

theNewMediaReader

Edited by Noah Wardrip-Fruin and Nick Montfort

Designed by Michael Crumpton

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Winner's most famous example of explicitly politically charged technological objects is probably found in "Do Artifacts Have Politics?" In that essay, early in his discussion, he recounts the story of Robert Moses, who explicitly designed the freeway overpasses on Long Island so that they would be too short to ever accommodate buses. Moses also fought the extension of the Long Island Railroad toward his famous Jones Beach. Both were attempts by Moses to keep low-income, minority New Yorkers out of these areas.

Doug Engelbart's "bootstrapping" is a similar concept specific to the realm of new media: users are continually involved in the ongoing definition and construction of the tools that they as a community will use (008). Processes of this sort have been the primary method of defining the Internet over the course of its history (and even in its prehistory as the ARPAnet). A good example of this is seen in "Requests for Comments" (RFCs). As Janet Abbate writes in *Inventing the Internet*, "Members of the Network Working Group would post new RFCs concurring with, criticizing, or elaborating on ideas presented in earlier RFCs, and an ongoing discussion developed. Eventually, after members had debated the issues through RFCs and at NWG meetings, a consensus would emerge on protocols and procedures, and this consensus was generally accepted by ARPA as official policy for the network" (74).

Perhaps it is not such a surprise that this approach was adopted, once one considers that the electronic medium used for the exchange of RFCs was the Network Information Center (NIC) that Engelbart's group created at SRI. However, this manner of decision making lasted long after the NIC (and the discussion) left SRI. In the 1980s, when the Internet had already grown significantly, it was decided that the involved parties who needed to be represented in Internet technology decision making were quite a few, and, as Abbate writes, membership in the groups working with RFCs was opened "to anyone, anywhere in the world, who had the time, interest, and technical knowledge to participate" (207). Later, she writes, the Internet Engineering Task Force (IETF) continued the RFC decision-making process: "Working groups within these task forces coordinated their activities through email, and the task forces held meetings several times a year. Standards for the Internet were set by consensus, after discussion among all interested parties and after proposed protocols had been tested in practice, and they continued to be published electronically in the form of Requests for Comments" (207). This process ensured the meaningful participation of everyone from university students to corporate information systems managers to interested researchers—all acting as individuals, rather than representatives of organizations, since no organizational or corporate membership in the IETF is possible.

The Internet is now moving toward another model of social production and embodiment. Since the early 1990s the U.S. government has been involved in privatizing the Internet. The stated goal is to promote competition—but the opposite has happened. The government privatized the Internet backbone, and a few large carriers now dominate. This problem is either exacerbated or caused by the government's refusal to require these dominant players to interconnect with smaller ones. The government privatized the process of registering the domain names of computers, leading to undemocratic monopolization: first by Network Solutions Incorporated (NSI), and more recently by the Internet Corporation for Assigned Names and Numbers (ICANN). NSI was purchased by Verisign, and retains the lucrative ownership of the ".com" domain database as of this writing—via an agreement with ICANN that was negotiated and concluded in secret.

Sometimes characterized as the "World Trade Organization of the Internet," ICANN is a DNS decision-making body that has replaced the broad public participation of organizations such as the IETF with closed-door meetings involving primarily corporate interests. It has worked consistently to broaden its power, attempting to recast bodies such as the IETF as mere "supporting organizations" for ICANN's activities (empowered only to make suggestions to ICANN). Meanwhile, many have questioned whether ICANN has any basis for legal existence at all, and it has been suggested that Internet users may revolt. On the one hand, revolt against ICANN might be easy: use a different server than ICANN's as the "root" for the domain name system—and persuade everyone else who has information you want to access to do so. Even then, the Internet privatization that ICANN represents has widespread support in very powerful circles.

In short, precisely the sort of technology definition that Williams wrote about is ongoing now. The Internet did not spring, full-grown, from J. C. R. Licklider's head. It was created, and is still being created, by social processes interacting with scientific/technical processes. Those who work and live with the Internet can choose to either become involved or wait and see what happens. The decision will have a profound impact on the social values embodied in the technology of our next-generation Internet.

—NWF

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The Technology
and the Society

Raymond Williams

It is often said that television has altered our world. In the same way, people often speak of a new world, a new society, a new phase of history, being created—"brought about"—by this or that new technology: the steam-engine, the automobile, the atomic bomb. Most of us know what is generally implied when such things are said. But this may be the central difficulty: that we have got so used to statements of this general kind, in our most ordinary discussions, that we can fail to realise their specific meanings.

For behind all such statements lie some of the most difficult and most unresolved historical and philosophical questions. Yet the questions are not posed by the statements; indeed they are ordinarily masked by them. Thus we often discuss, with animation, this or that "effect" of television, or the kinds of social behaviour, the cultural and psychological conditions, which television has "led to," without feeling ourselves obliged to ask whether it is reasonable to describe any technology as a cause, or, if we think of it as a cause, as what kind of cause, and in what relations with other kinds of causes. The most precise and discriminating local study of "effects" can remain superficial if we have not looked into the

notions of cause and effect, as between a technology and a society, a technology and a culture, a technology and a psychology, which underlie our questions and may often determine our answers.

It can of course be said that these fundamental questions are very much too difficult; and that they are indeed difficult is very soon obvious to anyone who tries to follow them through. We could spend our lives trying to answer them, whereas here and now, in a society in which television is important, there is immediate and practical work to be done: surveys to be made, research undertaken; surveys and research, moreover, which we know how to do. It is an appealing position, and it has the advantage, in our kind of society, that it is understood as practical, so that it can then be supported and funded. By contrast, other kinds of question seem merely theoretical and abstract.

Yet all questions about cause and effect, as between a technology and a society, are intensely practical. Until we have begun to answer them, we really do not know, in any particular case, whether, for example, we are talking about a technology or about the uses of a technology; about necessary institutions or particular and changeable institutions; about a content or about a form. And this is not only a matter of intellectual uncertainty; it is a matter of social practice. If the technology is a cause, we can at best modify or seek to control its effects. Or if the technology, as used, is an effect, to what other kinds of cause, and other kinds of action, should we refer and relate our experience of its uses? These are not abstract questions. They form an increasingly important part of our social and cultural arguments, and they are being decided all the time in real practice, by real and effective decisions.

It is with these problems in mind that I want to try to analyse television as a particular cultural technology, and to look at its development, its institutions, its forms and its effects, in this critical dimension. In the present chapter, I shall begin the analysis under three headings: (a) versions of cause and effect in technology and society; (b) the social history of television as a technology; (c) the social history of the uses of television technology.

A. Versions of Cause and Effect in Technology and Society

(i) We can begin by looking again at the general statement that television has altered our world. It is worth setting down some of the different things this kind of statement has been taken to mean. For example:

(ii) Television was invented as a result of scientific and technical research. Its power as a medium of news and entertainment was then so great that it altered all preceding media of news and entertainment.

(iii) Television was invented as a result of scientific and technical research. Its power as a medium of social communication was then so great that it altered many of our institutions and forms of social relationships.

(iv) Television was invented as a result of scientific and technical research. Its inherent properties as an electronic medium altered our basic perceptions of reality, and thence our relations with each other and with the world.

(v) Television was invented as a result of scientific and technical research. As a powerful medium of communication and entertainment it took its place with other factors—such as greatly increased physical mobility, itself the result of other newly invented technologies—in altering the scale and form of our societies.

(vi) Television was invented as a result of scientific and technical research, and developed as a medium of entertainment and news. It then had unforeseen consequences, not only on other entertainment and news media, which it reduced in viability and importance, but on some of the central processes of family, cultural and social life.

(vi) Television, discovered as a possibility by scientific and technical research, was selected for investment and development to meet the needs of a new kind of society, especially in the provision of centralised entertainment and in the centralised formation of opinions and styles of behaviour.

(vii) Television, discovered as a possibility by scientific and technical research, was selected for investment and promotion as a new and profitable phase of a domestic consumer economy; it is then one of the characteristic "machines for the home."

(viii) Television became available as a result of scientific and technical research, and in its character and uses exploited and emphasised elements of a passivity, a cultural and psychological inadequacy, which had always been latent in people, but which television now organised and came to represent.

(ix) Television became available as a result of scientific and technical research, and in its character and uses both served and exploited the needs of a new kind of large-scale and complex but atomised society.

These are only some of the possible glosses on the ordinary bald statement that television has altered our world. Many people hold mixed versions of what are really alternative opinions, and in some cases there is some inevitable overlapping. But we can distinguish between two broad classes of opinion.

In the first—(i) to (v)—the technology is in effect accidental. Beyond the strictly internal development of the technology there is no reason why any particular invention should have come about. Similarly it then has consequences which are also in the true sense accidental, since they follow directly from the technology itself. If television had not been invented, this argument would run, certain definite social and cultural events would not have occurred.

In the second—(vi) to (ix)—television is again, in effect, a technological accident, but its significance lies in its uses, which are held to be symptomatic of some order of society or some qualities of human nature which are otherwise determined. If television had not been invented, this argument runs, we would still be manipulated or mindlessly entertained, but in some other way and perhaps less powerfully.

For all the variations of local interpretation and emphasis, these two classes of opinion underlie the overwhelming

majority of both professional and amateur views of the effects of television. What they have in common is the fundamental form of the statement: "television has altered our world."

It is then necessary to make a further theoretical distinction. The first class of opinion, described above, is that usually known, at least to its opponents, as *technological determinism*. It is an immensely powerful and now largely orthodox view of the nature of social change. New technologies are discovered, by an essentially internal process of research and development, which then sets the conditions for social change and progress. Progress, in particular, is the history of these inventions, which "created the modern world." The effects of the technologies, whether direct or indirect, foreseen or unforeseen, are as it were the rest of history. The steam engine, the automobile, television, the atomic bomb, have *made* modern man and the modern condition.

The second class of opinion appears less determinist. Television, like any other technology, becomes available as an element or a medium in a process of change that is in any case occurring or about to occur. By contrast with pure technological determinism, this view emphasises other causal factors in social change. It then considers particular technologies, or a complex of technologies, as *symptoms* of change of some other kind. Any particular technology is then as it were a by-product of a social process that is otherwise determined. It only acquires effective status when it is used for purposes which are already contained in this known social process.

The debate between these two general positions occupies the greater part of our thinking about technology and society. It is a real debate, and each side makes important points. But it is in the end sterile, because each position, though in different ways, has abstracted technology from society. In *technological determinism*, research and development have been assumed as self-generating. The new technologies are invented as it were in an independent sphere, and then create new societies or new human conditions. The view of *symptomatic technology*, similarly, assumes that research and development are self-generating, but in a more marginal way. What is discovered in the margin is then taken up and used.

Each view can then be seen to depend on the isolation of technology. It is either a self-acting force which creates new

ways of life, or it is a self-acting force which provides materials for new ways of life. These positions are so deeply established, in modern social thought, that it is very difficult to think beyond them. Most histories of technology, like most histories of scientific discovery, are written from their assumptions. An appeal to "the facts," against this or that interpretation, is made very difficult simply because the histories are usually written, consciously or unconsciously, to illustrate the assumptions. This is either explicit, with the consequential interpretation attached, or more often implicit, in that the history of technology or of scientific development is offered as a history on its own. This can be seen as a device of specialisation or of emphasis, but it then necessarily implies merely internal intentions and criteria.

To change these emphases would require prolonged and cooperative intellectual effort. But in the particular case of television it may be possible to outline a different kind of interpretation, which would allow us to see not only its history but also its uses in a more radical way. Such an interpretation would differ from technological determinism in that it would restore *intention* to the process of research and development. The technology would be seen, that is to say, as being looked for and developed with certain purposes and practices already in mind. At the same time the interpretation would differ from symptomatic technology in that these purposes and practices would be seen as *direct*: as known social needs, purposes and practices to which the technology is not marginal but central.

B. The Social History of Television as a Technology

The invention of television was no single event or series of events. It depended on a complex of inventions and developments in electricity, telegraphy, photography and motion pictures, and radio. It can be said to have separated out as a specific technological objective in the period 1875–1890, and then, after a lag, to have developed as a specific technological enterprise from 1920 through to the first public television systems of the 1930s. Yet in each of these stages it depended for parts of its realisation on inventions made with other ends primarily in view.

Until the early nineteenth century, investigations of electricity, which had long been known as a phenomenon, were primarily philosophical: investigations of a puzzling natural effect. The technology associated with these investigations was mainly directed towards isolation and

concentration of the effect, for its clearer study. Towards the end of the eighteenth century there began to be applications, characteristically in relation to other known natural effects (lightning conductors). But there is then a key transitional period in a cluster of inventions between 1800 and 1831, ranging from Volta's battery to Faraday's demonstration of electro-magnetic induction, leading quickly to the production of generators. This can be properly traced as a scientific history, but it is significant that the key period of advance coincides with an important stage of the development of industrial production. The advantages of electric power were closely related to new industrial needs: for mobility and transfer in the location of power sources, and for flexible and rapid controllable conversion. The steam engine had been well suited to textiles, and its industries had been based on local siting. A more extensive development, both physically and in the complexity of multiple-part processes, such as engineering, could be attempted with other power sources but could only be fully realised with electricity. There was a very complex interaction between new needs and new inventions, at the level of primary production, of new applied industries (plating) and of new social needs which were themselves related to industrial development (city and house lighting). From 1830 to large-scale generation in the 1880s there was this continuing complex of need and invention and application.

In telegraphy the development was simpler. The transmission of messages by beacons and similar primary devices had been long established. In the development of navigation and naval warfare the flag-system had been standardised in the course of the sixteenth and seventeenth centuries. During the Napoleonic wars there was a marked development of land telegraphy, by semaphore stations, and some of this survived into peacetime. Electrical telegraphy had been suggested as a technical system as early as 1753, and was actually demonstrated in several places in the early nineteenth century. An English inventor in 1816 was told that the Admiralty was not interested. It is interesting that it was the development of the railways, themselves a response to the development of an industrial system and the related growth of cities, which clarified the need for improved telegraphy. A complex of technical possibilities was brought to a working system from 1837 onwards. The development of international trade and transport brought rapid extensions of the system, including the transatlantic cable in

the 1850s and the 1860s. A general system of electric telegraphy had been established by the 1870s, and in the same decade the telephone system began to be developed, in this case as a new and intended invention.

In photography, the idea of light-writing had been suggested by (among others) Wedgwood and Davy in 1802, and the *camera obscura* had already been developed. It was not the projection but the fixing of images which at first awaited technical solution, and from 1816 (Niepce) and through to 1839 (Daguerre) this was worked on, together with the improvement of camera devices. Professional and then amateur photography spread rapidly, and reproduction and then transmission, in the developing newspaper press, were achieved. By the 1880s the idea of a "photographed reality"—still more for record than for observation—was familiar.

The idea of moving pictures had been similarly developing. The magic lantern (slide projection) had been known from the seventeenth century, and had acquired simple motion (one slide over another) by 1736. From at latest 1826 there was a development of mechanical motion-picture devices, such as the wheel-of-life, and these came to be linked with the magic lantern. The effect of persistence in human vision—that is to say, our capacity to hold the "memory" of an image through an interval to the next image, thus allowing the possibility of a sequence built from rapidly succeeding units—had been known since classical times. Series of cameras photographing stages of a sequence were followed (Marey, 1882) by multiple-shot cameras. Friese-Greene and Edison worked on techniques of filming and projection, and celluloid was substituted for paper reels. By the 1890s the first public motion-picture shows were being given in France, America and England.

Television, as an idea, was involved with many of these developments. It is difficult to separate it, in its earliest stages, from photo-telegraphy. Bain proposed a device for transmitting pictures by electric wires in 1842; Bakewell in 1847 showed the copying telegraph; Caselli in 1862 transmitted pictures by wire over a considerable distance. In 1873, while working at a terminal of the Atlantic telegraph cable, May observed the light-sensitive properties of selenium (which had been isolated by Berzelius in 1817 and was in use for resistors). In a host of ways, following an already defined need, the means of transmitting still pictures and moving pictures were actively sought and to a considerable extent discovered. The list is long even when selective: Carey's

electric eye in 1875; Nipkow's scanning system in 1884; Elster and Geitel's photoelectric cells in 1890; Braun's cathode-ray tube in 1897; Rosing's cathode-ray receiver in 1907; Campbell Swinton's electronic camera proposal in 1911. Through this whole period two facts are evident: that a system of television was foreseen, and its means were being actively sought; but also that, by comparison with electrical generation and electrical telegraphy and telephony, there was very little social investment to bring the scattered work together. It is true that there were technical blocks before 1914—the thermionic valve and the multi-stage amplifier can be seen to have been needed and were not yet invented. But the critical difference between the various spheres of applied technology can be stated in terms of a social dimension: the new systems of production and of business or transport communication were already organised, at an economic level; the new systems of social communication were not. Thus when motion pictures were developed, their application was characteristically in the margin of established social forms—the sideshows—until their success was capitalised in a version of an established form, the motion-picture *theatre*.

The development of radio, in its significant scientific and technical stages between 1885 and 1911, was at first conceived, within already effective social systems, as an advanced form of telegraphy. Its application as a significantly new social form belongs to the immediate post-war period, in a changed social situation. It is significant that the hiatus in technical television development then also ended. In 1923 Zworykin introduced the electronic television camera tube. Through the early 1920s Baird and Jenkins, separately and competitively, were working on systems using mechanical scanning. From 1925 the rate of progress was qualitatively changed, through important technical advances but also with the example of sound broadcasting systems as a model. The Bell System in 1927 demonstrated wire transmission through a radio link, and the pre-history of the form can be seen to be ending. There was great rivalry between systems—especially those of mechanical and electronic scanning—and there is still great controversy about contributions and priorities. But this is characteristic of the phase in which the development of a technology moves into the stage of a new social form.

What is interesting throughout is that in a number of complex and related fields, these systems of mobility and

transfer in production and communication, whether in mechanical and electric transport, or in telegraphy, photography, motion pictures, radio and television, were at once incentives and responses within a phase of general social transformation. Though some of the crucial scientific and technical discoveries were made by isolated and unsupported individuals, there was a crucial community of selected emphasis and intention, in a society characterised at its most general levels by a mobility and extension of the scale of organisations: forms of growth which brought with them immediate and longer-term problems of operative communication. In many different countries, and in apparently unconnected ways, such needs were at once isolated and technically defined. It is especially a characteristic of the communications systems that *all were foreseen—not in utopian but in technical ways—before the crucial components of the developed systems had been discovered and refined*. In no way is this a history of communications systems creating a new society or new social conditions. The decisive and earlier transformation of industrial production, and its new social forms, which had grown out of a long history of capital accumulation and working technical improvements, created new needs but also new possibilities, and the communications systems, down to television, were their intrinsic outcome.

C. The Social History of the Uses of Television Technology

It is never quite true to say that in modern societies, when a social need has been demonstrated, its appropriate technology will be found. This is partly because some real needs, in any particular period, are beyond the scope of existing or foreseeable scientific and technical knowledge. It is even more because the key question, about technological response to a need, is less a question about the need itself than about its place in an existing social formation. A need which corresponds with the priorities of the real decision-making groups will, obviously, more quickly attract the investment of resources and the official permission, approval or encouragement on which a working technology, as distinct from available technical devices, depends. We can see this clearly in the major developments of industrial production and, significantly, in military technology. The social history of communications technology is interestingly different from either of these, and it is important to try to discover what are the real factors of this variation.

The problem must be seen at several different levels. In the very broadest perspective, there is an operative relationship between a new kind of expanded, mobile and complex society and the development of a modern communications technology. At one level this relationship can be reasonably seen as causal, in a direct way. The principal incentives to first-stage improvements in communications technology came from problems of communication and control in expanded military and commercial operations. This was both direct, arising from factors of greatly extending distance and scale, and indirect, as a factor within the development of transport technology, which was for obvious reasons the major direct response. Thus telegraphy and telephony, and in its early stages radio, were secondary factors within a primary communications system which was directly serving the needs of an established and developing military and commercial system. Through the nineteenth and into the twentieth century this was the decisive pattern.

But there were other social and political relationships and needs emerging from this complex of change. Indeed it is a consequence of the particular and dominant interpretation of these changes that the complex was at first seen as one requiring improvement in *operational* communication. The direct priorities of the expanding commercial system, and in certain periods of the military system, led to a definition of needs within the terms of these systems. The objectives and the consequent technologies were operational within the structures of these systems: passing necessary specific information, or maintaining contact and control. Modern electric technology, in this phase, was thus oriented to uses of person to person, operator and operative to operator and operative, within established specific structures. This quality can best be emphasised by contrast with the electric technology of the second phase, which was properly and significantly called *broadcasting*. A technology of specific messages to specific persons was complemented, but only relatively late, by a technology of varied messages to a general public.

Yet to understand this development we have to look at a wider communications system. The true basis of this system had preceded the developments in technology. Then as now there was a major, indeed dominant, area of social communication, by word of mouth, within every kind of social group. In addition, then as now, there were specific institutions of that kind of communication which involves or

is predicated on social teaching and control: churches, schools, assemblies and proclamations, direction in places of work. All these interacted with forms of communication within the family.

What then were the new needs which led to the development of a new technology of social communication? The development of the press gives us the evidence for our first major instance. It was at once a response to the development of an extended social, economic and political system and a response to crisis within that system. The centralisation of political power led to a need for messages from that centre along other than official lines. Early newspapers were a combination of that kind of message—political and social information—and the specific messages—classified advertising and general commercial news—of an expanding system of trade. In Britain the development of the press went through its major formative stages in periods of crisis: the Civil War and Commonwealth, when the newspaper form was defined; the Industrial Revolution, when new forms of popular journalism were successively established; the major wars of the twentieth century, when the newspaper became a universal social form. For the transmission of simple orders, a communications system already existed. For the transmission of an ideology, there were specific traditional institutions. But for the transmission of news and background—the whole orienting, predictive and updating process which the fully developed press represented—there was an evident need for a new form, which the largely traditional institutions of church and school could not meet. And to the large extent that the crises of general change provoked both anxiety and controversy, this flexible and competitive form met social needs of a new kind. As the struggle for a share in decision and control became sharper, in campaigns for the vote and then in competition for the vote, the press became not only a new communications system but, centrally, a new social institution.

This can be interpreted as response to a political need and a political crisis, and it was certainly this. But a wider social need and social crisis can also be recognised. In a changing society, and especially after the Industrial Revolution, problems of social perspective and social orientation became more acute. New relations between men, and between men and things, were being intensely experienced, and in this area, especially,

the traditional institutions of church and school, or of settled community and persisting family, had very little to say. A great deal was of course said, but from positions defined within an older kind of society. In a number of ways, and drawing on a range of impulses from curiosity to anxiety, new information and new kinds of orientation were deeply required: more deeply, indeed, than any specialisation to political, military or commercial information can account for. An increased awareness of mobility and change, not just as abstractions but as lived experiences, led to a major redefinition, in practice and then in theory, of the function and process of social communication.

What can be seen most evidently in the press can be seen also in the development of photography and the motion picture. The photograph is in one sense a popular extension of the portrait, for recognition and for record. But in a period of great mobility, with new separations of families and with internal and external migrations, it became more centrally necessary as a form of maintaining, over distance and through time, certain personal connections. Moreover, in altering relations to the physical world, the photograph as an object became a form of the photography of objects: moments of isolation and stasis within an experienced rush of change; and then, in its technical extension to motion, a means of observing and analysing motion itself, in new ways—a dynamic form in which new kinds of recognition were not only possible but necessary.

Now it is significant that until the period after the First World War, and in some ways until the period after the Second World War, these varying needs of a new kind of society and a new way of life were met by what were seen as specialised means: the press for political and economic information; the photograph for community, family and personal life; the motion picture for curiosity and entertainment; telegraphy and telephony for business information and some important personal messages. It was within this complex of specialised forms that broadcasting arrived.

The consequent difficulty of defining its social uses, and the intense kind of controversy which has ever since surrounded it, can then be more broadly understood. Moreover, the first definitions of broadcasting were made for sound radio. It is significant and perhaps puzzling that the definitions and institutions then created were those within which television developed.

We have now become used to a situation in which broadcasting is a major social institution, about which there is always controversy but which, in its familiar form, seems to have been predestined by the technology. This predestination, however, when closely examined, proves to be no more than a set of particular social decisions, in particular circumstances, which were then so widely if imperfectly ratified that it is now difficult to see them as decisions rather than as (retrospectively) inevitable results.

Thus, if seen only in hindsight, broadcasting can be diagnosed as a new and powerful form of social integration and control. Many of its main uses can be seen as socially, commercially and at times politically manipulative. Moreover, this viewpoint is rationalised by its description as "mass communication," a phrase used by almost all its agents and advisers as well, curiously, as by most of its radical critics. "Masses" had been the new nineteenth-century term of contempt for what was formerly described as "the mob." The physical "massing" of the urban and industrial revolution underwrote this. A new radical class-consciousness adopted the term to express the material of new social formations: "mass organisations." The "mass meeting" was an observable physical effect. So pervasive was this description that in the twentieth century multiple serial production was called, falsely but significantly, "mass production": mass now meant large numbers (but within certain assumed social relationships) rather than any physical or social aggregate. Sound radio and television, for reasons we shall look at, were developed for transmission to *individual* homes, though there was nothing in the technology to make this inevitable. But then this new form of social communication—broadcasting—was obscured by its definition as "mass communication": an abstraction to its most general characteristic, that it went to many people, "the masses," which obscured the fact that the means chosen was the offer of individual sets, a method much better described by the earlier word "broadcasting." It is interesting that the only developed "mass" use of radio was in Nazi Germany, where under Goebbels' orders the Party organised compulsory public listening groups and the receivers were in the streets. There has been some imitation of this by similar regimes, and Goebbels was deeply interested in television for the same kind of use. What was developed within most capitalist societies, though called "mass communication," was significantly different.

There was early official intervention in the development of broadcasting, but in form this was only at a technical level. In the earlier struggle against the development of the press, the State had licensed and taxed newspapers, but for a century before the coming of broadcasting the alternative idea of an independent press had been realised both in practice and in theory. State intervention in broadcasting had some real and some plausible technical grounds: the distribution of wavelengths. But to these were added, though always controversially, more general social directions or attempts at direction. This social history of broadcasting can be discussed on its own, at the levels of practice and principle. Yet it is unrealistic to extract it from another and perhaps more decisive process, through which, in particular economic situations, a set of scattered technical devices became an applied technology and then a social technology.

A Fascist regime might quickly see the use of broadcasting for direct political and social control. But that, in any case, was when the technology had already been developed elsewhere. In capitalist democracies, the thrust for conversion from scattered techniques to a technology was not political but economic. The characteristically isolated inventors, from Nipkow and Rosing to Baird and Jenkins and Zworykin, found their point of development, if at all, in the manufacturers and prospective manufacturers of the technical apparatus. The history at one level is of these isolated names, but at another level it is of EMI, RCA and a score of similar companies and corporations. In the history of motion pictures, capitalist development was primarily in production; large-scale capitalist distribution came much later, as a way of controlling and organising a market for given production. In broadcasting, both in sound radio and later in television, the major investment was in the means of distribution, and was devoted to production only so far as to make the distribution technically possible and then attractive. Unlike all previous communications technologies, radio and television were *systems primarily devised for transmission and reception as abstract processes, with little or no definition of preceding content*. When the question of content was raised, it was resolved, in the main, parasitically. There were state occasions, public sporting events, theatres and so on, which would be communicatively distributed by these new technical means. *It is not only that the supply of broadcasting facilities preceded the demand; it is that the means of communication preceded their content.*

The period of decisive development in sound broadcasting was the 1920s. After the technical advances in sound telegraphy which had been made for military purposes during the war, there was at once an economic opportunity and the need for a new social definition. No nation or manufacturing group held a monopoly of the technical means of broadcasting, and there was a period of intensive litigation followed by cross-licensing of the scattered basic components of successful transmission and reception (the vacuum tube or valve, developed from 1904 to 1913; the feedback circuit, developed from 1912; the neutrodyne and heterodyne circuits, from 1923). Crucially, in the mid-1920s, there was a series of investment-guided technical solutions to the problem of building a small and simple domestic receiver, on which the whole qualitative transformation from wireless telegraphy to broadcasting depended. By the mid-1920s—1923 and 1924 are especially decisive years—this breakthrough had happened in the leading industrial societies: the United States, Britain, Germany and France. By the end of the 1920s the radio industry had become a major sector of industrial production, within a rapid general expansion of the new kinds of machines which were eventually to be called “consumer durables.” This complex of developments included the motorcycle and motorcar, the box camera and its successors, home electrical appliances, and radio sets. Socially, this complex is characterised by the two apparently paradoxical yet deeply connected tendencies of modern urban industrial living: on the one hand mobility, on the other hand the more apparently self-sufficient family home. The earlier period of public technology, best exemplified by the railways and city lighting, was being replaced by a kind of technology for which no satisfactory name has yet been found: that which served an at once mobile and home-centred way of living; a form of *mobile privatisation*. Broadcasting in its applied form was a social product of this distinctive tendency.

The contradictory pressures of this phase of industrial capitalist society were indeed resolved, at a certain level, by the institution of broadcasting. For mobility was only in part the impulse of an independent curiosity: the wish to go out and see new places. It was essentially an impulse formed in the breakdown and dissolution of older and smaller kinds of settlement and productive labour. The new and larger settlements and industrial organisations required major internal mobility, at a primary level, and this was joined by secondary consequences in the dispersal of extended families

and in the needs of new kinds of social organisation. Social processes long implicit in the revolution of industrial capitalism were then greatly intensified: especially an increasing distance between immediate living areas and the directed places of work and government. No effective kinds of social control over these transformed industrial and political processes had come anywhere near being achieved or even foreseen. Most people were living in the fall-out area of processes determined beyond them. What had been gained, nevertheless, in intense social struggle, had been the improvement of immediate conditions, within the limits and pressures of these decisive large-scale processes. There was some relative improvement in wages and working conditions, and there was a qualitative change in the distribution of the day, the week and the year between work and off-work periods. These two effects combined in a major emphasis on improvement of the small family home. Yet this privatisation, which was at once an effective achievement and a defensive response, carried, as a consequence, an imperative need for new kinds of contact. The new homes might appear private and “self-sufficient” but could be maintained only by regular funding and supply from external sources, and these, over a range from employment and prices to depressions and wars, had a decisive and often a disrupting influence on what was nevertheless seen as a separable “family” project. This relationship created both the need and the form of a new kind of “communication”: news from “outside,” from otherwise inaccessible sources. Already in the drama of the 1880s and 1890s (Ibsen, Chekhov) this structure had appeared: the centre of dramatic interest was now for the first time the family home, but men and women stared from its windows, or waited anxiously for messages, to learn about forces, “out there,” which would determine the conditions of their lives. The new “consumer” technology which reached its first decisive stage in the 1920s served this complex of needs within just these limits and pressures. There were immediate improvements of the condition and efficiency of the privatised home; there were new facilities, in private transport, for expeditions from the home; and then, in radio, there was a facility for a new kind of social input—news and entertainment brought into the home. Some people spoke of the new machines as gadgets, but they were always much more than this. They were the applied technology of a set of emphases and responses within the determining limits and pressures of industrial capitalist society.

The cheap radio receiver is then a significant index of a general condition and response. It was especially welcomed by all those who had least social opportunities of other kinds; who lacked independent mobility or access to the previously diverse places of entertainment and information. Broadcasting could also come to serve, or seem to serve, as a form of *unified* social intake, at the most general levels. What had been intensively promoted by the radio manufacturing companies thus interlocked with this kind of social need, itself defined within general limits and pressures. In the early stages of radio manufacturing, transmission was conceived before content. By the end of the 1920s the network was there, but still at a low level of content-definition. It was in the 1930s, in the second phase of radio, that most of the significant advances in content were made. The transmission and reception networks created, *as a by-product*, the facilities of primary broadcasting production. But the general social definition of “content” was already there.

This theoretical model of the general development of broadcasting is necessary to an understanding of the particular development of television. For there were, in the abstract, several different ways in which television as a technical means might have been developed. After a generation of universal domestic television it is not easy to realise this. But it remains true that, after a great deal of intensive research and development, the domestic television set is in a number of ways an inefficient medium of visual broadcasting. Its visual inefficiency by comparison with the cinema is especially striking, whereas in the case of radio there was by the 1930s a highly efficient sound broadcasting receiver, without any real competitors in its own line. Within the limits of the television home-set emphasis it has so far not been possible to make more than minor qualitative improvements. Higher-definition systems, and colour, have still only brought the domestic television set, as a machine, to the standard of a very inferior kind of cinema. Yet most people have adapted to this inferior visual medium, in an unusual kind of preference for an inferior immediate technology, because of the social complex—and especially that of the privatised home—within which broadcasting, as a system, is operative. The cinema had remained at an earlier level of social definition; it was and remains a special kind of theatre, offering specific and discrete works of one general kind. Broadcasting, by contrast, offered a whole social intake: music, news, entertainment, sport. The advantages of this

general intake, within the home, much more than outweighed the technical advantages of visual transmission and reception in the cinema, confined as this was to specific and discrete works. While broadcasting was confined to sound, the powerful visual medium of cinema was an immensely popular alternative. But when broadcasting became visual, the option for its social advantages outweighed the immediate technical deficits.

The transition to television broadcasting would have occurred quite generally in the late 1930s and early 1940s, if the war had not intervened. Public television services had begun in Britain in 1936 and in the United States in 1939, but with still very expensive receivers. The full investment in transmission and reception facilities did not occur until the late 1940s and early 1950s, but the growth was thereafter very rapid. The key social tendencies which had led to the definition of broadcasting were by then even more pronounced. There was significantly higher investment in the privatised home, and the social and physical distances between these homes and the decisive political and productive centres of the society had become much greater. Broadcasting, as it had developed in radio, seemed an inevitable model: the central transmitters and the domestic sets.

Television then went through some of the same phases as radio. Essentially, again, the technology of transmission and reception developed before the content, and important parts of the content were and have remained by-products of the technology rather than independent enterprises. As late as the introduction of colour, "colourful" programmes were being devised to persuade people to buy colour sets. In the earliest stages there was the familiar parasitism on existing events: a coronation, a major sporting event, theatres. A comparable parasitism on the cinema was slower to show itself, until the decline of the cinema altered the terms of trade; it is now very widespread, most evidently in the United States. But again, as in radio, the end of the first general decade brought significant independent television production. By the middle and late 1950s, as in radio in the middle and late 1930s, new kinds of programme were being made for television and there were very important advances in the productive use of the medium, including, as again at a comparable stage in radio, some kinds of original work.

Yet the complex social and technical definition of broadcasting led to inevitable difficulties, especially in the

productive field. What television could do relatively cheaply was to transmit something that was in any case happening or had happened. In news, sport, and some similar areas it could provide a service of transmission at comparatively low cost. But in every kind of new work, which it had to produce, it became a very expensive medium, within the broadcasting model. It was never as expensive as film, but the cinema, as a distributive medium, could directly control its revenues. It was, on the other hand, implicit in broadcasting that given the tunable receiver all programmes could be received without immediate charge. There could have been and can still be a socially financed system of production and distribution within which local and specific charges would be unnecessary; the BBC, based on the licence system for domestic receivers, came nearest to this. But short of monopoly, which still exists in some state-controlled systems, the problems of investment for production, in any broadcasting system, are severe.

Thus within the broadcasting model there was this deep contradiction, of centralised transmission and privatised reception. One economic response was licensing. Another, less direct, was commercial sponsorship and then supportive advertising. But the crisis of production control and financing has been endemic in broadcasting precisely because of the social and technical model that was adopted and that has become so deeply established. The problem is masked, rather than solved, by the fact that as a transmitting technology—its functions largely limited to relay and commentary on other events—some balance could be struck; a limited revenue could finance this limited service. But many of the creative possibilities of television have been frustrated precisely by this apparent solution, and this has far more than local effects on producers and on the balance of programmes. When there has been such heavy investment in a particular model of social communications, there is a restraining complex of financial institutions, of cultural expectations and of specific technical developments, which though it can be seen, superficially, as the effect of a technology is in fact a social complex of a new and central kind.

It is against this background that we have to look at the development of broadcasting institutions, at their uses of the media, and at the social problems of the new technical phase which we are about to enter.

21. [Introduction] From Computer Lib / Dream Machines

Computer Lib / Dream Machines is the most important book in the history of new media.

Nelson's volume is often called the first personal computer book, probably because it arrived shortly before the first personal computer kit (the Altair) and was later recognized to have predicted the effects of its coming. This, however, was only one of the many visions, prescient and influential, offered in the volume.

Computer Lib / Dream Machines is a Janus-like codex that joins two books back to back; in the middle, the texts of the two bound-together books meet. The "Computer Lib" side, its cover featuring a raised fist with a computer in the background, didn't simply predict that personal computers were coming, but effectively challenged the popular notion of what computers were for, at a fundamental level. As Stewart Brand wrote in his foreword to the 1987 edition, Ted Nelson is "accurately depicted as the Tom Paine of the personal-computer revolution. His 1974 tract, *Computer Lib / Dream Machines*, had the same effect as Paine's *Common Sense*—it captivated readers, informed them, and set them debating and eventually marching, rallying around a common cause many of them hadn't realized was so worthy or even a cause before. . . . The enemy was Central Processing, in all its commercial, philosophical, political, and socio-economic manifestations. Big Nurse." Nelson's book raised the cry, "Down with Cybercrud!" He exhorted his readers to defy the computer priesthood, and its then-leader IBM, and to never accept, "The computer doesn't work that way" as an answer again. "Computer Lib" was in writing what the Altair and Apple II became in engineering; an artifact that destabilized the existing computer order, that brought about a conception of the computer as a personal device.

The volume's other side, "Dream Machines," had even greater significance for new media's development. Nelson wrote in the "Dream Machines" introduction, "Feel free to begin here. The other side is just if you want to know more about computers, which are changeable devices for twiddling symbols. Otherwise, skip it." He wrote this believing his most essential message was not about computers, but about media and design. He believed the importance of computers lay not in their capacity for calculation, but in the fact that they would enable new generations of media. In the pages that followed, Nelson reported on some of the most important work in new media up to that time, such as that of Doug Engelbart (008, 016) and Ivan Sutherland (009), and set forth his own unique twofold vision.

First, he argued that computer experiences were media to be designed, and that this design should be both a creative process and undertaken with the audience (users) in mind. His most stirring essay on the subject ("Fantics") is reprinted here, along with a small selection of Nelson's own designs. These are founding documents for the field now called human-computer interaction. They caused Nelson's book to be passed around, borrowed, stolen, and made a totemic object in early new media businesses. One former Apple Computer designer tells the story of having a copy of *CL/DM* placed in her hand the first day she reported for work.

Second, Nelson proposed that these new, designed media experiences be placed in a radical, open publishing network. A network that supported the reconfiguration, comparison, and interconnection of his 1965 hypertext proposal (011), in addition to complex version management and powerful user interface conventions. In pages reprinted here, he envisions the resulting explosion of knowledge radically altering the daily experiences of everyone from students to scientists. This vision and the project to realize it—Xanadu—made Nelson the butt of jokes for 20

Mitch Kapor, Designer of Lotus 1-2-3, Cofounder of the Electronic Frontier Foundation:

I spent a lot of the early 1970's prowling around the bookstores and newsstands of Harvard Square. By day, I was a very junior computer programmer and occasional teacher of Transcendental Meditation. I stumbled upon *Computer Lib* on a nocturnal excursion and was instantly bewitched. Here was a man who dreamed my dreams before I did, who gave voice to a radically different concept of computers as other than giant calculating machines. *Computer Lib* inspired me as no other book has before or since and sustained me over the next few years until I bought my first Apple II. It pointed me in the direction of a career in the as-yet then-uninvented field of personal computers. For which I am eternally grateful.