female and male genitalia and the heterogeneity of visual and textual representations. We also compare cyberspace conventions with those in print texts. But, in only a limited fashion do we deconstruct nomenclature since, by the 20th century, it is fairly standardized, and the issue instead is whether or not elements are labeled and what is labeled how. Anatomies matter in terms of not only medical and popular constructions of embodiment, but also as means by which the culture of science extends into everyday life (Gieryn, 1998; Jordanova, 1989; Martin, 1987).

Methods

From Textbooks to Hypertext: Experiencing the Differences

> We have learned to take things at interface value. We are moving toward a culture of simulation in which people are increasingly comfortable with substituting representations of reality for the real. (Turkle, 1995: 23)

Cyberanatomies are different in a number of ways. First, the data analyzed are not simply the same anatomical images from textbooks scanned into a computer program and enhanced for high-resolution computer screens. Many new renderings have been produced and, even where the same images are used, the medium of transmission of images (on a computer screen) and the direct involvement of viewers through the physical manipulation of the images (the sensations of clicking on, moving and hearing) changes users' relationships to these images and thus their meanings. Viewing these highly produced, multiply angled, colorful, wet and shiny representations may become more 'compelling than the real' (Turkle, 1995: 237). Further, as users negotiate their relationships with the hypertext, images of the clitoris and penis are understood in new ways. Cyberprocesses

influence the ways in which images are approached, understood and evaluated. Lisa's fieldnotes discuss this:

> There is also an issue of on-line searching being different from research for the [text-based] papers. For texts, I was actually in the library, in the stacks, digging through the shelves and physically looking though books, discarding some and choosing others and then going to the xerox machines and inserting my copycard and making copies. It was a multi-leveled process that involved considerable physical activity by me. It was dusty; the books were heavy; I had to carry several to the machines at once. The archival work was even more ritualistic: no pens allowed; I had to use their pencils; I could only request a few books at a time; archivists gave me the precious contraband which had to be examined in their presence. Any copies had to be ordered through them and were given to me as sacred objects for my very careful handling. These were researching adventures that really made me value the materials and their realness as precious objects.
>
> As a result of this type of working process, the actual materials were invested with an extra personal significance. These books were in our extraordinary library. They were shared throughout history and others had touched, learned from, taught with, operated from, done practices using [them]. I saw them as active texts that were physically there. The reproduced images were mine; my xerox copies were my souvenirs and evidence of the special research journey as well as 'our data'. I marked them up in my coding and analyzing. They were evaluated and assessed, stacked in different ways and reordered.
>
> Researching on the net is more difficult. You ARE the MTV generation, whether you want to be or not. You are recruited to the quickly moving changing screens and video images of cyberanatomies. [Just simply] Finding these anatomies in cyberspace involves new skills, and I end up finding many other, often totally unwanted, things including several hundred advertisements – which cheapen the research for me. It also doesn't feel like work as in the library. I can do it while I am in my own home or from the office, I can think about other things, pick my nose, listen to music loudly, talk on the phone or whatever private affairs I want to do. Then I can also look up pornography, which is terribly easy and often appears without my even trying as definitions of anatomy in cyberspace are broad.
>
> I also had the experience of not being able to see the images on the net. I mean I know they are there, sometimes more visually interesting than the early to mid-twentieth century images. But their realness did not seem to be real to me but rather like a television commercial or something not to think about too long. It felt like there was no there there, as Gertrude Stein once said of Oakland, California. Simulacra are us. It was (and is) only in the printing that I really began to appreciate these images and think that they counted and mattered in my sample of what to include in this study. (Fieldnotes, Lisa Jean Moore, 13/5/97)

Further, when consuming more complicated cyberproducts in which you can 'move around' or opt for different segments, we found that once inside, users must continue to the end of that segment or exit it; moving back and forth among segments is often impossible. Here the locus of authority is different. In the texts, the authority resides in the image itself. In cyberanatomies, there is an additional authority-from-the-screen whereby viewers must play follow-the-leader or not play at all. Others have set the agenda and programmed it firmly in place. We are configured as users (Woolgar, 1991) in new ways as we observe these anatomies. You can feel the disciplining live and in person.

Finding Cyberanatomies, Experiencing Technical Difficulties

> . . . medical knowledge is generated through technologies of power and renders bodies available for social use. . . . The computer screen increasingly provides the frame through which bodies are seen and understood within medical practice. . . . [C]omputer technology is working bodies over in its own image . . . [and] this convergence is not only conceptual but also material, involving the literal reorganization of the flesh. (Waldby, 1997: 228)

Unfortunately, due to the high volume of production of computer-mediated anatomical objects, there is no up-to-date compendium referencing what is actually available on the Internet at any given time, much less archives of past sites and activity. Mega search engines (such as Hotbot), as well as many other commonly used search engines (such as Lycos and Yahoo), tend not to list things by relevance.[7] For instance, searching on the word *anatomy* brings up many sites such as 'anatomy of the automobile' as well as some anatomical representations. There are also medically dedicated search engines on which users can seek human anatomies.[8] However, finding anatomies that include or focus on genitalia is very unusual. The illegitimacies of sex, sexuality and reproduction are sustained in cyberspace (Clarke, 1990, 1998). For example, the Net-Doctor[9] website advertises that users can 'Experience Your Body Internet Style'. However, Internet style does not have genitals.[10]

Further, many anatomies produced on the Internet are what we have termed 'temporary anatomies'. Since webpages are constantly updated leaving no remaining traces, unless a previous version was printed or downloaded and stored digitally, there is no lingering evidence of its existence. With textbooks, such as *Gray's Anatomy*, we could easily review multiple editions, tracking the appearance and disappearance of the clitoris compared with images of the penis and their labels (Moore and Clarke, 1995; see also Petersen, 1998). It is impossible to trace the progression of cyberimages. Instability is democratized.

Criteria for Inclusion

Our criteria for inclusion of sites and sources were as follows:[11]

- must be on the WWW, video or CD-ROM;
- must have images of human genital anatomy – male and/or female;[12]
- may or may not have labels;
- must be in English language.

Exemplars were chosen for intensive analysis with the goal of obtaining a wide range of variation (Strauss, 1987; Clarke, in prep.), including sites which focus on particular types of anatomical representations (i.e. genitourinary, reproductive), or general anatomical representations (entire body). We also noted webpage

warnings of explicit or pornographic materials. Boundaries are blurred and anatomies can be viewed as obscene.[13]

Cyberanatomies

There are three types of cybertechnology: first, an interactive series of previously collected stereoscopic photographic images of dissected cadavers with user control through reading a series of bar codes with a hand-held laser device.[14] Second, CD-ROMs offer multiple images and pronunciations of human body systems, often providing tours of the body. Some are highly technical and biomedically oriented while others are general consumer or popular products for household reference which manufacturers claim can be used for continuing education or general interest.[15] Third, anatomical webpages are constructed on the Internet.[16]

Across all three technologies, cyberanatomies can be viewed as falling on a continuum from biomedically oriented to lay/popular products. Most cyberanatomies are created and used by biomedical professionals, especially for training health care professionals of many types. Medical educational institutions, faculty and medical students post very temporary webpages to convey course listings, homework, dissection information, study guides and evaluations. In contrast, popular anatomies are widely available and potentially democratic in that they do not require formal biomedical education or student status for access. Medical illustrators, graphic artists and health care providers professionally produce many popular anatomies; here it is the intended audience that is not biomedical.[17]

Video Anatomies

In the 1950s, an anatomy professor and acclaimed dissector at Stanford University School of Medicine collaborated with Viewmaster inventor William Gruber to create 1547 color stereo views of the human body in Viewmaster reel format, the state-of-the-art device of its day. In 1993, this *David L. Bassett Stereoscopic Atlas of Human Anatomy* was electronically updated to project its rich and dense three-dimensional images on a television screen. Using a hand-held device, the user scans bar codes on the paper guide and the corresponding video image appears.[18]

We analyzed data from volume 3, dedicated to the thorax, abdomen and pelvis. Bassett's is among the most ambitious dissectional anatomies ever done. There is an abundance of different angles, each foregrounding different features of the sex organs and a very serious and thorough attempt to label them in representations even when they are not the central focus. For example, as one might hope, there

are multiple parts of the clitoris labeled in 'Dissection of female pelvis from lateral approach: Close-up view of the clitoris'. But there are also multiple parts labeled in 'Dissection of the female pelvis from a lateral approach: Vestibule of vagina, opened and viewed from the right side'. Unlike other anatomies, there are no narratives describing forms and functions. Images on the screen are replicated by line-drawn hard copy illustrations with numbered pointers corresponding to labels – i.e. corpus clitoridis. The line-drawn images, reproduced here, are reminiscent of the intense anatomical realism of Kobelt's 19th-century illustrations (see Kobelt quoted in Moore and Clarke, 1995: 265).

Out of Sight, Out of Mind

From the 21 images labeling at least one part of the clitoris, and the 33 images labeling at least one part of the penis, we selected five exemplars. Some of these representations depict the clitoris (crus clitoridis) extending back several inches into the depth of the woman's body. For example, in image 160–2, we are able to see a prominent clitoris with multiple parts labeled (see Figure 1, Labels 1, 4, 15, 16).[19] These images illustrate how presence of the clitoris in the body does not intrinsically deproblematize its representation and/or labeling. 'Stereo processes had a hard time achieving an actual register of depth providing instead an illusion that was highly distorted and exaggerated' (Lisa Cartwright, personal communication).

With an eye toward realism, pubic hair is visible on this cadaver and the glans of the clitoris appears clearly. Image 161–3 is a typical cross-section of the female pelvis with a new orientation to the location of the clitoris (see Figure 2, Label 27), deeply

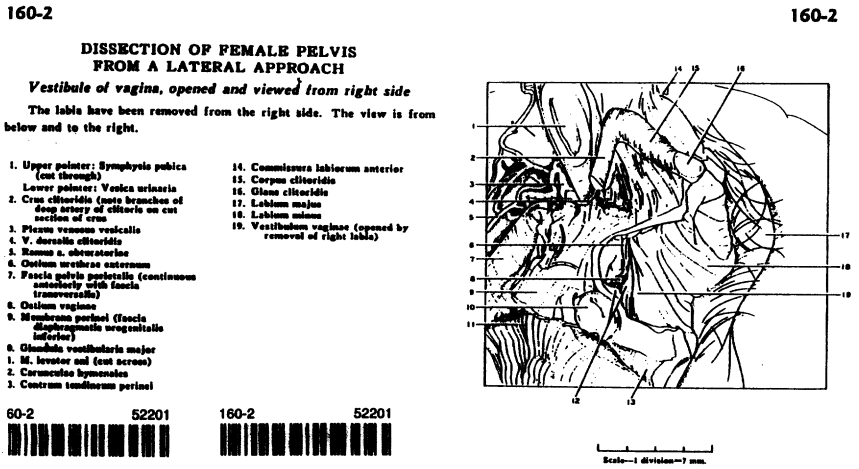


Figure 1

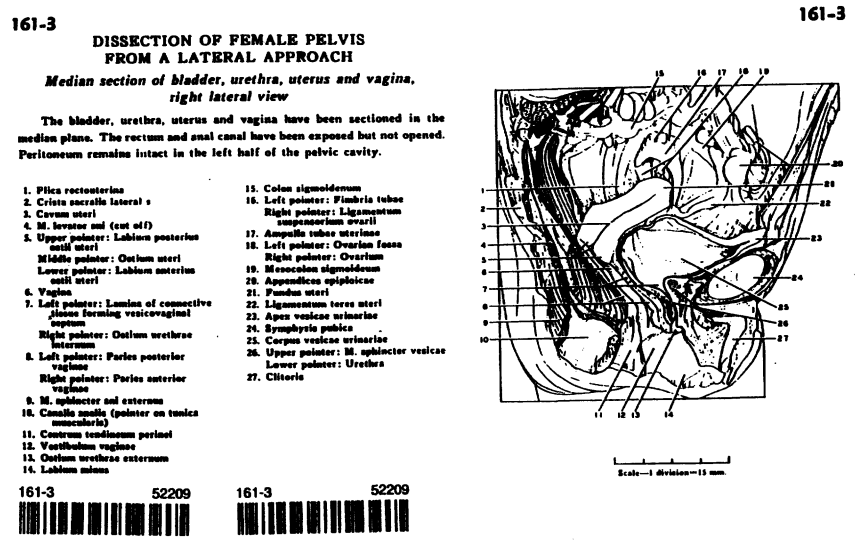


Figure 2

embedded in the internal genitalia and lower abdomen. Conversely, the penis appears to be an add-on structure, fully on the exterior of male bodies. The penis is projected while the clitoris is introjected. While there are more parts of the penis labeled, the clitoris images show a large internal structure *parallel in size* to a non-erect penis, to which it is embryogenically homologous.[20] Of all the clitoral images we have seen, this dissection of a once living body shows the largest designated clitoral structure, but this structure is visible from only very few angles of dissection.[21] Only here do we perceive that homology between the clitoris and penis is structurally proportional as well as functionally parallel in terms of orgasm.

CD-ROM Anatomies[22]

> Colorful, comprehensive graphics guide you on a journey through the body. With its vast database, Bodyworks Classic lets you study specific areas from head to toe, zooming in and out for a complete look at the world within you, and focusing on different internal systems such as the skeletal, muscular, cardiovascular, reproductive and more. (*Bodyworks*, 1997)

Through narrated animations, medical illustrations, videos and photography, these anatomies purport to offer guided and interactive tours of the human body. CD-ROM anatomies are usually marketed to medical students and medical libraries, but popular anatomies also have larger markets outside the medical field, radiating into the private sector of individual personal computers. For some popular CD-ROMs, target audiences are families and/or children. As part of our sampling of CD-ROM anatomies,[23] we contacted 15 companies for demo disks.

Of the three we received, *The Anatomy Project* (Parthenon), *Human Anatomy* (Gold Standard MultiMedia) and *Interactive Atlas of Human Anatomy* (CIBA), none included genital anatomy as part of the demonstration, offering instead 'less controversial' (Clarke, 1990, 1998) parts of the body, like the heart or lungs, to advertise their product. Given that sex is among the most common sales devices (de Grazia, 1996), such omissions are significant.

Cyberanatomies produced with the possibility of being seen by children are packaged in particular ways to bring attention to the potentially *sensitive* nature of materials on genitalia. As a recent *New York Times* article was titled, 'No Sexology, Please. We're Americans' (Bronner, 1997). One cyberanatomies reviewer (Fleisher, 1995: 8) states:

> A number of software publishers have recently tackled the task of teaching about human anatomy and physiology. Their varied approaches reflect a range of viewpoints on such aspects as how information should be organized and presented, how much detail should be included, and in what manner each topic, including the sensitive issue of human reproduction, should be addressed.

This author carefully notes the reproductive content of each individual program. For example, for *Body Park* (a take-off on *Jurassic Park*): 'The title also offers a "family" attraction with a limited view of how characteristics are passed to offspring, but no information on sex organs or reproduction.' For *Body Scope*: 'The reproductive system is touched upon, but the process is not discussed and no external organs are shown.' For *ADAM*:

> Parts of the reproductive system are discussed in detail in one of the text files, and there are related animations, though the procreative act itself is not tackled head-on. A teacher option actually allows instructors to cover breasts and genitals with fig leaves, if they don't want them examined by students.

Misinformation strategies are always already available.

Some developers of CD-ROM programs have also paid considerable attention to the potential of CD-ROMs and related technologies to become not only the new family medical reference materials, but also cornerstones of managed health care which involves patients themselves in managing more of their own medical care, requiring their (re)configuration as semi-active consumers. This creates new niches for patient education and explanations of medical phenomena and procedures that CD-ROM programs can fill, supposedly saving provider time. 'CD ROM sales are growing at an explosive rate and it has as much to with health being a poignant topic as with the fact that it's a category that interests every member of most households personally' (Everson, 1994). Through 1996, IVI had sold more than 750,000 copies of the *Mayo Clinic Family Health Book* CD-ROM. Next, we analyze three exemplary CD-ROM anatomies.

ADAM

Attempting to corner the market on medically oriented CD-ROM anatomies, the *Animated Dissection of Anatomy for Medicine* or *ADAM* programs seek to capture both the popular/home and biomedical markets with both Windows and Mac products. They offer multiple biomedical products from low-end Student Editions, such as *ADAM Comprehensive* at $199.95, to the *Comprehensive 2.3* with a Lab Pack at $3495.00 for institutional instructional purposes. We have selected two versions of *ADAM* for analysis: one biomedical and one popular.

ADAM Interactive Anatomy (1997)

There is currently considerable debate among medical school anatomy faculty regarding the use of software in instruction. For example, as of January 1999, UCSF, regularly among the top three medical schools in the country, owned hardly any software for medical students, as there was reported dissatisfaction with the dissections offered. The goal for *ADAM* products is to meet their developer's claim (Swayne, 1993: 9) that it will be 'the *Gray's Anatomy* of the 21st century', 'the flight simulator' for physicians or the 'anatomy processor'. Former Surgeon General C. Everett Koop is cited as using *ADAM* products at Dartmouth to 'build a better physician for the 21st century'. Millenarian narrative seems very important here, as is the use of *ADAM* products in European medical schools.

Promotion materials for this interactive CD-ROM program boast 'World's Most Comprehensive Anatomy Database'; it contains over 20,000 images of anatomical structures including three-dimensional images from the Visible Human Project.[24] This product enables users to view three different types of images of the body: dissectible anatomy, atlas anatomy, and 3-D anatomy, with additional capabilities for creating slide shows for teaching and presentations. With its market dominance in CD-ROM anatomies, *Interactive Anatomy* appears aimed at creating an *ADAM*-using global community through creating Internet links from the CD-ROM to *ADAM* websites. The Language Lexicon options (users can select English, French, Hungarian, Italian, Portuguese, Spanish and Swedish, with Japanese and Chinese soon) enhance the globalizing reach of this software through localizing strategies. Users can also set the skin tone setting of the model body used in their session to Black, Asian or olive. The skin color, some facial characteristics and the hair of the models change, but the body remains the same, suggesting that race is solely surface, only skin deep (see Figure 3).

In our evaluation of the program for its treatment of human genital anatomy, we initially found it difficult to locate 'sex organs'. While there are mouse-linked pinned atlas images, labels of parts are not revealed without actually clicking on the parts. Using the 'find' feature, a search for 'penis' yielded 18 sites while

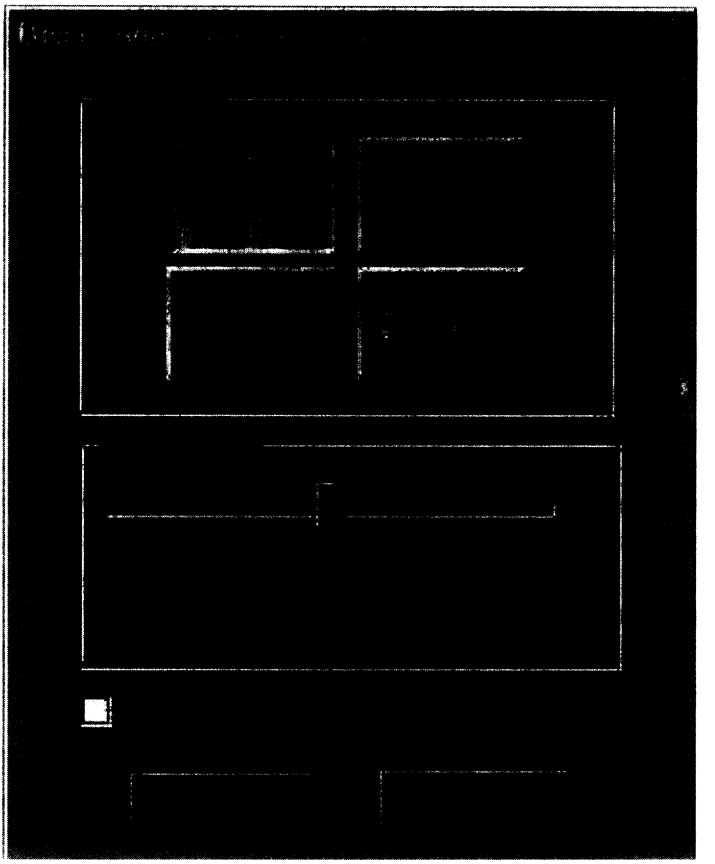


Figure 3

'clitoris' resulted in 12 available in one of three areas of images. For example, by clicking into one of the 'clitoris' results in Atlas Anatomy, we can see a differently configured and multiply labeled image of the clitoris than that shown in the Dissectible Anatomy section. While this program was relatively equitable in its treatment of images of male and female genitalia, there are no narratives. Clearly a biomedical product aimed at teachers, undergraduate science majors and masters level health care professionals, certain previously acquired knowledge of human anatomy is expected of users.

ADAM The Nine Month Miracle

In *ADAM: The Nine Month Miracle*, users can follow Adam and Eve (the names used for the Mom and Dad to-be) through the 'incredible journey' of their first pregnancy.[25] It offers a very highly and traditionally gendered sit-com-style

presentation, featuring the mother-to-be routinely taking emotional care of the anxious father-to-be. As users, we can (1) read through nine chapters of a pregnancy book, one month at a time; (2) watch A Child's View of Pregnancy; or (3) use the anatomical dictionary of male and female bodies. Retailing for $69.95, this product is advertised for students grades 9–12, teachers and families, with a special section for 3–9-year-olds as siblings-to-be. Immediately upon opening the product on-line, we are reminded that this is a family-based popular anatomy through the primacy of the *modesty setting* in which fig leaves can be placed over the genitals and female breasts. The initial user can click between a yes and no button to block access to removing the fig leaf. Through the anatomical dictionary setting, a body appears on a split screen. The default, a seemingly sex/gender transcendent body that appears when one opens this option, is white, slender, youthful and devoid of pubic hair. Manipulating a pull-down icon on the side of the screen, users can strip the body layer by layer, exposing new body systems (i.e. respiratory, cardiovascular, skeletal). As in the *ADAM Interactive Anatomy Program*, there is a 'skin tone option'.

Finding genital organs during searches, however, is not an easy task. Using the eyeglass icon within the Reproductive System Option, a user can search for a body part by typing in the name. 'Clitoris' resulted in one reference. After clicking on the highlighted word, half of the split-screen that contains the body highlights that part of the body. The clitoris is a very small part momentarily highlighted in light blue; if the user were not paying complete attention to the genital area, they would miss it. The user can also click the mouse all around the vaginal area attempting to get the word clitoris to illuminate. Within the labeled body option of the female body, the clitoris is not labeled. In other words, the user needs to ask for clitoris on the search command in order to get it, and even then it is very difficult to find. The definition for clitoris is 'a small female organ near the opening of the urethra that consists of erectile tissue and is the sexual analog of the penis'. A small but agentic clitoris, for users who know the meaning of 'analog'.

Searching for 'penis' resulted in five references. The highlighted penis foreskin flickers in pink, the shaft is light blue. It is much more obvious and easy to locate. In clicking around the male genital area, there is a greater hit rate of 'penis' labels. Unlike the clitoris, the penis is defined without comparative reference to female body parts as 'the male organ of copulation and urination that consists of the urethra and surrounding tissue. Stimulation can lead to erection, emission and ejaculation.'

Fetal images are also available as month-by-month photographs of fetuses inside the amniotic sac. Taken by photographer Lennart Nilsson, known for the

book *A Child is Born* (1977/1990), they appear alive but were taken of aborted fetuses (Hartouni, 1997), though unnoted here. Exploring each fetus-of-the-month, we were surprised to find Month Five offering the clitoris and labia majora as labeled body parts, while Month Eight contains a labeled penis and scrotum, with a strikingly parallel presentation. There was also a Sexual Differentiation Video option, a superb two-minute color animation of homologous development. A male voice (Adam's) leads us: at seven weeks, the male develops androgens which help create a penis and the female develops estrogens which help form a clitoris. Simulated time-advanced illustrations show male and female side by side with a color-coded schema. A female voice (Eve's) guides us through the changes: the genital tubercle is in purple, the uro-genital folds are in pink and the labio-scrotal swellings that form the penis and the clitoris are in green. She states, 'The penis and the clitoris are called sexual analogs because they originate from the same structure.' We had never seen such explicit equality of organs. However, we need not have worried that our analysis would fall apart. Adam, the husband, immediately states, 'Well, Eve, it just goes to show you the difference one [*sic*] little androgen can make.' The interior sex organs are not shown.

Bodyworks: Classic Edition

An early and simpler CD-ROM by Softkey Multimedia (1994), *Bodyworks*, enables the user to click on to bodily systems from an icon-driven menu at the top of a screen. A general anatomy for the lay public and possibly for children, this CD contains line and color drawings, three-dimensional images and movies with sound. Images are not from vivid realist regimes of representation such as photographs of cadavers but rely instead on medical illustration.[26]

Bodyworks' genital anatomy falls under the broad heading of Genitourinary System, represented by the male and female symbols, and 'includes the urinary and reproductive organs. Because these organs are located in the same area of the body, and share some functions, they're often treated together.' In keeping with many 20th-century representations (Lawrence and Bendixen, 1992; Mendelsohn et al., 1994; Moore and Clarke, 1995), the male and female genitalia are unequally represented. Nor is the homology argument prominent in the hypertext of the program. While the penis, glans of the penis, corpus cavernosa and ejaculatory ducts of the male system are depicted, labeled, highlighted (hypertexted) and defined, the clitoris is not (see Figures 4, 5). The only mention of the clitoris is in the narrative listing of the parts of external organs of the vagina; it is not on the list of visual options. Male erection is described as part of sexual arousal, while the female reproductive system is exclusively portrayed, both visually and textually, as the site of conception and childbirth. The female

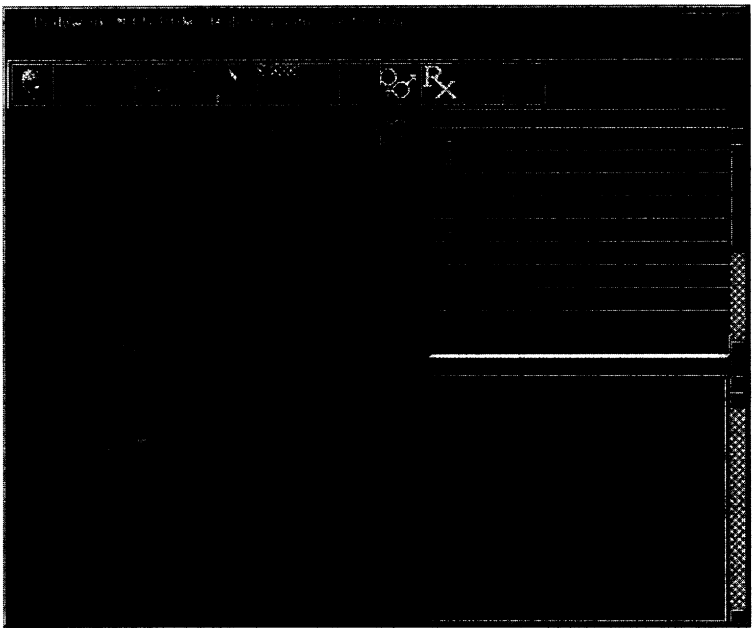


Figure 4

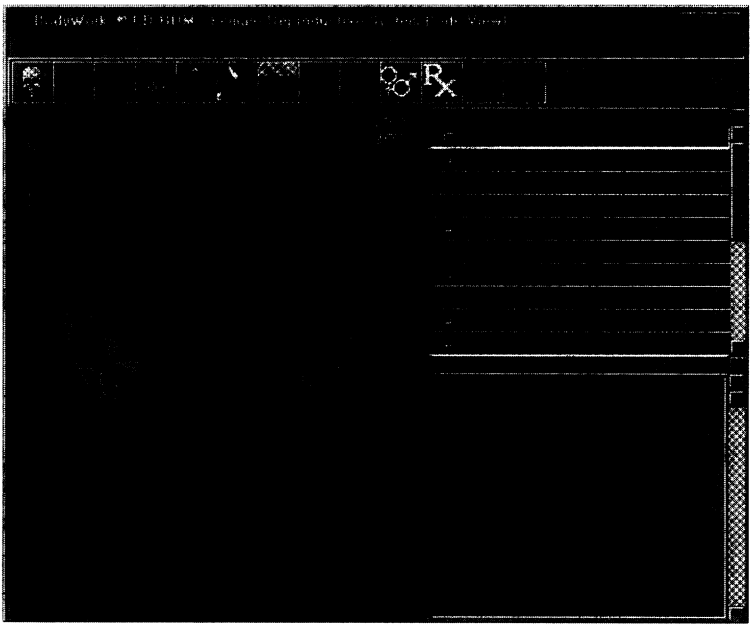


Figure 5

body is a wholly non-sexual body. A Fetus icon provides entry into 'The Living System' which 'covers many of the processes of living including conception, pregnancy and childbirth'.

Internet Anatomies

Concealment from children of what are considered pornographic images is also a major issue circulating on the Internet. Programs such as *Cybersitter*, *Cyberpatrol*, *Netsheperd* and *Netnanny* are available from $39.00 for adults to download in order to control children's access. Because pornography industry webpages typically use keywords of genital anatomy in their titles, these sites are also typically listed in anatomy search results. As in hard copy pornography, the words seem to refer almost exclusively to female bodies. Searching 'clitoris' on the HotBot Search engine led to 57,857 matches and a plethora of XXX pages with the warning (or enticement) 'This site contains adult materials' (search from 25/1/99). Names of sites include '!!Absolute Adult Filth', 'XXXFETISH.COM', and 'Throbnet Quality Movies and Images'. Clicking on to one site called LIPS.Com, there was a preview page which further seduced, 'please click here for clitoris' with *clitoris* written throughout in different fonts and sizes. These sites have multi-colored scanned high-resolution photography of barebreasted women with their hands down their panties, teasers to encourage viewers to purchase online images. Indeed a lucrative venture, as reported in *Computerworld* magazine, one pornography web site claimed to have brought in $500,000 a month from $12 memberships (Staff, 1997: 59).

Searching for 'penis' led to 258,283 matches, over five times the number for clitoris. In addition to pornography sites, search results indicated a preoccupation with penis accessories, including penis pumps ('Power Piston Penis Pump' and the 'Erecto Blast Penis Pump'), masturbators, and s/m sex tools (search from 25/1/99). In cyberspace as in art (e.g. Pollock, 1992) male sexuality is marketed as very much within men's own control, including enlarging and playing with their organs, whereas female sexuality is usually displayed as passive.

Visible Human Project

The Visible Human Project (VHP), a $1.4 million project funded by the National Library of Medicine (NLM) and initially developed at the University of Colorado, is an attempt to digitally capture very high-resolution images of dissected male and female bodies. 'These data sets are being applied to a wide range of educational, diagnostic, treatment planning, virtual reality, artistic, mathematical and industrial uses.'[27] This Project comes at time when the Human Genome Project mapping the genetic structure of the human race has been prominent for a decade (e.g.

Hilgartner, 1995). As the Human Genome Project sequences human DNA to make more of the human blueprint knowable, the Visible Human Project team procured two human corpses: a male death row inmate[28] who dedicated his body to science, and an anonymous 59-year-old female resident of Maryland who died of heart attack. These bodies were frozen in block gel, sawed into four sections, packed with dry ice and, through a milling procedure, 1 millimeter incremental slices were made to create cross-sections which were then digitally imaged. After four months of work to slice the body into 1871 cross-sections of the male and 5000 slices of the female, databases were compiled. The body images created from these massive amounts of imaging through MRIs, X-rays and other computerized devices were next converted into pixels, small increments of digital image, that are themselves manipulable. Since these images are intended to be used by others (researchers, CD-ROM manufacturers and universities) for a fee with a formal licensing agreement, there are no labels on the original images. In 1999, there were over 1200 licensees in 41 countries.[29] The VHP is likely to have significant influence globally over all future anatomical renderings. Many webpages and CD-ROMs already cite their use of these databases.

Only insiders can easily navigate these images. One of its creators notes that it is 'very useful if you already know anatomy. It's difficult to learn any anatomy from him' (Wheeler, 1996: A6). As in traditional anatomies, Cartwright (1997: 129) notes 'the virtual man more often has served as a gender-neutral model of human anatomical form and function'. Indeed, the Director of the VHP, Cornelius Rosse (Monaghan, 1994: A26), claims that the project can:

> ... encode a major portion of biomedical knowledge that has to do with anatomy of the structure of the body, in a machine readable form – and to do it in a way that is transportable, transferable, usable very widely, to meet the needs of very different people, going all the way from the general public to a neurosurgeon specialist.

Rosse argued that this computerized model could both improve medical students' knowledge, will teach them things they 'cannot learn from actual bodies' and provide members of the public with ready access to databases explaining human anatomy and health. Finally, products created with the VHP can also be applied in managed care settings. Such broad claims-making for the VHP is routine. Again, Dr Rosse: 'Physicians don't have time to talk to their patients and explain everything. They will, however, be able to explain problems and treatment to patients if the patients already have some understanding of anatomy' (Monaghan, 1994: A26). This is anticipatory claims-making (Aronson, 1984) before any patient has even used the system or it has existed in practice. It situates the visible man and woman as boundary objects *extraordinaire* (Star and Griesemer, 1989). However, in actual practice, the Visible Man and Woman have also been found to

be not quite flexible enough for the varied purposes for which different groups wish to use them.[30]

The VHP itself as an enterprise transforms our notions of space and place. Morley and Robins (1995) explore how the electronic age changes the contours of geography through transforming communication systems. Space and place are reconfigured by the ways in which information is packaged and instantaneously sent to heterogeneous and far-ranging locations. There are tensions between two aspects of these new spatial dynamics of the information age: the *de*-territorialization of audiovisual production toward globalism, and the popularization of local production and local distribution networks toward localism. It is now possible to take the body (the anatomically universal standard white, physically fit, youthful, male) and then segment, digitize, computerize and transmit it to multiple transnational social worlds, including medical schools, high schools, physical therapy offices and private residences. While singularity of representation (one of each sex) has characterized anatomies since at least the Middle Ages (Clarke and Moore, in prep.), Visible Human Project bodies have the potential to become *the* two global human forms. Thus transport of these images of the body to all parts of the world can be seen as a postmodern form of biomedical informational imperialism. The fact that a prisoner's body has become part of global biomedical disciplining is Foucauldian in the extreme (Cartwright, 1997, Treichler et al., 1998). The fact that the woman was postmenopausal – beyond usual reproductive age – is often lamented and she will likely be supplemented if not replaced by a younger (trophy) body that is more traditionally gender appropriate. Fascinatingly, the Visible Man has only one testicle, the other apparently removed after it descended. This 'peculiarity' has been noted by commentators, but only in passing, while the postmenopausal age of the Visible Woman is relentlessly highlighted.[31] The tensions between globalism and localism operate both as tensions within the images created and as their effects. For example, the VHP's images have been standardized or universalized through the production of media images from one 'core' power center and filtered elsewhere to the 'periphery'. But users who apply for licensing can also make new specific local products based on these bodies.

We visited several sites linked to the NLM page: *Marching Through the Visible Man*, *Marching Through the Visible Woman*, *A Guided Tour of the Visible Human* from Washington University Medical School, *The Vesalius Project*, and some specific applications of the data set such as: the University of Pennsylvania's *Interactive Knee Program*, and SUNY Stonybrook's 3-D *Virtual Colonoscopy*. When visiting the site *A Guided Tour of the Visible Human Project*, it is possible to search the 9000 digitized sections of the body for file names, key points and annotations containing a keyword.[32] A search conducted with the keywords, 'clitoris', 'vagina'

and 'penis', yielded no matches in any of the 9000 sections. Thus the key finding for our project is that remarkably few programs provide any focus on human genitalia available from the VHP. Few, if any, want to reach out and touch genital anatomy using the Visible Human, even with a digitalized 10-foot pole.

We were able to locate one use of the VHP database for the pelvis and perineum available on-line. Loyola University Medical Center's webpage[33] presents images from the VHP with a few labels and no narrative description of parts or their function. An image of a white man in black briefs with a white waistband greets visitors to this site. Through clicking on to different boxes which correspond to a cross-section of this underwear-clad man, users can view color images of unlabeled or labeled cross-sections, MRIs, CT scans or movies. Those images that are labeled are not comprehensive; rather, three or four pointers identify parts like 'corpus cavernosum' or 'spermatic cord'. The penis itself is not specifically labeled although clearly visible in the last image. There is no female counterpart to this 'Cross-sectional Anatomy of the Pelvis and Perineum' at Loyola's site. Of course, it was still 'under construction'.

University and Medical School Sites

The University of Arkansas Medical Center site[34] illustrates some continuities with traditional textual representations of women's genitalia as containing fetuses (Moore and Clarke, 1995). Produced as part of their curriculum for the Department of Anatomy, these images are part of a thorough array of lists, tables, assignments and narrative explanations used in the anatomy courses. While there were only a few images currently available on this webpage, these images are used to advertise the plastic-like models available in the Medical Center's Marvin Laboratories. On the ten color-photographed images of the female pelvis and perineum, there are no labels of the parts. The images are titled, for example 'uterus with fetus' or 'female perineum'.

On our initial visits, the Tulane Student Health Center website,[35] developed for use by mostly undergraduate students, featured pages dedicated to descriptions of anatomical structures related to Men's and Women's Health Issues. Medically illustrated color images taken from AMI-Mosby stock images were used to depict male and female external and internal genitalia. Students were encouraged to use this site to have questions answered in a private setting. There was no use of VHP images here. These clearly sexed and gendered pages were constructed in a parallel fashion using similarly structured narrative and visual display templates. The parallel construction emphasized the gender neutrality (as opposed to gender bias) of the representations. The Men's Health Issues page offered hypertexted descriptions of five parts of male anatomy:

> The penis is made of spongy tissue, not muscle or bone. Inside are several tubes. The urethra carries the urine and semen to outside the body. The other tubes aid in erection. The penis is usually flaccid but can become hard and erect when these tubes engorge with blood. This occurs during sexual arousal and makes intercourse possible. The penis is the most sensitive part of the male anatomy.

Although the description of the penis included a narrative of engorgement and a claim of its necessity in sexual intercourse, this engorgement was not articulated for the female. However, the Women's Health Issues page does include six hypertexted body parts, where the clitoris is quite radically figured: 'The clitoris is right below the mons and at the top of the labia minora. It is the most sensitive part of the female genitalia and is covered by a hood of skin. Its sole function is to provide pleasure when touched or rubbed.' After the seemingly endless asexualization of women on-line, this pleased us immeasurably.

Sadly, when we returned to this site in our final revisions, the locally developed materials had been completely erased by a set of hot links to previously produced sites and other University references.[36] In directing users to other sites, anatomy likely becomes more derivative relying upon previously published materials. This change demonstrates the dominance of homogenization and standardization over and against the democratization promised by the World-Wide Web.

Our Bodies, Our Selves On-Line[37]

In the popular traditions of the feminist self-help health movement, the *Our Bodies, Our Selves* (OBOS) webpage invites users to participate in their own exploration as they browse the *Anatomy and Physiology of Sexuality and Reproduction* section of this site. 'The following description will be much clearer if you look at yourself with a mirror while you read the text and look at the diagrams. It is written as if you were squatting and looking into a hand mirror.' Obviously intended for women, this site seeks to create a virtual self-help community brought to you through your computer screen. Guiding women through a self-administered examination of their sexual organs, this site, unlike any other, engages the user in directly exploring the multiple parts of the clitoris materially and virtually simultaneously.

> As you gently spread the inner lips apart, you can see that they protect a delicate area between them. This is the vestibule. Look more closely at it. Starting from the front, right below the mons area you will see the inner lips joining to form a soft fold of skin, or hood, over and connecting to the glans, or tip of the clitoris (klit-or-iss). Gently pull the hood up to see the glans. This is the most sensitive spot in the entire genital area. It is made up of erectile tissue that swells during sexual arousal. Let the hood slide back over the glans. Extending from the hood up to the pubic symphysis, you can now feel a hardish, rubbery, movable cord right under the skin. It is sometimes sexually arousing if touched. This is the shaft of the clitoris. . . . At this point where you no longer feel the shaft of the clitoris it divides into two parts, spreading out

> wishbone fashion but at a much wider angle, to form the crura (singular: crus), the two anchoring wingtips of erectile tissue that attach to the pelvic bones. The crura of the clitoris are about three inches long.... Both the crura of the clitoris and the bulbs of the vestibule are wrapped in muscle tissue. This muscle helps to create tension and fullness during arousal and contracts during orgasm, playing an important role in the involuntary spasms felt at that time. The whole clitoris and vestibular bulbs are the only organs in the body solely for sexual sensation and arousal.[38]

Also on this website are multiple black and white line drawings from various angles of the female sexual and reproductive organs including many versions of the clitoris.

Comparatively, there is one image of the male pelvic organs, a side view. In keeping with the discourse of homology, this site also includes a chart of corresponding sexual organs in females and males. Note that the female organs appear in bold here and are positioned as the baseline referent for the male organs. While there is no text exclusively dedicated to the penis, users can refer back to the female description of homologous female organs and translate these functions to male anatomy and physiology.

FEMALE	=	MALE
Outer lips	=	Scrotum
Inner lips	=	Bottom side of penis
Glans of clitoris	=	Glans of penis
Shaft of clitoris	=	Corpus cavernosum
Ovaries	=	Testes
Bulb of vestibule	=	Bulb of penis and corpus spongiosum
Bartholin's glands	=	Cowper's glands (bulbourethral glands)

At the time of our research, OBOS was the only feminist anatomy on-line. The other major feminist anatomy, by the Federation of Feminist Women's Health Centers (1981a), is available only by snail mail.

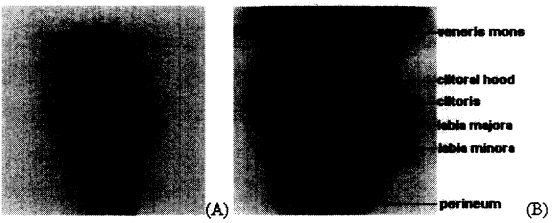
Newsgroup and Individual Anatomies

Usenet newsgroups, where people get together on-line to communicate about a variety of topics, may also be seen as virtual communities of individuals dedicated to particular topics, many of which are medical, such as prostate cancer, menopause or Alzheimer's (Linden and Kienholz, 1995). One group-designed anatomy page is part of the alt.sex newsgroup,[39] hosted in part by an individual named Elf Sternberg, a science fiction writer. His webpage has a link to the alt.sex newsgroup which boasts, 'if statistics are to be believed, alt.sex is the single most widely read newsgroup of Usenet'. According to Mr Sternberg:

> The group 'alt.sex' as I knew it existed from 1989 to 1995, at which point commercial advertising made the group untenable. The website has existed from 1994 to the present, although the images were added in late 1995. In that time, approximately 2 million people have viewed the website. (Personal communication, 21/6/97)

As part of the Frequently Answered Questions (FAQ) page, there is a warning 'no material of an explicit or erotic nature is intended in this FAQ'. Users can log on to this newsgroup, maintained by a group of people interested in human sexuality, and email questions. FAQ pages are designed to limit the number of repeat questions. Two pages of anatomic interest are available: *vulvas – the female genitalia*, and *penises–the male genitalia* (see Figures 6, 7), each with multiple black and white photographs of real penises and vaginas and medically illustrated color drawings. The vulva page also introduces visitors to the hymen through line drawings. Intended for the lay public, this site uses both language and images that

External View: The Vulva

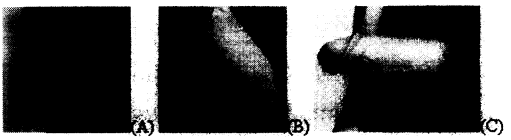


- (A) External View, closed
- (B) External View, open and flushed.

The Vulva is the external sexual organ of women. The above view (A) shows the external view of the female vulva as normally seen when the woman is standing up. View (B) shows the vulva when it is opened, and from the top down one can clearly see the Veneris Mons, clitoral hood, clitoris, and labia minora. There are many questions about the vulva on alt.sex, and this FAQ will begin to attempt to answer some of these.

Figure 6

Male external genitalia



- (A) Circumcised
- (B) Uncircumcised
- (C) Erect

The penis and scrotum are the external sexual organs of men. There are many questions about the penis on alt.sex, and this FAQ will attempt to begin to answer some of them.

Figure 7

are accessible to most people. There are no images from the VHP. The clitoris and penis are clearly labeled with multiple parts, and sexual function is included in the description of each organ. However, there are no narratives of engorgement for the clitoris.

This site is neither pornographic nor biomedical, but draws on both of these visual traditions in order to construct itself. There are real live black and white crotch-shot photographs of real live white people, there is a warning about the site, and sexuality is discussed in detail on other site pages (including sex toys, anal sex and oral sex). At the same time, there are biomedical illustrations and clinical labels of certain body parts. This site is sex-positive and purposefully speaks to visitors about the benefits of sexual fulfillment.[40]

Pornographic Anatomies: Cockworld, LIPS, and Amateurs

Most of the pornographic web sites that we sampled are gendered sites for gender-specific consumption, regardless of sexual preference. Depending on the search engine, searching under 'penis' or 'clitoris' as keywords may lead a user to commercially produced pornography such as *Cockworld*, or *LIPS*, or to pornography created by individual amateurs. What one notices immediately and vividly is that, unlike all other locations of anatomical images on the Internet, pornographic sites boast a range of variation in body types: races, ethnicities, sexes/genders/sexualities, ages and sizes. However, this is not range of variation for its own sake or for representational realism. Rather, each difference is fetishized for a niche group of consumers.

One investment analyst estimates that the market for on-line porn is now worth about $1 billion in yearly sales, much of it for monthly subscriptions ranging from $5 to $20. The market is dominated by a few major players earning $150 million each, but about 40,000 smaller sites also compete. One of the most profitable sites averages about 7 million hits per day and boasts more than 27,000 paying subscribers. A new San Francisco Bay Area nonprofit industry group for on-line adult entertainment businesses may help local firms go public (Lazarus, 1999: D1, 3).

Webpages of pornographic images, found through the same exact search routines[41] as biomedical anatomical renderings, demonstrate the continuum of 'legitimate' and 'illegitimate' ways to see the human body. In *LIPS*, we noted the similarities of the bodily variation in the amateur photography of the Pretty Pussy Contest with variation appearing in *A New View of the Woman's Body* by the Federation of Feminist Women's Health Centers (1981a). Further pages, such as 'Al's Amateurs' weekly postings, offer photographs of women spreading their vaginal lips also in much the same way as in *A New View*. It is clear that

biomedical images can be read as pornographic, especially if they are photographs. Photos of penises and vulvas look much like photos of cocks and pussies.

Audiences can, of course, consume these images as anatomical representations. While biomedical imaging and websites are designed to read as impersonal and factual 'scientific' presentations of body parts, newsgroup and pornography sites designed for lay people present information as intimate, embodied, compelling narrative (Cerulo, 1997). Hence these remediated cyberspace anatomies, in their close kin relations to both pornography and advertising more generally, offer not only sexual imagery but also the worlds of science, medicine and cyberspace itself for consumption. Moreover, anatomy in cyberspace updates pornography, thereby postmodernizing eroticism.

Conclusions: Globalized Bodies

> Representation follows two laws; it always conveys more than it intends; and it is never totalizing. The 'excess' meaning conveyed by representation creates a supplement that makes multiple and resistant readings possible. (Phelan, 1993: 2)

> Medical and scientific imaging systems 'claim to make "the natural" newly visible, yet they simultaneously reinforce what we have already learned to see.... [V]isibility is not transparency.... [V]isibility is itself a claim that must be carefully examined. (Treichler et al., 1998: 3)

Cyberanatomies as a new regime of representation of human genital anatomies illustrate the doubled vision of remediation: the persistence via reincorporation of certain historical forms while simultaneously creating new (often hypermediated) experiences. The vast majority of the cyberanatomies we examined reinscribed traditional assumptions about sex/gender/sexualities even as they seemed to articulate something new. Diana Forsythe (1996) titled a paper on medical informatics 'New Bottles, Old Wine: Hidden Cultural Assumptions . . .'; similarly, in cyberanatomies it is usually only the prefix *cyber* that is new. Specifically, in all but the feminist anatomies, comparisons between genital anatomies of the clitoris and penis reveal the clitoris as still disproportionately under-figured, and non-agentic. The homology argument about human genitalia is only evident in the occasional computer-mediated product such as, *ADAM's 9-Month Miracle*. Female genitalia are related explicitly to reproduction while those of the male considerably less so. And, finally, not surprisingly, seeking female genital anatomies on the Internet leads one directly to graphic pornographic representations of women's bodies (and, much less frequently, to males).

Sociologists and other cultural critics have begun to analyze the meanings that newer computer/information technologies co-construct with individuals and

communities.[42] Focus has been primarily on the transformations of communication as it emerges on-line and to suggest 'that new social formations may require new forms of inquiry' (Jones, 1995: 7). Critically, doing research in this historical moment in the creation of new technological formations allows us to observe the remediation of patterns of representational domination as they move from textual formats to cyberspace. *Many different patterns of domination must be re-engineered as soon as possible: 1) western biomedical domination of the body; 2) patriarchal domination of females; and 3) corporate domination of the informational market sector.* As Gatens (1996: 149, emphasis in original) states:

> The specificity of human embodiment should be understood not simply in terms of sexual or racial specificity, but also in terms of the *historical* specificity of human embodiment which provides a basis of commonality for all those who share, however inequitably, a present *as being their present*. It is this fact of embodiment that makes our present situation 'ours' and one which only 'we' can address. Those who make up any particular sociability are literally embodied elements of the historical conditions which make that form of sociability possible.

Dominations – like liberations – take work to enact and to embody. Yet there can be a certain excitement and hopefulness about using the World-Wide Web and other computer-mediated technologies, and their capacity to deliver multiple heterogeneous versions of information to a screen (at the library, work or home) with such ease and efficiency. When we began this project, we felt the Internet held much promise for the democratization of anatomy: heterogeneous authors of genital anatomies could offer accessible alternative representations to counter the often narrow, singular, racialized and non-feminist (at times anti-feminist) traditional biomedical genre. And, indeed, there are personally crafted web sites based on individual and collective visions and agendas. However, the dominance of the Visible Human Project of the National Library of Medicine, the continued supremacy of a narrowly biomedical authorship and the continuous technical innovation of highly sophisticated, commercially produced hypermediated anatomy products is sustained. Popular alternative genital anatomies, including feminist anatomies, remain comparatively rare, isolated and quite difficult to locate.

Differences between biomedical and popular anatomies persist. First, although on a broad level the goals of both may be similar – to depict anatomical structures to an audience – their purposes, strategies and interests are often quite different. There are medical centers posting anatomical renderings for clinical audiences who need body maps for surgical procedures, just as there are CD-ROMs produced as home reference guides to understand sexual function. Some of the authors of webpages (e.g. the alt.sex.newsgroup) are very invested in producing non/anti-racist, non/anti-sexist, and non/anti-normative representations of the human body. Such concerns were not apparent in the 'scientific versions' of the

body we studied. But all are produced under constraints including financial costs, time and technical expertise.

Second, the main target audiences of popular and biomedical cyberanatomies differ in both composition and size. The organization of images, linguistic choices and accompanying narratives can be designed to exclude or include particular audiences. While there is traffic among all groups who produce these images as they adopt and appropriate each other's images for different purposes in the elaborate choreographies of remediation, there are also distinctive differences among the sites. Biomedical sites, packed with medical terminology and versions of pathological genital conditions (for example, STDs or cancers), are difficult to understand and interpret for those not already educated within these systems of knowledge and classification.

If popularly produced genital anatomies remain dwarfed by biomedical dominance in cyberspace as well as in textual formats, what then are the implications of biomedical anatomical singularity (what we term anatomical essentialism)? Evidence of the continued enforcement of the singularity of the anatomical body, *despite incredible remediated potential for heterogeneity*, lies in the discussion of the search for the 'Adam and Eve' candidates for the Visible Human Project. A *personal ad* format was used in one *Scientific American* article: 'The NLM does not need a few good specimens. Just one of each sex will do. The ideal candidates should be between the ages of 20 and 60, of medium height, not too thin, not too plump. Race or ethnic background is not an issue' (Stix, 1993: 146). This is a breathtaking erasure of race and ethnicity as embodied. Race, whatever it may be, is often manifest in height, weight and stature. But multiplicity as variation is not represented. Instead, digitalization is tacitly claimed to miscegenize the body itself. For example, in some programs we are invited to change/pick the race of the model, but the only parts that change are the face, hair and skin color. We found this pattern in both popular family CD-ROMs and in programs intended to educate patients about an upcoming medical procedure. The doctor (or other health care provider) can flip the switch to make the video patients the same race as the actual patients before they arrive.

If the body is a simulacrum 'a copy with no original' (Poster, 1990), individual variations – the heterogeneities within classes of life forms – become irrelevant. Origins are erased along with the situations and conditions of production, and we are presented with the ultimate universalizable bodily forms. It is singular anatomy all over again, 'straight' from the Middle Ages. Yet this is obscured by the multiple – even infinite – number of views of those two singular bodies made possible, for example, in their VHP remediation.

Perhaps the medium of the Internet has not *yet* enabled more active citizenship

in creating not only an array of representations but also heterogeneities *within* representations. To date, *A New View of a Woman's Body* (Federation, 1981a) and to some degree *Our Bodies, Ourselves* (Boston Women, 1971–1998) have served as the key heterogeneous resources enabling women to become active citizens in the creation and consumption of a variety of genital images. They have literally sparked the production of new anatomical research on the clitoris (e.g. O'Connell et al., 1998). Can such initiatives be made more global via the Internet? Or is their strength in being more local media? Are both possible?

Our analysis of cyberanatomies found sedimentation of older problematic forms of sex/gender/sexuality in new arenas of representation of human bodies. Continuities with previous textual anatomical representations abound in new visual and cyber formations such as the heterosexual requirement, the female body as reproductive and not sexual, and the biomedical expert as the proper and dominant mediator between humans and their own bodies. Other hidden continuities can also be archeologically revealed. This is critically important because they are often sites of the resurrection in new forms – the remediation – of older forms of power and stratification. But this is not merely old wolves in remediated sheep's clothing; rather a new genus and species appears always already prepared for technical 'evolution'. Produced at faster rates and for an array of new audiences, the Western biomedical anatomical imperialism, which privileges certain conceptions of the body over others and further normalizes certain human relationships, will have increasingly global consequences for how we view our bodies, genders and sexualities.

We therefore end with a call for ethnographic studies of how cyberanatomies are actually taken up and dealt with in other corners of the world – other local formations. Massey's (1994) work leads us to anticipate a heterogeneity of localizations in practice through the global distributions of cyberanatomies. With Lock and Kaufert (1998: 1), we call for a 'semiotic return' to local sites of consumption of cyberanatomies to better grasp how globalization affects body politics in concrete practice, in the sites where we cannot help but dwell. Such research needs to attend most carefully to the localization of the accompanying cultural authority of Western biomedicine, assumptions deeply built into these artifacts. We are trying to read against a technoscientifically remediated version of biomedical manifest destiny. Hence we need studies of production and distribution from non-Western and other Western sites as well as studies of reception/consumption.

> At stake ... is not so much a decision to side with either the human or the posthuman, as a search for versions of the posthuman that do not erase embodiment and do not consider human beings as inscriptions that can be frictionlessly transferred into another medium. The creation

> of a conceptual framework for reading [and for learning anatomies] that traces the permutations between incorporations and inscription is one way to insist, yet again, that human beings are embodied creatures. (Hayles, 1999: 247–8)

Notes

Our article has benefited from suggestions by Lisa Cartwright, Monica Casper, Stefano Harney, Catherine Waldby and anonymous reviewers for *Body & Society*.

1. See e.g. Bell (1994), Clarke (1998), Jacobus et al. (1990), Jordanova (1989, 1993), Laqueur (1990), Martin (1987, 1991), Moscucci (1990), Oudshoorn (1994, 1996), Oudshoorn and Van Den Wijngaard (1991), Schiebinger (1989, 1993), Stepan (1986), Tuana (1989), Wiber (1998).

2. We seek to counter tendencies of equating the penis with breasts to frame a discourse of size. Kal Austin (Department of Education, University of Illinois Urbana/Champaign) has studied sex education materials in public schools and found that the clitoris is often totally missing, or its function is not discussed. Instead, girls' breasts and their agonies over breast size are highlighted, paralleling boys' anxiety over penis size. We seek to assert instead the homology of penis and clitoris in embryogenesis, and a discourse that external size does not really matter and pleasures can be equitable. We also seek to counter the normative anatomical equation of male genitalia as mostly if not exclusively for pleasure while female genitalia are mostly if not exclusively for reproduction. We object, at the end of the 20th century, to the continued representation of women as an essentially passionless social category (Cott, 1978).

3. See Foucault (1978), Jordanova (1989, 1993) and Laqueur (1990).

4. On globalization theory, see e.g. Cvetkovich and Kellner (1997), Appadurai (1996) and Morley and Robins (1995).

5. On the discourses of biomedicine, see Tesh (1988), Haraway (1995) and Lupton (1994). On rationalization in biomedicine, see Berg (1998), Armstrong (1983, 1987) and Waldby (1999).

6. Only among feminist anatomies and two other works was there a shift away from the universalizing tendencies of most narratives and visual representations toward a range of variation and difference of body maps and embodied experiences represented in the text. Feminist anatomies include the Boston Women's Health Book Collective (1971, 1973, 1976, 1984, 1994, 1998) and the Federation of Feminist Health Centers (1981a, 1981b). The two historical texts which address difference are Lowry and Lowry (1976) and Dickinson (1949) which we analyze in another article.

7. Two search engines claim to be useful for seeking images. In 1997, we visited two of these sites, Webseer [webseer.cs.uchicago.edu/] and webseek [www.ctr.columbia.edu/webseek/], engines that exclusively search for images (photographic, illustrated, video). Periodic searches on these engines yielded different results. Whereas webseek did not contain any images of 'clitoris', 'vagina' or 'penis', webseer found 0 images of the 'clitoris', 18 images of vulvas with 5 available photographs of STD infected vaginas and 1 photograph of a penis. Of the 50 images of the 'penis', again disease was commonly imaged as well as demonstrations for penis enlargement techniques. In 1999, using www.lycos.com/cgi-bin to search exclusively for images, there were 155 'vagina', 31 'clitoris' and 332 'penis'. It is important to note that the 'penis' query resulted in images regarding circumcision, medical concerns, STDs and enlargement issues as well as pornography. Female genital organs were largely pornographic sites.

8. For example, www.sunshine.net/folkstone/anatomy/projects.html#Human_Anatomy

9. See www.net-doctor.com/ie/index/html.

10. There are searches available by body systems, circulatory, digestive, immune, muscular and nervous. Human reproductive or genitourinary system is notably missing. Additionally, there are no links to other sites that might offer information about these systems.

11. As part of our data analysis, we reviewed several sources of computer-mediated technologies that projected anatomical representations. Final updates were conducted in 1999.

12. We do not use search words *obstetrics and gynecology* because our interest in representations of human genitalia are not explicitly connected to human reproduction. Although human reproduction does emerge repeatedly, we did

not want purposely to seek such representations. In fact, it strengthens our claims about the absence of female sexual agency disconnected from reproductive function to find reproduction linked particularly to female genital anatomy in *non*-obstetrics and gynecology sites.

13. Expanding information technologies with readily available sources of images have become matters of concern for parents wishing to control children's access to images of human sexuality. This situation has led to discussions of censorship and warning labels of sexually explicit material on the Internet. Anatomical representations, often as visually detailed as pornography, are exempt from this necessity. In June 1997, the US Supreme Court invalidated part of the 1996 Communications Decency Act and allowed the Internet the same free speech rights available to books and newspapers (Chiang and McLeod, 1997).

One suggestion made by certain pornography groups in the interest of quelling conservative backlash is to develop a voluntary rating system, similar to that now found on many network television programs. Additionally, many porn sites choose to post warnings. Obscenity laws are especially important for the non-biomedical, radical revisionists who have posted cyberanatomies – down homey images of vaginas and penises, similar to the explosion of revolutionary feminist images of the 1970s and 1980s.

For feminist anatomies, see note 6. The continued reinterpretation of the Communications Decency Act of 1996 remains an issue. However, unlike earlier feminist images, these cyberanatomies do not differ in production quality from many of the university sites. Web designers can download some of the same or similar quality anatomical images of biomedicine to create their popular sites. These new modes of producing, via remediation, have brought into focus the problematics of defining anatomy and pornography.

14. This program costs $300 for the videodisk and $150 for the accompanying books. It also requires the use of a videodisk player, a television and a tracking device to input images; it is primarily available through medical school bookstores.

15. CD-ROMs range in price from approximately $60 (individual) to $2000 (institutional) and require computers with CD-ROM capability.

16. The Internet claims free access but requires a computer, peripherals and, if printing is desired, a high-resolution printer.

17. When searching for 'genital anatomy' on the web, one also comes across many sites developed by multimedia companies created and used much like pornography, as teasers or marketing devices to sell products: CD-ROM packages, instruments or procedures for penis enlargement, and technical expertise for conception. Individuals also create webpages including terms of human anatomy.

18. Users are dependent on the video screen, disk and location equipment, as it is impossible to print these three-dimensional images due to complexities in their digitization.

19. Due to limitations in technological abilities, these representations are line drawings of the stereoscopic photographs.

20. Homologous in embryology means originating from the same cells in the course of development. The same cells configure differently in males, females and intersexuals after the fifth week of gestation (Haeberle, 1981: 14). See also Laqueur (1990: 169) and Dreger (1998).

21. With these images, the diagram offered by the Federation of Feminist Health Centers (1981a, 1981b) seems much more accurate and unexaggerated. More recently O'Connell and colleagues (1998) have published the first of several planned papers which redefine what tissue should 'count' anatomically as part of the clitoris. The 19th-century German texts (e.g. Kobelt) have been a key resource for recent anatomies (Federation, 1981a; O'Connell et al., 1998).

22. Special thanks to Linda Mitteness, Marilyn Little and Val Hartouni for loans of materials.

23. In order to obtain CD-ROM anatomies, we inquired at the University of California, San Francisco Millberry Union Book Store for the most commonly requested CD-ROM anatomies. We requested samples from this list. We also reviewed *Publisher's Weekly* for reviews (1/1996–9/1998) on CD-ROM anatomies and requested samples based on their reviews.

24. At this time only the heart, skull, trachea and lung are part of the data set.

25. The product's disclaimer is noteworthy as it reasserts the medical dominance of licensed physicians as appropriate interpreters of the body. 'This product is not warranted to be medically accurate or correct. This product is

intended for general educational and entertainment purposes only. The information provided herein should not be used for diagnosis and treatment of any and all medical conditions' (Product insert, p. 15).

26. This product also does not rely on the Visible Human Project for images.

27. From the Smithsonian's webpage about the Visible Human Project http://innovate.si.edu/smith/1996/96long/96me221.htm.

28. In her important research, Lisa Cartwright (1997) explores issues of the criminal body, the public and private rights of identity and the disclosure of the identity of the body used to make the images, deftly illustrating some of the ironies of creation. See also Waldby (1997, 1999), Cartwright (1998) and Ackerman (1996).

29. The web address is http://www.nlm.nih.gov/research/visible or search the NLM site for Visible Human Project.

30. See www.nlm.nih/gov/research/visible/vhp-conf/vhpconf.htm for discussion of some of the problems with data.

31. See Quackenbush et al. (1996). Thanks to Lisa Cartwright for pointing this out to us.

32. The address is http: //medicine.wustl.edu/cgi/cgiwrap.cgi/~ysp/tests/image_search in 1997.

33. The address is www.meddean.luc.edu/lumen/MedEd/GrossAnatomy/cross_section/vhppelvis/vhppelvis.html last updated 2 November 1998. We reviewed both the original and the new and improved images.

34. See website anatomy.uams.edu/html/pages/anatomyhtml/marvinpelvis.

35. See website www.tulane.edu/~health/text/mhi.html the Site Counter on 11 June 1997, since 22 July 1996 posted 1411 visitors. We revisited the site on 1 July 1998 and it posted 2182 visitors. However, at this date, the site had changed and solely offered user's links to look up *Men's and Women's Health Issues* and *Sexual Issues*.

36. See http: //www.tulane.edu/~health/text/Health_Links.html.

37. For a listing of feminist and consumer on-line resources, see Boston Women's Health Book Collective (1998: 25–8). During data collection phases of our research in 1997, we were able to view and print these images from the Internet free of charge. Originally we found *Our Bodies, Our Selves* at the website www.healthgate.com/ and, in order to view the book on line, users need to join Healthgate.com for $29.95 per year. The Boston Women's Health Book Collective developed their own site, www.ourbodiesourselves.org/ which presents excerpts of the book and options to purchase their products.

38. This narrative is from the book by the Boston Women's Health Book Collective (1998: 270–1).

39. Elf Sternberg's site is www.halcyon.com/elf/altsex/. While these images are still being used, this site merged with www.sexuality.org a part of the Society for Human Sexuality 'an all volunteer social and educational organization devoted to appreciation of myriad consensual forms of human relationships and sexual expression. Participation is open to anyone over 18, regardless of gender or sexual orientation.'

40. Not all popular sites are aimed at sex-positive communities. For example, the American Life League's webpage demonstrates how a keyword search for 'vagina' may introduce another type of anatomical discourse. Their page, designed by pro-life activists, contains a very simple line drawing diagram with descriptions of the 'six parts of the woman's reproductive system directly involved in reproduction, and of particular interest; the ovaries, the fallopian tubes, the uterus, the cervix, the vagina and the breasts'. The narrative defining the uterus states 'although many neofeminists seem to have a fixation on the organ (US out of my uterus!) not ten percent of them know exactly how it functions'. And for the vagina,

> The external [*sic*] female sexual organ. Sperm deposited in the vagina enter the cervix and eventually progress to the uterus and into the fallopian tubes, where conception may occur. In the area of the vagina are the clitoris, a pea-sized organ located above the opening to the vagina, and the labia, the flaps of shin [*sic*] covering the vagina's opening.

41. These were using the same keywords listed in the methods section on the same search engines.

42. For example, a special issue of *Sociological Inquiry* edited by Cerulo (1997) addresses the production of new meanings of communication, community, interaction and experience by computer-assisted communications or CACs (including email, Internet relay Chat and Multi-User Domains). However, these articles do not theorize the co-production of images and knowledge available through these technologies. See also Turkle (1995).

Bibliography

Ackerman, Michael J. (1996) 'Editorial Comments: Build for Future Technology When Building for the Future: A Lesson from the Visible Human Project', *Journal of the American Medical Informatics Association* 3(4): 300–1.

Appadurai, Arjun (1996) *Modernity at Large: Cultural Dimensions of Globalization*. Minneapolis: University of Minnesota Press.

Armstrong, David (1983) *Political Anatomy of the Body: Medical Knowledge in Britain in the Twentieth Century*. Cambridge: Cambridge University Press.

Armstrong, David (1987) 'Bodies of Knowledge: Foucault and the Problem of Human Anatomy', pp. 59–76 in Graham Scambler (ed.) *Sociological Theory and Medical Sociology*. London: Tavistock.

Aronowitz, Stanley, Barbara Martinsons and Michael Menser (eds) (1996) *Technoscience and Cyberculture*. New York and London: Routledge.

Aronson, Naomi (1984) 'Science as a Claims-Making Activity: Implications for Social Problems Research', pp. 1–30 in Joseph W. Schneider and John I. Kitsuse (eds) *Studies in the Sociology of Social Problems*. Norwood, NJ: Ablex.

Becker, Howard S. (1982) *Art Worlds*. Berkeley: University of California Press.

Bell, Susan E. (1994) 'Translating Science to the People: Updating *The New Our Bodies, Our Selves*', *Women's Studies International Forum* 17(1): 9–18.

Berg, Marc (1998) *Rationalizing Medical Work: Decision-Support Techniques and Medical Practice*. Cambridge, MA: MIT Press.

Berg, Marc and Annemarie Mol (1998) *Differences in Medicine: Unraveling Practices, Techniques, and Bodies*. Durham, NC: Duke University Press.

Blake, John B. (1980) 'Anatomy', pp. 29–47 in Ronald L. Numbers (ed.) *The Education of American Physicians*. Berkeley: University of California Press.

Bolter, Jay David and Richard Grusin (1999) *Remediation: Understanding New Media*. Cambridge, MA: MIT Press.

Boston Women's Health Book Collective (1971) *Our Bodies, Ourselves*. Boston: South End Press.

Boston Women's Health Book Collective (1973/1976) *Our Bodies, Ourselves: A Book by and for Women*, 2nd edn. New York: Touchstone/Simon and Schuster.

Boston Women's Health Book Collective (1984/1994) *The New Our Bodies, Our Selves: A Book by and for Women*, 3rd and 4th edns. New York: Touchstone/Simon and Schuster.

Boston Women's Health Book Collective (1998) *Our Bodies, Our Selves for the New Century: A Book by and for Women*. New York: Touchstone/Simon and Schuster.

Braidotti, Rosi (1997) 'Comment and Response to Felski's "The Doxa of Difference"', *Signs: Journal of Women in Culture and Society* 23(1): 23–47.

Bronner, Ethan (1997) 'Study of Sex Experiencing 2nd Revolution', *New York Times* 28 December: 1(N), 1(L).

Brumberg, Joan Jacobs (1997) *The Body Project: An Intimate History of American Girls*. New York: Vintage.

Butchart, Alexander (1998) *The Anatomy of Power: European Constructions of the African Body*. London: Zed Books.

Butler, Judith (1990) *Gender Trouble: Feminism and the Subversion of Identity*. New York: Routledge.

Cartwright, Lisa (1997) 'The Visible Man: The Male Criminal Subject as Biomedical Norm', pp. 124–37 in Jennifer Terry and M. Calvert (eds) *Processed Lives*. New York: Routledge.

Casper, Monica J. and Lisa Jean Moore (1995) 'Inscribing Bodies, Inscribing the Future: Sex, Gender and Reproduction on the Final Frontier', *Sociological Perspectives* 38(2): 311–33.

Cerulo, Karen (1997) 'Reframing Sociological Concepts for a Brave New (Virtual) World', *Sociological Inquiry* 67(1): 48–58.

Chiang, Harriet and Ramon McLeod (1997) 'Net Porn Law Shot Down', *San Francisco Chronicle* 20 March: A1, A8.

Clarke, Adele E. (1990) 'Controversy and the Development of American Reproductive Sciences', *Social Problems* 37(1): 18–37.

Clarke, Adele E. (1998) *Disciplining Reproduction: Modernity, American Life Sciences and the 'Problems of Sex'*. Berkeley: University of California Press.

Clarke, Adele E. (2000) 'Grounded Theorizing after the Postmodern Turn: Mapping and Analyzing Situations, Historical Data, Visual Images, and Social Worlds'.

Clarke, Adele E. and Lisa J. Moore (in prep.) 'Sex/Gender/Sexuality in Anatomies from Medieval Texts to Cyberspace: Scientific Representations and Social Practices'.

Clarke, Adele E., Janet Shim, Jennifer Foskett, Jennifer Fishman and Laura Mamo (2000) 'Technoscience and the New Biomedicalization: Western Roots, Global Rhizomes' [in French], *Sciences Sociales et Santé* 18(2): 11–42.

Cott, Nancy (1978) 'Passionless: An Interpretation of Victorian Sexual Ideology, 1790–1850', *Signs* 4: 219–26.

Cvetkovich, Ann and Doug Kellner (eds) (1997) *Articulating the Global and the Local: Globalization and Cultural Studies*. Boulder, CO: Westview Press.

Daston, Lorraine and Peter Galison (1992) 'The Image of Objectivity', *Representations* 40: 81–128.

de Grazia, Victoria (1996) 'Introduction', pp. 1–10 in Victoria de Grazia with Ellen Furlough (eds) *The Sex of Things: Gender and Consumption in Historical Perspective*. Berkeley: University of California Press.

Dickinson, Robert Latou (1949) *A Topographical Hand Atlas: Human Sex Anatomy*, 2nd edn. Baltimore: Williams and Wilkins Co.

Dreger, Alice Domurat (1998) *Hermaphrodites and the Medical Invention of Sex*. London: Harvard University Press.

Everson, Laura (1994) 'Patient Diagnose Thyself with CD-ROMs', *San Francisco Chronicle* 11 March: E7.

Featherstone, Mike, Mike Hepworth and Bryan S. Turner (eds) (1992) *The Body: Social Processes and Cultural Theory*. Newbury Park, CA: Sage.

Federation of Feminist Women's Health Centers (1981a) *A New View of the Woman's Body*. New York: Simon and Schuster.

Federation of Feminist Women's Health Centers (1981b) *How to Stay Out of the Gynecologist's Office*. Los Angeles: Women to Women Publications.

Fishman, Jennifer, Janice E. Wick and Barbara A. Koenig (1999) 'The Use of "Sex" and "Gender" to Define and Characterize Meaningful Differences between Men and Women', pp. 2–20 in *An Agenda for Research on Women's Health for the Twenty-First Century*, vol. 2. Washington, DC: Office of Research on Women's Health, National Institutes of Health.

Fleisher, Paul (1995) 'Investigating the Human Body', *Technology and Learning* 16(1): 8–12.

Forsythe, Diana (1996) 'New Bottles, Old Wine: Hidden Cultural Assumptions in a Computerized Explanation System for Migraine Sufferers', *Medical Anthropology Quarterly* 10(4): 551–74.

Foucault, Michel (1973) *The Birth of the Clinic: An Archeology of Medical Perception*, trans. Alan Sheridan. New York: Pantheon.

Foucault, Michel (1977) *Discipline and Punish: The Birth of the Prison*, trans. Alan Sheridan. New York: Vintage Books.

Foucault, Michel (1978) *The History of Sexuality, Volume 1: An Introduction*. New York: Vintage Books.

Fyfe, Gordon and John Law (eds) (1988) *Picturing Power: Visual Depictions and Social Relations*. New York: Routledge.

Gardetto, Darlaine Claire (1992) 'Engendered Sensations: Social Construction of the Clitoris and Female Orgasm, 1650–1975', Dissertation in Sociology, University of California, Davis.

Gatens, Moira (1996) *Imaginary Bodies: Ethics, Power and Corporeality*. London: Routledge.

Gieryn, Thomas (1998) *Cultural Boundaries of Science: Credibility on the Line*. Chicago: University of Chicago Press.

Grewal, Inderpal and Caren Kaplan (eds) (1994) *Scattered Hegemonies: Postmodernity and Transnational Feminist Practices*. Minneapolis: University of Minnesota Press.

Grosz, Elizabeth (1994) *Volatile Bodies: Toward a Corporeal Feminism*. Bloomington: Indiana University Press.

Haeberle, Edwin J. (1981) *The Sex Atlas*. New York: Continuum.

Haraway, Donna (1995) 'Universal Donors in a Vampire Culture: It's All in the Family: Biological Kinship Categories in the Twentieth Century United States', pp. 321–78 in W. Cronon (ed.) *Uncommon Ground: Toward Reinventing Nature*. New York: W.W. Norton.

Haraway, Donna (1997) *Modest_Witness@Second.Millenium*. New York: Routledge.

Hartouni, Valerie (1997) *Cultural Conceptions: On Reproductive Technologies and the Remaking of Life*. Minneapolis: University of Minnesota Press.

Hayles, N. Katherine (1999) *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics*. Chicago: University of Chicago Press.

Hilgartner, Stephen (1995) 'The Human Genome Project', pp. 302–16 in Sheila Jasanoff, Gerald Markle, James C. Petersen and Trevor Pinch (eds) *Handbook of Science and Technology Studies*. Thousand Oaks, CA: Sage.

Hunt, Lynn (ed.) (1993) *The Invention of Pornography: Obscenity and the Origins of Modernity, 1500–1800*. New York: Zone/Cambridge, MA: MIT Press.

Jacobus, Mary, Evelyn Fox Keller and Sally Shuttleworth (eds) (1990) *Body/Politics: Women and the Discourses of Science*. New York: Routledge.

Jameson, Frederic (1998) Preface, pp. xi–xvii in Frederic Jameson and Masao Miyoshi (eds) *The Cultures of Globalization*. Durham and London: Duke University Press.

Jones, S.G. (1995) 'Introduction: From Where to Who Knows?' pp. 1–9 in S.G. Jones (ed.) *CyberSociety: Computer-Mediated Communication and Community*. Thousand Oaks, CA.

Jordanova, Ludmilla (1989) *Sexual Visions: Images of Gender in Science and Medicine Between the Eighteenth and Nineteenth Centuries*. Madison: University of Wisconsin Press.

Jordanova, Ludmilla (1993) 'Gender and the Historiography of Science', *British Journal of the History of Science* 26: 469–83.

Kulish, Nancy Mann (1991) 'The Mental Representation of the Clitoris: The Fear of Female Sexuality', *Psychoanalytic Inquiry* 11(4): 511–36.

Laqueur, Thomas (1990) *Making Sex: Body and Gender from the Greeks to Freud*. Cambridge: Harvard University Press.

Latour, Bruno (1986) 'Visualization and Cognition: Thinking with Eyes and Hands', pp. 1–40 in Henrika Kuklick and Elizabeth Long (eds) *Knowledge and Society: Studies in the Sociology of Culture Past and Present*. Greenwich, CT: JAI Press.

Latour, Bruno (1988) 'Visualization and Social Reproduction: Opening One Eye while Closing the Other . . . A Note on Some Religious Paintings', pp. 15–38 in Gordon Fyfe and John Law (eds) *Picturing Power: Visual Depictions and Social Relations*. New York: Routledge.

Law, John (1986) 'On the Methods of Long-Distance Control: Vessels, Navigation and the Portuguese Route to India', pp. 234–63 in John Law (ed.) *Power, Action and Belief*. London: Routledge and Kegan Paul.

Lawrence, Sarah and Kae Bendixen (1992) 'His and Hers: Female Anatomy in Anatomy Texts for US Medical Students, 1890–1989', *Social Science and Medicine* 35(7): 925–34.

Lazarus, David (1999) 'Tricks of the Trade: Online Porn Purveyors Form Group to Share Tips, Build Credibility', *San Francisco Chronicle* 11 September: D1, 3.

Linden, Tom and Michelle Keinholz (1995) *Dr Tom Linden's Guide to Online Medicine*. New York: McGraw Hill.

Lock, Margaret and Patricia Kaufert (eds) (1998) *Pragmatic Women and Body Politics*. New York: Cambridge University Press.

Lohr, Steve (2000) 'Welcome to the Internet, the First Global Colony', *New York Times* 9 January, Sec. 4: 1, 4.

Lowry, Thomas P. and Thea S. Lowry (1976) *The Clitoris*. St Louis, MO: Warren Green.

Lupton, Debora (1994) *Medicine as Culture: Illness, Disease and the Body in Western Society*. Thousand Oaks, CA: Sage.

McLuhan, Marshall and Quentin Fiore (1967) *The Medium is the Massage*. New York: Random House.

Martin, Emily (1987) *The Woman in the Body: A Cultural Analysis of Reproduction*. Boston, MA: Beacon Press.

Martin, Emily (1991) 'The Egg and the Sperm: How Science has Constructed a Romance Based on Stereotyped Male–Female Constructed Roles', *Signs: Journal of Women, Culture and Society* 16: 485–501.

Massey, Doreen (1994) *Space, Place and Gender*. Minneapolis: University of Minnesota Press.

Mendelsohn, Kathleen D., Linda Z. Nieman, Krista Isaacs, Sophia Lee and Sandra P. Levinson (1994) 'Sex and Gender Bias in Anatomy and Physical Diagnosis Text Illustrations', *Journal of the American Medical Association* 272(16): 1267–70.

Monaghan, Peter (1994) 'Information Technology: Computerized Anatomy – Model of the Human Body Will Form the Base of a Powerful Medical Information System', *The Chronicle of Higher Education* 20 April: A26–27, A30.

Moore, Lisa Jean (1997) ' "It's Like You Use Pots and Pans to Cook. It's the Tool": The Technologies of Safer Sex', *Science, Technology and Human Values* 22(4): 434–71.

Moore, Lisa Jean and Adele E. Clarke (1995) 'Genital Conventions and Transgressions: Graphic Representations in Anatomy Texts, c. 1900–1991', *Feminist Studies* 22: 255–301.

Morley, David and Kevin Robins (1995) *Spaces of Identity: Global Media, Electronic Landscapes and Cultural Boundaries*. London: Routledge.

Moscucci, Ornella (1990) *The Science of Woman: Gynecology and Gender in England, 1800–1929*. Cambridge: Cambridge University Press.

Nilsson, Lennart (1977/1990) *A Child is Born*, 1st and 2nd edns. New York: Delacorte.

O'Connell, Helen E., John M. Hutson, Colin R. Anderson and Robert J. Plenter (1998) 'Anatomical Relationship between Urethra and Clitoris', *Journal of Urology* 159: 1892–7.

Omi, Michael and Howard Winant (1986) *Racial Formation in the United States from the 1960s to the 1980s*. New York: Routledge and Kegan Paul.

Oreskes, Naomi (1996) 'Objectivity or Heroism? On the Invisibility of Women in Science', *Osiris* 2nd series 11: 87–113.

Oudshoorn, Nelly (1994) *Beyond the Natural Body: An Archeology of Sex Hormones*. London: Routledge.

Oudshoorn, Nelly (1996) 'A Natural Order of Things? Reproductive Sciences and the Politics of Othering', pp. 122–33 in George Robertson, Melinda Mash, Lisa Tichner, John Bird, Barry Curtis and Tim Putnam (eds) *Future Natural: Nature, Science, Culture*. London and New York: Routledge.

Oudshoorn, Nelly and Marianne Van Den Wijngaard (1991) 'Dualism in Biology: The Case of Sex Hormones', *Women's Studies International Forum* 14(5): 459–71.

Park, Katharine (1997) 'The Rediscovery of the Clitoris: French Medicine and the Tribade, 1570–1620', pp. 171–93 in Carla Mazzio and David Hillman (eds) *The Body in Parts: Discourses and Anatomies in Early Modern Europe*.

Park, Robert Ezra (1952) *Human Communities*. Glencoe, IL: Free Press.
Petersen, Alan (1998) 'Sexing the Body: Representations of Sex Differences in *Gray's Anatomy*, 1858 to the Present', *Body & Society* 4(1): 1–15.
Phelan, Peggy (1993) *Unmarked: The Politics of Performance*. New York: Routledge.
Pollock, Griselda (1992) *Avant-Garde Gambits 1888–1893*. London: Thames and Hudson.
Poster, Mark (1990) *The Mode of Information*. Chicago: University of Chicago Press.
Potter, Elizabeth (in prep) *Making Gender/Making Science: Gender and Boyles' Law of Gases*.
Quackenbush, Debra, Peter Tatin and John Kerr (1996) 'Segmentation of the Visible Human Data Sets', Visible Human Project Conference Proceedings, online at www.nlm.nih.gov/resarch/visible/vhp_conf/quackenb
Schehr, Lawrence R. (1997) *Parts of an Andrology: On Representations of Men's Bodies*. Stanford, CA: Stanford University Press.
Schiebinger, Londa (1989) *The Mind Has No Sex? Women in the Origins of Modern Science*. Cambridge, MA: Harvard University Press.
Schiebinger, Londa (1993) *Nature's Body: Gender in the Making of Modern Science*. New York: Routledge.
Solomon-Godeau, Abigail (1996) 'The Other Side of Venus: The Visual Economy of Feminine Display', pp. 113–50 in Victoria de Grazia with Ellen Furlough (eds) *The Sex of Things: Gender and Consumption in Historical Perspective*. Berkeley, CA: University of California Press.
Staff (1997) 'Pornography on the Internet', *Computerworld* 31(9): 59.
Stafford, Barbara (1991) *Body Criticism: Imaging the Unseen in Enlightenment Art and Medicine*. Cambridge, MA: MIT Press.
Stafford, Barbara (1996) *Good Looking: Essays on the Virtue of Images*. Cambridge, MA: MIT Press.
Star, Susan Leigh (1983) 'Simplification in Scientific Work: An Example from Neuroscience Research', *Social Studies of Science* 13: 205–28.
Star, Susan Leigh and James Griesemer (1989) 'Institutional Ecology, Translations, and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–1939', *Social Studies of Science* 19: 387–420.
Stepan, Nancy (1986) 'Race and Gender: The Role of Analogy in Science', *Isis* 77: 261–77.
Stevens, Rosemary (1971) *American Medicine and the Public Interest*. New Haven, CT: Yale University Press.
Stix, G. (1993) 'Habeus Corpus: Seeking Subjects to be a Digital Adam and Eve', *Scientific American* 268(1): 146–7.
Strauss, Anselm (1987) *Qualitative Analysis for Social Scientists*. New York: Cambridge University Press.
Swayne, David (1993) 'Into the Twenty-First Century', *Physicians and Computers* 11(3): 8–11.
Tesh, Sylvia Noble (1988) *Hidden Arguments: Political Ideology and Disease Prevention Policy*. New Brunswick, NJ: Rutgers University Press.
Treichler, Paula A., Lisa Cartwright, Constance Penley (eds) (1998) *The Visible Woman: Imaging Technologies, Gender and Science*. New York: New York University Press.
Tuana, Nancy (ed.) (1989) *Feminism and Science*. Bloomington: Indiana University Press.
Turkle, Sherry (1995) *Life on the Screen: Identity in the Age of the Internet*. New York: Simon and Schuster.
Waldby, Catherine (1997) 'The Body and the Digital Archive: The Visible Human Project and the Computerization of Medicine', *Health* 1(2): 227–43.
Waldby, Catherine (1999) 'IatroGenesis: The Visible Human Project and the Reproduction of Life', *Australian Feminist Studies* 114(29): 77–90.
West, Candace and Don Zimmerman (1987) 'Doing Gender', *Gender and Society* 1(2): 125–51.
Weston, Kath (1998) *Longslowburn: Sexuality and Social Science*. New York and London: Routledge.

Wheeler, David L. (1996) 'Creating a Body of Knowledge (The Visible Man Project)', *The Chronicle of Higher Education* 42(21): A6–A9.

Wiber, Melanie G. (1998) *Erect Men/Undulating Women: The Visual Imagery of Gender, 'Race' and Progress in Reconstructive Illustrations of Human Evolution*. London: Wilfrid Laurier University Press.

Wilson, Deborah S. and Christine Moneera Laennec (eds) (1997) *Bodily Discursions: Genders, Representations, Technologies*. Albany: State University of New York Press.

Woolgar, Steve (1991) 'Configuring the User: The Case of Usability Trials', pp. 57–70 in John Law (ed.) *A Sociology of Monsters*. New York: Routledge.

Young, Katharine (1997) *Presence in the Flesh: The Body in Medicine*. Cambridge, MA: Harvard University Press.

Lisa Jean Moore is Assistant Professor of Sociology at the College of Staten Island, City University of New York. She is currently working on a book exploring various representations of human semen tentatively titled *Sperm Tales*.

Adele E. Clarke is Professor of Sociology and History of Health Sciences at the University of California, San Francisco. Her book *Disciplining Reproduction: Modernity, American Life Scientists and the 'Problem of Sex'* (University of California Press, 1998) focuses on the emergence of the American reproductive sciences in biology, medicine and agriculture c. 1910–63. She has also published on biomedical technologies such as RU486 and the Pap smear, and co-edited with Virginia L. Olesen *Revisioning Women, Health and Healing: Feminist, Cultural and Technoscience Perspectives* (Routledge, 1999). She is currently working on a book on qualitative research methods titled *Grounded Theorizing After the Postmodern Turn: Mapping and Analyzing Situations, Historical Data, Visual Images, and Social Worlds*.