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ABSTRACT

The communication satellite already has developed a mature technology. It carries a substantial part of the world's long range communication, and is now useable for special cultural and educational purposes. Major cultural effects come from its contribution to increasing enormously the flow of information in the world. It will increase human dependence upon media and bring about shifts in power related to control of information. There will be more contact between cultures, changes in ways of perceiving reality, and significant new trends in socialization. The technology is now available to permit individuals and small organizations to participate actively in special uses of communication satellites which will happen only if we make them happen, among them: changing the communication environment, combating remoteness, creating new networks for useful information, serving special groups and needs, substituting communication for transportation in certain situations, making the performing arts more widely available, and innovations in learning and teaching. Lessons learned from early uses of satellites warn of some difficulties, but space communication remains ready for challenging and important uses. This paper includes an annotated bibliography. (Author/WBC)

CULTURAL EFFECTS AND USES OF COMMUNICATION SATELLITES

Some Notes for Educators

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CONTENTS

Abstract

The communication satellite, less than 20 years old, already has developed a mature technology, carries a substantial part of the world's long-range communication, and is now usable, at relatively low cost, for special cultural and educational purposes. It is, of course, a delivery system, and extender of media and information services, rather than a medium itself. Its strengths are its ability to deliver messages over a very large area without the cost increasing much with distance; handle either one- or two-way communication; talk any symbolic language that can be coded electronically; and carry information point-to-point, distributively, or directly to users. Major cultural effects come from its contribution to increasing enormously the flow of information in the world (even to the point of threatening serious overload). It will increase human dependence upon media and bring about shifts in power related to control of information. There will be more contact between cultures, changes in ways of perceiving reality, and significant new trends in socialization. Most of us will participate in these developments only as consumers; they will happen whether or not. The technology is now available, however, to permit individuals and small organizations to participate actively in special uses which will happen only if we make them happen. Among these: changing the communication environment, combating remoteness, creating new networks for useful information, serving special groups and needs, substituting communication for transportation in certain situations, making the performing arts more widely available, and taking a new look at learning and teaching. A summary of lessons learned from early uses of satellites warns of some difficulties. But the conclusion remains that space communication is ready for some challenging and important uses, if we are.

A NOTE ON OBJECTIVES

This paper is intended for educators, scholars, and planners who are considering innovative social uses of communication satellites.

"Culture" is therefore defined in broad social terms to mean the designs for living, the values and understandings, the patterns of organization that exist as "guides for the behavior of men," to paraphrase Clyde Kluckhohn (Kluckhohn and Kelly, 1945). It includes but is not limited to the part of culture represented by the arts, and the part represented by education. It is not intended to be a treatise either on culture or on the technology of satellites, inasmuch as both those subjects are far too large for the pages available to us, and in any case it can be assumed that anyone planning to use the satellite for cultural purposes already knows something about culture and where to find out what he still needs to know, and also where to go for the sophisticated guidance he may need on the technology of space communication. Rather, the paper is centered on the area where space communication meets human culture, the results that are likely from that collision, and the results we may be able to bring about by using the relationship in our interest.

Although the following pages are concerned with cultural effects and uses of space communication, rather than with technologies, in order to think of satellites as social instruments it is helpful to understand something about their characteristics as electronic instruments. For this reason the pages immediately following will seek to provide some elementary information on what a communication satellite is and what it can do. The paper will then turn to the cultural effects of communication satellites to the extent that they are predictable -- that is, the cultural fallout from the very large

contribution of space communication to information flow in the world, already visible in telephone and telegraph service, expansion of the broadcast media, and data transmission. These services represent the most obvious and commercially viable ways to use a communication satellite. But a different kind of use is coming into being, innovative rather than obvious, specialized rather than mass, mostly at low rather than high cost. A section of the paper will deal with this latter type of use that is quite feasible electronically but still in the stage of early experiment. For the guidance of educators or planners who are thinking of experimenting with these unorthodox uses that are attractive socially in every way except perhaps commercially, the final section of this paper sums up some of the lessons already learned from innovative uses of satellites and from related experiments using systems other than satellites for the transmission of information.

WHAT IS A COMMUNICATION SATELLITE

A communication satellite is essentially an electronic relay flying a controlled orbit around the earth. It picks up a signal from any point on earth that can "see" the satellite, and relays it -- passes it on -- to any point or points the satellite can "see." As a matter of fact Arthur Clarke's now well-known article in the October 1945 issue of the British journal Wireless World that first conceptualized the communication satellite, was entitled "Extraterrestrial Relays." Clarke suggested a satellite that would be put into orbit 22,300 miles above the equator so that its centrifugal force would closely balance the gravitational attraction of the earth, and its speed would correspond to the earth's speed of rotation. Thus it would seem always to stand still above a certain point on the map. This is exactly what has been done with the modern synchronous satellite, but even Clarke had no idea it would be accomplished so soon. In February, 1945, in a letter to the same journal, he had mentioned the possibility of a communication satellite, and remarked that it was "a possibility of the more remote future -- perhaps half a century ahead." Later he recalled wryly that even with that cautious estimate he was "bravely risking ridicule, predicting communication satellites by 1995!" (Unesco, 1970, p. 49). He was caught as much by surprise as were other scientists when the transistor was invented in 1947 and made possible the miracles of miniaturization in space communication, and when both the Soviet Union and the United States decided to make a major effort to put man into space. Consequently the rate of development of space communication has been truly extraordinary.

Instead of 50 years it was only 12 from Clarke's article to the first man-made satellite (the Soviet Sputnik I, in 1957), 15 years to the first active repeater satellite

(the U.S. Courier, in 1960), 18 years to the first synchronous satellite (the U.S. Syncom, in 1963). Compare this with the history of television, for which a complete system was patented in Germany in 1884, and a system very much like present television was described fully in print in 1904; but the first television broadcasts were not made until 1926, the first regularly scheduled broadcasts in 1935, and the first wide use only in the late 1940's -- more than 60 years from that first patent. The first satellites of a world-wide communication system (Intelsat) were up in 1965, just 20 years after Clarke's article. Within six years after that, the capacity of the Intelsat satellites had increased, and the cost per circuit had decreased, by an order of magnitude each. The first synchronous satellites were designed to last 1 to 2 years; six years later the expected life was 7 years; and within the next decade reusable spacecraft are expected to be available to launch, assemble, refuel, repair, and if necessary remodel communication satellites so that their lives can in theory be as long as we want to keep them.

The importance of this history is that the rate of development has far outrun our ability to use the new communicating machines for anything except the most obvious social purposes. Principally they have been used to supplement the long-lines capabilities of the world's telephone and telegraph systems.

A communication satellite, of course, is an information delivery system rather than a mass medium. It is a high tower without legs. It is to a mass medium as a printing press is to a newspaper, or transmitters and towers to a radio network. That is to say, as media extend men, so can the satellite extend media. It starts and ends with the communication content of telephone, telegraph, television, radio, telex,

facsimile, digital data, computer assisted instruction, and so forth. It accepts the electronic signals representing any of these media, amplifies them, and passes them on.

Obviously, satellites are very "big" technology, and they have been used for "big" tasks. Only recently has there been much interest in exploring their uses for smaller and more special purposes. This has been stimulated by NASA's launching of three Applications Technology Satellites (the ATS-1, ATS-3, and ATS-6; three others were failures). These have been made available to various organizations and countries for innovative experiments, and as a result it has been possible to move beyond the long-lines services of the Intelsat system and the Soviet Molniya satellites to such relatively specialized services as guiding a paramedic in Alaska through a problem in diagnosis or treatment, with experts a thousand miles away looking, so to speak, over his shoulder; a university in the South Pacific sharing its teachers with learning centers thousands of miles away on other islands; and a country like India using satellite transmission to bring development information to remote villages. The launching of these experimental instruments, the recent launching of a number of domestic and regional satellites (like Western Union's Westar I and II and the Canadian Anik), and the expanded capacity of the Intelsats have made circuits available for lend or lease. The development of low-cost ground stations for use with the ATS-1 and ATS-6 has brought experimentation within the capability of universities, organizations, small nations or political units. Thus with the technology relatively mature, circuits available, and a few examples of experimental use under way, the time has come to review the full cultural potential of these remarkable instruments.

In one of his evocative phrases that have challenged educators and planners ever since 1945, Clarke predicted (Unesco, 1968, p. 32) that "Ours will be the last century of the savage." That day may not be quite so close at hand as he believes, but at least we now have another chance to think about how it might be brought to reality, and in particular how we might use some of man's most remarkable technology to speed the hoped-for time.

WHAT CAN A COMMUNICATION SATELLITE DO

Before concerning ourselves with what a communication satellite does and might do socially, let us take stock of what it can do physically and electronically.

1. A satellite can deliver messages over very long distances without the cost increasing much with distance.

Ordinary long-lines costs are highly sensitive to distance. The longer a cable, the more it costs, and the more amplifiers and switching mechanisms that have to be installed along the way. The longer a microwave circuit, the more towers, receivers, amplifiers, transmitters that are required to relay the signal. Consequently charges go up with distance. Not so with satellites, which in this respect behave more like television, although with an enormous size differential. Television costs and performs about the same anywhere in its primary coverage area. Theoretically at least, it costs no more to deliver television 50 miles away than next door. But the primary coverage area of a television station is about 11,000 square miles, of a synchronous communication satellite nearly 5,000 times that large. Thus a television station can deliver a signal without extra cost from Baltimore to Washington; but an equatorial satellite can deliver a program without extra cost from Baltimore to Eastern Europe or the southern end of Latin America. If telephone charges were figured only on actual satellite costs of carrying the call, the cost of a transpacific or transatlantic call by satellite would be about the same as a short call carried by satellite in the United States. In other words, distance almost ceases to be a consideration with space communication.

The importance of this is that it frees the planner of satellite communication to think in very wide terms. He can think about serving whole countries as large as

the Soviet Union, the United States, Brazil, India, Indonesia, or China, or whole regions as large as the Pacific Basin or Europe. So far as the limits of human communication are technological rather than cultural or political, the retraints are enormously reduced. The effect is to take man up on a 22,000 mile mountain and let him see the world, speak to it, listen to it. And the consequent challenge is to raise man's sight from short-range communication to whole-world communication -- to lead him to dream of the "global village" where every man can know and talk to any of his neighbors.

2. A satellite can deliver signals over a very large coverage area or any part of it.

We have already spoken of the enormous coverage area. Some satellites are designed to scatter a signal over most or all of that area; this is what the ATS-1 was designed to do, and as a result it can be picked up throughout much of the Pacific and well into the North American continent. But a satellite can also be designed to gather its power into one or a few beams. These beams can be made steerable (as on the ATS-6 and the Canadian CTS) so that the satellite can selectively serve one or two areas and avoid others. This not only makes it easier to keep the signal from countries or areas where it is not wanted, but also concentrates the power and thus reduces the sensitivity required of the ground receiver and, consequently, the cost.

3. A satellite can handle either one-way or two-way communication.

One can make a telephone call by satellite, or relay a television program intended for one-way broadcast at distant stations. But even television can be sent two-way on a modern satellite. Thus, for example, by using light, inexpensive

cameras it was possible for an isolated medical officer in Alaska to transmit electrocardiograms or X-rays back to a hospital for expert evaluation. The experts could actually see the patient if they wished, and thus, in effect, participate in the examination. It has proved possible for teachers at the University of the South Pacific to discuss a question, two-way, with students hundreds of miles away, and for a press conference to be scheduled with, say, the head of the South Pacific Commission answering questions from reporters on islands scattered throughout the Pacific basin. It proved possible to offer computer-assisted instruction over a satellite, allowing distant students to interact with a computer at Stanford University. In other experiments, students have answered test questions, and discussion groups registered opinions, by pressing one of a group of buttons. These great possibilities of two-way use of satellites have hardly begun to be utilized.

4. A satellite can talk any symbolic language that can be expressed electronically.

It makes no difference to the satellite whether it handles television, radio, telephone, telegraph, facsimile, digital data, electronic mail, slow-scan pictures, or any other information that can be coded into electronic signals. It is the satellite's capacity that makes a difference. Thus, for example, about 240 times as much capacity is needed to relay television as a telephone call. The key question is, therefore, how much capacity is available in the communication satellite, and how best to use it for a given purpose. Even here there are opportunities that have been underused. For example, if one is willing to give up moving pictures (television and film) it is possible to transmit what some writers call an "electronic blackboard" -- pictures at the rate

of about one every few seconds like slides or overhead transparencies -- using only about as much capacity as one needs for a voice circuit. By adding one more voice channel, this can become in effect an illustrated lecture, all at about one hundredth of the capacity required by television.

5. In many cases a satellite can overcome atmospheric barriers to satisfactory reception.

In wide areas of the world even radio reception is undependable because of distance and atmospheric disturbances. For many such areas the satellite holds new hope of getting clear signals through the interference.

6. The satellite can communicate point-to-point, through a distributive center, or directly to a user.

Point-to-point satellite communication is already well established -- that is, one earth station to the satellite to another earth station. Most of the "long lines" uses of Intelsats and Molniyas are of that kind. But distributive transmissions are also entirely feasible. For example, in India the ATS-6 is being used in part to deliver programs to ground television stations which rebroadcast them through their own facilities. This is how the public television network of the United States hopes to serve viewers of the 200-plus public stations. Direct television broadcasting to home or village receivers is also possible, though not without augmenting the receiver to amplify the signals that have come so far from the satellite and to convert them into frequencies usable by the receiver. This is now being done in India and Alaska, and has been done elsewhere in the United States. A "dish" antenna seven or more feet in diameter is usually required. The cost is estimated to run from $500 to $1,500. In Alaska two-way television has proved

possible with larger antennas and transceiver installations costing in the tens of thousands. The cost of local reception of radio is considerably less than that of television, although it too requires a special antenna. The two-way radio installations of the Peacesat experiment in the Pacific averaged in the neighborhood of $2,000.

The point is that there are ways to use satellite communication, for other than "long-lines" purposes, at cost levels far below those of the Intelsats. Furthermore these costs have been coming down as the technology has developed and as people have experimented with it.

THE PROBABLE CULTURAL EFFECTS OF COMMUNICATION SATELLITES

Let us turn first to the class of effects which are likely to happen whether we intend them to or not -- that is, the effects of the enormous contribution that space communication has made to the long-distance transmission of information. So strong is this dynamic, so built into the information systems of the world, that the only way to change it substantially is to restrict the amount or the content of the information accepted. This is precisely what is happening in many countries of the world where authoritarian controls are strong. And yet even in these cases we have every reason to suspect that the results of the restriction may be partial and temporary. The tidal wave of information will not be completely held back.

We are in the early years of a period that historians may well call an Age of Information, when the flow of information in the world will so greatly increase as to create a serious overload unless we can take care of it with computers and related expertise and institutions. Much of this information will come from far away; distance (thanks to the satellite) will become a much less crucial element in communication. And it will come faster, so fast to so many people that it may challenge the traditional information advantage of the leaders over the led.

If this is a reasonable prediction, then certain further predictions follow as to how such an Age of Information will effect human culture:

1. It will bring different cultures and sub-cultures into contact to an unprecedented degree.

2. It will require every culture to handle information as a major component of power and change.

3. It will clothe certain information institutions within the culture, notably the mass media and particularly the electronic mass media, with a kind of "reality" comparable in importance to face-to-face reality.

4. It will challenge every culture to re-examine the institution of information by means of which it socializes new members and reinforces the values, beliefs, and behaviors of the society -- the education system.

We can agree with general statements like these simply on the basis of what we now see happening around us. But to do so is not necessarily to agree on the specific cultural effects that are likely to occur as a result of the trends we observe. The evidence on these more specific effects is still largely in the future. Therefore, let us look a little harder at them.

1. More contact between cultures

Once when I was teaching at Stanford I assigned a series of background readings on primitive cultures, including one on a tribe where cannibalism was practiced. A prim little lady who was visiting the class read a few pages of that book, closed it gently, and said quite firmly to the librarian, "I don't really want to know any more about this tribe!"

We have had the experience during the last few years of seeing a war on the television screen in our living rooms. To most of us the experience was troubling, to some deeply disturbing. It did not fit with our image of America overseas or of wholesome American boys. What was on the screen often clashed with what we heard from the national government.

This is a forecast of things to come. Already we are coming to know vastly more about distant peoples like the Khmers, the Palestinian Arabs, and the Angola tribes. We are learning more about our own minorities. This new learning about cultures will be indubitably interesting. It will be potentially healthful. In the short run it may be extremely uncomfortable.

We shall have to revise a number of stereotypes, just as many other peoples will have to revise their stereotypes of the United States. We shall have to review a number of policies, and often in the light of public knowledge rather than behind closed doors in Washington.

We shall have to learn to live in a world where all the protective distances have shrunk. We shall have to learn to talk with strangers, and ultimately to adjust to living close to strangers, whether we like them or not. We may have to rethink the dream of the "global village," where each man knows his neighbor and they work out problems in a neighborly spirit, for it is unfortunately true that many cultures will not want to hear much of the communication we have to send them, and will thank us to keep our hands off.

It is not easy to communicate effectively between cultures. As Edward Hall has said, culture is typically oriented toward the past rather than the future. Its task is to provide models, from experience, so that members of a given culture can have clearcut ways of relating to each other. So far as I know, no culture has developed any special skills in relating to outsiders in terms other than its own. This is especially important because so much of a culture is communicated by nonverbal, silent language. In our ow ulture we develop skills in using and understanding these

silent languages without even being consciously aware of them. In dealing with another culture, therefore, we can interpret what it communicates only in terms of our own culture, and often miss its silent languages completely.

So it is difficult to find the algorithm by which to relate an event in a strange culture to an event in our own. But it is doubly hard when we must depend so largely on cameras, microphones, and brief news items to mediate between us. One thing that troubled us most when we saw the Vietnam War played out in our living rooms was to realize that whatever we saw was highly selected. What we saw came from where cameramen happened to be, and what we heard came to no small degree from what reporters happened to be told. That famous scene of setting fire to peasants' thatched huts with cigarette lighters: was there more behind that than met the eye? Was this a common kind of event, [redacted], or a unique event? How representative of what was going on was what we saw?

We shall have to come to terms, in this new Age of Information, with the media reality of cultures we shall seldom if ever know face-to-face. We shall have to learn to live with two streams of reality: the official one, built out of government policy and political intention, and the unofficial one coming along the satellite channels and the thin wires of the news media.

On balance, an increased flow of information between cultures, especially distant cultures, is promising. It will not necessarily lead to peace and friendship, of course. India and Pakistan have had a lot of information about each other, and yet have had their fists up ever since independence. France and Germany know a great

deal about each other, and yet have fought three times in 75 years. For us an increasing flow of information of and from our Native Americans has not made relationships with them any easier or more pleasant.

And it is indeed the case that many cultures and national states do not entirely welcome the rising tide of information. A weak government is likely to find an increase in information dangerous. Insecure government, governments that operate with a caretaker philosophy, are extremely careful about who can say what on their media. It is possible, therefore, that for the time being, at least, the rising tide of information may actually result in narrowed rather than widened access to the channels of information in large parts of the world.

Also inimical to cross-cultural communication, at the present time, is the almost world-wide movement to retain cultural differences, protect them from "cultural imperialism," and thus defend cultures from change. A group of Third World journalists, meeting recently in Sweden at the invitation of the Dag Hammarskjold Foundation, lashed out bitterly at "near monopoly" over international information, the "market orientation" of transnational news and entertainment, and called for "protection of the cultures of developing countries from the transnational media of the rich countries." A great deal of this attitude coalesced, in the UN and Unesco, in an attack on direct broadcasting from satellites. This kind of satellite, able to deliver television directly to unaugmented home receivers, is not imminent. There is still time to plan and work together to insure that such an instrument will be used for the general good. But the developing countries were understandably worried about the effect of cheap entertainment and beguiling advertisements that might be showered

upon their people by the big capitalist powers who would own the satellites. It was an ideal time to make a political issue of the question and to twist the tail of the big powers, especially the biggest of them. Therefore a confrontation developed, with rigid positions on both sides -- the Communist and Third World countries opposing any television broadcast into a country without pre-censorship and consent; the United States with some timid non-voting support insisting on free speech, free flow, and unrestricted broadcasting. Doubtless the United States was unwise to press the question in that form; doubtless the other side gained nothing except emotional satisfaction. But the vote was 101-1.

So the dream of the global village, when the natural peaceful and cooperative instincts of men will take precedence over the aggressive and protective instincts of nation states, seems so near, and yet so far. Given the increasing flow of information and contact, one should expect the classical processes of borrowing and assimilation to operate. Slowly the more abrasive culture traits should be dropped, and common needs and interests emphasized. And this is the most likely outcome, over the long term. But over the short term the road to the dream of McLuhan and Clarke and Gandhi and many others, is not likely to be smooth.

2. Information as power

Anyone who visits Japan is likely to marvel at how much that country has been able to accomplish with so few natural resources except people. Without disparaging the talented, hard-working loyal Japanese people, or the many remarkable qualities of their culture, including their way of making group decisions and the values that guide their child-rearing, still it seems to an outsider that Japan is a living example of the

power of information. The unique resource of Japan is what its experts and its workers know. Given that, they became leaders in branches of science and industry they did not start, like electronics and optics. Given that, they were able to build up a bombed out country to a point where it has the second largest GNP in the world.

That is one aspect of information as power. It may well be that in the Age of Information the ability to obtain, direct, sort out, store and retrieve information may be a source of power to a country or a culture comparable to military and economic resources. This is all the more likely to be the case if the controls over natural resources are more nearly equalized. In that case, what a nation knows and can learn will help very much to distinguish the weak from the strong.

Still another aspect of information as power has to do with the redistribution of power within a culture or a state. For instance, one intriguing question is whether the effect of a greatly increased supply of information will be to narrow or widen the gap between the members of a society who are already information-rich or information-poor. Will the tendency be to equalize the distribution, or will the rich simply grow richer compared to the others? All existing evidence leads us to believe that when a new opportunity to learn is offered, the better informed are more likely to seize upon it and to learn from it. On the other hand, the curve of amount of information one can learn and store must approach an asymptote, and therefore if the supply is large enough it may indeed have an equalizing effect.

There are other questions regarding the redistribution of information within a culture. Will a flood tide of information simply become counter-productive, because it will give audiences too much to handle in a short time, and consequently disrupt their

information processing? This was Toffler's hypothesis (1970), that future shock arises from an overload -- too much, too fast -- causing people to retreat from, rather than make use of, the experience. However, Toffler may have underestimated man's biological ability to process information, and his ingenuity in organizing socially and electronically to handle an overload.

But if information overload indeed becomes a major problem, then the computer is likely to be a power center. There is good reason to expect that the computer will become the great communicating machine of the last quarter of the twentieth century, both because of its ability to handle great qualifies of information and also its ability to extend man's thinking. The ability to use it or control it will itself constitute power. A computer expert, a computer owner, will in effect know the language of powerful foreign cultures, possess keys to most of the memory banks of the world, and have a map with which to explore the far edges of the geography of knowledge. Of course, in time the computer, operating with natural languages, may become as comfortable and familiar to all of us as the telephone or the phonograph. But at least for a while it will confer a particular power on those able to work with it, and have an undoubted effect on the pattern of thinking within the culture where it is used. And if that is so, must we not then ask whether it will tend to create a two-class society -- those who cannot use computers and those who can?

Ask a modern politician about the nature of information as power, and his first reaction will probably be to talk about access to the media. An increase in political information will enable citizens to see their leaders and political candidates more often. Face-to-face contacts in political campaigns are already being replaced by

television and radio; and as personal appearances become more dangerous and demanding, media campaigning and media reporting to voters will probably take over more and more of the political process. This coin has two sides. On the one side will be an advantage for political personages who are handsome, assured, media performers. On the other, these performers will be seen in greater detail, and citizens will have more chance to observe them, hear them questioned, judge them against background material and their competition. The result might be in some cases to create and maintain political media idols, in others to build cynicism or distrust regarding some or all political figures.

The underlying assumption of the last few pages has been that knowledge is power in the sense that more information will enable members of a culture to participate effectively in governance. Will an increase in information really result in a broadening of governance? It is a fascinating possibility. There are many reports from developing countries that the spread of media and education into villages has encouraged more villages to participate in the responsibilities of governing. Can we suppose that this effect is general -- that a large amount of information will bring a significantly greater part of the population into policy making and administering? If so, are we possibly drawing toward the time when Marx's vision of the "withering away of the state" (which as yet has shown no sign of occurring either in a Communist or a Capitalist state) might at last be a realizable possibility?

3. <u>The mightier media</u>

Buckminster Fuller tells of something that happened to him when he came home one evening in the 1920's. His child ran out to meet him. "Daddy!" he called, "come here quickly and listen to the radio! A man has just flown across the Atlantic!" Fuller

said "What!" and came running. What was the significance of that, Fuller asked, and answered, that "Daddy hadn't brought home the news that day. Daddy hasn't brought home the news ever since. This was a complete change in history....[Parents] were no longer the authorities. They were listening in, too...being told by someone else what was going on" (Fuller, PTR, 1974, 2,6, p. 18).

Media have taken over that and many other functions that used to belong elsewhere. It might seem that we could not possibly envisage an environment in which the media would play larger parts than they do now. We are bathed in, massaged by, a media culture for a fantastic proportion of our time. The average child spends more than 15,000 hours with television before he finishes high school, and during that time, Liebert comments wryly (1973, p. 23), watches the violent destruction of about 13,400 persons on the TV tube. More and more studies pile up showing that people know what they learn from the media, say what the media say, want what the media want them to want.

But the evidence is that the media can occupy still larger places in our lives, especially as our leisure time stretches out longer. For instance, a remarkable study by Robinson (Television and Social Behavior, 1972, II, 410 ff.) containing samples of viewers in 11 countries, found that television is unequaled as a thief of time. Whereas owners of automobiles, in Robinson's samples, spend only about 8 per cent more of their time on transportation than non-owners, when television is introduced a viewer increases his media time by 58 per cent!

Suppose that the media do indeed bulk even larger in the Age of Information. Will they contribute more to knowledge of different cultures and faraway places, or

only to the opportunity to live in fantasy? The outlook is not too promising. For example, the newspapers who have been most successful in adding to circulation during the last decade have typically relied upon features and a "daily magazine" approach for their gains. The commercial television networks have been far less successful in increasing their audiences for public affairs than for professional football and violent drama.

What will they contribute to high culture as compared to low? Here again the outlook is not too good. The electronic media have distinguished themselves more by their contribution to popular music, serial drama, and music hall dancing than to classical music, serious drama, and ballet. Yet all those kinds of high culture are represented occasionally, on the networks, and it might be that, given more information, more channels, there might be more placesto present the best in art as well as the most broadly popular.

The most fascinating question of probable media effect is the effect on thinking and learning about environment. For example, events now pass through the media at incredible speed. One hears many stories but not much of any of them; he remembers few and loses track of others in mid course. Will this contribute to better-informed people or to superficial attitudes toward public problems? On the one hand we can expect people to find out more quickly what is happening in the world; on the other hand, when events and persons pass him by so quickly, and problems will be so little detailed and followed up, will the residue be not a systematic map of environment but rather a flashing kaleidoscope?

It is very likely that mediated reality testing, "hearing it" on radio, "seeing it" on television, "attending" an event through the media, will increasingly be accepted as a substitute for being there personally or talking to a trusted friend who has been there. If this is the case how will media reality blend, in one's mind, with face-to-face reality. And what standards of reporting will be required of newsmen and observers?

When information comes so fast, will skepticism be abandoned, or will new ways be found within a culture to check out the new information? For an individual this is a matter of integrity and trust; for a government or a large business it may be a matter of survival. Traditionally, governments and businesses have had swifter channels of information than the general public, and have benefited from lead time, to check, to consider a problem before it becomes publicly known, and to prepare a response. However, we are nearing the time when public channels may operate almost as swiftly as commercial or official ones. What new methods can large organizations develop to verify information before a public response has to be made? And how about the rest of us who will be -- already are being to some extent -- bombarded by a swift hurricane and fact, fiction, rumors, and feature? How are we going to separate out the rumors and the fiction? If the problem is already difficult, it can only grow more difficult.

We have been talking about the probable effects of increased media information on our ways of thinking and perceiving. There will undoubtedly be direct effects on behavior as well. For example, to what extent are we likely to use information to substitute for transportation, media to replace travel. We already use an electronic purse to pay our bills. Will efficient ways be found to shop by phone -- videophone,

probably? Will we find ourselves administering branch offices or factories by media, rather than by travel? What effect will such developments have on the placement of homes in relation to factories and offices, and on a topic to which we shall return later, the nature of the city and the suburb?

4. The institution of socialization

Sampling the adjectives applied in public print or private speech to our educational system usually yields two clusters -- old fashioned, too academic, conservative, self-protective, too concerned with fundamentals, resistant to change, and the like; or, too progressive, egg-headed, too little concerned with fundamentals, undisciplined, impractical, and so forth. Yet neither list squares with what we see around us in the world.

There are signs of a ferment in education. Whatever prime mover is responsible, we are surrounded by extraordinarily varied and open learning opportunities. The trends that are becoming visible are neither particularly in the direction of progressivism or conservatism; rather, they are aimed at offering more opportunities to learn more things, at more levels, under more conditions, to more people. This is precisely what we might expect of an Age of Information.

What are the trends? These, among others:

a. Offering a larger proportion of education outside school.

-- In the developing areas of the world the topic of highest interest is non-formal education -- study outside school, with a curriculum designed to meet local needs, usually with local or volunteer teachers. In the economically developed world nothing has caught the imagination of educators and planners more than the open uni-

versities and schools, of which about 50 are now in operation. The flagship of that fleet is the British Open University which teaches 50,000 students and is, by any reasonable standard, a distinguished university. In addition to these activities, somewhere in the neighborhood of 200 million people are believed to be studying by correspondence or in commercially operated, nonacademic schools. The city of Tokyo, alone, has 500 such schools.

b. Extending educational opportunities throughout most of life.

-- In 20 years of military service, for example, a serviceman can now expect to be assigned to four or five different service schools as the times come for him to take on new responsibilities and learn new skills. Many large industries maintain continuing retraining programs. Professions like medicine and dentistry offer fairly continuous refresher courses. Many universities cooperate with these programs. One example: Stanford University televises advanced engineering courses into nearby industries and research laboratories, where students, who are granted time off from work, have a radio talkback link to ask questions of the instructor. Several hundred universities offer extensive programs of courses at night or on weekends, and some of these courses are free to persons over 60 or 65. Increasingly, consortiums of universities are being formed to offer home study courses by open-circuit broadcast, and they look forward to the coming of cable with its many channels, some of which will surely be for education.

c. Combining work and study in a flexible pattern.

-- Some countries, China for example, require every student to work for a time before being considered for entrance into a university. A number of schools in

many countries combine work with study; in the United States at the present time more students in higher education are reported to be studying part-time than full-time. There is a considerable trend toward moving away from the pattern of spending 12 consecutive years, beginning at age 6 or 7, in school.

d. Emphasis upon opportunities for individual study with or without the help of technology.

-- A very large number of universities now permit students to help design their own programs and study by themselves wherever the best place for that study is. Most universities and colleges will give credit, by examination, for what a student has learned in a job or private study. New technology is being adapted more and more to individual learning opportunities. For example, the Plato system offers computer-assisted instruction at several hundred terminals throughout the state of Illinois.

Whether these trends are early effects or merely foreshadowing of the Age of Information is beside the point. Rather, the point is that they will play an important part in that Age, and as this role develops we may expect communication satellites to play their part in it.

WHAT MIGHT A COMMUNICATION SATELLITE BE USED FOR

We have been talking about the great wave of information which is beginning to break on us, thanks to communication satellites. As we have said, we can't do much about *this* wave except as consumers. Therefore, let us talk about the kind of use of satellites we can do something about: the smaller uses, the less expensive, less complex systems that have been made possible by the development of low-cost ground terminals and the choice of specific rather than general goals. The technology is ready, as has been pointed out. The question is whether we are ready -- whether we can be imaginative and resourceful enough to take advantage of the opportunity.

What follows is not a catalogue of what might be done, but rather a few suggestions and examples.

1. Can we use the satellite to create a communicative rather than a media environment?

Before defining "a communicative environment," let us look at an example of one. Here is a transcript of a conversation that took place a few years ago on Peacesat. The speakers were students in the upper elementary grades in Wellington, New Zealand, Honolulu, Hawaii, and two villages in Alaska -- vastly different cultural and geographic settings, but all with access to ground terminals of the small Pacific satellite. They had been studying each other in textbooks. But for an hour or so, they had a chance actually to talk with each other, with people their own age in the other cultures. This is a part of what they said:

(Hawaii to Alaska). I'd like to know how many hours of sunlight you have a day.

(Point Barrow, Alaska). I'll tell you a little bit about what it's like up here today. There's no sun. It's pitch black outside. The temperature is about zero. We're in another medical epidemic. If you haven't heard, about two months ago we had a hepatitis epidemic. Now we're starting to go around with the flu. Right now students are watching Electric Company on television and Bill Cosby is teaching the Easy Reader. Our students can watch closed-circuit cable television....although the only programming we're offering now is Electric Company...

(Wellington, New Zealand). What sort of animal life can you find around the place where you live?

(Beaver, Alaska). In the winter and summer we hunt moose and wolf. In the summer the people of the interior hunt black bears and brown bears. Also in the winter we trap furs...The places have wolves. Lynx are worth $100 to $150. Wolves are worth $100 to $170. We also trap foxes, b rtons, minks, and weasels.

(Hawaii). Have any of you ever been frightened by a bear when you go hunting?

(Beaver). Mostly the bears run from humans.

(Wellington). Do you live in log cabins in Beaver?

(Beaver). Every house in Beaver is a log cabin except the school.

(Wellington). What's the size of Beaver and the population there?

(Beaver). We have a hundred people and about thirty houses at the top, and the town is about two miles long.

(Wellington). I'd like to know what chores you do around the house for your parents.

(Barrow). The boys bring in the ice so we can have water in the house. The girls do the dishes, sweep the floor, and make their beds.

(Wellington). Is life in Hawaii really as we see it on TV in Hawaii 5-0?

(Peacesat Project: Early Experience, 1975, appendix).

The conversation went on at a high level of interest. The Honolulu students said that Hawaii looked the way it looks on "Hawaii 5-0," but 5-0 is a show! They talked about how people really lived in Hawaii, and in New Zealand, and in Alaska. They got around to business, government, and schools. They talked about how young people have dates in the different places. They could have gone on for a very long time. And even if the facts they learned were available elsewhere, still this exchange was clearly a memorable experience.

For the most part, of course, our media environment is what McLuhan calls a "massage." It is one-way. It is for a general audience. It is largely background or diversion. It is to our culture as wall paper is to our houses.

The conversation between school children in New Zealand, Hawaii, and Alaska was something quite different from that. It was two-way. It was purposive. It was the exchange of messages, not massages. And this is what Edward Ploman means by a "communicative environment" as opposed to a "media environment." The phrase comes from Ploman's article in the Journal of Communication (1975, 25,2, p. 97). He is talking about using our communication technology, rather than being used by it: actively participating in it, actively employing it to communicate with other people or other cultures. Only a decade or two ago, it would have seemed extraordinary to think of individuals or small groups actually participating in technology as large as the communication satellite, and yet this is the possibility brought about by the growth of technology and the application of human imagination.

It hardly needs saying that the transformation of a media environment in part into a communicative environment would be a basic and important change in culture and

open the way for individuals and small groups to make a contribution to their culture. A large number of the examples suggested in this section of the paper are that type of use of satellites. Readers will be able to think of many others.

It may be worth noting that even the example we have given is subject to endless variation. For example, somewhat the same kind of thing was done in 1968 by satellite television (the Peacesat exchange was by radio). A French language class in a West Bend, Wisconsin high school talked with an English language class in a lycée in Paris. The Wisconsin students spoke French; the Paris students, English. Dieuzeide describes it: "The programme lasted 50 minutes and took the form of a dialogue. To begin with, it was rather stiff (each speaker occupied the screen for a fairly long time and then formally handed over to another). The discussion soon became more lively. After the customary civilities, John Kitchen of West Bend, speaking in French, introduced his school and the town by means of photographs. The schoolteacher, Mr. Gumpert, also in French, outlined the progress of French teaching in his class and in Wisconsin in general. The Paris teacher, Mr. Antier, speaking in English, introduced his students and gave an account of the school's history (a camera provided various direct shots). Jean Rousseau, a student at the Lycee Henri IV, then spoke in English to defend the principle of French schooling: "Don't imagine that we spend all our time on Latin." Slight restiveness appeared on the American side: "What do you do outside school?" It was obvious that all concerned were groping toward contact with their opposite numbers outside the conventional topics suggested by the adults. Suddenly, the atmosphere became warmer; in Paris, Denis Ilovaiski raised his hand and said: "I must warn you: I am a Beatles fan." There was a roar of laughter in the American classroom and Mr. Gumpert

announced that, "Nous aussi, nous avons un Beatles fan." The laughter spread to Paris as a tall girl with a bow in her hair appeared on the screen. From Paris came the challenge: "Why do American girls scratch each other's faces and swoon over pop singers?" The girl being questioned protested. A keen, lively discussion, with no punches pulled, went on for half an hour, covering jazz, Camus, Hemingway, the age at which driving licenses should be granted, existentialism, the stage and television. The discussion was finally cut short by the end of the link-up and concluded with a chorus of "Goodbye!" "Au revoir!" The programme was not rebroadcast by the ORTF over its normal network but was broadcast and repeated in the United States on the educational network and over a certain number of commercial stations." (Unesco, 1968, p. 72)

2. Can we use the satellite to combat remoteness?

Remoteness can be geographical or psychological. The Pacific islands, the villages of Alaska and northern Canada, Siberia, the Australian "outback," the settlements in the great deserts of Africa and Asia, are remote geographically. Equally remote psychologically are the American Indians in their settlements in the western parts of the United States, the tribes in the mountains of Latin America and the Amazon basin, perhaps even the residents of inner-city ghettoes. It has often been remarked that geographically remote cultures feel more remote today than they did a hundred years ago, although transportation, tourism, and broadcasts have brought the outside world physically nearer to them. A century ago they did not really know what was "out there." Now they know enough about it to be concerned.

There is little doubt that space communication will have an effect on remoteness in the world, whether we use it for that purpose or not. Arthur Clarke is fond of reminding American audiences that the United States was created by two inventions: the railroad and the electric telegraph. Before those inventions existed it was impossible to have a country like this one; afterwards, it was impossible not to have it. All large modern states could not exist without such technology. And now history is repeating itself, he says: "What the railroad and the telegraph did to continental areas a hundred years ago, the jet plane and the communication satellite will soon be doing to the whole world." (Clarke, in Unesco, 1968, p. 52).

The question, then, is not whether space communication will combat remoteness, but rather what direction we can give that movement, how we can relate it to education and education to it. This is another challenge to innovative thinking in education, and again we shall suggest the possible nature of it not by a catalogue but by the example of one region.

A characteristic of remoteness is that remote cultures get very incomplete and uneven, often inaccurate, information rather than no information. The smaller countries of Latin America typically get far more news from the large countries of the world than from their neighboring countries. Therefore, one of the problems of education and national development alike is how neighboring countries can share their resources of information and knowledge.

The islands of the Pacific, although bound together by many common problems and experiences, have typically had more contact with their metropolitan (often ex-colonial) countries than with each other, until recently. The organization of the South

Pacific Commission, the introduction of faster travel, and the like, have done a great deal to change that. But Peacesat in the last five years has contributed enough to show what space communication might do to combat remoteness.

Peacesat, let us recall, is an informal network of twelve Pacific locations, operating with free time on the old ATS-1 satellite (courtesy of NASA), with very little money, and low-cost facilities. Terminals, however, have provided both reception and transmission for radio and, when necessary, for such visuals as X-rays and EKG's. However, the ATS-1 is a Model T compared to the ATS-6 or the Canadian CTS, and the Peacesat network is a cracker barrel operation compared, for example, to Intelsat or Molniya.

In 1971 the University of Hawaii took advantage of free time on ATS-1 to broadcast a credit course to one of the other Hawaiian islands. A senior tutor at the Wellington Polytechnic Institute, in New Zealand, had been constructing a small satellite terminal with the aid of his students. He heard voices from Hawaii and responded. The University of the South Pacific, in Fiji, was engaged in creating extension centers in some of the 11 Pacific countries it serves. The Vice-Chancellor was impressed by the though of how much satellite transmission might contribute to these centers. And thereafter the network grew swiftly, although it never has become very big or had much money to work with. From the very first, it began to share resources, building on the participants' feeling of their own needs and what they could contribute to other needs.

As a result, things like this have been going on:

-- a Professor at the University of Auckland has lectured to classes at the University of Hawaii on laws of the sea.

-- leading U.S. scientists, invited one by one to Hawaii to consider the probable shape of the world in 2020 have discussed that problem in question and answer sessions with audiences assembled in Pacific countries. The national radio service in Papua, New Guinea thought enough of the exchange that it taped and rebroadcast it to the whole country.

-- tropical agriculture extension officers on a number of islands have conferred regularly on problems of increasing food production.

-- an expert on land tenure laws at the University of the South Pacific has been sharing his knowledge of that hot topic, and answering questions from listeners, on Peacesat.

-- newsmen from six widely separated areas have been holding weekly exchanges of local and regional news, which was almost entirely unavailable on the islands before that. In Rarotonga, Cook Islands, many of the news bulletins are reproduced in a weekly mimeographed publication.

-- major poets and writers of fiction from several different cultures have exchanged and discussed their work, by satellite radio.

-- senior maternity and obstetrics nurses throughout the Pacific area have shared their different approaches to child birth and mother-child relationships.

-- participants in a seminar for agricultural information officers have "met" by satellite, several months after the seminar, to review their experiences and their second thoughts on the conclusions reached by the seminar.

The kind of thing that is going on, rather than the specific exchanges, is what is important. The countries are sharing. It is more than a two-way, it is a multi-way,

exchange. Each is seeking the information it needs, giving the information it has to give. It is therefore a healthy arrangement, and it suggests countless other acts of sharing that might be arranged to the mutual benefit of other schools, universities, cities, and nations.

3. Can we use a communication satellite to deliver specific information over long distances precisely where it is needed?

For 20 years planners and scholars have worried over how to make research findings available where and when they are needed. Harrison Brown pointed out that in 1970 35,000 scientific journals published over 2,000,000 articles, by 75,000 scientists in about 50 languages (Brown, Madrid paper, 1970, pp. 3 ff.). This output is not declining. Over 90 per cent of all the scientists who have ever published are still alive today. These figures are impressive, but they threaten a monumental glut of information, too big to summarize and too large and scattered for one user ever to bring it to bear fully on a problem.

A few fields of science, notably chemistry, medicine, and nuclear physics, have taken this seriously and have tried to put together more or less complete abstract services, many of them computerized. Certain fields have published journals of abstracts, Psychological Abstracts, for instance. The Educational Research Information Center has maintained useful abstracts on microfiche of fugitive educational reports. But all this activity comes to a test when a professional or a field worker needs an answer to a practical question, and needs it quickly.

There are a number of networks of field workers, both in developing and developed countries, who represent the resources of modern scientific research but

yet are relatively isolated from it. Health workers in remote areas are a good example; agriculture workers, another. A teacher, even in an economically advanced country, may at any time need some evidence or advice to help in treating a case of learning disability. A physician may need to know the recent evidence on the toxicity of a particular drug. A pharmaceutical laboratory may need access to recent findings on a chemical before they use it in a compound. The paramedic in Alaska may be more remote, less well served by information, but all these others also need specific information when they need it, and it must come out of an enormous mass of data which no one of them is likely to have in complete or easily usable form.

This is the information problem. No single instrument, not even the computer or the communication satellite, can solve it. There will have to be many skillful abstracters and summarizers, and "middle men" able to summarize the summaries and interpret them to fit the urgent needs of the field workers or professionals who will be applying the knowledge. Yet this is one of the great challenges to modern communication technology: how can instruments like the computer and the satellite help to get the latest information out of the laboratories and the journals, combine and package it in such a way as to make it quickly and easily usable, and deliver it swiftly to the applier who needs it? No other information service would be received with more gratitude.

For years men have dreamed of the day when the contents of the world's great libraries could be offered by printout anywhere in the world. That is still out of the question; computers simply do not have such capacity, and the mere act of computerizing the copy would be fabulously expensive. Yet some innovative thinking would help along

this line, too. Data packets can now be sent at great speed by satellite over great distances. Short of the entire contents of the Library of Congress, the British Museum, the French National Library, or the Moscow State Library, what kind of service could be provided to make printed information available where it is needed? What interconnection of libraries by satellite would share their strengths and equalize the opportunities of their users? What part of the contents of great libraries should be computerized so that they can be handled electromagnetically? As steps are taken to solve these questions, it is predictable that computers in the libraries themselves, and satellites reaching between the libraries, will probably work hand in hand with a new class of information handlers whose task will be to make information useful just as the task of scholars and writers has been to make information.

Still another promising line of innovation is making data banks of information available to qualified users. This can be done either with very complex or very simple data. At the present time, for instance, a policeman can sit in his car and check a license or a description. That hardly takes a satellite. Nor does it take a satellite to operate the "one-stop information counter," connected to many offices and records, that some local governments provide for citizens. But make the questions larger. Suppose that a research scholar or a classroom wants to query the national census, or the last several national censuses. We are undoubtedly approaching the time when the raw data of large field research projects, especially those financed by government or foundations, will be placed in a research bank available to other scholars. To what extent should data of that kind be available electronically rather than only in the form of computer printouts or protocols? And how could space communication contribute to making sources like those more readily usable?

4. Can we use a communication satellite to serve special groups and needs?

The larger a coverage area, the more cultures, interests, abilities it is likely to include, and the greater will be the difficulty of serving them all. Yet this works two ways. Although it is more difficult to serve all these groups with a single transmission, it is possible because of the wide coverage to serve groups that have common interests and needs but are too widely separated to be reached by a single ground station.

For example, universities as close as Berkeley and Stanford could share resources by ground transmissions or by travel back and forth, but a satellite would make it possible for all the campuses of the University of California, or for all the universities of a given kind in the United States, to share their teaching or research resources. Study centers and knowledge centers, research centers specializing in similar problems, clinics or hospitals with corresponding problems, state, county, or city school systems, all have reason to communicate back and forth, and much to gain by doing so on a regular basis and without time-consuming travel.

Similarly, culturally alike groups within any coverage area will probably have interests and needs more in common with each other than with culturally dissimilar groups near them. For example, information for or from black communities, Chicanos, Native Americans, Asian Americans is likely to be of interest and use to such groups within a very large coverage area. So is information to or from scholars of a given kind, chess players, members of a given union or kind of union, and many other such groups. Blind people and deaf people can be more economically served over a large area than a small one. Computer-assisted instruction, as computers grow larger, can more economically be offered over a large area. And so forth.

In other words, the satellite promises to change the boundaries in which similar information services can be offered without paying more for distance or for repetition of ground transmitters. And the development of low-cost ground terminals -- a few hundred dollars for radio receive only, a few thousands for two-way radio or television receive only, and a few tens of thousands for two-way television, with the addition of facsimile, recording, and other services costing only a little more -- makes it possible to personalize and individualize these information exchanges.

Let us take a hypothetical futuristic example. We have heard much in the last decade of "invisible colleges" -- groups of scholars or scholarly organizations who are working on the growing edge of a given problem. These groups may be no larger than 50 to 250, yet they are scattered over wide areas, and they all have a great deal to gain by keeping in close touch with each other. Suppose, now, that members of a given "college," using the satellite terminal of their universities or research organizations, should agree to transmit their research data, as soon as it is ready, to be scrutinized by other members of their invisible college. If that were the case, they would be sharing (a) much more data than would usually be available, (b) much sooner than it could come by mail or publication, and (c) short-cutting the need to publish preliminary journal reports, so that there could be fewer journals and these could be used for findings which have already passed the examination of an author's colleagues and are relatively mature and complete. It hardly need be said that the number of publications in the most active scholarly fields already constitutes both a delay and a glut on the flow of information; this might be a refreshing alternative.

5. What cultural contributions can we make by using a satellite to help substitute communication for transportation?

In a talk in Mexico, Marshall McLuhan predicted the demise of the automobile in the United States, and credited television for the demise because it "would keep people at home." This may be McLuhan hyperbole, and most people would say that if the automobile does indeed go out of existence it will be because traffic strangles itself, not because people are watching television. Yet there is some support for what McLuhan says about television in the paper by Robinson previously quoted (Television and Social Behavior, 1972) and the growing evidence on television's effect on time and living styles.

The effect of satellites on transportation is likely to be considerable both because a satellite can offer many communication services in addition to television, and because it can offer them over great distances and, given low-cost terminals, on a relatively restricted basis. For this reason most futurists have considered the substitution of communication for transportation to be one of the easily predictable trends of the next half century.

This likely development challenges us to rethink certain practices and patterns within a culture that now depend largely on transportation. One of them is meetings. How many meetings could be held by electronics rather than travel, at considerable saving of time and money? Meetings of learned societies, for example. Such meetings are fine for socializing with one's colleagues, doing the business of the organization, and looking over the young scholars, but not very good for exchange of research information. What would be the effect of replanning such scholarly meetings so that

at least the formal part of research exchange could be handled by satellite at a distance and as often during the year as seemed desirable? If this were done, would it seem less necessary to hold meetings of the whole society annually? Would there be a tendency for the research exchange to take place within smaller groups interested in special areas of the field -- as indeed, now happens in fact at annual meetings? Would such use of satellite communication reach more people who would truly benefit from hearing the presentations in a given area, whether or not they could afford to attend the annual meetings?

How about other kinds of meetings? Could not the President of the University of California or the President of the University of Hawaii meet with the top administrators of his branch campuses more often and more easily by satellite than by travel? Might surrogate travel to 10 foreign countries each school year, by satellite television, be a desirable addition to an expensive family trip to <u>one</u> or <u>two</u> foreign countries every five or ten years? None of these possibilities seems to us the kind of thing that would do away with travel, but rather would make <u>some</u> travel unnecessary, and greatly increase the amount of information that might otherwise be gained only by travel.

This kind of possibility challenges us to rethink the nature of the city and the suburb. In fact, nothing so excites futurists as the possibility that the tools may now exist to stop the slide of the city into slums. What they have in mind, of course, is that it is no longer so necessary to have a center whether business men can meet readily, or to have factories and branch offices close at hand to top administration. Such functions can be handled by communication, and, thanks to satellites, over long distances.

The effect on the city undoubtedly will be great. The precise nature of the effect -- the direction that redesigning should go -- is not so evident. Some observers think it might be possible to remove much of the industry and the traffic congestion, and thus make the city again a fit place to live. Others, like Clarke (Unesco, 1968, p. 38) feel that "Megapolis may soon go the way of the dinosaurs it now resembles in so many respects." The traditional role of the city as a meeting place is coming to an end, he says. "This century may see the beginning of a slow but irresistible dispersion and decentralization of mankind -- a physical dispersion which will take place, paradoxically enough, at the same time as a cultural unification."

Either of these scenarios for the future of the city would, of course, mean great changes in the economic structure of a society, in the structure of government and public administration, and in the kind of educational opportunities and distribution that a culture will require.

6. Can we use satellites to make the performing arts more widely available within a culture?

Visitors to the stations of All-India Radio have been startled to find large rooms in the station given over to the traditional instruments of India, and a surprising amount of time on the station devoted to the music of these instruments and to the reading of original poetry. It was a matter of national policy that broadcasting in India should help to maintain and support the traditional arts, the musicians and the poets, in order to maintain traditional culture at what was thought to be its best and brightest. When the ATS-6 was assigned to India and it was necessary to fill a number of hours a week for a number of different sub-cultures these traditional arts and ancient legends and drama did indeed prove to be very much appreciated by the audiences.

Of course, Indian broadcasting is different from our broadcasting, and Indian cultures from ours. And it is true that India itself was not able to maintain this high-culture policy unchanged against the competition of popular music broadcast over its borders; it had to put in a popular music service and support it by taking advertising. But the example leads us to ask whether there is anything we might do, especially now that satellites are becoming available, to make the best in the performing arts more readily available to American listeners and viewers.

An enormous amount of music, drama, and dance are now available on the electronic media of this country, but they are mostly the kind of art that will appeal to large numbers of people and often can be broadcast for the cost of a disc or a tape plus a small fee, and consequently make a good commercial investment. We see relatively little of the best drama, the best ballet and modern dance, the best opera, symphony, or chamber music. Furthermore, we rarely see much of the newest in these arts.

The qualities of the communication satellite that seem promising in relation to this problem are its very large capacity, and its cost being relatively independent of distance. The growth of cable systems will make a great many more channels available for homes, and the combination of a satellite for distant transmission and cable for local distribution is a very promising one.

What could be done to share more widely some of the performances of art theatres, off-Broadway theatres, local theatres, university theatres, non-Metropolitan music and dance groups, and the like? What could be done to give a hearing to new playwrights, new composers, new choreographers? [redacted] Our culture will be richer if we can find an answer.

7. Can communication satellites help us to take a new look at the relation of technology to learning and teaching?

We have already said something about the new trends that are becoming visible in education at the same time as the new technology of space communication becomes available. These developments can hardly be anything less than exciting to educators because some of the old dreams of the profession -- education available to everyone, everywhere, at any age -- seem on the verge of coming true.

The problem suggested above, however, is sometning else. Assuming that communication satellites will, or at least can, extend learning opportunities, it raises the question of what is the best way to use satellites in particular, all instructional technology in general, for that purpose.

An article by Charles A. Wedemeyer, the William H. Lighty Professor of Education at the University of Wisconsin, speaks to that question in a challenging way. Wedemeyer's position is (PTR, 1975, 3,4, pp. 15-21) that (a) education has placed too much emphasis on schooling, (b) instructional technologies have been relatively ineffective because they have been conceived as serving schools, (c) the best place to use them is out of school, and (d) the element in the process to concentrate on is the learner, wherever and whoever he is.

Needless to say, he approaches "deschooling" from a vastly different political philosophy than Ilich's. Indeed, he does not predict that there will be any fewer schools, but rather more learning outside schools; and that the kind of learning he is talking about will be best accepted in the adult field, and will "engage universities as unique resources for program development." But schools arose originally, he says,

for reasons that no longer apply. There were few teachers in the early years of schools, and learners had to be collected where the teachers were. Adults and older youths had to work and were not available for child-watching; children, therefore, had to be in groups where they could be watched. Child-watching and teaching could be combined. There was an acute shortage of books and other resources useful in teaching and learning; therefore, learners had to be brought where the learning resources were. And finally, it was more economical to carry on teaching in groups. But of these five reasons for the creation of schools, only one, he says, has any current validity. That is the need for child watching and safety.

But a strong cultural bias developed for schools, he says, and as a result

> -- Because education was identified as something that happened in schools, the [instructional] technologies were thought of as school aids.
>
> -- Because education was something which proceeded according to standard curricula, the technologies were conceived of as media for school curricula.
>
> -- Because education was something which had approved goals and rewards, the technologies were thought of as vehicles for conventional school goals and rewards.

Has this approach worked? "In my opinion," he says, "it has not. Education as schooling (despite some excellent but exceptional programs) nearly alone of all areas of human endeavor, has remained singularly aloof from the charms, powers, and benefits of communication technology. At the same time, in the larger sphere of education that lies outside of schooling, technology has had a greater impact, even though it is far indeed from reaching its potential!"

Why hasn't more been accomplished with technology outside school? For one thing, he says, "the tradition in government, public service, schools and service industries of doing things for people, making them dependent instead of helping people to do things for themselves with increased independence, self-reliance, and responsibility... always strengthens the established way of doing things, the status quo, ... the conventional." Consequently, users of instructional technology have been "fearful of the distance" that the use of media places between teacher and learner. They have failed to see the possibility of exploiting distance, freedom, independence, responsibility and choice-making. They have not seen the potential advantage of "integrating learning and living in the real community." They have neglected the rewards that come from a learner solving the problem for himself and applying the lesson to the problems around him. In other words they have gone about using technology for learning in a community just as they would go about teaching in a classroom.

What is most of all needed, he says, is a different view of the learner. That means seeing the learner as a person, wherever he is, not primarily as a pupil in school:

> "it means seeing the environment for learning as the learner and his environment wherever he is (not just the school); it means respecting the learner and letting him take responsibility, experience failures and successes so he learns and accepts his own strengths and weaknesses, and doesn't blame others for failure, or envy them for their successes, or assume success if solely the result of crooked machination; it means options of short and long duration in learning, selected by self-determination...."

The tone is reminiscent of Jacob Bronowski's statement in the last chapter of The Ascent of Man, that the long childhood of man will end only as the importance of

man as a learner is understood, and as we free ourselves from older, prescribed notions of what knowledge is and how it may be used.

The tone is very different, however, from the Big Pie in the Sky approach of Werner von Braun ("the world after the communication explosion....where the finest library is available via satellite facsimile to the remotest outpost...where Nobel Prize lecturers speak to high school classes...etc.) (Cablelines, May/June, 1975, p. 5) or Clarke ("a time is going to come when any student or scholar anywhere on earth will be able to tune in to a course on any subject that interests him, at any level of difficulty he desires...) (Unesco, 1960, p. 51). It focuses not on the technology but on the learner. It assumes that there are many humans who want to learn, who need to learn, and the majority of them are probably out of school; that their needs are probably unconventional by school standards, but that they have great energies for seeking out the knowledge they need and real-life laboratories around them in which to test it; and that we had better not spoon-feed them, but rather stimulate them to seek and find and turn them loose to succeed or fail as they will and can.

Wedemeyer would therefore answer the question, yes: this is a highly fortunate time to think again about the relation of technology to education. A considerable amount of cogent advice is now available from scholars like Gagné, Briggs, Glaser, Snow, Salomon, Lefranc, Dieuzeide, and others, and they too would say, with the coming in of potent new technology, that this is the best time to discover how to use it. But Wedemeyer challenges us to look at the fundamentals of the problem. We can hardly disagree with that.

What can we say about the potential learners who might be served by a satellite? How many are there? What do they want to learn? How can they best learn? How can we help them most effectively, and what can they do effectively themselves? When we have at least tentative answers to those questions, then we can begin to design some experiments using space technology, in what we hope will be a better way, to advance man's learning and the quality of life in our culture.

WHAT WE HAVE LEARNED ABOUT THE USE OF SATELLITES FOR SPECIAL PURPOSES

If what we have been able to say about the broad social effects of communication satellites is still in the realm of questions, what we can say about their special and particular uses is still in the realm of experiments and some of it in the realm of dreams. However, since 1968 when NASA launched the first Application Technology Satellite, a series of experiments with these instruments has contributed notably to our knowledge of how satellites can be used for social purposes other than the long-lines transmission of messages.

The three ATS instruments sill operating, the powerful new Canadian CTS (Communications Technology Satellite) and other such experimental satellites are designed to answer both social and engineering questions. For example, the CTS is intended to pioneer in the use of higher frequencies where there is more room for satellite operations, but also to try out the delivery of television to remote villages and the broadcasting of special events from transportable terminals in remote places. The ATS-1, which is the oldest experimental satellite still in active use (let us repeat some of the things we have said about it) has been used to experiment with furnishing medical advice and support to remote paramedical officers, supplemented the educational offerings of Alaskan rural schools, and in the Pacific it has provided the channels for a network in which 12 nation states or territories throughout the Pacific cooperate in conferencing, news exchange, sharing educational resources, tracing epidemics, and the like.

The ATS-6, last and most powerful of the American series, is now over India being used to bring development information by television directly to 2,400 village receivers, and indirectly to 2,600 additional receivers through distribution by regional stations. During the year before the ATS-6 was lent to India it was used in three separate groups of social experiments. In Appalachia, it was used for the inservice training of teachers, and for sharing seminars, clinics, Grand Rounds, tele-consultations, and even some computer-assisted instruction, with medical personnel. In the Rocky Mountain States, it was used to bring career education to junior high schools, inservice training of teachers, and special information to Indian, Spanish-American, and other minority communities. In Alaska it was used for primary school courses, teacher training, and medical support, including an arrangement with the University of Washington medical school which includes two-way television transmission between Seattle and points in the interior of Alaska.

In addition to what has been learned from these experiences, some lessons can be extrapolated from other media experiments not involving satellites -- for example, the major efforts to use television for educational reform in Samoa, El Salvador, Niger, and the Ivory Coast; the multimedia project in South Korea, which is using tethered balloons instead of satellites for national educational transmissions; the "Airborne" project in the American Middlewest, which broadcast instructional television from airplanes, and the like. At a conference in Indonesia, Dr. Clifford H. Block, of the U.S. Agency for International Development, summed up conclusions he felt able to derive from these experiments (Block, 1974), and in the following pages we shall draw in part upon his summary.

Based on existing experience, what kind of advice can we give future experimenters who are considering the use of satellites for education and related social purposes?

1. Examine the media options carefully and systematically. The tendency has been to opt for the glamorous media, the Big rather than the Little Media, television when radio would do, sound films when slides would do almost as well. The result has been media overkill, an unsound economic decision, removal of control over the acts and sequences of instructions from the teacher or the learner. One familiar example is the installation of six open-circuit VHF television channels to serve an educational system of 8,000 students. This decision resulted in some of the most costly ITV in the world, and lately in three of the channels being withdrawn from use. Satellite communication lends itself to this kind of overkill, and therefore must be looked at hard: Is it the best way to distribute the necessary information? Is it something that can be worked into the economic and educational growth of the using area, or merely an ornament to be displayed for a while and then abandoned or used mostly for entertainment?

2. Programming this kind of system always takes longer than expected. All the educational television experiments have gone through this experience, and the satellite uses of television and radio have followed in their path. "I have seen this phenomenon occur in many other projects throughout the world," said Dr. Block in the conference paper mentioned (Block, 1974, p. 5). "It is one of the severest factors limiting instructional quality. Time after time, plans for instructional development may include such important approaches as the careful development of learning objectives, a close articulation between the television programs and associated written materials, and,

most importantly, careful tryout and revision of the programs. But, time after time, the need to have programs taped or on the air on schedule has caused many of these essential steps to be short-circuited." The solution is to begin the planning and preparation early, and to keep the content of the program open to testing and revision.

3. A distant program of social change or learning needs a strong implementing organization. Any teaching-learning program needs an organization, but a distant program, a remote program, needs it especially. Radio rural forums on three continents, fundamental education and development programs like the Acción Cultural Popular in Colombia, development programs like the Mothers Clubs in Korea, have demonstrated over and over again the need of an implementing organization. In the Rocky Mountain part of the ATS-6 experiments, despite very generous financing it was necessary to abandon the part of the experiment that was to be conducted outside of school simply because it was too difficult, and took too much time and personnel, to organize the community groups that would have been necessary. When the University of the South Pacific used the ATS-1 satellite to share some of its teachers with learners on distant islands, it found it necessary first to organize learning centers on those islands, then to reinforce them with satellite transmissions -- not in the reverse order.

4. Just as such a project needs a strong organization in the field, so it also needs strong administration at home. A complex activity requiring the programming of a satellite is not the kind of thing that commends itself for operation by a committee. The commitments of personnel and support, the deadlines, the decisions to change or revise, are so demanding that there must be a strong hand at the helm. The large television projects we have mentioned all discovered this. They found out also that project administra-

tion must be organically related to project control at the user end. A major activity of this kind is not something that can merely be dropped into a culture from the outside. Thus some of the best primary school ITV ever made for a developing country never reached more than 800 students for ten years in a Central African country because the national educational system did not feel involved. And on the other hand, one reason why the Peacesat experiments have been as successful as they have, despite very low financing, has been the fact that the participants talked together on the satellite and decided together what most needed to be done.

5. Any major channel of communication, used for social purposes, is more effective when combined with a system of related elements. All teaching is multi-media. The first teachers we know anything about used not only the medium of speech, but also the bow and arrow and axe as media of demonstration and practice. The most primitive school any of us ever see does not depend on the teacher alone, but also on slates or a sand patch for practicing writing and figuring, and on outside observation, occasionally a picture. Even a sophisticated medium like television is not so effective alone as with other learning and practice materials. The British Open University, for example, has found that it has to be a "university of the post office" more than a "university of the air," and furthermore it has to provide tutorial centers where books are available, tutors can be consulted, and study groups can meet. The temptation in using communication satellites for learning or development or social change is always to put one's effort on programming the satellite (which is quite enough responsibility) and count on it to do the whole job. Except in a few cases this has not proved to be sufficient, even with satellite television. What else must be provided? What reading

materials? What practice materials? What consultative opportunities? What kind of communication organization?

6. If the purpose is to effect social change, the strategies of change must be considered most carefully. It is rarely effective simply to say that smoking is bad, or agricultural cooperatives are good, or reading is something one should learn, or family planning clinics are available. Ways for making the change must be provided, reinforcement furnished, rewards kept always in view. Henri Dieuzeide, who then was chief of educational radio and television for the French Institut Pédagogique National, discussed in 1968 some of the basic strategies for change:

> The first is to change everything at the same time, but so far there has been no instance of this having been done anywhere. The second one involves modifying the existing state of affairs by introducing innovation at the lowest level and carrying on from there, the new system pushing the old one in front of it; such is the case with the gradual introduction of television, year by year, involving, in the case of the Ivory Coast, the transformation of primary education and, in the case of El Salvador, of secondary education. The third strategy involves setting up and developing a new system parallel to the old one and capable of replacing it one day; such is the case, for example, of educational television for elementary schools in Niger, or at another level, of the Open University. (quoted, Smith, UNESCO COM/WS.333, n.d., p. 92).

Smith, who quoted this passage, noted that the second and third strategies are the most likely for educational satellite development, and the third likely to become the most popular.

7. Users of communication satellites for social purposes must be conservative in time projections. The most common justification for large media projects is that they can speed the process of change and development. India, for example, felt that a satellite could bring modernizing ideas to its villages 25 to 50 years before any other

method. Samoa officials felt that only with a massive use of television could they hope to modernize their schools in their own generation. Dieuzeide, whom we have just quoted, told a Unesco conference that "space communication should help to make it possible for education to win the race with time" (Unesco, 1968, p. 61). Experience leads us to be skeptical. The social effects of a large project always tend to take longer than expected. New ideas diffuse slowly through a society; basic changes in a culture come very slowly except in crisis. Historians when they can discern any broad general change in a century consider that significant. The experience has been that a one year project is more likely to show peripheral than fundamental results, and unlikely to show any results of a lasting kind; and even the results of half a dozen years are likely to be less than hoped.

8. There is reason to believe that communication satellites, used as part of a system, can help to catalyze change. This has proved to be true of the use of other dramatic technologies. The introduction of the technology is so impressive, so demanding, that it controls the deadlines for related change and provides an organizing and rallying point for making special efforts. One of the best examples of this was the introduction of television into the 7th, 8th, and 9th grades in the El Salvador schools. The results in the early years were less readily measurable in scores than in changes which were long overdue but now had a special reason to be made: reorganization of the Ministry of Education and of the entire teacher training system, new curriculum, a full year of advanced training for all teachers who were going to teach in a classroom with television, remodeling of a number of schools, and the like.

9. The bigger the coverage area, the bigger the problem of serving different cultures. This is the familiar problem of a wide-reaching education or development program. Different groups within the audience have different needs, different abilities, different experiences, different values. It is hazardous to try to reach the whole audience with the same materials. One does not always save money on software, therefore, by using it over a wide area. And the wider the area, the more diverse the audience appears to be, the greater the need for pretesting.

10. Finally, the technology works well. Experience thus far has demonstrated that the satellites do a better job of delivering a signal than had been anticipated. Even with chicken wire antennas, the ATS-6 is delivering good television pictures in Indian villages. Even with ground installations costing only a few thousand dollars, the old and weak ATS-1 picks up and delivers two-way radio all over the Pacific. We can close this catalogue of experience with this most general experience of all: that the social skills of using communication satellites have lagged behind the technological skills; that if we can solve the social and educational problems of using satellites for the good of man and society, the technology will be there for us to use.

A NOTE IN CONCLUSION

The conclusion can be very brief; the paper has been very long.

Some of the most potent communication technology ever developed is available. It will affect our culture whether we want it to or not. However, if we learn to use it effectively, in the ways open to us to use it, we can have something to do with its impact on man and society, and the extent to which it enriches or impoverishes our culture. The technology is ready if we are. That is what this paper has tried to say.

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