PORNOGRAPHY, TECHNOLOGY AND PROGRESS

Jonathan Coopersmith

By temporarily divorcing pornography from the dense web of societal concerns surrounding it, this paper examines the influence of pornography in promoting the diffusion of new communication technologies and how these new technologies have radically altered the nature of pornography in the last few decades. These technologies include camcorders and the Polaroid camera, VCRs, cable TV, premium telephone services, Minitel, computers, and the Internet. Pornographic products have served to stimulate initial interest in these new technologies, despite their higher initial costs. The attractions are greater perceived privacy and easier access. As each of these technologies matures and prices drop, the role of pornographic products diminishes relatively, but not absolutely. Another pattern is the elimination of the distinctions as between producers, distributors and consumers as instant photography, video, and computers have permitted a 'democratisation' of pornography.

In the rush to the information superhighway, many observers have noticed the important role played by a major promoter of new communication technologies, pornography. Concomitantly, it is advances in these communications technologies, coupled with the increasing social acceptance of sexually-oriented materials, that have drastically changed the environment and nature of pornography.

This article examines several technologies – cable TV, VCRs, camcorders and the Polaroid camera, Minitel, computers, the Internet, and premium telephone services – to demonstrate how they have transformed the nature of pornography and how pornography has affected them. What these communication technologies share is the ability to create, receive or send information in privacy with minimum effort. The privacy may be more apparent than real, but the sense of safety from the oversight and opprobrium of others is undeniable.

The focus is on the last few decades, a period of enormous technological change in the world of communication technologies. This article will not discuss the implications of pornography and
censorship, morality, or wider questions of sexuality – tasks done very well by others.¹ Nor is this paper concerned with the differences between erotica and pornography.² These issues are important, but, at the risk of appearing indifferent to moral questions, this paper will focus on pornography’s importance in diffusing new technologies and how these technologies have reshaped the nature of pornography.³ Driving this diffusion have been the great capitalist engines of innovation and the quest for profits. Like war, pornography has served as an agent of change for both, and similarly benefitted greatly. If it were not for the subject matter, pornography would be publicly praised as an industry that has successfully and quickly developed, adopted, and diffused new technologies. But because the subject matter was pornography, silence and shame have been the standard responses.

This article proposes two arguments. The first is simple: In the last two decades, consumers of pornography have accelerated the diffusion of new communication technologies like the VCR and CD-ROM by becoming early buyers and users, thus providing a profitable niche market for newly introduced services. Their willingness to pay an initial premium increased early sales, thus reducing costs for later buyers who benefitted from the economies of larger markets for more mainstream services. Furthermore, these customers gained experience which enabled them to use and promote, for example, electronic mail with greater skill and understanding. Providers and distributors of pornography gained experience and profits. These pushed technologies which were soon transferred to mainstream products.

The subtheme of this argument is that the profits and publicity gained by providing pornography have significantly enhanced the financial position of its producers and distributors. Pornographic products usually command premiums in the market, regardless of the medium. This higher profit margin, compared with mainstream products, made pornography attractive to retailers too.

The second argument is that the waves of new communication technologies over the last three decades have affected pornography in ways as revolutionary as in any other area of society. The changes in the pornography industry are part and parcel of larger changes of growing globalisation, ‘commodification’ of goods and services, development of niche markets, and the infor-
mation revolution affecting commerce and cultures worldwide. Indeed, these changes have shaken up the established pornography industry, forcing companies to reinvent themselves to survive.

These new technologies have 'democratised' the pornography market by greatly lowering barriers to entry and transaction costs. Not only have many new means of production and distribution appeared, but the distinction as between producers, distributors and consumers has become increasingly blurred. This 'democratisation' of pornography has radically changed its patterns of production, distribution, marketing and consumption. Consequently, the environment and nature of a pornographic experience has altered. As cost of access to pornography has decreased, usage has grown enormously. Some consequences of this expanded access are higher degrees of specialisation, more innovation and experimentation, and easier development of geographically independent 'communities of practitioners'. Some media, such as the telephone and computer, offer two-way, interactive linkages, further radically changing the nature of pornography.

HISTORY

In a sense, pornography is defined by technology, because its creation, transmission and diffusion are so intimately related to the development of communication technologies. As G.N. Gordon noted:

The avidity with which eroticism was devoured by the technologies of communication that might allow people to accomplish these ends is confirmed by one startling (to me) fact: Each and every instrument of communication that has been devised to date by man (including television) has been almost immediately turned to the service of what the culture in which it was invented called ‘pornography’, not on a limited basis but to whatever extent that technology – and the inventive mind of man – could contrive, regardless of so-called ‘public attitudes’ at the time or the law.

This connection, predating the printing press, is so basic that it is assumed more than stated. To see the erotic scenes on the walls of
a brothel in Pompeii, or the carvings of the temples of Khajuraho and Konarak in India, required the consumer to go to the product. The printing press, which made mass production of books, pamphlets, prints and cards possible, extended that audience to tens of thousands. As important, the printing press brought the product to the consumer, vastly lowering barriers to consumption. Cable television and VCRs attracted audiences of hundreds of thousands with even easier access. Today, a site on the World Wide Web may register millions of visits in a week.

The rise of pornography paralleled and intertwined with the rise of the printing press, its products, and the Enlightenment. Pornographic material, including literature, engravings and playing cards, existed before the printing press. But the immense increase in the circulation of such material and its increasing political content increased pornography's societal effects. The increased circulation meant easier access because of decreased cost as well as greater availability. Pornography began the move from the elite erotica confined to the few to material written and engraved for the growing literate population. Perhaps the best known early post-Gutenberg pornographic author was Pietro Aretino (1492–1556) whose pen produced enough money for him to live by. He wrote the Ragionamenti (1534–36) which served as the prototype of seventeenth century pornographic prose dialogues and the Sonnetti lussuriosi (1527) which added sonnets to accompany sixteen anonymous erotic engravings.

Many of the first attacks on pornography as subversive to the well-being of the state and society came from its association, especially in ancien régime France, with radical political literature. As Lynn Hunt notes, 'pornography was most often a vehicle for using the shock of sex to criticize religious and political authorities'. Perhaps the best example of the confounding of Enlightenment philosophy and sex was Thérèse philosophe (1748, probably by d'Argens), one of the most important eighteenth century pornographic works.

Sexually-oriented material comprised nearly 21 per cent of the 28,212 copies of illegal literature in pre-revolutionary France surveyed by Robert Darnton. Some attacks on the French church and the monarchy portrayed royalty and clergy in activities unmentioned in official publications. Indeed, bawdy anti-clerical works, with their stereotypes of lascivious monks, rutish nuns, impotent bishops succumbing to venereal disease, and lesbian
abesses surrendering to "uterine fury", comprised nearly two-fifths of this pornographic material.\(^\text{15}\)

Two generations later, despite the increasing number of legal actions in the Victorian era against it, pornography's diffusion had increased as part of the same information revolution transforming other forms of knowledge. The advances in printing, such as lithography and inexpensive sulphide pulp paper, that made the penny press and mass-produced magazines and prints possible, also expanded the market for pornography by decreasing the cost of materials and reproducing images of high quality. In an example of an economist's 'virtuous circle', decreased costs increased demand, which further stimulated the supply.

These changes in technology produced far-reaching changes in pornography. The lower costs in reaching a broader audience meant that the nature of pornography became not necessarily more explicit, but certainly briefer, simpler, and more straightforward.\(^\text{14}\) The philosophical aspect of a Thérèse took second place – if it did not vanish completely – to titillation. Politics and pornography separated, if only on the printed page.

The nineteenth century, despite increasing legal restrictions, saw a growing clandestine circulation of printed pornographic materials, including pamphlet novels, written by popular writers such as George Thompson and Henri Foster, in the United States.\(^\text{15}\) Street and railroad station bookstands served as retail points. A more legal outlet for a 'softer' but no less lurid product was publications like the Police Gazette and photographs and pamphlets of 'freaks'.\(^\text{16}\)

Another destabilising technology, the railroad, proved an indirect agent of diffusion via the newsagent. Walking through the passenger cars, the agent openly sold food, magazines and newspapers. More discreetly, he often offered a range of 'faintly naughty literature' at high profit.\(^\text{17}\) The easy availability of pornographic literature in the United States helped propel the late nineteenth century anti-vice movements exemplified by Anthony Comstock.\(^\text{18}\)

The production and representation of pornography were further transformed by the invention of still photography in the mid-nineteenth century, 'the single most important event in the history of pornography'.\(^\text{19}\) More powerful and accessible than words or prints, photographs greatly expanded the potential audience.
Literacy was no longer necessary. The photographic image also offered greater realism than an engraving.

Pornographic photographs quickly appeared, replacing lithographic prints.\(^{20}\) The scale of the production of photographs, postcards and slides was enormous: an 1874 police raid on London pornographer Henry Haylor found 130,248 obscene photos and 5,000 obscene slides.\(^{21}\) The movie industry, which developed in the late nineteenth century, further expanded the realm of possible sensory experiences with the inclusion of movement and, later, sound.

Although restricted by severe moral and legal sanctions, the pornography industry in the United States grew, albeit illegally. By the mid-twentieth century, an industry structure existed with clear delineations between production and consumption that were bridged by underground or informal distribution networks. For the overwhelming majority of consumers, pornography was a passive experience – the consumer read or watched. The only exertion or expertise required was to find the illicit material. Literature could be acquired in a variety of ways, but consumers had to go somewhere to view movies. This was the era of seedy stores located in crumbling downtowns or just outside town limits, plain brown wrappers, and peep shows.\(^{22}\) Despite these geographic and legal obstacles, the pornography industry in the United States did well.\(^{23}\)

Despite its illegality, pornography continued to attract producers and distributors, because of the high profit margins, profits which until recently were often associated with high legal risks and organised crime.\(^{24}\) As pornography gained greater social and legal acceptance, the legal challenges and costs diminished, attracting more entrepreneurs into this market. While companies may still be somewhat circumspect in public for fear of boycotts or poor image, pornography has been a high-growth, high-profit market.

Profits accrued not just to the producers, but also to distributors and retailers. In a trade-off between public acceptance and higher profits, the retailers often win, particularly if the pornography is packaged and sold in such a way as to be discreet. Hotels, for example, have profited greatly from renting X-rated pay-per-view movies, and serving as an innocuous venue to view them.\(^{25}\)

The change from covert to overt access to pornography was closely linked to wider social and legal changes. The sexual
revolution in the United States can be dated from the publication of *Playboy* in 1953 or the introduction of the birth control pill in 1960. For pornography the key date was 1957, when the Supreme Court in *Roth v. United States* ruled that the First Amendment limited restrictions on pornography only to material 'utterly without redeeming social importance'. Regardless of the specific year, the decades following saw a vastly increased diffusion of sexually-oriented material in all media.26

PRINT

Before the advent of the communication technologies discussed below, printed literature – magazines, books, cards, etc. – was the most prevalent form of pornography. It was portable, required no special equipment to use, and could be easily distributed and stored surreptitiously. Like other parts of the industry, 'adult' magazines benefitted from profit margins significantly higher than those for the mainstream periodicals.27

Even after the arrival of new technologies, traditional print media continued to be a low-tech provider of pornography. The improved printing technology of the 1970s permitted significant qualitative improvements in the glossy magazines as well as new entrants to the market like *Hustler*, which appealed to a somewhat different clientele from the industry standard, *Playboy*. In 1995, *Penthouse* trailed only *People* and *TV Guide* as the most popular magazine sold at military post exchanges. These stores stocked 219 different adult magazines, comprising over 20 per cent of the 57 million magazines they sold.28 While this seems a huge number, a 1986 survey of six East Coast cities found 2,300 different pornographic magazine titles in 16 stores.29

Nonetheless, the average monthly circulation of the three main 'men's magazines' (*Playboy, Penthouse* and *Hustler*) gradually declined from a 1976 peak of nearly 12 million to 4.7 million copies in 1996.30 This drop reflected both the greater range of options for pornography and the passive nature of the print and image, compared with the more active and interactive nature of some of the newer forms of pornography. The magazine publishers confronted the standard dilemma of firms faced with new technology: should they develop the new technology and risk harming their existing markets? Consequently, part of the decline in circulation was caused by investment in new products in other
lines of the industry, such as video, cable, and the Internet, offered by the publishers. While the core competency of these businesses remained, their range of products increased greatly.\footnote{31}

**FILM**

Before the videocassette transformed viewing habits, there was film.\footnote{32} And there was a great deal of profitable, pornographic film—over 13,000 films by 1983, with the first appearing in 1896, two years after the first public movie.\footnote{33}

Like the mainstream movie industry, changes in production technology affected the pornographic movie industry. In the United States, the 16mm camera dominated filming until after World War Two. The expense and expertise needed for this equipment restricted the market to a few professional producers. Distribution and consumption were handled by entrepreneurs, each of whom travelled a route with his own film and projector for any person or organisation willing to pay the rental fee and host a 'smoker' or a bachelor's 'stag night'.\footnote{34}

The postwar introduction of less costly and easier 8mm cameras and projectors partially shifted production from a few to many operators, and consumption from rentals to sales. A core of small businesses evolved to sell such movies via the postal system. Camera stores also quietly stocked films to rent. Not only did the films provide clear profits after a few rentals, but they 'also served as a catalyst for the rental or purchase of movie projectors, screens, cameras, and other equipment'.\footnote{35}

By the mid-1960s, aided by a more permissive legal environment and the potential for higher profits, the technological and commercial momentum was shifting back to larger cameras for better film quality as movie theatres, not private rooms, became the viewing area. Producers usually shot 16mm film, the standard size used in adult theatres. For peep shows, the film was transferred to poorer quality 8mm in loops of several minutes. Only rarely was a film made or transferred to the far more expensive 35mm. In the late 1970s, America’s nearly 800 adult film theatres and thousands of peep shows took in untold tens of millions of dollars annually.\footnote{36}

Indicative of pornography’s growing social acceptance, a few films in the 1970s made the transition to the mainstream theatres and great profits. *Deep Throat* cost $25,000 to make but earned
over $50 million. More typically, according to David Friedman of the Adult Film Association of America (AFAA), a film cost $75,000–115,000 to make but usually earned $300,000 within 18 months, with high profit margins for the producer, distributor, and wholesaler. The technology had not changed, but the market had increased.

In an excellent example of geographic clustering, Southern California became the worldwide centre of the X-rated film industry, benefitting from the existing infrastructure for the regular film industry, a situation that continued into the video age. The AFAA, which represented the collective interests of the industry, reflected its rise and fall. Founded in 1969 and based in Los Angeles, the AFAA died in 1987, reflecting the domination of the adult video cassette. Its spirit lived on, however, in the Adult Video News Award Show, given, appropriately enough, at the annual Consumer Electronics Show.

By the late 1970s, however, the film industry could see that cable TV and video cassettes were the wave of the future. These were the first communication technologies that changed the world of pornography. Film did not die – 7852 new pornographic films appeared in 1996 compared with 471 Hollywood films – but consumption had moved from adult theatres and sex stores to the more private environments provided by cable TV and the VCR.

**CABLE TV**

Cable TV was the first new twentieth century medium that significantly expanded access to pornography for millions of people. Flicking a channel to ‘cableporn’ was much easier, and demanded far less planning, effort or subterfuge, than going to an adult bookstore or ordering pornography by mail. In a shift as revolutionary as the printing press, the product came to the consumer, not vice versa.

Although cable systems had existed since 1948, they initially served mountainous regions or other areas with limited TV reception. In the 1970s and 1980s, the increasing availability and decreasing cost of satellite transmission, which allowed the creation of new channels with a nationwide audience, as well as changes in federal regulations, enabled the cable industry to expand its geographic reach. Cable’s percentage of all American households with TV expanded from 6.4 per cent in 1968 to 17.5
per cent in 1978 to 52.8 per cent in 1988 and 62.4 per cent in 1994.\textsuperscript{41}

The attraction of cable TV and its rapidly emerging competitor, direct broadcast satellite TV, is the ability to receive scores, if not hundreds, of channels. Viewers could watch pornography through pay channels, local community access channels, or leased access channels. Pornography generated profits for the cable firms and the cable channels. In a business pressed by competition to expand and merge, necessitating large outlays of capital, cable-porn delivered a welcome income.

Like every other technology discussed here, pornography on cable TV provoked many concerns about the greater access to pornography it afforded. Concerned groups questioned the probity of offering pornography, violence, and, more critically, ease of access by children.\textsuperscript{42} The popularity of pornography, as well as concerns about freedom of expression, largely frustrated all attempts to outlaw totally access to cable TV pornography. In 1981, a well-publicised campaign in Buffalo by Morality in Media to force the city council to revoke the licence for the 'Escapade' adult-film channel resulted in greater public awareness of the service – and more subscriptions.\textsuperscript{43}

By the late 1980s, cable TV and its critics had reached a modus vivendi. The majority of X-rated offerings are available only through pay-per-view TV, where subscribers pay a premium for those channels beyond regular cable offerings.\textsuperscript{44} By 1996, the four adult channels had approximately one-third of the $600 million American pay-per-view market.\textsuperscript{45} In an example of worldwide market growth based on domination in their home market, the two major firms, Playboy Enterprises and Spice Networks, had utilised direct-satellite broadcasting both in the United States and, increasingly, worldwide.

Far less visible in their spread but far more revolutionary in their consequences were the video cassette recorder and the camcorder. Cable TV provided easy access and discreet viewing. The video revolution built on these and thus enabled consumers to become producers.

VIDEO

The video cassette recorder (VCR) is an excellent example of how a niche market can accelerate the diffusion of an expensive new
technology. The VCR is also a prime example of a technology that actually increases privacy in both production and consumption (providing you can obtain tapes without leaving a paper trail; not always an easy matter as one nominee for the U.S. Supreme Court discovered).  

Compared with film, making a videotape is faster, less expensive, and easier to reproduce. The average cost of a video was less than a fifth of making a 16mm feature-length film in 1985.  

Because video is easier to edit than film, producers can more easily make different versions of the same feature (usually 'softer' versions for the more conservative American Midwest and television, more graphic, 'harder' versions for the two coasts and cable TV).  

Like magazines, pornographic videotapes offered high profits for everyone. In 1985, the producer usually sold his tape to a distributor for a 100 per cent profit. The distributor spent $8–15 to buy, duplicate, package, and advertise each tape, which he usually reproduced by the thousands. He sold the tapes for about $31 to a wholesaler, who resold them to a retailer for $33–37. Although the final price of a tape to the consumer had dropped from over $100 in the late 1970s to $60–80 in 1986, that was still significantly more than the $42 average of all pre-recorded tapes.  

Like magazines and cable TV, profits on pornographic videotapes were higher than for mainstream videotapes.  

On the demand side, VCRs created a huge, potential audience of people who could view pornography in privacy. Instead of travelling to a disreputable store, viewers could watch films at their convenience at home. To maintain privacy, customers could order video-by-mail, visit a distant store, or browse the discreetly separated section of a local store. Starting in the late 1970s, advertisements for adult films filled hundreds of pages in new video magazines like Video Review and adult magazines like Penthouse, generating income for the publishers. Indicative of a growing market, specialised magazines sprouted in the 1980s to provide consumers with information.  

Pornography played a major role in the early years of VCRs by providing customers with a product, and, at the same time, justification for acquiring an expensive piece of equipment. VCR buyers in the late 1970s and early 1980s comprised a new market. Not only was the equipment very costly, but two incompatible
formats, VHS and Beta, were jousting for market superiority, so users had to risk buying a format that might soon disappear. Consequently, early VCR buyers were an audience willing to pay a premium for equipment in exchange for the prestige of 'cutting edge' technophiles and also for enjoying viewing privacy.

The VCR created a vast market for pornographic video cassettes worldwide. Casual observations of the spread of VCRs in the United States, Britain, Australia and the former Soviet Union revealed that videoporn, much of it American, comprised a large percentage of available tapes in those early years. The German market for adapters to enable PAL-format VCRs to play American NTSC-format video cassettes was fuelled initially by pornography.

Pornography provided the profits that enticed stores to offer video cassettes. General releases were not put on video until 1978, one year after sexually explicit films. By 1990 pornography trailed only new releases and children's tapes in popularity nationwide and, in the Northeast and West Coast, was second only to new releases.

According to a 1986 Merrill Lynch study, X-rated tapes constituted over half of all sales of pre-recorded tapes in the late 1970s. By the mid-1980s, that share had dropped to approximately 10–25 per cent, reflecting the maturation of the rest of the market, not a diminution in the demand for pornography. That percentage has held fairly steady since then, according to Adult Video News. Not surprisingly, pornographic videos have remained a significant source of income for many stores, especially independents trying to compete with big chains which do not carry pornography.

The potential of home videogames, such as Pac-Man and Donkey Kong, did not escape the attention of pornography marketers either. The attraction of adult games like X-Man, Harem, and Bachelor Party, proved fairly limited, however, reflecting poor graphics and limited gameplaying options. The success in the 1990s of similar, but higher quality games on CD-ROM shows that the basic concept was sound, the customers willing, but the technology weak.

Most attention on videoporn has focused on pre-recorded tapes. Partly owing to its nature, the self-made videotape has attracted far less attention, yet it has reshaped the nature of pornography as much as the professional productions.
DO-IT-YOURSELF (DIY) PORNOGRAPHY

As well as viewing professionally produced films, owners of VCRs and video tape recorders (now called camcorders) could -- and did -- produce their own pornography. In an example of the true democratization of technology, the development of the Polaroid instant camera and the camcorder allowed people to produce their own pornography free from anyone else seeing their work. Standard photography, whether for stills or movies, required someone to develop the film. Unless the consumer had access to a photographic darkroom or a film projector, he depended on others to produce and distribute the material -- and risked a concomitant potential for exposure. Eliminating this outside dependence greatly expanded people's privacy and their scope for action.

This was one of the most significant changes in the history of pornography and communications technologies. Polaroid still photography and camcorders eliminated the distinction between producers and consumers as well as the need for distribution channels. In a sense, these technologies can be seen as liberating and empowering, allowing individuals to actively create, not just passively consume, their own pornography. For the first time, anyone with a modicum of skill could become a producer.

Edwin Land introduced the self-developing Polaroid Model 95 Land camera in 1948 and Polacolor colour film in 1963 partly to enable more people to become photographically creative. And they did: as soon as new Polaroid camera technology reached the market, many consumers perceived this freedom from the 'censoring eye of the local druggist or the ogling leer of the film laboratory technician ... as enough of a boon to single-handedly assure Edwin Land's spot in photographic heaven'.

One tendency in the history of technology has been blackboxing, shifting skills from people into machines. Often a management tool to reduce dependence on skilled labour by reducing the level of expertise needed to operate machinery, blackboxing can also enable more people to use equipment they could not otherwise benefit from. Instant photography was no exception. Reducing the level of skill needed to produce good pictures increased the market for this expensive equipment. Perhaps the two major advances were auto-focus and, for video, low-light level capabilities. The quintessential example is the Polaroid SX-
70, the first mass-produced self-focusing camera, and, at the time of its introduction in 1972, probably the most high-technology consumer product in the world.\textsuperscript{63} Rabbit, the main character in John Updike's novels of American life, undoubtedly voiced the thought of many that 'SX' stood for 'SeX'.\textsuperscript{64}

Whether the manufacturers were unaware of this unadvertised application is dubious. Such filming was among the first subjects tackled by many new camcorder owners.\textsuperscript{65} Polaroid named its first low-cost model The Swinger, which was also the nickname for a sexually active person.\textsuperscript{66} In 1978, Fortune writer James Cook claimed that camcorder manufacturers

\begin{quote}
like to think that [camcorders] will be used to enable people to watch more cultural and sports events. They are only kidding themselves. It is an open secret that the biggest market is [visual sex].\textsuperscript{67}
\end{quote}

Some entrepreneurs quickly capitalised on the potential of DIY video. In an early effort at 'value-added services', one New York brothel in the early 1980s offered customers 'fantasy rooms' with a VCR and camcorder.\textsuperscript{68} These features became standard in many such establishments.

Nor were entrepreneurship (and exhibitionism) confined to established businesses. More than a few people rented or sold their films, creating a cottage industry in its own right. Showing all the signs of voluntary self-organisation that Alexander de Tocqueville so admired among Americans, DIY videosex even had its own journal (Amateur Video Guide) and held conventions.

Although at least one distributor, Susan's Video, started buying and selling DIY videos in 1980, DIY pornography did not reach video stores in significant quantity until 1989. By 1991, DIY pornography comprised 30 per cent of the thousands of new industry offerings, and amounted to several hundred thousand actual cassettes, numbers that have remained fairly consistent since then. The attraction for viewers was the greater realism and voyeurism of the films. Retailers were attracted by the significantly lower cost of purchasing an amateur film from a wholesaler – $15 versus $25 for a regular film.\textsuperscript{69} Nor were DIY videos limited to the United States.\textsuperscript{70}

While the slow creation of a marketing infrastructure may be one reason for the lapse of time between the first distributors and
widespread diffusion, a more important reason was the greater diffusion of camcorders and the introduction of better autofocus-
ing and low-light-level camcorders which occurred only in the
late 1980s. While the 'less practiced, more realistic' look may be
more enticing, the actual quality of a film is not incidental. As
with other technologies, once standards rise, all competitors have
to keep up or face a loss of both status and market.\textsuperscript{71}

Videoporn embodies the paradox of technological deskilling
and enfranchisement. By packaging the 'smarts' in the camcorder
and Polaroid camera instead of having to employ a technician
and laboratory, companies enabled millions of people to partici-
pate in an activity previously open only to those who had the
necessary skills, knowledge and expensive equipment. While this
enfranchisement has vastly expanded the ranks of producers,
their overall levels of expertise and knowledge have dropped.
Improved technology has substituted for human skill and com-
petence. Similar repackaging in computing is likewise transform-
ing the world.

**THE COMPUTER AND THE INTERNET**

Pornography and computing have long been related. In the era of
punch cards and impact printers, some programmers posted low
resolution computer printouts of pin-ups on their walls. The
quality of the imagery was far, far less than that of a photograph,
but it served as a visible testimony of the programmer's technical
prowess. Such pin-ups also served to re-emphasise the questions
of control and domination inherent in some pornography and the
computer.\textsuperscript{72} As Claudia Springer has noted, there is more than a
hint of technoeroticism, 'the passionate celebration of technol-
ogical objects of desire' in much of this activity.\textsuperscript{73} The more recent
development of interactive computer games and customer-directed
peep shows over the Internet strengthens this interpretation.

The computer revolution is reshaping the nature and environ-
ment of pornography at an accelerated pace in the same ways
that other businesses are being altered. While much of the
material on-line is fairly 'traditional', cyberspace has the potential
to change concepts of sex just as it is changing concepts of
pornography.\textsuperscript{74} Far more than DIY video, computer networks
have destroyed the differences as between production, distribu-
tion and consumption, while also greatly reducing barriers to the
creation and support of geographically disparate communities of practitioners.

Perhaps the most visible aspects of the influence of pornography on communication technologies are on the Internet. Like a light drawing moths, pornography has attracted users on-line and provided producers with high-profit goods that sell. Pornography has given many people a reason to spend time surfing the Internet, increasing their knowledge of the system, spreading the word to others, and providing revenue to the service providers.\textsuperscript{75}

To focus exclusively on the Internet, however, would be to neglect the capacity of computer systems to communicate the written (and, increasingly, oral) word. The first forms of cybersex\textsuperscript{76} comprised written information and typed communications among consenting participants on chat lines and bulletin boards. One of the first linkages of electronic networks and pornography occurred in April 1980 in the United Kingdom, when subscribers to Prestel, a videotext system, found they could access a 'Dirty Books Guide' prepared by one of the service’s information providers. The publicity and criticism prompted the Association of Viewdata Information Providers to develop a complaints procedure. Some executives feared that the nascent home information industry would become associated with pornography, not the upmarket business image they sought to project.\textsuperscript{77}

Far more successful than Prestel was Minitel, heavily promoted by the French government as a means of making possible the rapid accessing of information and of stimulating thereby its domestic telecommunications industry. Started in 1983 as an alternative to telephone directories, Minitel grew to 2.5 million terminals in 1987 and six million in 1991. Although less interactive than the Internet, and lacking its graphics, Minitel was far less expensive and easier to operate.

Its success was partly due to ‘one of the most conspicuous, popular and controversial’ services, the messageries roses.\textsuperscript{78} Mattias Duyves labelled these erotic advertisements a form of selbstfreie Kommunikation (anonymous communication), a perfect fit for the urban environments where most Minitel use occurred.\textsuperscript{79} Such sexually oriented messages accounted for an estimated third to a half of all Minitel traffic in the early years and an even greater share of the publicity. In a pattern seen elsewhere, the relative pornographic share of Minitel traffic decreased as thousands of
other services – 4,400 in 1987, over 16,000 in 1991 and nearly 25,000 in 1994 – developed.\(^8\)

Perhaps the greatest contribution of the Internet is the creation of community. Like home-made videoporn, cybersex has developed extensive grassroots links, albeit far more interconnected. One indication is the spread and popularity of sex-related bulletin boards, lists, chat lines, multi-user dungeons (MUDs), and ‘games rooms’ where people meet interactively.\(^8\) Much attention has focused on people changing roles (a common theme is men pretending to be women and being amazed at the types of traffic directed at them), being ‘flamed’ (publicly attacked in a virulent manner), or engaging in ‘Tiny sex’ (having sex with another character in a MUD via the keyboard).\(^8\)

More revealing than anecdotes are numbers. Four of the ten most popular Usenet bulletin boards in December, 1994, were sexually oriented with an estimated worldwide readership of 1.85 million.\(^6\) Perry Glasser’s survey of people logging onto chat rooms on AOL (America On-line) and Prodigy (another on-line service) found an acute disparity between highly acclaimed ‘family values’ and users’ actual interests.\(^4\)

The Internet fosters the creation of ‘virtual communities’ by making it easy for people with common interests, whether fly-fishing or spouse-swapping, to find each other and communicate. The computer-based groups established, such as alt.sex.fetish.star-trek, share the characteristic of being created by a geographically dispersed network of people. Most of these groups are not pornographic per se, but focal points for people interested in the same subject on which to converse – or learn. The communities need not only be virtual: Personal ads seeking companions, which played a major role in the popularity of Minitel, are also important.

In the last few years, the explosive growth of the Internet, World Wide Web, and computers in businesses and homes, together with improved graphics and higher transmission speeds, have moved videoporn from being the secretive habit of the few to the enjoyment of the many, removing ‘the biggest obstacles to selling pornography and sexual services: shame and ignorance’.\(^5\) The Internet offers nearly free access to pornography uninhibited by previous barriers of time and space. Essentially, videoporn has become an economist’s ideal free good: pornography is easily
accessible, incurs minimum transaction costs, and enjoys a large demand.

It is this availability that has attracted the greatest attention and fear. Perhaps the most patent demonstration is the popularity of certain Internet sites: on its first day of availability in March, 1995, *Penthouse's* Web site received 802,000 visits and *Playboy* averaged 620,000 daily visits, placing both sites in the ten most popular sites. By 1997, *Playboy* was receiving five million visits daily.\(^{86}\)

Some of the cybersex hoopla is promotional, like *Playboy* inviting women to e-mail their vital statistics to the magazine in the same way it earlier asked women to send pictures by fax.\(^{87}\)

Even with non-pornographic offerings, such as the on-line journal *Salon*, it has been found that putting the word 'sex' in an article's title dramatically increases readership.\(^{88}\)

Other activities are more practical, especially for providers of services and goods. Modern versions of the nineteenth century guides to the illicit pleasures of Paris are now available for cities worldwide.\(^{89}\) *Playboy* offers, for $60 annually, its Cyber Club for customers who want to peruse its photographic archive or converse on-line with its Playmates.\(^{90}\)

Many of these pornography providers were new arrivals, trying to catch a ride on the wave of computer technology, some of whom included the mythological poor students striking it rich.\(^{91}\) One justification for their products is that they are pushing the technological – and commercial – envelope.\(^{92}\) Or, as Lisa Fasold, a spokesperson for the Consumer Electronics Manufacturers Association, misleadingly stated, 'Without adult software, America would not have a VCR.'\(^{93}\) Some of these claims are undoubtedly designed to link their product with the socially appealing concept of technological progress, a long-standing theme in American history. But the underlying reality should not be denied.\(^{94}\)

Journalist and longtime computer industry observer, T.R. Reid, distinguishes five categories of cybersex products:

- 'traditional' films on CD-ROM
- graphics programmes, such as screen savers and calendars
- games like PornPoker
- interactive films where the viewer chooses from menus of men and women and desired activities
- software with Internet links\(^{95}\)

The first two categories are simple extensions of pornography onto a computer system. The games are important in pushing the
multimedia frontier, but most interest has focused on the last two categories, which have given new meaning to the concepts of self-expression. Blaine R. Richards, the producer of ‘Bodacious Bodies’, proclaimed, ‘You use the software to create your own fantasy. Then you upload it to the Net, so your buddies can see what’s on your mind.’66 This is a radical change in the nature of a pornographic experience, for in the past individuals had to be physically together or content themselves with verbal descriptions. Furthermore, since anyone can access a home page, the creator is broadcasting to the world, a significant extension of DIY pornography.

Unlike the VCR, where pornography accelerated the diffusion of a new technology without shaping it, the development of pornographic products has shaped computer technology. Reid considers the cybersex promoters ‘arguably one of the great pioneers of the multimedia industry.’67 These manufacturers in the late 1980s and early 1990s led the development and distribution of CD-ROM software. The ‘Penthouse Virtual Photo Shoot’, for example, won praise for one of the most interactive games then manufactured.68

The result of these activities by pornography providers is the development of new applications and solutions to the challenges encountered by businesses trying to commercialise the Internet. A ‘trailblazer in the economics of new technologies’, pornography is helping the Web mature economically by testing technologies and concepts to attract customers and their money. The Economist portrayed the typical on-line pornography consumers as ‘avid, savvy and well-wired young men – much like tomorrow’s shopper for less spicy on-line fare’. Estimates of the share of 1996 Web retail business by sexually-oriented products range from $50 million to $150 million (10–30 per cent). Seattle-based Internet Entertainment Group claimed 50,000 subscribers in 1997, equivalent to the Wall Street Journal’s on-line edition.69 Video Fantasy, which also offers videoconferenced customer-guided peep shows, claimed 20,000 subscribers.100

More important than numbers are the new technologies themselves. Some of the software used to verify Internet financial transactions has originated in systems devised to handle Dial-a-Pornography telephone and Internet accounts.101 More intriguingly, the firm AgeCheck, by providing subscriptions covering multiple Web sites, may provide the archetype for reducing risk
to users arising from the quality (or value) of unknown sites while offering providers higher visibility and income.\textsuperscript{102} In the realm of copyrighting, \textit{Playboy} has become one of the first customers of digital watermarking to prevent – or at least announce – unauthorised use of its material on the Web.\textsuperscript{103}

Another potential market, computer-based videoconferencing, has been pioneered by Virtual Dreams, a firm offering a striptease peep show over telephone lines. Customers type or speak their requests and the woman or man at the other end complies while the meter ticks at $5.99 a minute. Some of the firm’s $700,000 monthly income is reinvested in further developing this two-way technology which may benefit ‘medical, educational and a whole host of commercial and industrial transactions.’\textsuperscript{104}

Other technologies similarly being developed or deployed commercially are benefitting from perceived sexual applications. The emerging field of Virtual Reality (VR), which has received as much publicity as the emerging field of Artificial Intelligence (AI), has benefitted from its associations with the military and with pornography. As Howard Rheingold, inventor of the neologism ‘teledildonics’, can testify, writing about ‘technosex’ is a surefire way to attract attention.\textsuperscript{105}

Many people have taken advantage of their employers’ computers to trawl the Web. More often than not, they find pornographic sites. Employers and government agencies, anxious to prevent accusations of allowing a sexually harassing atmosphere and the waste of time and resources, are spawning a new market, that is, for filters to screen out designated sites.\textsuperscript{106}

Similarly, some of the first cybercrimes have involved cybersex. In ‘one of the most insidious scams the Federal Trade Commission has ever seen’, three Web sites offered pornographic pictures, which required downloading special software. The software was indeed special: it disconnected the existing telephone link to the user’s Internet service provider and called a provider in Moldova instead. Only turning the computer off disconnected the programme. Thousands of people discovered the switch only when their telephone bill arrived with the charges.\textsuperscript{107} More prosaically, similar switching may have secretly diverted customers from one ‘exotic dancer’ service in Las Vegas to another.\textsuperscript{108}

While Internet pornographic providers are pioneering ways of profiting from on-line services, a less heralded and far more
traditional form of pornography has benefitted greatly from a
dose of technological sophistication.

**DIAL-A-PORNOGRAPHY**

Though overshadowed by the public interest in cybersex, Dial-a-Pornography, also known as telephone sex or sex chat lines, is probably the most profitable area of pornography. A customer calls a number – originally with 976 and 900 prefixes in the United States and 0898 numbers in Great Britain, and is charged for a live conversation or recorded message. Providers require little investment beyond advertising, telephone lines, billing software, and labour. Consumers do not need any expertise or expensive equipment. In recent years, the traffic on such lines has been so heavy that it has distorted the international flow of telecommunications.

In one sense, Dial-a-Pornography is the original low-technology approach to transmitting information: by word of mouth. In its current manifestations, however, Dial-a-Pornography utilises highly advanced telecommunications to provide a service that literally encircles the globe. It is probably the quintessential example of the flexible, worldwide division of labour made possible by modern communication technologies. In the process, it is pioneering technologies that will find major applications in respectable businesses while improving the financial status of several small countries.

Until 1982, when the Federal Communications Commission ruled, as part of its larger drive towards deregulation, that telephone companies could not monopolise recorded information, the Dial-a-Pornography industry did not exist in the United States. In a burst of entrepreneurial activity, premium message services quickly expanded beyond time and weather bulletins. In New York, following a lottery to select providers of recorded messages, three Dial-a-Pornography lines became operational in February, 1983. Unlike the pre-deregulation message services, the new services charged customers who dialled a 976 number. While initial calls were pre-recorded, live sex chat lines quickly became a major offering. Dial-a-Pornography was a machine to make money. One message service in New York City received 180 million calls to its 976 numbers in its first year, earning $3.6
million. The peak demand for one day was 800,000 calls for a 57-second message, comparable to popular Web sites a decade later.\footnote{109}

Telephone companies faced a dilemma: Dial-a-Pornography provided major income, but often incurred community opposition for providing a service that children could easily use. In 1985–86 Pacific Bell estimated that it earned $12 million, and C&P Telephone in Washington, DC, that it gained $1.7 million. The latter company even claimed Dial-a-Pornography services benefitted the community as a whole by keeping basic rates low.\footnote{110}

The local 976 numbers migrated to nationwide 900 numbers in the late 1980s as part of the increasingly competitive market for telephone service. Like videotapes, the ratio of Dial-a-Pornography to all premium messages dropped over time, not due to a drop in demand but because of the growth of other offerings. Following Federal Communications Commission rules in 1991 designed to discourage minors gaining access to such services, the Dial-a-Pornography industry migrated to 800 numbers and, more recently, to international numbers.\footnote{111} The nominally free 800 number would offer the caller the opportunity to hear more – for a charge. International numbers automatically billed the caller.

In the United Kingdom, the Independent Committee for the Supervision of Standards of Telephone Information Service estimated that 70–80 per cent of all premium-message calls in the late 1980s were sex-chat lines. A year after its 1986 birth, the industry averaged 2.5 million calls weekly, generating an estimated £80 million in revenues. One firm, Broadway, utilised 240 computerised lines to handle its clientele. In an excellent example of regulation constricting an industry, when British Telecom and Vodafone required customers in 1994 to register for a special identification number with proof that they were over 18, demand shrank to less than one per cent of the total market.\footnote{112}

Prompted by social protests against such services, and taking advantage of new telecommunication deregulation and technology, the Dial-a-Pornography business has increasingly moved overseas to the unregulated realm of international telephone calls. By 1989, the estimated $900 million traffic in international sex-related calls equalled the European domestic premium call markets.\footnote{113} The International Telecommunications Union estimated that these calls comprised approximately 1.5 per cent of all
international traffic in 1996 or 60 million minutes a month, making Dial-a-Pornography a $2 billion annual business.\textsuperscript{114}

Typically, a caller dials a number which goes to a phone bank in another country where the call is transferred via leased lines to a third country where speakers actually handle the call. Small countries such as Guyana, the Dutch Antilles, Niue, and Moldova are popular with the Dial-a-Pornography businesses, mostly based in the Netherlands, because these countries want the money. Their international access codes, moreover, often look like those for local calls. The South Pacific island of Niue, for example, has only 2,500 people but over 10,000 telephone lines. Some of the calls are handled by answering machines; others are routed to Toronto where operators speaking English, French, Spanish, Greek, Italian and Swedish deal with the callers.\textsuperscript{115}

The telephone companies in these small countries view telephone sex not as a form of exploitation but a source of income. After the German firm ANT (Allgemeine Nachrichtentechnik) took over Guyana’s public telephone system in 1991, incoming calls grew fivefold to 140 million minutes in 1995, generating $130 million – almost 40 per cent of the country’s Gross Domestic Product.\textsuperscript{116} Benefitting greatly also are the telephone companies in the originating country which take half of the revenue of the calls.

Not all of the transfer of funds is international. Some is inter-generational. Schoolgirls in Japan have adapted the hi-tech Personal Handyphone System and electronic mailboxes to participate in terekuru (telephone clubs) with older men without losing their anonymity or parents’ discovering how their daughters afford expensive clothing.\textsuperscript{117}

CONCLUSION

Nearly four decades ago, science fiction author Arthur C. Clarke envisioned a capitalist America defeated by communist Red China. The tool of victory: satellites broadcasting non-stop pornography.\textsuperscript{118} Today, America is still adapting to unprecedented access to pornography, while the government of the People’s Republic of China, like those of Singapore and elsewhere, is trying to ensure that only state-approved data crosses its borders.\textsuperscript{119}
Such efforts should remind us that pornography is just one form of 'underground' or forbidden knowledge.\textsuperscript{120} Depending on the period and place, political discourse, religious literature and violence have also moved under the censor’s eye and, like pornography, relied on various ways of circulating. Many technologies are excellent for diffusing information authorities do not want distributed. A VHS tape or CD can carry political manifestos, a pornographic film like the American classic, 'Debbie Does Dallas', Japanese music into South Korea or more socially acceptable offerings without changing its outward appearance. Consequently, in situations where censorship prevails, subversive literature and pornography have often gone together, regardless of the medium.\textsuperscript{121}

One tendency across technologies and businesses is that, as they mature and reach wider audiences, some participants have tried to improve their status by repositioning themselves and their products. They may accept some market loss for a gain of prestige and legitimacy. To a historian of technology or of business, this pattern should not seem unusual.\textsuperscript{122}

Some businesses have reduced or eliminated some or all of their pornographic component in order to claim a higher social standing and attract (or not lose) larger, mainstream advertisers. Such posturing may seem hypocritical. It may also serve as a marker to indicate that a mass consumer market has finally been reached. For VCRs, one such indicator occurred in April, 1984, when Video Review banned advertising for adult video, following Playboy's example.\textsuperscript{123} For individuals who have made their profits, it may be the desire to enter other businesses or engage in other, more socially prestigious activities that triggers the shift.\textsuperscript{124}

For the multimedia computer market, the turning point was 1994 when Comdex, the largest computer exhibition in the United States, banned X-rated products, forgoing roughly $500,000 in rental revenues. Previously such purveyors of pornography had participated, often drawing the largest crowds, but were located at the back of the huge exhibition.\textsuperscript{125} Outraged at what she saw as a betrayal by an industry which had benefitted greatly from her products, Fay Sharp, president of CD Concepts Inc., producer of '3-D Darlings' and 'Dirty Tricks: The Ultimate CyberSpace Adventure', counterorganised an alternative exhibition of X-rated vendors at the same time as the Comdex show. Approximately 60 firms bought display space in her AdultDex '95, one mile from
the main Comdex exhibition in Las Vegas. Thousands paid the $20 surcharge to visit the banned vendors.\[126\]

Pornographic products are not banned everywhere. The Consumer Electronics Manufacturers Association has continued to welcome crowd-attracting ‘Adult Software’ to its annual Consumer Electronics Show.\[127\] The vendors are placed together in a semi-secluded or separate area, so that visitors can avoid it if they so desire. This proximity to both adult and non-pornographic vendors also allows the synergy of networking and competitive comparisons.\[128\]

New communications and information technologies have revolutionised the worlds of politics, religion, commerce, and other areas.\[129\] Pornography is no exception. These technologies have greatly reduced the economic and social transaction costs of creating and accessing pornography while providing greater privacy to users and profits to everyone else. By enabling consumers to become producers, pornography has become an active as well as a passive pursuit. Significant legal and social questions, primarily involving free speech and access by minors, have also emerged. Although people may not want to think about pornography, it has significantly affected the lives of everyone who has used a news-stand, VCR, telephone, or computer network.

The apparent privacy provided by new communication technologies has spawned a wide range of activities, ranging from sexual and marital counselling to child pornography.\[130\] Thousands of communities composed of individuals widely separated by distance have been created. The ease of creation, distribution and access to pornography has created an electronic information version of Gresham’s Law, except that the good information is still available – just not as eagerly pursued.\[131\]

The changes in the pornography industry are part of larger trends – of growing globalisation, of commodification of goods and services, and of the information revolution affecting commerce and cultures worldwide. The ‘democratisation’ of pornography is part of a larger decentralising trend in communications over the last few decades. The social consequences of the democratisation of the production and distribution of information of all kinds promise to be as earthshaking as the ‘democratisation’ of consumption by the development and diffusion of the printing press half a millennium earlier.\[132\]
ACKNOWLEDGEMENTS

I wish to thank Daniel Bornstein, Cathy Frierson, Lisa Halperin, Paul Josephson, Rachel Maines, ICON readers who read earlier drafts, and commentators at the Research Centre for Social Science at the University of Edinburgh and at the 1996 ICOHTEC conference.

NOTES

Letters preceding some page citations refer to the sections of those papers. 'CI', for example, refers to the business section of the New York Times.


2. Erotica is a more general term covering material with any sexual content; pornography, according to some definitions, is any material that inherently degrades a group or gender and often has implications of control and violence. There is usually also a class distinction, with the former considered of higher artistic quality and cost and the latter more plebeian and rude. B. Arcand, The Jaguar and the Antaeater. Pornography Group Zero (trans. W. Grady) (London, 1993), 59–121. I prefer Wendy McElroy’s more neutral definition of pornography as ‘the explicit artistic depiction of men and/or women as sexual beings’: W. McElroy, op. cit. (1), 51.

3. One intriguing theme not pursued here is the intertwining of religion and pornography in diffusing communication technologies, a relation far closer than might otherwise be suspected. Religious materials, particularly bibles, were some of the earliest and most prodigious overt – and covert – products of the printing press. In radio and television, religious broadcasters were some of the earliest and most effective users of the new medium. In a smaller matter, religious and pornographic images were the earliest and major uses of Stanhope lenses – glass slivers which magnified images – in the mid-nineteenth century: L. Fruhling, ‘Researchers find something smutty in the Big Muddy’, Des Moines Register, 4 July, 1996, 14.


9. For a sense of the range of pornographic material, see H. Marchand, The French Pornographers. Including a History of French Erotic Literature (New York, 1933; republished 1964); T.L. Devinne, The Invention of Printing (New York, 1876;
13. Ibid., 69, 72. Sexually-oriented works comprised 82 of the 457 titles (17.9 per cent). See also, Marchand, op. cit. (9), 114–33.
16. I am indebted to Rachel Maines for this point.
19. Department of Justice, op. cit. (14), 834.
22. A peep show was a small booth with a projector that, in exchange for tokens or quarters, played short 8mm films, often without sound and of poor technical quality. Sometimes, holes in the walls offered opportunities for anonymous sexual encounters. Reuben Sturman, a distributor and producer of printed pornography, invented the peep show and supplied the booths free to bookstore owners in return for half of the revenues. Sturman soon branched out into supplying and making the films (E. Schlosser, ‘The Bill Gates of Porn’, U.S. News and World Report, 10 February, 1997, 51–2).
24. In addition to the standard problem of finding information about a competitive industry, research on pornography has been hindered by its past stigma, links with organised crime, illegality and low status. Many of the numbers proffered are estimates, often by people or institutions with a vested interest – or an axe to grind.
26. For a comprehensive history, see J. Heidenry, What Wild Ecstasy. The Rise and Fall of the Sexual Revolution (New York, 1997).
27. Department of Justice, op. cit. (14), 1414.
29. Department of Justice, op. cit. (14), 1406.

32. For a history and explication of the pornographic film, see L. Williams, Hard Core. Sex, Power, Pleasure, and the ‘Frenzy of the Visible’ (Berkeley, 1989).


35. Ibid., 129, 190.

36. Cook, op. cit. (23), 81; Department of Justice, op. cit. (14), 1384.

37. Department of Justice, op. cit. (14), 1365.

38. Cook, op. cit. (23), 84; Department of Justice, op. cit. (14), 1384.


44. Department of Justice, op. cit. (14), 1421–7.


46. The Video Privacy Protection Act of 1988 was passed as a result of the publicising of U.S. Supreme Court nominee Robert Bork’s video rentals.

47. Department of Justice, op. cit. (14), 1368–74.


49. Department of Justice, op. cit. (14), 1392–4.

50. Department of Justice, op. cit. (14), 1394, 1397–8.


52. E.g., Adult Video News, the standard of the field, Best of Erotic X-Rated Film Guide, Hustler Erotic Video Guide, and X-Rated Cinema.


60. Some skilled technicians with such access did take advantage of their position, often after the formal close of a work day: Gordon, op. cit. (6), 311.


65. B. Rimmer, ‘Bob Rimmer: sex and video narcissism’, *Video Review*, September 1982, 132. In part because this is essentially a truly private activity, it is difficult to fully appreciate its extent.


67. Cook, op. cit. (23), 82.


77. ‘Fighting Teleporn on Home Information Systems – 1,200 Bawds?’, op. cit. (54) 1–3. Videotex displayed information sent from a computer via a telephone line on

78. E. Booker, 'Vive le Minitel', Telephony, 8 August, 1988, 24.


82. Rose and Thomas, op. cit. (81); see also, A.R. Stone, The War of Desire and Technology at the Close of the Mechanical Age (Cambridge, MA, 1995) and her 'Sex and death among the disembodied: VR, cyberspace, and the nature of academic discourse' in Star, op. cit. (72), 243–55.

83. Two each were devoted to news (1.25 million), humour (840,000), and business (890,000): 'Information Back Alleys', New York Times, 3 January, 1995.

84. Network-created Rooms (25 people maximum)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Rush Limbaugh</td>
<td>0</td>
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<tr>
<td>Photography</td>
<td>1</td>
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<tr>
<td>Soap Operas</td>
<td>2</td>
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</tbody>
</table>

User-created Rooms

<table>
<thead>
<tr>
<th>Name</th>
<th>Number of people (25 people maximum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shareyourwife/me</td>
<td>14</td>
</tr>
<tr>
<td>Married and Flirting</td>
<td>25</td>
</tr>
<tr>
<td>LOOKPRETTYUP</td>
<td>25</td>
</tr>
</tbody>
</table>


85. 'Giving the customer what he wants', op. cit. (4), 22.


87. 'Playboy Makes Pitch for "Girls of the Net"', op. cit. (86).


90. 'The case of the bouncing bunny', op. cit. (31), 58.

91. Venus Interactive Cinema was founded by two Northwestern University students who claimed that, to pay their tuition, they dropped out, sold all their possessions and then made 'Intimate Possibilities' for $100,000. If they had $100,000 of possessions, did they need to drop out? (M.J. Tucker, 'How Pivotal Is Porn in Developing the Market for CD-ROM?', CD-ROM Professional, November 1995, 8, 11: 68).

93. D.E. Kalish, 'Electronics convention sells more than software', *Bryan-College Station Eagle*, 13 January, 1997, A3. There was VCR before pornography on VCR; what pornography did was to accelerate the diffusion of the new technology.


96. Ibid., 17.

97. Ibid., 15, 17.


101. 'Cybersex', op. cit. (25), 64-6.


104. 'Cybersex', op. cit. (25), 64-6.

105. Springer, op. cit. (73) 80-91; Rheingold, op. cit. (74) 346-51.


108. The 106 pages of 'adult entertainers' is exceeded only by the 140 pages of lawyers in the local Yellow Pages: J. Markoff, 'Where Have All the Callers Gone?', *New York Times*, 26 June, 1997, A10.

109. Department of Justice, op. cit. (14), 1428-32.


111. Department of Justice, op. cit. (14), 1432; R.D. Hylton, 'For 900 Numbers, the Racy Gives Way to the Respectable', *New York Times*, 1 March, 1992, F8. For the 900 number the user must provide a credit card. International numbers are either billed to the telephone account or credit card.


113. 'Heavy Breathing', op. cit. (112), 64.
114. J. Riley, 'Telecom sex lines sizzle', South China Morning Post, 25 October, 1994, 2. It should be emphasised that such numbers are only estimates.
117. 'Clueless in Tokyo', The Economist, 8 June, 1996, 66.
120. Roger Shattuck distinguishes six categories of forbidden knowledge: that which is unattainable; prohibited by divine, religious, moral or secular authority; dangerous or destructive; fragile or delicate; double-bound in meaning; and ambiguous or Mobius-strip-like: R. Shattuck, Forbidden Knowledge. From Prometheus to Pornography (New York, 1996), 327–37.
123. G. Leonard, 'VR X changes: Better – for whom?', Video Review, June 1984, 123. A 1986 analysis of ads in pornographic magazines found that only 10 per cent of the ads in Playboy, which pursued an upmarket image, were sex-related, compared with 100 per cent for magazines like Club International: Department of Justice, op. cit. (14), 1400.
127. Kalish, op. cit. (93). For a visit to the Consumer Electronics Show, see W. McElroy, op. cit. (1), 15–40.
LITERARY RESPONSES TO TECHNOLOGY:
E.M. FORSTER'S 'THE MACHINE STOPS'

Alvin C. Kibel

The point of this paper is to bring into contrast two views of the relation between mankind and technology by comparing two brief texts, one written just after the last turn of the century and one written with the prospect of the next century in view. As an artifact of the decimal system, the turning of a century does not mark a turning point in human affairs, but the last turning and this one have each inspired a good deal of all-around summing up about the nature and course of modernity, and for this reason a comparison of current hopes and fears with those of one hundred years ago may show something about how attitudes towards technology have shifted in between.

1. THE AGE OF LICKLIDER

Unsurprisingly, much talk at the end of the last century was of the New Age of the Machine, of electricity, of new forms of modernity, of energies and forces over which mankind had vastly enhanced direction and control. Was the direction appropriate? How good was the control? Fears and hopes were focused upon mankind's increasing dependency upon machines, the manner of industrial production, the distribution of its goods, the general stirrings-up and confusions of social arrangements that might follow in consequence. The chapter on 'The Dynamo and Virgin' in The Education of Henry Adams can do duty here for much of what was said and written about the colossal change that many thought would mark the transition between the century that was closing and the century about to begin. The dynamos whirred quietly in their hall at the Paris Exposition of 1900, generating a form of energy that made no noise and betrayed no visible motion in its transmission. They led Adams to reflect on the impossibility of predicting mankind's intellectual future by taking stock of its current material transformations. No one living in the early days of Christianity could have deduced Chartres cathedral