quantity and some limits are being imposed on human demand which will be in balance with the total environment, both natural and man-made. Thus a lessening demand on quantity will give a new opportunity for an increase in quality. If mankind can establish such new values and new approaches it may be able to establish more coherent, more human and more valid metropolitan communication systems.

FOOTNOTES

2. ibid, p. 34

BIBLIOGRAPHY


Communications for survival

Peter Goldmark is President and Director of Research of Goldmark Communication Corporation, Stanford, Connecticut, U.S.A. Previous positions held include President and Director of Research of CBS laboratories and Vice-President of Columbia Broadcasting System Inc. He studied at the University of Berlin and the University of Vienna, where he earned his Ph.D. in Physics.

Holder of some 160 patents, Peter developed the long-playing record, CCIV and the first practical colour television system. He was responsible for the development of the high resolution readout and ground recording system used in the United States Lunar Orbiter Space Programme.

As Chairman of the National Academy of Engineering on urban problems, he sparked the New Rural Society Project. He is an active human rights campaigner in his home state.

Bonnie Kraig is special assistant to Dr. Peter C. Goldmark. Prior to joining G.C.C. in 1972, she was Chairperson of the Task Force on Health and Hospitals for the State Study Commission for New York City, and was responsible for evaluating New York City's hospital and medical care system. Bonnie was at one time an Aide to Mayor John Lindsay of New York City, and had the responsibility for co-ordinating health affairs, and then became Legislative Representative for the Health Services Administration. She has served on lobby groups and has served on many health planning councils. She was also a member of Governor Rockefeller's Committee for Social Problems, and the President's Committee for Health Education.

Introduction

The conclusions preferred by Mallows in Chapter 7 form the basis of the following contribution, "Communications for Survival". This essay is an outgrowth of the New Rural Society (NRS) project which aims to solve the problems of energy utilization, urban congestion and rural-urban migration currently facing the United States.
Observation of these processes have led many researchers to question the historical concept of the city. Max Weber commented that, "The modern city is losing its external and formal structure. Internally it is in a state of decay while the new community represented by the nation everywhere grows at its expense. The age of the city seems to be at an end."1 Friedman and Millar concur and build upon Weber’s statement, “Looking ahead to the next generation, we foresee a new scale of urban living that will extend far beyond existing metropolitan cores and penetrate deeply into the periphery... The older established centres, together with the intermetropolitan peripheries that envelop them, will constitute the new ecological unit of America’s post-industrial society that will replace traditional concepts of the city and metropolis.”2 This basic element of emerging spatial order is termed the “urban field” and may be viewed as an enlargement of the space for urban living that extends to within commuting boundaries (160 km with present technology) of existing metropolitan areas. In 1965 between 85% and 90% of the total United States population resided in only 35% of the total land area. Consequently Friedman and Millar have discarded the traditional physical, political, economic and demographic criteria usually invoked in definitions of the city. They have likened the city of the future to “... a pattern of point locations and connecting flows of people, information, money and commodities”.3 Friedman and Millar contend that:

1. The future growth of population in the United States will occur almost exclusively within areas defined as urban fields.
2. That within each urban field substantial centrifugal forces will propel the settlement of population and location of activities from existing metropolitan centres out into the present periphery.4

By 1960 an estimated 150 million Americans lived within urban fields. Friedman and Millar have estimated that by the year 2000, 180 million people will have to be accommodated within roughly the same area. Goldmark is even more pessimistic anticipating a population of 200 million out of a total of 300 million living on less than 10 per cent of total land area.

The NRS project should be seen against this background of increasing urban concentration and also as an attempt to harness anticipated trends in the spread of the urban field in an effort to improve the urban living conditions of United States citizens.

Goals, policies and strategies for regional economic development are aimed at the reduction of regional income disparities, to induce a more balanced regional economic growth through greater integration of the national economy, to reduce growth rates in over-expanded areas and to relieve the poverty of people living in economically distressed areas.

The efforts of the NRS represent only one avenue of research and should be studied in conjunction with other measures such as financial inducements to encourage relocation in the urban peripheries. Growth centre strategies which represent an alternative to the uniform dispersion of investment within chronically depressed areas are equally important. A number of economists have called for the adoption of a national growth centre strategy, whereby development effort would be concentrated in intermediate sized cities which would serve as decentralized centres of economic activity offering employment to those residing in depressed areas.

No one strategy, despite its theoretical soundness, can be considered to be a comprehensive effort in solving the problems of metropolitan areas, for little detailed empirical research has yet been conducted. The NRS, however, realized this limitation and have set in motion a vast programme of empirical research.

The NRS project has as its basic aims:

1. The application of existing and new communications technologies to improve the quality of life for people in rural communities in the United States.
2. To give all Americans the opportunity to work and live in small attractive rural communities.
3. To put everyone in contact with everyone else within the city through telephone, AM-FM radio and television broadcasting through broadband cables carrying a multitude of TV channels into individual homes and a second broadband cable system inter-connecting the major public institutions. External communications services will connect business, industry and government with their operations in other cities through telephone, videophone and other telecommunications facilities.
4. Social considerations include the maintenance of adequate interpersonal communication despite distance constraints and research into the acceptability of new forms of electronic communications systems to potential users.

The underlying assumptions of the project are:

- That by the year 2000 at least 50 million people already in cities may wish to be part of the new rural society.
- That all the necessary inventions have already been made and that broadband communications systems can now be imaginatively applied to the needs of business, government, education, health care and cultural pursuits to stimulate development of the new rural society.

Already Peter C. Goldmark, the NRS project director, is urging public action to encourage dispersal. Recent advances in communications technology, he
argues, will overcome the distance constraints which previously prevented decentralization.

Although this paper, unlike those which precede it, is almost entirely geared to an overview of specific NRS studies we feel that its significance lies predominantly in its efforts to combine theory with pragmatic action. At least one of the futuristic communications technologies mentioned in Chapter One will be operating in The United States by the end of 1976 and others have already been designed. "Communications for Survival" represents a challenge to the conclusion offered in Chapter 5 where the author states, "There is some doubt whether new telecommunications media will have sufficient power to offset centralizing forces." Nevertheless, the ultimate form of the NRS would be the aspatial city described in Chapter 5, with its man/machine relationships and the inherent danger of man becoming subservient to his electronic inventions.

The basic tenet of "Communications for Survival" then, is the analysis of ways in which real income (access to society's scarce resources) may be redistributed in rural areas in an effort to resolve the urban, rural and energy crises which will face the United States by the year 2000.

K.G.T.

Communications for survival

The last two centuries stand out in history as a triumph for science and technology, but mankind has not always benefited. Many scientists have been so involved in their own disciplines that they have tended to overlook the true needs facing society, and it is evident that scientists face a responsibility and a challenge which cannot be unheeded. An attempt should be made to apply at least a fraction of our diverse talents and education in solving the major problems presently facing society, problems which fall into the categories urban, rural and energy.

At the turn of the century, one third of the United States population lived in urban areas, while the remaining two thirds resided in rural parts of the country. A mounting migration reversed these percentages to the present population distribution of three quarters urban (and suburban) and one quarter rural. Urban centres expanded rapidly to accommodate the population growth, and led to countless unprecedented social, economic and environmental problems.

Concurrently, the quality of life in rural areas began to decline and was unable to compete with the real or imagined attractions of urban life. Concomitant with the onset of the urban and rural problems, was the accelerated exhaustion of traditional sources of energy supply.

The urban problem

If crime can be considered an index of social dysfunction, then urban areas contrast alarmingly with rural. Fifteen times more street robberies per unit population occur in a city of one million than in a town of ten thousand.

Other relevant indexes, for example, pollution levels, traffic congestion and health standards are all signs of a population saturation which urban scientists are unable to deal with adequately.

Many people and businesses have opted for a suburban location to escape urban problems. This trend has expanded the boundaries of urban areas, and placed an additional strain on existing facilities which may ultimately impair the quality of suburban life as well.

3. Ibid.
4. Ibid.
The rural problem

Unfavourable psychological attitudes towards rural regions are the cause of emigration of young, talented and energetic people who rove in search of higher incomes, better community services, and more job opportunities.

The energy problem

Parallel to this unplanned population dislocation has been an indiscriminate use of energy resources, particularly with regard to oil consumed during daily commuting (about 33% of the total oil consumption).

The first major concerted effort to apply science and technology, and in particular communications disciplines to national problems took place in 1971 under the auspices of the National Academy of Engineering’s Committee on Telecommunications. Its proposal was the New Rural Society project. The objective was to apply telecommunications technology to ease the plight of the cities by upgrading the quality of life in rural communities. Conditions were to be established whereby a voluntary decentralization of people, business and government would occur, which would contribute to a control and amelioration of the urban and energy crises.

Overview of specific studies and experiments pursued by the new rural society to date

The New Rural Society (NRS) project was funded under a grant from the Department of Housing and Urban Development and the Department of Transportation, both under a contract to Fairfield University, Connecticut.

Since 1974, a broad study has been made of the historical role of science, technology and telecommunications as a tool to aid in solving social problems. Also, a number of specific studies (employment, health care, community interaction, teleconferencing, etc.) were conducted, together with actual tests and pilot operations.

NRS has identified five areas considered critical to the development of viable rural communities and where communications technology could make a significant contribution. These are:

1. employment;
2. health care;
3. continuing education and vocational training;
4. entertainment and cultural opportunities; and
5. community interaction and planning.

Employment

One of the major objectives is to create job opportunities in rural areas to retain people who might otherwise leave and to attract new residents from congested areas. Urban business considering decentralization to rural areas requires assurance that such a move will be a cost-effective operation. Organizations are often concerned that relocation may be more dependent on and raise the cost of their communication activities, consume more employee time, cause delays or even the loss of essential contracts. NRS contends that these problems may be overcome in most cases by proper planning and suitable application of existing telecommunications technologies. To provide a basis for this planning, NRS tested its communications audit technique with several of the state of Connecticut’s criminal justice agencies.

The purpose of the audit is to establish the general and external communications processes and requirements of an organization and to show how reliance upon travel and complex communications systems might be minimized. Once an organization’s communications patterns have been established and analyzed, it is possible to plan for changes that would make them more effective and identify organizational components which could be relocated most easily to a rural area by virtue of their communications requirements.

Effort has also been devoted to the study and design of an electronic system that could serve as a satisfactory alternative to face-to-face business conferences in decentralized government and private organizations.

A field trial of the NRS audio-teleconferencing system by the Union Trust Company Bank of Connecticut showed the system to be a highly useful, well-utilized technique for conducting regular meetings between bank executives in two cities. The teleconference system was judged a favourable alternative to travel for most meetings and led to more effective time utilization. The monthly cost associated with teleconferencing (depreciation of equipment and monthly charges for telephone line) represented only 50 percent of what the Bank would have had to spend for transportation and executive time if the same number of meetings had been conducted on a face-to-face basis.

Health care

Access to essential health care services is commonly not available to rural communities. Of all rural and small town respondents, one third ranked health problems on a par with, or even slightly above income as their
primary personal concern (sufficient income does not guarantee rural residents adequate medical services).

Physicians tend to settle in urban or suburban places because their families, like three-quarters of the American population, prefer the amenities offered there. About one third of all U.S. doctors have chosen to work in research laboratories, industry, public health, academic faculties or to serve as hospital administrators, and the proportion of physicians who meet the primary care needs of patients on a continuing basis, has been diminishing.

The trend towards increasing specialization and the concentration of doctors in metropolitan centers has served to deprive many rural communities of adequate health care. Although the total number of U.S. physicians has increased 28% during the past decade, the proportion in general practice has dwindled sharply.4

The NRS project therefore aims to improve the quality of services in rural areas. It is believed that a systems approach is the best way to achieve good care and effective cost control. Here emphasis is on prevention, early diagnosis, less costly care and continuing patient and doctor learning opportunities, rather than on hospital and nursing home care.

Community interaction and planning
The separation of job from residence, among others, has made it difficult to realize a high degree of community interaction and planning. Today’s average individual moves around more than ever before and plays many roles. Under these circumstances, different communities may have different interests. This makes it difficult to define the term community precisely. A definition that would probably prove acceptable to most scholars, however, is that: “A community consists of persons in social interaction within a geographic area and having one or more additional common ties.”5

There is an idea that contemporary social organization has been destroying some of the more meaningful human associations and values that small town residents have traditionally acquired in church, family and neighbourhood.6

When people do not live and work in the same location, they may be less inclined to involve themselves in community affairs. Similarly, working parents who travel long distances to their jobs may have very little time during the week to spend with their families.

Much thought has been given to the problem of how to reclaim a sense of community. We believe that if people live and work in the same town, they are apt to become involved in local affairs and to develop community commitments. In addition, a focal point for community activities needs to be established in order to encourage citizen participation. This approach has proved most useful where activities have emerged from real needs identified by the residents of the town. A survey indicated that the greatest interest was in continuing education opportunities and improved public services.

Potentially, a centre can foster community interaction by offering a variety of cultural and educational activities and by providing a forum for debating important public issues.

Transportation
Under contract to the U.S. Department of Transportation the NRS will:
- investigate the implications for transportation technology of the redistribution of population to non-metropolitan areas;
- determine how and under what circumstances telecommunications might constitute an acceptable alternative to the movement of people and goods;
- define the complementarity of transportation and telecommunications in stimulating rural economic development and growth;
- propose planning considerations which would help local government officials and citizens in rural areas to plan more effectively for the improvement and development of their area.

Although the NRS identifies five dimensions to the quality of life, the current study focuses on the most basic of these, employment. Two rural counties (Indiana, Pennsylvania and Pitt, North Carolina) selected as study sites have yielded detailed economic, educational, medical and social data profiles. The project is using an econometric forecasting model to project the economic impact of changes expected in the industrial environments of the two sites. The model is also able to predict the effect of transportation improvements on industrial output, employment, income and population, as well as pollution levels and energy use. Communication indices, incorporated into the model, will assist an assessment of the impact of communications improvements. The hypothesis that greater percentages of the U.S. economy will become information and service oriented, leads to the conclusion that accessibility through telecommunications will be more important than accessibility through transportation. Applications of these two technologies to enhance the quality of life for current and future residents of the counties will be investigated.

Implementation, general considerations
A full implementation of the NRS plan is tantamount to setting a new national goal. Its aim is to optimize the match between population distribu-
tion and available human, environmental and energy resources to be independent of imports and assure a high quality of life for all Americans in the future. Experience with the NRS project has shown that this goal could be reached by the end of this century if the problem were divided into smaller, manageable units. Making decentralization a goal within each of the 50 states, would come close to accomplishing this purpose. There are a number of states on the Eastern and Western Seaboards where the population density is already so high that effective relief could only be derived from making migration to less densely populated states desirable. In order to alleviate the urban problems, the poor and minority groups should be able to decentralize first. For the many low-populated and economically underdeveloped regions of this country, self-planning has to come to grips with the fact that economic growth, through a decentralization of business and government, will require accepting a limited amount of immigration to fill the new jobs and will have to provide for residents seeking employment. Where the states represent the natural individual decentralization units, there is the advantage that they are largely self-contained politically and administratively, and most of them have sufficient resources necessary to accomplish the desired goals. The development of rural regions can best be achieved by optimizing the interchange of existing resources in a given area between an economically developed focal centre and its less developed surroundings. An example would be short distance commuting to a manufacturing and business centre from a surrounding rural area which is attractive and has adequate health care, access to continuing and vocational education, cultural and recreational activities, and social interaction. Federal co-ordination of state efforts is necessary, especially in terms of transportation and communication. Redistribution would not only involve decentralization of business and industry but of federal and state government operations. As a result, government would be more responsive to local needs. It is unfortunate that no single federal agency has the charter to cope with the solutions proposed by the NRS project, since federal co-operation is needed to provide a sufficiently funded and well co-ordinated effort.

Proposals for specific projects

Transportation

The redistribution of people from large urban centres to rural areas would have to be stimulated by a decentralization of government and business operations. It has been argued that transportation links between rural areas and a larger population centre disproportionately favour the larger com-

munity. There is good reason to believe that, since the use of communications systems overcomes separation and minimizes movement, the effects on growth may favour the smaller communities. This could have major significance for the relative investments between transportation and communications, where the issue is to strengthen rural communities in terms of quality of life as defined by the community. The Department of Transportation is thus facing decisions which may require it to embrace telecommunications as an integral part of transportation planning. Considerations regarding mass transportation versus individual personal travel partially substituted by telecommunications, when superimposed on a system of rebalanced population distribution, can only be planned optimally when both technologies are fully applied. In order to improve the quality of life in the U.S. rapidly and at minimum energy cost a replication of the optimized sub-regional systems within individual states should be the immediate goal.

NRS proposes to do the following:

1. Broaden and refine the techniques now under development for measuring the influence of communications on the economy of rural regions. The Harris Econometric Model would be extended towards modelling the means by which telecommunications can affect the development of focal economic points, and the largest surrounding region. The communications indices will measure the impact of mass media, as well as modes of industrial communications, such as data handling. The indices would embrace the use of specific communications technologies needed for maximizing government and service employment, and to extending their influence on surrounding rural areas in terms of improved health, educational and cultural services. The complementary roles of transportation and telecommunications are essential ingredients in these analyses.

2. Certain institutional problems have to be considered:

(a) Which government, business or civic organizations will be affected by the processes outlined under 1, and what legal, legislative or public educational programmes need to be developed to ease the enactment of necessary changes?

(b) Which institutions and what methods need to be involved in the necessary long-range planning functions and which stimuli have to be provided for individuals to participate in such activities within their communities?

(c) What institutional barriers need to be removed to arrive at a transportation and communication system best able to achieve the desired goal in the region?
3. Local work centres can effect a major influence on the balance between transportation and communication and on energy usage in the proposed rural models. Equipped with communication and office facilities, these centres permit employees to travel to the larger industrial locations less often, and only when face-to-face meetings or conferences are required. At other times contacts and correspondence could be concentrated into certain days, and travel reduced.

Urban needs

The impact of a voluntary population distribution will lead to what may be called a Headquarters City, where the headquarters of business, commerce, the arts and sciences, of medicine and education are located. This is already the case in several of our large cities. The numerous divisions, services and subsidiaries of these headquarters operations could be dispersed throughout the respective state.

A voluntary metropolitan decentralization must become a national goal and the creation of rural employment opportunities through telecommunications is essential for urban residents who are now unemployed or underemployed. Job training would be geared to the underprivileged people who would be migrating to the rural areas from the city and to residents in rural areas. In addition to job training, there must be a state and federal commitment to provide the opportunity to resettle, and assure employment in the place of destination. It is estimated that expenditures would be a fraction of what the city now spends directly and indirectly on welfare provision.

The opportunity for minorities and poor people to transfer with their families into attractive rural communities represents a vital step towards improving the quality of life for this sizeable segment of the population.

The growth control of a community, including the type of employment and the increase in population that are acceptable, should be based upon local planning, with public participation, and co-ordinated with overall regional and state objectives. The decentralization of government (state and federal) and the extent to which it reduces the operating costs of planning and administrative agencies is an important part of an overall distribution plan. NRS proposes to develop criteria to test, measure and evaluate the effectiveness of decentralized government operations in sociological and economic terms using its communications audit technique. An assessment of the various forms of communications technology, and their substitutability for travel would be part of the same study.

Health care services

Research has indicated that, when education is made relevant to the health requirements of individuals and their families, it can produce significant improvement in their actions. As a consequence, people are able to react to health problems with more knowledge and confidence, and thereby reduce the need for expensive clinic and hospital facilities and services.

To educate people in home health care on a wide scale, they should be reached near to where they live and work and be able to follow a schedule most suitable to their needs. A new electronic delivery system for learning called RTS (Rapid Transmission and Storage) has been developed for use in learning centres and would be employed in the proposed project. The low cost, high quality and flexibility of the recorded programmes make this a cost-effective way to apply health education across the country.

NRS proposes a programme in which clinics, manned by physician assistants, would be set up in the various townships, readily accessible to the residents. Based upon tests and experiences thus far, the majority of cases can be handled by physician assistants. In the remaining instances, a supervising physician in attendance will be able to advise and assist through telecommunication links, interconnecting these clinics to a nearby hospital.

Adult and vocational education

Ever since the invention of the printing press, the primary means for transferring knowledge has been the instructor and the printed word. Today, in a world of ever accelerating change, it is necessary to improve the process of learning. This is especially important in view of the fact that one quarter of our population has not completed high school, and some twenty percent of all adults want to learn some subject of their choosing — academic, vocational, home and hobby related, etc.

Educational institutions traditionally serve only those who come to the campus and it has been recognized only recently that a great many people would like to learn near where they live or work. Community colleges, of which there are some 1,200, business and industry are aware of this challenge.

Community colleges today are faced with more people wanting to learn more subjects in off-campus learning centres than can presently be satisfied. It is not economically feasible to send instructors to learning centres near where people live to teach all the subjects desired, and still retain schedule flexibility at reasonable cost to the user. To meet such needs, educators and scientists have, for the first time, combined to develop a method of learning and delivery. The RTS system integrates the best
available educational and technology resources into a universal system and went into operation with a group of community colleges during the latter half of 1976.

The following characterizes the RTS system:

1. Up to 30 one-hour, or 60 half-hour or 120 fifteen-minute programmes, etc. can be stored on a one-hour standard 1" video cassette. Up to 30 of these can be shown simultaneously in as many classrooms. This satisfies the requirement of continuous enrolment, whereby people can start a new semester on any subject each week, or every other week, etc. to suit their own schedules.

2. Sound is the main medium and is illustrated with picture and graphics material. Illustrations are synchronized with the corresponding words to create a single impact on the student.

3. Motion is provided only when essential, for clarification or emphasis.

4. A wide choice of learning materials can be produced quickly and at low cost - a fraction of conventional video or motion picture presentation.

5. Programmes can be stored on 1" video cassettes or transmitted over standard television stations, cable links, or microwave systems.

6. Updating pictures and sound is an easy process and worldwide use is possible through dubbing the sound track.

7. Printed materials are provided with RTS in the form of texts, administrative guides, and testing aids. It is possible to arrange the programmes so that each lesson has built-in testing sections, an important factor in any successful learning programme.

Postal service in rural areas

In order to upgrade rural mail and message delivery the NRS programme will suggest the following:

1. Examination of issues on state-by-state basis

   (a) Determination of maximum ranges in delivery time between central collection points and outlying post offices of various districts (especially in remote areas).

   (b) Availability of preferable collection points in adjacent states.

   (c) Percentage of various classes of mail destined to different regions of the world, particularly rural areas.

   (d) The degree of privacy desired for various classes of mail and type of mail or messages on which to focus initially.

   (e) Consider two-way terminals designed for these specific services, located at all distant and particularly remote post offices, utilizing alpha-numeric printout, with digital signals on standard phone lines. This could be utilized primarily at night-time (estimated capacity - 10 000 pages, averaging 500 words each, per terminal between 6 p.m. and 8 a.m.)

   For the transmission of documents, drawings, handwritten messages, etc. a portion of the night schedule may be devoted to facsimile with highest efficiency utilization of telephone circuits (maximum two minutes per page.)

(f) Investigations of optimum delivery system for new service between remote post office and addresses.

2. Equipment considerations for this system

   (a) Availability or adaptation of existing devices or systems.

   (b) Cost of hardware and operation.

   (c) Degree of automation.

3. Delivery of electronic messages from post office to distant addresses via TV or telephone, or both or other alternatives.

4. Interstate and intrastate regulations, as well as telephone system interconnections.

5. Investigation of potential users of the rural mail or message system

   (a) Government agencies - local, state, federal.

   (b) Business and industry.

   (c) Hospitals, laboratories, physicians’ offices, etc.

   (d) Law enforcement.

   (e) Schools, libraries, etc.

6. Proposal for specific pilot operations in selected states and regions, and their relationships with other NRS projects planned for the same places.

7. Implementation plan for full project activity, including cost, duration, and anticipated results.

Environmental protection

A decentralized population pattern can have profound effects on environmental regulations and their influence on the country’s economy. The dispersion of power plants and automobile travel as a result of more even distribution of people in the metropolitan and rural communities will result in less air and water pollution and should be more easily controlled on a local level.

The impact of telecommunications on living conditions and transportation is an important factor in voluntary dispersal of people and jobs, and is expected to result in significant easing of environmental constraints.
ENERGY

Energy was not an issue when early in this century two thirds of all Americans lived in rural communities. Pollution and almost total reliance on oil for electricity and transportation assumed crisis proportions when migration from rural areas resulted in three quarters of the population living and working in metropolitan regions.

It is proposed to develop conditions for an optimally matched between population distribution and the most efficient use of our energy resources. If a greater proportion of the population lived and worked according to a decentralized pattern, power generation could be dispersed as well.

Calculations based on available data indicate that one third of gasoline consumption is due to cars being driven daily to and from work in our large metropolitan centers. Thus an examination of this nation’s energy utilization based on current life patterns and a comparison with alternative modes of population distribution are likely to show that we may be able to attain reliance solely on our own energy resources for centuries to come and at the same time maintain a high quality of life. This would permit us to develop alternate sources of energy without haste and undue burden on our economy.

Communication services

Communications technology is a crucial factor in providing rural communities with the necessary services to make them viable alternatives to urban life. However, there still remains a sizable portion of our rural population without access to an adequate TV broadcast service.

An even larger fraction have virtually no cultural and recreational opportunities available to them.

It is unfortunate that the notion “Wired Nation” was created, giving the impression that all of rural America can be made accessible by means of cable TV. To provide all rural homes with an adequate cable TV service would create an enormous economic strain, and regulatory problems of enormous magnitude.

At the NAE-NASA 1974 Summer Study, a broadcast satellite system “Rural-Sat” was recommended which required a modest investment by the users, and could make adequate broadcast services available to all rural residents.

“Rural-Sat” consists of a pair of special communication satellites in synchronous orbit over the equator in such a way as to cover the US optimally. The basic role of the “Rural-Sat” System is to serve all rural homes, whether in communities or on farms. It will perform three types of broadcast services:

1. A national coverage capable of being received in any home, but especially rural homes.
2. Regional broadcast programmes each covering approximately one quarter of the U.S. corresponding to the time zones.
3. A new high-resolution colour TV broadcast system for theatre projection anywhere in the country, of live cultural events, such as theatre, opera, ballet, museums, conventions, etc.

In the following the technical description and details of the Rural-Sat System are given as published by the National Academy of Sciences at the end of 1975 from the Panel on Uses of Communication to the Space Applications Board of the Assembly of Engineering, National Research Council.

CONCEPT FOR A NATIONWIDE SATELLITE COMMUNICATIONS SYSTEM TO SERVE RURAL AREAS

To fulfill the need to make rural America attractive for more people and to deliver to the home continuing vocational and health education as well as regional and community information, in addition to the entertainment and public affairs offerings on national TV, the Panel offers a concept of a synchronous communications satellite system consisting of two identical satellites, each with fourteen 40 MHz TV transponders each with 100 watts output. Typically, the total of 28 transponders can be utilized as follows. On Satellite I, three 400 watt high-power signals are produced by combining 4 output stages for each of three national TV channels corresponding to the commercial networks. These three TV signals, each 40 MHz wide, are fed to the same antenna, covering the entire US. Two more channels on the same satellite serve regions I and II, approximately corresponding to Time Zones I and II, counting from the West. Satellite II has two national broadcast channels, again each combining the output from four 100 watt transmitters. One of these channels could be assigned to the Public Broadcast Service and the other to cable networking or for educational-health care services. Of the remaining six 100 watt transmitters, two serve Time Zone III and four broadcast to Time Zone IV (East Coast of the U.S.). This makes it possible on the average for 6 states to share one transponder. Thus, within a given region or time zone, each state can have a one sixth share of a broadcast day to transmit pertinent, local or regional information which can be received everywhere within the zone. Each satellite would have two antennas, the smaller one taking the broadcast feeds covering the entire nation, and the large antenna serving the individual zones.
Figure 1 illustrates the above and also the number of 40 MHz channels transmitted by the two satellites. The twelfth 40 MHz channel, namely F6, is reserved to be combined with F5 providing an 80 MHz wide special broadcast channel for the high-resolution colour TV signals for theatre projection discussed under "Teleculture".

Regarding reception, it is estimated that a two-metre antenna, together with a 250° receiver and using a parametric amplifier at room temperature, will provide commercially acceptable pictures anywhere in the U.S.

1. The use of the Rural-Sat as a main communication link for electronic mail

The Rural-Sat system provides a double bandwidth channel for the high-resolution theatre TV service. Assuming that the use of this extra wideband channel for broadcasting of live cultural events is averaging four hours per 24 hour day, then the channel could be used 20 hours per day for relaying electronic mail. Augmenting this with a partial use of the regional channels for mail-service, one could realize the equivalent of a full 24 hour use each day with an 8 MHz video band and 80 MHz RF channel. This could handle yearly 2.5 billion pieces of mail (single page.) Based on a surcharge of 50c per page for satellite mail, the yearly income generated would be one and a quarter billion dollars. Because of the low cost of the receiving terminals, every post office in the U.S., including the smallest rural ones could afford a receiving station. At the same time many businesses, government agencies, institutions, etc. could receive electronic mail directly from the satellites only a fraction of a second after it was transmitted from the ground-station nearest to the collection centre. Appropriate coding techniques will assure necessary privacy. A ground network is required for forwarding electronic mail from a given region's post offices to a ground station which then transmits it to the Rural-Sat. Postal stations serving small communities or low density areas will only require narrow band (conventional telephone) or 48 kHz lines to intermediate post offices from where signals are speeded up and forwarded over broadband links to the nearest ground station. Businesses and government operations with high mail traffic would have direct links to and from the nearest post office thus bypassing local processing. It is important to stress that the complexity of a national electronic mail system rests not only in the satellite collection and distribution system, but more so in the high-speed paper handling and scanning equipment located in a large number of post offices all over the country. The magnitude of such installations will depend on the amount of traffic flowing through the particular post office which is also the determinant for the bandwidth of the communication channel feeding out of that postal office. Slow-speed paper handling and electronic scanning equipment would be less complex and also less expensive.

2. National and regional educational services

A new type of instructional service is described, using the Rural-Sat system at night-time, when most TV transmitters are normally off the air. The new learning format and technology, which permits a highly compressed transmission and storage of lessons of any length, based on a carefully
composed sound and still-picture presentation, and using motion only when necessary, has been developed and is available for the Rural-Sat. If we assume the use of one pair of satellites (5 national and 8 regional channels), then one national channel could be employed together with the 8 regional channels for seven hours of night transmissions (one hour of the total of eight night hours would be reserved for augmenting the postal service as described previously under 1). The educational programmes would be divided into the following categories:

- **Supplementary audio-visual material for:**
  - Primary and secondary schools.
- **Complete courses for:**
  - Continuing adult education, with or without college credits.
  - Vocational and job improvement.
  - Professional education for physicians, lawyers, scientists, etc.
  - Health care for residents.
  - Home care, etc.

Existing learning centres would be used nationally, employing receiving equipment low enough in cost to permit widest distribution. Such learning centres in rural communities or cities, would be in churches, schools, libraries, hospitals, prisons, community centres, etc. and the course recorded at night-time would be stored for the next day’s classes.

One national and eight regional channels together can transmit close to 2,000 different half-hour lessons each night. The eight regional channels could be shared nightly by each of the 48 states permitting each state to transmit 42 of its own programmes. It should be noted that the transmissions by each state within a zone could be received by all of the region’s population. Thus, various states could co-ordinate their programmes so as to minimize duplication and jointly provide the maximum choice.

**Curricula**

An entirely new, comprehensive health programme is proposed, which takes advantage of the RTS format and delivery system.

The new service for physicians and allied health manpower would be provided at the local hospital or other health facility.

1. **Physician information**

As a result of their heavy work schedules, doctors do not have an opportunity to study the wealth of material published related to the uses of certain drugs, and their relationship to various diseases, etc. Often, unwittingly, a physician errs in prescribing certain medication, and the outcome can be serious.

It is suggested that jointly with one or more pharmaceutical houses, programmes be developed that focus upon the uses and abuses of pharmaceuticals and drugs. These mini-courses would not substitute for medical representatives, but rather would support their efforts, by reinforcing and sharpening the information content in the literature. Stress would be upon the advantages of certain pharmacological aids, research underway and so on.

2. **Physician continuing education and re-certification**

As part of the same philosophy, course material would provide continuously updated information regarding particular fields of interest, such as internal medicine, allergy, pediatrics, etc.

3. **Nurses and allied health personpower**

Programmes would be developed to provide information concerning the work of the nurses — including regulations and legislation affecting that profession — as well as course material to encourage career opportunity for medical technicians and other support people.

The ability of the RTS system to transmit a wide variety of programmes at night means that it lends itself especially well to the Rural-Sat proposal. The capacity to select from a vast range of courses is central to the success of the system.

In summary, the Rural-Sat system proposed will make it possible to provide rural communities with components necessary for a viable life style.
NRS ABSTRACTS

"Experiments and field tests of communications systems" NRS Reference 301, May 1973

Because of the difficulty of providing video links at reasonable cost, three experiments were undertaken to evaluate different types of audio-only conferencing systems. The hypothesis that multichannel audio would be more acceptable than a monaural system for two-person exchanges, because of the greater realism and richness of sound such a system affords, was not supported (Experiment I). However, the hypothesis that a multispeaker (one loudspeaker for each person) audio-only system would have advantages compared with a monaural system for group conferencing was supported (Experiment II). The major advantages and disadvantages of a two-speaker sound system which creates a distinct sound source for each conference participant was explored in greater detail in Experiment III. The analysis suggested that this system had four main advantages over a monaural system. It was seen by users as (a) providing separate sound images for the different conferees, thus facilitating speaker-identification and possibly giving a greater sense of individuality to the conferees, (b) facilitating a better, more stimulating discussion, (c) apparently resulting in a better overall sound quality, and (d) facilitating a warmer, more personal contact between the conferees.

It is concluded that audio-only teleconferencing is acceptable in more situations than has been thought previously and that more research should be devoted to this type of teleconferencing than has been the case in the past.

"An NRS Project Experiment to Determine the Effects of Acquaintance and Communication Medium in a Bargaining Task" NRS Reference 302, May 1974

An acquaintance hypothesis is proposed which in its general form maintains that there is an interaction between the degree to which people are acquainted and their ability to communicate over different types of communication systems.

The basic premise in this experiment is that uncertainty is uncomfortable and that efforts will be made to eliminate it. The concept of uncertainty can be applied both to the relationship between people and to the characteristics of communications systems. It would follow that between individuals becoming acquainted reduces uncertainty. An audio communications system can be said to impose more uncertainty on a contact than a face-to-face meeting, because it does not provide any visual information. Individuals using an audio system would be better off if they were acquainted (have low interpersonal uncertainty) than otherwise. It is also possible that where uncertainty between people is low, that a face-to-face meeting is unnecessary and counterproductive, because it involves redundant information. Thus a face-to-face meeting between acquaintances would be less fruitful than the same type of meeting for non-acquaintances. These considerations underline the following hypotheses:

1. Using an audio-only system (high uncertainty), acquainted persons would perform a problem-solving communication task significantly better than would unacquainted persons.
2. Conversely, in a face-to-face meeting (low uncertainty), unacquainted persons would perform the task better than acquainted persons.

Eighty-eight subjects were tested in a $2 \times 2$ randomized factorial design; subjects were either strangers or acquaintances, and met via either an audio system or face-to-face. The communication task was to develop a priority ordering of a number of topics by sharing information. Subjects met for five minutes and then were given the evaluation questionnaires.

The experimental results supported both hypotheses.

"An NRS Project Experiment to Determine the Effects of Acquaintance and Communication Medium in a Bargaining Task." NRS Reference 303, September 1974

NRS found in an experiment dealing with the acquaintance hypothesis that acquainted people performed a problem solving/decision making task significantly better than unacquainted people using an audio-only communication medium.

The purpose of this experiment was to extend the scope of the acquaintance investigation to a bargaining task. In relation to problem solving, bargaining tends to involve more personal conflict and, therefore, is more difficult to perform over a communications system than face-to-face. The following hypotheses were investigated:

1. Using an audio-only system (high uncertainty), acquainted persons would perform a bargaining communication task significantly better than would unacquainted persons
2. Conversely, in face-to-face meeting (low uncertainty), unacquainted persons would perform the task better than acquainted persons.

Forty subjects were tested in a $2 \times 2$ randomized factorial design; subjects were either strangers or acquaintances, and met via either an audio
system or face-to-face. The communication task was to develop a compromise strategy based on two conflicting strategies. Subjects met for ten minutes and then were given the evaluation questionnaires.

The main hypotheses were not supported.

Further analysis of the bargaining results revealed that the participants' strategy in bargaining was to compromise. This was true in all the experimental conditions except where unacquainted persons used an audio system. In this condition, the stronger case dominated.

Communicating by audio seems to minimize the non-task specific factors which would affect the outcome of a bargaining task. In this latter experimental condition, the participants had no prior knowledge about each other and no visual information. Thus the inherent strength of their bargaining positions became more decisive and was less affected by other considerations such as status.

“Broadband Teleconference Test Between Hartford and Willimantic” NRS Reference 304, January 1973

A field test of teleconferencing was conducted for a two-day period between Hartford and Willimantic. The aims were:

- to provide a two-day demonstration of teleconferencing service between two locations separated by a significant physical distance.
- to design the teleconference facilities in light of the laboratory results.
- to arrange for real business to be transacted using these facilities.
- to expose all groups of conferences to two different types of teleconferencing systems, one of which would require broadband transmission and the other of which could, in principle, be accommodated by a narrowband transmission facility.
- to evaluate user opinions of the teleconference service and to compare these with what would be predicted from the laboratory results.

These objectives were met successfully by using a microwave link and audio lines to connect the specially prepared conference rooms in Hartford and in Willimantic, a distance of 40 km (approximately 45-60 minutes travel time). The teleconference facilities included simultaneous two-way television, two-way audio communication and a two-way facsimile link allowing hard copies of text and graphics to be exchanged. Ten different business and government organizations participated in nine conferences ranging from half an hour to two hours in duration over a two-day period. All of these conferences involved the conduct of business having real significance to the participants and which, in a few cases, would not have been possible without the teleconference setup. The overall response to the tests was favourable. There does seem to be a need for teleconference services, possibly operated on a shared basis, even between locations separated by no more than about 45 minutes’ travel.

“The Field Trial of Audio Conferencing with the Union Trust Company.” NRS Reference 305, July 1974

Between December, 1973 and May, 1974 NRS conducted a field trial of an experimental teleconference system. The system was tested between the Stamford and New Haven Executive Offices of the Union Trust Company, a large Connecticut bank chain. The purpose of the field trial was two-fold:
1. to determine the acceptability and effectiveness of teleconferencing as an alternative to travel for face-to-face meetings by management
2. to measure the effects of teleconferencing on communication between the two executive offices.

Specially-designed speakers permitted the listener to hear the stereophonic effect, regardless of his position in the room. A facsimile device provided graphics transmission. Inter-connection of the two terminals was, initially, by Class A audio-grade telephone lines; near the end of the field trial, these were replaced with less expensive Class C voice-grade lines which were evaluated as equally acceptable.

A total of twenty-four senior management personnel at Union Trust were regular participants in the field trial, which began on December 3, 1973. They were members of various management committees who, until that time, had alternately been travelling to Stamford or New Haven for their regular committee meetings.

The evaluation of the field trial provided information on four basic dimensions of users’ responses to teleconferencing:
1. users’ attitudes or feelings toward teleconferencing before using the system
2. users’ attitudes or feelings toward teleconferencing after first use of the system, and at other points during the field trial
3. users’ beliefs or cognitions about teleconferencing, compared with face-to-face meetings
4. frequency of use of the teleconference system, as a substitute for face-to-face meetings.

The data gathering phase of the field trial lasted until the end of May, 1974, for a total of six months during which approximately 70 teleconferences were held.
In summary, the results were:
1. Before using the system, participants expected teleconferencing to be an acceptable medium for conducting meetings.
2. After using the system, users evaluated teleconferencing as acceptable, with little change in acceptability over time.
3. Teleconferencing was perceived by users as being as effective as face-to-face communication for most meetings.
4. Use of the system was high. Between 50 and 80 percent of what had previously been face-to-face meetings was conducted using the teleconference system. The greatly-reduced travel saved the bank between $500 and $750 per month depending on usage. (Travel costs included mileage costs, as well as the cost of executive travel time.)

Further, the monthly cost associated with teleconferencing (that is, depreciation of equipment and monthly charges for telephone lines) was offset by a ratio of more than four to one by the savings associated with not having to travel for face-to-face meetings.

FOOTNOTES
3. Tomey, J. F.: "The Field Trial of Audio Conferencing with the Union Trust Company", in New Rural Society Report, Fairfield University, Connecticut, July, 1974 (see abstracts)

NRS REPORTS
"A Matrix Method for Classifying Communications Devices and Systems" NRS reference 204, June 1972

National Growth Strategy

Quality of Life
CONCLUSION

Ardrey: Buckminster Fuller—a critique

Keyan G. Tomaseelli

Frequently man is presented with the promise of new media and new ways of using currently available hardware. The future is often portrayed as a technological wonderland in which communication techniques have cheaply and painlessly solved major social, economic and educational problems. An examination of history, current information and the logic of the situation, however, reveals less optimistic expectations.¹

Science Fiction

While many of the ideas presented in this volume may appear to delve into the realm of science fiction, one futurist considers this genre of such great importance that he has described it as “. . . the relevant literature of our time . . .”¹² Originally science fiction took the form of narrative which supported an eigenweltliche logic and order, was pragmatic and idealistic, was sustained by a mystique in technology and a belief in the desirability of a mathematical order in human affairs.² New science fiction is concerned with fantasy, alternative worlds and fictions.

By the end of the twentieth century the spatial and social dimensions delimiting the post-industrial society will have matured. It is difficult if not impossible to predict accurately the kind of living, working and entertainment environments which may supersede the post-industrial state. Science fiction writers, architects, futurologists, film-makers and artists have applied their diverse talents to this task and have produced numerous alternative visions ranging from the controlled system-maintaining society described by George Orwell in 1984 to man’s ability to arrest and control some elements of the natural order, as portrayed in the film Zardoz. In this film most of the action occurs in a technological commune whose members have discovered the secret of eternal life. This innovation, however, only succeeds in providing the means whereby this future “vortex community” unwittingly imprisons itself in a self-perpetuating deathless physical and social state from which a natural desire and longing for death arise. The consequent release from the sterile constraints of immortality brings with it a sense of relief and inner peace.

According to the director, John Boorman, the moral of this film is aimed at futurologists, “Too often, it seems to me, they ignore the power of evolution itself to upset the equation. Some new mutation, something we encounter on the way, some unimagined factor can change the course ahead. Science and logic are not infallibles. Paradox has a poetry of its own. For example, my vortex people have forgotten what death is like and, as a result, life has lost its vital savour. It is a psalm to paradox, a knee bent to the cruel majesty of nature.”²³ The film Rollerball similarly displays a ray of hope when the controlling mechanism is defeated. In the Rollerball society of the year 2018, rigid social control is effected through an equilibrium maintaining system. By the year 2000, hunger, pollution, overpopulation, militant nationalism, crime and political corruption will have been eliminated, while material comfort for all will be achieved through a well-ordered managed society dominated by the major conglomerate corporations which control the food, energy, luxury, transport and communications. Rollerball, an institutional sport of brutal physical contact functions to provide the masses with a vicarious outlet for violence and hostility. This sensory mechanism is of sufficient variety to cope with and sublimate any disturbances which may impinge upon the social system and works to maintain a state of de-differentiation and sameness in the Rollerball society. The theme of hope is activated when Jonathan E who has become a national folk hero, defies the management or controlling mechanism’s order to retire before he becomes too famous. His stubborn independence is a threat to their carefully controlled comfort-orientated society. He survives and turns to advantage an ultimate institutional attempt to have him killed during a ruleless rollerball game. Consequently he introduced a disturbance which the control mechanism cannot handle and which leads to the re-introduction of some diversity (the identification of a sports hero) in an otherwise undifferentiated society.

In contrast, the “New Images of Man” exhibition held in the New York Museum of Modern Art in 1959, portrayed a singular devastating vision as to the future of human society. Of a total of fifty artworks exhibited, only one inspired a feeling of hope. Images of man presented him amputated, decapitated, without ears, with lacerated feet, as alienated and bewildered, and facing an impending psychological and physical deterioration. Guilt and death were portrayed alongside intimations of thermonuclear disaster. Similarly, recurrent themes of much science fiction literature are apocalyptic visions of impending social disaster, of absolute devastation in which survivors are tested in terms of uncontrollable external forces.

If the future is seen in terms of disaster, what of the present? The dawn of man, the paleocybernetic age, the new media, the technotropic society, the post-industrial state, the global village and technooanarchy are all concepts which describe an increased state of human awareness and expanded consciousness, made possible through the process of communication.
Contemporary developments in new communications technologies fit onto the historic trend that was originally traced by such elements as the printing press, the pony express, the telegraph and the telephone. The new media have been made possible through almost invisible electronic components, which are increasingly influencing life at all levels of existence. Data processing systems, telex communication, telegraphy and other signalling networks are the arteries of business and administration and have permeated the fabric of modern civilization. By 1970, more than half the United States work force was employed in information occupations. In 1975, a national ratio of 68 telephone stations per 100 inhabitants was the norm. By 1980, only 22% of the labour force is expected to be employed in manufacturing industries. With the new electronic environments made possible by the prospects of holography and other laser technologies, a quality of presence may be introduced to telecommunications meetings which will be comparable to the intimacy of the boardroom, even though the participants may be spread between Frankfurt, Paris and New York. Rationalized planning, integrating transportation networks and telecommunication facilities will relax many of the locational constraints which previously determined the siting of business and industry. Already aspatial trends are operating and settlement patterns in the United States are spreading over the continental surface, localized at those places where the climate and landscape are pleasant. Population densities are settling down at the scale of the ex-urban fringes of the Eastern metropolitan areas, while household communications apparatus will be more sophisticated than that which is currently in use at the White House.

Entertainment and fun places will provide facilities and possibilities even beyond the limits and innovations set by Walt Disney in Disneyland and Disneyworld. The World Expo's, the Fun Palace, the Astro Mechani-cool and smaller temporary exhibitions such as the Cybernetic Serendipity Exhibition and Hyperspaces are only the forerunners of electronic experiential environments where three-dimensional holographic images and multichannel sound will interact with random human movements, where sound and light define the physical and perceptual environment.

**Innovation diffusion: some impedences**

The diffusion of an idea through a society does not guarantee its acceptance. A given population is not always easily convinced of the greater merits of using new communications technologies at the expense of the systems which are currently in use. It is also unlikely that electronic environments will automatically supersed face-to-face interaction. The traditional mechanisms which facilitate and encourage social interaction such as the pub, the coffee shop, societies, clubs and meetings will continue to be influential long after even the most sophisticated communications technologies have been accepted. Nilles et al., for example, demonstrated that, despite the relative advantage of attending lectures via telecommunications instead of driving to the campus, respondents still preferred to attend class in person and thereby to optimize social contacts. Further, the compatibility of innovations with existing values, experiences, attitudes and needs is positively related to the adoption process. The current status of AT & T's innovation of the videophone is a case in point. This device has not achieved the expected acceptance in the United States, partly because of cost, but mainly because visual telephone contact is thought to conflict with society's concept of the nature and function of the telephone. Again, despite the high potential of cable television, the predicted communications revolution whereby every person would be plugged into the world has not yet occurred. High initial investment costs, institutional barriers, the lack of an adequate subscriber base, conflicting federal and local government regulations and pressure from the broadcast industry have impeded the spread and development of TV's electronic umbilical cord. This lack of investment has led one writer to comment, "... the building of a nationwide, satellite, microwave, cable-connected system probably won't materialize in the foreseeable future". Another study investigated the feasibility, cost effectiveness and acceptability of telecommuting in Los Angeles with the information intensive industry of insurance. Telecommuting was defined as the dispersing of work functions from a central location to remote work centres closer to the workers. The results indicated that telecommuting was feasible, cost-effective and had a significant impact on energy used during commuting. Acceptability of the system was, however, somewhat limited, with factors such as educational level influencing acceptance of the communication alternative. The preference for travel was more due to subtle psychological factors of the destination than to the specific shortcoming of the communication technology. This technology/human consciousness dichotomy has been placed in perspective in Price's statement, "... we know precious little about the value of television over radio, or colour over black and white, of television or radio over print, and of increased human relationships over all of them".

**Media scientists and futurists**

Despite the sometimes hostile attitudes of society to new communication techniques, many of the systems discussed in the foregoing pages already
exist and are subject to increasing proliferation and utilization. Many of the new media were only dreams or tracts of science fiction when McLuhan first astounded the world with *Understanding Media* and *The Gutenberg Galaxy*. More than a decade of research later, media scientists are not much closer to understanding McLuhan's prophecies of the electronic age. Indeed, Tudor has even gone so far as to accuse media researchers of seeking sanctuary in a self-confirming simplified framework of macro-sociology where elements that do not fit the mass culture thesis were conveniently ignored.

The futurist establishment is now a firmly entrenched and clearly recognizable body and representative examples are included in journals such as "Futures" and an increasing number of readers such as Alvin Toffler's book, *The Future*. The immature stage of this discipline is amply illustrated by the lack of opposing opinions, weak critical dialogue and recourse to conjecture and speculation, while basic questions remain unanswered. Toffler's bestseller, *Future Shock* is an imaginative and provocative tome which contains an almost overpowering array of information and statistics, bordering at times on what may justifiably be described as science fiction. Although this book is a compelling sociology of the future, it does fall short of a thorough investigation in certain areas. His reading of some of the available references (in terms of the total literature available on that subject) tends to lead his conclusions and leaves his arguments open to charges of superficiality and lack of depth. Bell has charged Toffler's term "future shock" as being deceptive. His basic criticism concerns the differences in the rate of change experienced between 1850 and 1940, the present and the future. Bell asserts that more change was experienced during the 70 years since 1850 when railroads, steamships, telegraph, electricity, telephone, automobile, motion pictures, radio and aeroplanes were introduced, than in the period which assumes importance in Toffler's theory. Other than television, there has not been one major innovation which has affected the daily life of the individual as much as the above-mentioned innovations. Bell, however, appears to have missed the point, television is the most important of these inventions. Ubiquitous, influential, capable of screening electronic impulses ranging from two-dimensional monochrome pictures to three dimensional holographic colour images, it has the capacity, as previously intimated, to alter the spatial, social and economic structure of cities, business, administration and leisure time activities. The innovation itself will not cause change, but rather its implementation and the new physical and social environments which it will create to replace the old. The New Rural Society project is based on this assumption; that is, that all inventions have already been made and that the task now is one of implementation.

Ultimately, Bell's information-based post-industrial society will depend, to a significant degree, on communications services described in this book. Increasing access to an ever proliferating number of public access cable channels may well lead to a variety of future shock. The idea behind public access television is that anyone should have the opportunity to produce, direct, or hold forth on his own television programme. Subjects vary from amateur soapbox opera imitations to special interest audiences such as the Gay Activist Alliance and even pornographic "art" video shows.

The development and refinement of existing and new communication technologies will have to be linked with research in other disciplines such as architecture, townplanning, regional science, sociology, and psychology. Although social patterns are likely to be radically altered as a result of innovations in lifestyle and living environments, architects in particular seem to pay scant attention to the social and psychological effects of their proposals on society. They have produced a number of hypothetical future city designs which are no longer beyond the bounds of present technology. Many of these designs are synthesized in Peter Cook's somewhat disjointed and all-too-brief account of twentieth century experimental architecture. The futuristic planning approach appears to be confined to only a few experimenters who believe that the future city must have technological structures radically different from those of present cities. The first settlement of this new world is already in the process of being built on 1,600 hectares in the Arizona desert. This city, named Arcosanti, is based on the arcology (a combination of architecture and ecology) notions of Paolo Soleri and represents "... the unmistakable expression of man the maker as man the creator."

In physical terms arcology rejects the horizontal nature of the flat city and aims rather at an urban solid of superdense human vitality. A conventional city of 1,000 km² would be rendered instead by a hexahedron 1 km³ in volume where distances are measured in terms of walking times. The compactness of the structure conserves land with about 90% of the area devoted to open space. Other projects still in the planning stage are the Plug-in City of the Archigram Group, the Bridge Structure of Friedman, the Marine Cities of Kikutake and Kobayashi, the Domed Cities of Buckminster Fuller, the Helical City and the Walking City.

It is perhaps significant that Cook's exposition is obviously written for architects who already possess some considerable knowledge of the works he covers and who understand that strain of jargon peculiar to architects. Not surprisingly then, his most vociferous critics are drawn from the ranks of architects. Only once does Cook mention the sociological
aspects of living in such cities, and even then he only alludes to a particular sociological implication (of dubious relevance) that people don’t seem to worry about the mediocrity of the dwellings they live in. Rechristening the Plug-in City, one architect, no doubt with his plug in his cheek has taken Cook’s Archigram Group to task and has indulgently overstated his case in the process: “Is Archigram’s Plug-in City in fact Drug-in City, the sub-conscious herald of capsule society, the ultra and last nihilist statement of world architecture, a vast web of plastic worms in which man’s limbs rot away and his brain, drug injected, blows up to fill the capsule home until, finally, the brain no longer in control of the machinery it has so carefully set up over the millennia of years, gets sucked down the waste tube.”

Cook reports on architectural visionaries who appear, to a surprisingly high degree, to be developing their respective projects independently of and in contradiction to the aspatial forces which are presently determining the spatial organization of the society of the future. Their designs in the main appear to be predicated upon a lack of space, hostile environments and a vertical integration of working and living spaces. Such constructions may certainly be of value in overpopulated areas, deserts, ice environments and even the moon, but at this point will only serve a novel or experimental function in the post-industrial society.

The Utopia or Oblivion disciples led by Buckminster Fuller and his adherents who thrive on the repetition of his jargonistic terminology have been more successful in preparing man for his confrontation with and control of the future. Their “comprehensivist” approach is eclectic and cannot therefore be considered a rigorous analysis. The contribution of this school, as with that of McLuhan, lies basically in their efforts to create in man a psychological climate to accommodate the kind of influences that individuals may experience in the future. Fuller believes that the new media and new technologies can function to separate man from the present and invalidate his past. In so doing, man will have at his disposal the mechanisms to redistribute society’s scarce resources on an equitable and deserving basis. His numerous articles, books and inventions all fall back on the same basic theme: that efforts to perpetuate disparities between the rich and the poor are the result of an ancestral mentality, and that technology can work to open the gates of abundance and happiness.

Although Fuller, like Darwin, places his emphasis on the mind and not the brain, their respective arguments diverge dramatically on the mind/instinct relationship. Fuller totally rejects Darwinian theory on biological determinism and attempts to throw Malthus and his scarcity apostles out with the bathwater. Darwin’s research led him to believe that mind and civilization are of little use, if, in the end, man’s animal endowment will determine his ultimate fate. Robert Ardrey has modified Darwin’s original assertions, positing that human intelligence and symbolic communication assist man in his capacity to relate past to future, to foresee contingencies, to evaluate, and to imagine solutions. These abilities draw on a power flowing from an evolutionary main event, even though the human mind does incorporate unlimited investigative powers as moderator in the eternal instinctual debate. The human mind, Ardrey argues, stands free and uncommitted, and is not consequent upon a single given instinct. The paradox lies in the mind’s dependence on the outcome of the interaction of all the human instincts. The most pervasive, significant instinct of man is his urge to develop ever better and more devastating weapons. In terms of this hypothesis, the process of civilization may be regarded as a dynamic compensatory sublimation of man’s killing imperative, and rests on the most ancient of animal laws – that of commanding order.

The ascendency of civilization corresponds closely to man’s increasing ability to kill – the one cannot exist without the other. Ardrey’s comparison of man to animal society is absolute, however hard man tries to delude himself. “Civilization”, says Ardrey, “lacks nothing in its imitation of nature; what it lacks, and lacks only, is its recognition of man as an animal.” The Fuller/Ardrey antithesis then, revolves around the question of human nature. Each side has marshalled an impressive army of generals to win its point. Ardrey can include Lorenz, Tinbergen and Morris; while Fuller can draw on the more encompassing resources of McLuhan, Youngblood, the futurists and science fiction writers. The latter group hold that human nature is adaptable, is shaped and conditioned by fictions, media and other influences and that human survival is independent of a genetically inherited killing imperative and therefore that life in highly sophisticated city forms is ultimately realizable. Ardrey’s opinions are based on the presumption of the unchanging animal nature of man.

Hence the importance of the study of ethology or animal behaviour which may be extrapolated to illuminate man’s present and future behaviour. This concept has no place for the futurist visions of the experimental architects or those scholars who, like Fuller, have urged a redirection of our consciousness, if mankind is to progress. The all-or-nothing arguments of Fuller are similar, although more optimistic than the Ardrey school which foresees nothing short of at least partial thermonuclear destruction. The result, Ardrey predicts, will be an inhibition in the further use of such weapons and a consequent darkened threshold for society, through which
man may never return. His central human dream, personified in the superior weapon will have been shattered. Deprived of the context of weapons man must find new dreams, new dynamics, new experiences to absorb him, new means of resolving his issues and of protecting whatever he holds as good. His survival depends on this search, or he will find himself lost. Governments will lose their force and societies their integration. Ardrey, in a severe attack of pessimism, is not very hopeful:

"Must the city therefore perish in a blinding moment of universal annihilation? Was the sudden union of the predatory way and the enlarged brain so ill-starred that a guarantee of sudden and magnified disaster was written into our species' conception? Are we so far from being nature's most glorious triumph that we are in fact evolution's most tragic error, doomed to bring extinction not just to ourselves but to all life on our planet?"33

In other words, the genetically pre-programmed nature of man will preclude his mind or consciousness from exerting control over his predatory and territorial animal instincts. If this is so, then the answer to Ardy's questions is Yes. An alternative option to the above conclusions is to be found in Desmond Morris's contribution, The Human Zoo. His submission to the Darwin-Ardey hypothesis is total, although his emphasis and conclusions differ:

"In what promises to be the more crowded world of the future, they (the politicians, administrators, etc.) must become good biologists as well, because somewhere in all that mass of wires, cables, plastics, concrete bricks, metal and glass which they control, there is an animal, a human animal, a primitive tribal hunter, masquerading as a civilized super-tribal citizen and desperately struggling to match his ancient inherited qualities with his extraordinary new situation. If he is given a chance he may yet contrive to turn his human zoo into a magnificent human game park. If he is not, it may proliferate into a gigantic lunatic asylum."34

A more recent parallel concept, sociobiology, the study of the biological basis for social behaviour in every species, ran into a cloud of marxist fallout at the 1976 Meeting of the American Anthropological Society. Labelled by its detractors "as an attempt to justify genetically the sexist, racist and elitist status quo in human society", the antagonism level monitored was reminiscent of the churches' denunciation of Galileo. For this reason alone, the concept may snowball and ultimately survive as a valid method of analysis despite the book burning pogroms of its hysterical egalitarian minded persecutors.35

The constant and somewhat dubious comparison of man and human society with the behaviour of rats, termites, sea birds, chimpanzees, mon- keys, and gorillas, and of his built environment to a zoo or territorial imperatives tends to relegate all philosophical discussion to a zero level and conveniently evades the possibilities of the evolution of a new strain of homo sapiens which may be able to enlist its mind in the control of instinct. Such a creature may yet become integrated in a future society where socio-minds, developed to the degree postulated by Siff, may become the norm, although, as Millows clearly points out, the majority of people may never attain this ability. Ardyrey cannot deny that such a mutation is possible, and that their enlightened control of society may well avert the impending holocaust. Rollerball describes one such society.

The Utopia chimera

Unfortunately Fuller, in company with many professed Utopians, does not concern himself with either an adequate definition or a measurement of the concept of happiness. A number of writers have tackled his thorny problem with inconclusive results. Smith proposes the notion, "social well-being" and defines it as "... the specific end of a continuum of abstraction that descends from human happiness through the concept of the quality of life to social well-being".36 Although the pursuit of happiness is of fundamental social concern, this notion requires philosophical explanation because scholars agree neither on its substance nor its source. Galbraith cites Bertrand Russel in this connection, "... a profound instinctive union with the stream of life," but, as Galbraith remarks, "... we do not know what is united."

To agree that the purpose of science is to improve society in order to achieve what Bentham has phrased, "... the greatest happiness of the greatest number..." is essentially simplifying the issue and evading the operational difficulties in its application as an optimal welfare function. Does the scientist standardize a happiness level and then try to achieve this for the greatest number, or should a maximum welfare level be identified to benefit the greatest number? Another writer, perhaps with a tongue in the cybernetic cheek, constructed the following definition: "The amount of happiness is the quotient of all that is attained at a given moment, and all that is consciously and unconsciously desired at that given moment". That is:

\[ G(t) = \log \frac{dA(t,W)}{dt} \]

\[ G(t) = -\log \frac{dW(t,A)}{dt} \]
Where: \( G = \text{amount of happiness} \)
\( A = \text{all that is attained at a given moment} \)
\( W = \text{all that is consciously and unconsciously desired at that moment} \)
\( G, W \) and \( A \) are functions of time (t)\(^{38}\).

The equation represents a situation where happiness depends on how far our desires are fulfilled at a given moment. Two alternatives exist in order to compute the highest possible value for \( G \). These two opposing approaches delineate the methods by which the Eastern and Western worlds search for happiness. The East has attempted to optimize the subject equation by minimizing the denominator, by making the wishes smaller in order to achieve their fulfillment. The West, in contrast, has tried to optimize the subject equation by making the numerator always bigger and bigger. Changes in this equilibrium can be directly attributed to, amongst other influences, the effects of the media.

**Information rich versus information poor**

A major problem associated with the application of new communications technologies is its tendency towards unbalanced development. Although communications capacity has increased tremendously over the last few years, this increase has benefited institutions and businesses rather than the public, and the urban, rather than the rural regions of the country.\(^{39}\) The problem is stated: "In an urban technological society the difference between those with, and those without access to new communication and information-handling devices, often produces a difference between a group that controls its own affairs and a group that is totally dependent on the paternalistic benevolence of information handlers."\(^{40}\) In other words, new communication techniques and technologies create new information gaps before old gaps close, i.e. the information poor group is increasingly left behind with the introduction of each new communication technique.

Considerable differences also exist between developing countries and modern economies. Although the gap, for example, between countries with a high proportion of telephones and those with comparatively few is decreasing, on a world basis the telephone population ratio remains at less than 10 telephone stations per 100 inhabitants. While the information orientation of industrial and post-industrial civilizations may increase human awareness amongst their respective populations, the same information can exert negative influences on information poor societies, who, although included in the global information network or noosphere, are nevertheless not actively part of that network. Mead \(^{41}\) provides an example of this kind of separation,

". . . At the time that a New Guinea native looks at a pile of yams and pronounces them 'a lot' because he cannot count them, teams at Cape Kennedy calculate the precise second when an Apollo mission must change its course if it is to orbit around the moon". Mead has identified three basic types of culture which have relevance for an analysis of society from the traditional to the post-industrial.

1. At the lower end of the continuum are postfigurative cultures in which children learn primarily from their forebears. Change is slow and imperceptible, so much so, that grandparents cannot conceive of any other future for their grandchildren than their own past lives. On the passing of traditional society Daniel Lerner writes, " . . . inertia was the modal principle of personality for most people. It is not that traditional people did nothing, on the contrary, many of them worked as hard and as long as their oxen. It is rather that they did nothing new. What sustained traditional society . . . was the routinization of life-patterns in a self-sealing system that required no ingenuity and rewarded no initiative from its population. Rooted in their place and pride, traditional mankind lived by their constraints—unaware of them as constraints, because no communications alerted them to alternatives. Modernization . . . reversed all this".\(^{42}\) In other words the system maintaining propensity of traditional society was disturbed by one or a combination of modernizing influences resulting in change from inertia to one of experimentation. The statement "we have always done it this way" developed in an evolutionary and sometimes revolutionary direction, to "there must be an easier and more efficient way." Traditional social systems usually exhibit a built-in resistance to change, have low literacy, poor understanding of scientific methods and remain relatively isolated because of poor communication links. Often communication in support of change has no common ground or basis of understanding with the receiving culture. Congolese soldiers, for example, during World War II, meeting Donald Duck for the first time, threw stones at the screen because they thought they were being ridiculed. "Animals don’t talk," they shouted. "Whoever saw a duck in uniform?"\(^{43}\)

Traditional societies in contact with other cultures will only survive if they can achieve internal stability or homeostasis. Life continues only until it begins to decay more quickly than it can reconstruct itself.

The last two centuries have shown only too often that there are limits to the rate of cultural change, and that beyond a certain point the pressure of an alien culture results in internal collapse of the native life without assimilation of the new.\(^{44}\) The amount of happiness, if defined as a measure of the adaptability of a cybernetic system at a given moment will lead to the
establishment of an equilibrium between desires and what can be attained at a given moment. If this delicate balance is upset, societal decay will proceed faster than adaptation or reconstruction. A classic example is Sharp’s account of the indiscriminate supply by missionaries of steel axes to stone age Australians.45

The stone axe was a fundamental piece of cultural equipment in that it helped relate men, women and children to nature and technological behaviour; it served the purpose of transforming natural into cultural equipment, and defined person to person contact. The uncontrolled diffusion of steel axes, operating in conjunction with other elements also being introduced from the white man’s several subcultures undermined the realm of traditional ideas, sentiments and values without defining new conceptions to replace them. The result was a mental and moral void which foreshadowed the collapse and destruction of all Yir Yorant culture, if not, indeed the extinction of the biological group itself. The Yir Yorant society, once a local enclave of increasing organization maintained by the process of homeostasis, became subject to a reversible information transfer from the general stream of increasing entropy, was unable to adapt to such disturbances and consequently degenerated into a state of increasing chaos and dedifferentiation. The happiness equation could not correlate desires with fulfillment, the error control signal was unable to prevent the communication of disturbances, and the variety in the decision making or controlling mechanism could not match up to the alien influences communicated by the missionaries.

2. Postfigurative cultures generally overlap with configurative cultures which, for our purposes, are the result of the development of new forms of technology in which the old are not expert and where the experience of the young generation is radically different from that of their parents, grandparents, and other older members of their immediate community. The young have to develop new styles based on their own experience and thereby provide models for their own peers. Configuration occurs mainly in developing or modernizing societies and the demands on communications are proportionately greater than at any other stage of social growth. Communication is exported to help survey a new environment, raise people’s aspirations, guide and control a dynamic process, teach new skills and socialize citizens to a new and different society that is still only in the process of becoming.46 In a modern society a certain degree of change is anticipated and the behaviour of each new generation is expected to differ from that of the preceding generation; in a modernizing society, change assumes the proportions of an overriding national value, and therefore planned and

purposeful use of communication ranks highly. The relationship between communication and the modernizing process raises many problems of which two will be dealt with.

(a) Since the majority of innovations which diffuse through a modernizing society are most probably first introduced by imitation from outside the country rather than by local invention, the process of international innovation diffusion is important also for the spread of economic development within that country. In many of the less developed countries, while new techniques and ideas are accepted and adopted with relative ease in the capital cities, they do not spread to the lower levels of the urban hierarchy or to the rural areas.47

(b) The mass media possess the “multiplier property” which functions to produce productive development attitudes rapidly.48 The media are able to impart new skills and new values with relative ease. According to Lerner49 they have performed this task all too well, which is why mankind now faces a revolution of rising expectations. People have assimilated new desires and demands, their aspirations and expectations have risen, the media have taught people what to want. The result is that when all desires for the moment are attained, more desires immediately emerge. In this case the media have optimized the subject equation by making the numerator always greater, so as to obtain everything possible. What the media have not done is to teach people how to get. Lerner does offer some general though vague guidelines to bring the want-get ratio into a dynamic equilibrium. People, he says, must be taught not to expect things they cannot get, that reward will follow effort and that productivity is the source of goods. The regulatory mechanism of the mass media in conjunction with natural communications allies such as schools, religious organizations and work associations should co-operate in providing people with a reliable guide to a better reality.

3. In prefigurative cultures the future of society can no longer be seen as an extension of the past. The high level exchange of information from one social system to another has increased the rate of change or neogenesis to a level where parents are also learning from their children. The rapid development and diffusion of communications technologies ensures that enclaves in human society are no longer isolated individual closed systems. Those societies which are unable to adapt and survive are not endowed with adequate decoding mechanisms or social institutions to cope with the new information input. Like the stone age Australians, new information cannot be assimilated, information is lost in transit, and Western man or the innovators who induce changes appear to be unable to control this loss or predict the consequences that their technologies may have on such tra-
ditional or modernizing societies. Interaction between postfigurative and prefigurative societies is perforce dominated by confusion, impotence and ultimately, confrontation. The Habitat '76 United Nations Conference on Human Settlements, for example, yielded an insight into the structure of this confusion. Editorial comment, published in *Futures* reads: "The poor may have found it politically expedient to denounce the rich in public, but in private, relations seemed much more harmonious than one might have expected. There seemed to be a common vocabulary and a recognition of common problems."50

Hallen's report was more pessimistic, "The confusion of ideas, the thousands of interests and causes all shouting to be heard at the Forum at Vancouver reminded me of the day after God and his action committee had dealt the builders of Babel their comeuppance. An erudite intellectually alert world set within a technology of enormous communications possibilities has solved the problem of the old historical and social languages. For today the new languages are of ideas, of concepts and of causes. Men are now separated more by the ideas they hold than by the historical language they speak."51 In other words the same generations living at the same point in time live in essentially different but overlapping cultural epochs, all of which represent different interpretations of overlapping realities. Reality and future assume a symbiotic relationship, and definition depends more upon a given society’s position on the postfigurative-prefigurative continuum, than on semantic construction. For as Bell asserts, for most of human history reality was nature – to find shelter from the elements and to wrest food and sustenance from the soil, the waters and the creatures. Then reality became technics. The Industrial Revolution was an effort to substitute a technical order for the natural order. In the industrial society the cosmological vision was the game against fabricated nature. The post-industrial society is not concerned with either nature or technics. Reality is primarily the social world where men live more and more outside nature, and less and less within the machinery of things; they live with and encounter one another.52

Similarly other definitions will change depending on a society’s location on the reality matrix. Architecture, for example, originally a response to the need for adequate shelter was broadened to include other aspects such as religion, status, protection, functional specialization and aesthetics. Today architecture draws heavily on the social sciences, the physical sciences and electronics. To modify Cook’s assessment: music and other sounds, lights and other things seen, media and electronic audio-visual environments, and almost any kind of physical support will be an integral part of architecture within the next decade. The central thesis of Young-

blood’s exposition is a redefinition of cinema to mean "... a process of becoming, man’s ongoing historical drive to manifest his consciousness outside his mind, in front of his eyes."53

According to Mead, the paths by which man entered the present can never be traversed again. Coming by different roads out of the past, all the peoples of the earth are now arriving in the new world community. In this respect, Mead’s thoughts converge with those of Fuller, "... The freeing of man’s imagination from the past depends... on the development of a new kind of communication with those most deeply involved in the future—the young who were born in the new world... the development of prefigurational cultures will depend on the existence of a continuing dialogue in which the young, free to act on their own initiative, can lead their elders in the direction of the unknown." Mead concludes, "... we must recognize that we have no descendants as our children have no forebears... The Future is Now!"54

The post-industrial society postulated by Daniel Bell has emerged, the concept of the noosphere has become a fact, the wired city may eventually become the wired nation and the metasocio-mind may become reality, but man’s consciousness has not yet caught up with his technology. The technology/human interrelationship still remains, however, unclear. Teer has posed the question of who should be consulted in the search for clarity. He states, "Having made a quick check by rereading in retrospect the transactions of former symposia on the future, I have the impression that the artist and the philosopher have a better developed ‘clairvoyance’ than the technologist and the sociologist."55 This statement is strengthened if credence is paid to the phenomenon whereby an increasing number of academics are seriously studying the literary importance of science fiction. In the United States alone, over 200 schools, colleges and universities offer courses on science fiction.56 Working within total experimental freedom, the science fiction artist is not restricted to any particular discipline or method of enquiry, his works may exhibit the same precise logic and rigorous attention to detail as a scientific endeavour, but he is not constrained by scientific determinism. If science fiction is a window to the future then the impressions conveyed in the literary historical development suggests some hope for mankind, for in surveying science fiction literature over a period of many years, at least one reviewer has monitored an optimism in future thinking that is becoming less of a rarity than it has been in the past, particularly for those people working on creative visions of alternative societies.57 Science and art and a convergence of the two into the technological artist may
ultimately explain the relationship between man and his technology and media and change.

**FOOTNOTES**

4. Quotations taken from *Production Notes*, Twentieth Century Fox
7. Siemens International Telephone Statistics, 1976
10. See Architectural Review, January, 1965
17. Ibid., p. 55
30. Also see J. Tarn’s energetic dedication of 26 verses: "The Gospel according to Archigram." *RIBA Journal*, May 1973, p. 245
35. See Time report, Dec. 13, 1976, p. 72
42. Lerner, D. and W. Schramm (eds.): *Communication and Change in Developing Countries*. East West Center Press, Honolulu, 1967, p. 306
46. Lerner and Schramm, op. cit., p. 6.
47. See Hillewick et al., p. 29
49. Lerner and Schramm, ibid. pp. 305-317
54. Mead: op. cit., p. 119
GLOSSARY OF TERMS

Cybernetics

cybernetics: The science of control and communication in an organism or organization, natural or technological. It incorporates the study of messages as a means of controlling society.

chaos: the 2nd Law of Thermodynamics implies that the ultimate state of any system is disorder or chaos. Chaos is a state of sameness of components and conditions in a system.

control: intervention which corrects deviations from certain goals within a system.

disorder: same as chaos.

disturbance: an influence which may cause deviation from a system’s state of equilibrium.

entropy: a measure of the degree of order or disorder existing in any system based on the distribution of energy.

feedback: an output signal which is returned to the input to influence the relationship between input and output.

homeostasis: the functioning of a system so as to correct adverse disturbances through the detection of deviations from the desired state; it involves correction by negative feedback.

information: a pattern of energy used for communication or control within a system.

negative feedback: this signal tends to diminish deviations or errors in transmitted messages and leads to stability of a system.

negative entropy: a state of increasing order.

order: the opposite of chaos or disorder, a state of increased differentiation.

positive feedback: this signal tends to increase deviations and causes instability or change.

sensory mechanism: a device which is sensitive to different forms of energy (e.g. information) in a system.

system: a group of interacting, interrelated, or interdependent elements forming a collective entity.

variety: for effective regulation in any system, the variety in the decision making mechanism or control device must be at least equal to that of the disturbances.

General

bioelectric: electrical impulses occurring within a living organism.

diachronic: the study of a sign-system in an historical evolutionary, linear system.

distance decay: the fall-off of attraction (e.g. a stopping centre) with increasing distance.

exoskeleton: a skeleton external to the body, e.g. a motor car, a computer.

friction: the impedance of motion.

kinesics: a discipline based on structural and descriptive linguistic models to describe communicative behaviour of the human body.

meme: similar to noogene.

mentation: mental processes or function.

noo (Greek) pertaining to mind.

nooGene: thought patterns generated by minds and transmitted nonbiologically from mind to mind and generation to generation to ensure the persistence of concepts, philosophies and behaviour patterns.
noosphere: Chardin defined this as the terrestrial sphere of thinking substance. Despite Chardin's rejection of Asian thought, this notion appears to be based on the ancient Hindu philosophy, the *Akasha*, a Sanskrit word relating to the Universal Mind, from which all matter is derived. (Term coined by Youngblood.)

paleocybernetic: The psychological transition from the Industrial Age to the Cybernetic Age, or Post-Industrial Age. The Age when man is free to discover what and who he is and when he gains the ability to manifest his mind in front of his eyes. Similar to Chardin's concept of convergence and the *Akasha* notion of the Universal Mind.

paradigmatic: those elements which occur among the potential (or "absent") elements of a statement.

semiology: the study of sign systems as a communicative medium.

surface: a geographical term describing a stylized graphical interpretation of specific data (e.g. marketing or consumer).

synchronic: the study of the condition of a sign-system at a given stage.

synergistic: the process whereby individual components interact and combine to produce a system whose performance is greater than the sum of the contributions of its separate parts.

syntagmatic: those elements which exist among the actual (or "present") elements of a statement.