

The Mitchell Prize Competition

**1977
ABSTRACTS**

OF

Papers Selected

AS

FINALISTS

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For

Alternatives to Growth '77

The Nature of Growth in Equitable and Sustainable Societies

October 2-4, 1977, The Woodlands, Texas

ABOUT THE ALTERNATIVES TO GROWTH PROGRAMME

The Alternatives to Growth Programme is a ten-year effort, begun in 1975, to generate sustainable and just alternatives to present material growth patterns and associated worldwide problems. The Programme is divided into five two-year cycles each consisting of a world conference, a Mitchell Prize Competition and related activities. The conference and the contest are closely linked so that maximum benefit can be derived from mobilizing global intellectual resources around the concept of sustainable societies. The goal is to gain a better understanding of the growth problematique and promote the formulation and consideration of workable approaches to growth-related problems.

The Programme is sponsored by the Club of Rome, the University of Houston and the Mitchell Energy & Development Corp. The second phase (1976/1977) was organized and managed by the Society for International Development (SID), an international, non-profit membership organization founded in 1957. The Society provides a forum for the exchange of ideas, facts and experience among all persons--professional and otherwise--concerned with the issues and problems of global development.

A distinguished international ATG Steering Committee acts as a policy planning body to help give shape, substance and guidance to the ten-year Programme.

Willem P. J. Boichel
Alternatives to Growth Programme
Coordinator

Washington, D.C.
September 1977

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Preface

One glaring problem confronts mankind, if it should choose to develop a sustainable and equitable global society. There is essentially no body of knowledge from which to design the new institutions and values consistent with the sustainable state. Two hundred years of growth have left biases and blind spots throughout the physical and social sciences. There is today no economic theory of an advanced technology society in which there are essentially zero interest rates, no net accumulation to society's productive capital and in which the principal concern is equality rather than growth. There is no equilibrium sociology which is concerned with the social aspects of a stable population, whose age composition is skewed toward the elderly. There is no equilibrium political science in which we might look for clues to the ways democratic choice could be exercised when the potential for short-term material gain is ruled out as the basis for political preference. There is no comprehensive equilibrium technology that places high emphasis on the recycling of all matter, on the use of the sun's pollution-free energy and on the minimization of both matter and energy flows. There is no psychology for the steady state which might provide man with a new self-image and with feasible aspirations in a system where material output is constant and in balance with the globe's finite limits.

Each of our traditional disciplines could respond to the challenge of working out the details of sustainable and attractive equilibrium societies. The effort would pose many difficult technical and conceptual problems, whose solutions would be intellectually satisfying and of enormous social value.

In the above spirit, George and Cynthia Mitchell have inaugurated an international competition to stimulate the best minds in their analysis of the problems and potentials inherent in the social transition to a sustainable state. Five prizes of \$10,000 each will be awarded at the Alternatives to Growth '77 conference. Nearly 400 submitted papers were first evaluated by six screening institutions from around the world. Thereafter, international multidisciplinary panels selected the twenty finalists and then the five prize-winning papers. The twenty finalists in the competition will participate in the October 1977 conference. The following are abstracts of the papers submitted by the twenty finalists.

The 1979 competition will offer \$100,000 in prizes. Further information can be obtained from Mitchell Prize, Box 58, Plainfield, New Hampshire 03781.

Hanover, New Hampshire
September 1977

Dennis L. Meadows, Director
Research Program on Technology
and Public Policy
Dartmouth College

Abstract

One of the most important functions of a research program is to provide a systematic and organized approach to the study of a problem. This is especially true in the case of a research program in which the investigator is concerned with the design of a new system or the improvement of an existing one. The first step in the design of a new system is to define the problem. This involves a clear statement of the objectives of the system and a determination of the constraints which will govern its design. The next step is to develop a conceptual model of the system. This model should be based on a sound understanding of the principles of the system and should be able to predict the behavior of the system under various conditions. The third step is to develop a detailed design of the system. This design should be based on the conceptual model and should be able to specify the components of the system and their interconnections. The final step is to build and test the system. This involves the construction of a physical model of the system and the measurement of its performance under various conditions. The results of the tests should be compared with the predictions of the conceptual model and the detailed design to determine the accuracy of the model and the design.

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In the above article, George and Gordon Mitchell have investigated the problem of the design of a new system. They have shown that the first step in the design of a new system is to define the problem. This involves a clear statement of the objectives of the system and a determination of the constraints which will govern its design. The next step is to develop a conceptual model of the system. This model should be based on a sound understanding of the principles of the system and should be able to predict the behavior of the system under various conditions. The third step is to develop a detailed design of the system. This design should be based on the conceptual model and should be able to specify the components of the system and their interconnections. The final step is to build and test the system. This involves the construction of a physical model of the system and the measurement of its performance under various conditions. The results of the tests should be compared with the predictions of the conceptual model and the detailed design to determine the accuracy of the model and the design.

The 1977 competition will offer \$100,000 in prizes for the best design of a new system. The competition is open to all students and faculty members of the University of Toronto. The deadline for the submission of designs is December 31, 1977.

George L. Mitchell, Director
Research Program on Technology
and Public Policy
Durham College

University of Toronto
September 1977

ANDREW MICHAEL GAMBLE
DAVID EARLE GAMBLE

TOWARDS A SUSTAINABLE-STATE ECONOMY IN THE UNITED KINGDOM

Economic decline has revealed how unsustainable the present growth-oriented economy in Britain has become. In its past the oldest industrial nation embraced two kinds of dependence--external dependence on other regions to supply food, energy and raw materials; internal dependence on the institutions and consumption patterns that sustain growth. Both have turned into weaknesses; the external environment has become more threatening and the internal environment has lost its former capacity to stimulate growth, at the same time undermining individual independence.

North Sea oil promises to counter the decline temporarily. Four main options exist for the use of the oil wealth: boosting consumption, investment in overseas assets, investment to regenerate British industry, and investment to create a sustainable society.

The last option would mean collecting the oil revenues and savings on the balance of payments into a fund and entrusting it to a new agency, the Conservation Commission. This Commission would have statutory powers and responsibilities to ensure its independence of governments, and would coordinate all conservation policy, building on past precedents as well as launching new initiatives. It would pursue two main strategies: containment and transformation. The first would make grants from the oil fund, supplemented by administrative and fiscal measures, to reduce Britain's external dependence by the time the oil is exhausted. This strategy would have three main targets: a stable population, self-sufficiency in food, and finding alternatives for finite resources, particularly energy. The second strategy would ensure that the first was implemented in ways that could promote a revolution of falling expectations and changes in the institutional framework, so helping to end internal dependence and establish a sustainable society.

JEROME MARTIN WEINGART

THE HELIOS STRATEGY - A HERETICAL VIEW OF THE
ROLE OF SOLAR ENERGY IN THE FUTURE OF A SMALL PLANET

Over the next hundred years there must be a worldwide transition from reliance on fossil fuels to the use of some combination of long-term and abundant primary sources for the production of heat, electricity and synthetic fuels. The rate at which such options can be developed and employed, as well as the maximum rate at which they can provide energy at a sustained rate, will place important constraints on the rate and limits to growth of other human activities.

It is generally argued that only the fission option, in the form of the fast breeder and high temperature reactors, can provide the energy required for a livable world, particularly if this means a world of ten billion people living at the present energy level of Western Europe. However, a careful examination indicates that the use of solar energy, through a menu of technological options, can provide the needs of a world at this scale of energy use, and that this can be accomplished within the constraints of land availability, and requirements for energy, materials, and labor.

No scientific breakthroughs are required, although a number of these would be helpful, but very substantial engineering advances are required, and the transition to such a system worldwide would take no less than a century. However, the feasibility of such large scale use of solar energy will substantially alter those aspects of the "limits to growth" discussions in which future growth strategies are constrained by available and acceptable energy alternatives.

This paper outlines a global solar energy system considered feasible for more than 10 billion people living at 5 kW per capita.

CHARLES J. RYAN

THE CHOICES IN THE NEXT ENERGY AND SOCIAL REVOLUTION

The purpose of this paper is to provide a context for choosing the energy system that will replace fossil fuels. It does not pretend to answer all of the difficult problems that will be encountered in reaching equilibrium. It argues the case on physical and social grounds why solar energy, not nuclear fusion, the other possible ultimate source, provides the best alternative.

Two events of unparalleled importance stand out in the long course of human history: the introduction of agriculture, and industrialization. They were profound energy and social revolutions: energy revolutions in that each vastly increased energy availability over the former period; social revolutions in that each increased the scale of society and rearranged the social order around new technologies, institutions and values. As fossil fuels, the energy source of industrialization, are depleted, the world enters into the third most important energy and social revolution in the development of civilization.

Natural and social systems operate under the same principles of energy management. Growth, stability or decline is determined by the interdependent relationship between energy and structure (Energy in Natural and Social Systems). The evolution of civilization over more than a million years can be seen as a successful quest to control greater amounts of energy through social organization in three different energy and social systems: hunting and gathering, agriculture and fossil fuels (Two Energy and Social Revolutions). Many nations based on different energy and social structures have flourished and disappeared throughout history. The cases of Egypt, Rome and Britain are used to illustrate the dynamic forces which effect the rise and fall of empires, dependence on foreign resources and the changing purposes of social organization (The Influence of Energy on Nations). The energy perspective of the paper suggests the relationship between continuous growth and social discontinuity in United States history (Continuous Growth and Social Discontinuity in the United States). The physical and social consequences of future energy alternatives are discussed in terms of an Orwellian, Jeffersonian and Malthusian type future (The Third Revolution: Orwell, Jefferson or Malthus). The paper concludes with an endorsement of solar energy as the alternative most likely to afford a stable future in a humanly organized environment (Conclusion).

EGBERT BOEKER
HARRIE ELJKELHOF

'ALTERNATIVES TO GROWTH' IN EDUCATION

A COURSE ON 'PHYSICS AND SOCIETY' IN DUTCH SECONDARY EDUCATION

The problems of the 'limits' and 'alternatives' to growth should be appreciated by significant parts of the population. One way to achieve this is by including a discussion of these problems in the curricula at secondary school level. The paper describes an attempt at such a curriculum innovation for a high status subject like physics in the Netherlands.

It first describes the economic, social and political situation in the country and the organization of secondary education as a set of conditions that have to be taken into account. Next it is shown how the 'limits' problems are discussed as part of a course on 'physics in society.' This course starts with a treatment of problem areas like energy, noise, transport and weapons. Then as a contrast the situation in developing countries is described. At last the course culminates in a treatment of forecasting and a description of two alternatives. The first is an OECD-type growth model and the second one describes a society of weakly coupled units of consumption and production. The students learn to evaluate these models against physical limits and against the social and psychological properties of human beings.

The paper shows how these topics are being introduced into the educational system, and the results that have been achieved so far. The reactions of students, teachers and the public are encouraging. Policy suggestions that follow are on the stimulation of programmes like these. This can be done by incorporating the topic into the curriculum, especially for the age group of 16-18 years, by an international exchange of information and by the publication of an international teachers' guide.

WILLIAM E. HALAL

BEYOND THE PROFIT MOTIVE:

THE POST-INDUSTRIAL CORPORATION

Global approaches to solving the world problematique are augmented in this paper by a grassroots approach which may encourage the business corporation to evolve into an organic post-industrial form.

This post-industrial model embodies two main concepts. One involves the development of social accounting frameworks that encourage the pursuit of social welfare rather than financial profit alone. Results are presented of a computer simulation of such a framework, called the "return on resources" model. The second concept suggests that systems of corporate governance be extended to form a corporate community composed of investors, employees, customers, the public and others involved in corporate affairs in order to facilitate collaborative policy making. These two complementary principles comprise a broader equivalent of free enterprise that provides more appropriate decision-making processes for post-industrial society.

This post-industrial paradigm of corporate behavior is believed to be technically feasible, and trends suggest that its adoption is quite possible. The power of business corporations could thereby be transformed into a humanitarian force for achieving sustainable increases in human welfare.

DAVID W. EHRENFELD

TOWARDS RESOLVING THE PROBLEM OF ADMINISTRATIVE GROWTH

The inexorable growth of administration is a major obstacle to the establishment of a steady state society. In most medium and large-sized organizations, increase in the number of administrators and administrative functions is uncoupled from productive output. This is the result of a positive feedback loop in which administrative output above a certain level is an intrinsic force for administrative growth. The increase of administration in government, with its resulting increase in laws and regulations, adds an extrinsic propulsion to this force. The consequences of administrative growth include: 1) increased direct costs of administration, 2) increased indirect costs--the wasting of producers' time, and 3) the depersonalization of work.

Administrative growth will not be controlled by the control of population growth or by such measures as zero-based budgeting. To resolve the problem, the positive feedback loop must be eliminated and new negative feedback links between production and administration must be established. These links should consist of partial producer control, through an administrative control committee, of the hiring, promoting, and firing of administrators, the creation and elimination of administrative positions, and the approval of administrative budgets. The limited rotation of administrators through production jobs is also suggested.

The government bureaucracy should receive first priority, and special control measures will be needed. These include control committee staffing from outside the agency being cut, and a temporary annual quota for staff reduction. Guidelines for this process are suggested. The proposed institutional changes are mechanical in nature, and would not depend upon widespread altruism or fundamental changes in human perception of the environment.

HARRY G. HAILE

TEACH US TO PLAY AGAIN

Sustainable civilization is in the best practical self-interest of world business. As the social consciousness of business has grown, large enterprises have also emerged with genuine (= organically) supranational perspective. Such corporations are motivated to work toward good ends not attainable by governments.

A major problem of our time is that governments are unequal to the task of arresting destructive economic trends. Democratic governments are denied persuasive techniques routinely used by business to promote its economic goals. Governments rely largely on coercion, but this is an ineffective and antiquated concept of leadership. Educational institutions have not functioned as leaders, either, but are following the economic sector. Business must therefore continue to broaden its construction of "economic interest."

The moderation of "growthmania" will occur only gradually, as coming generations free themselves of the intense materialism which attended early industrialization. The corporation can further the process by emulating the best forms of patronage tested in the past, and by giving its patronage a contemporary, democratic thrust. Patronage differs from philanthropy in that it derives from the patron's initiative and goals. The long-range self-interest of business includes the aesthetic education of world populations.

I recommend a Consortium of a few of the largest corporations to nurture sustainable civilization through democratizing creativity. I pinpoint the origin of public attitudes in the way people play. At present recreational consumption serves as a feedback loop to reinforce materialism. The Consortium will encourage individual creativity and artistic development among the many.

TERENCE P. YORKS

TWO APPROACHES TO THE GARDEN OF EDEN

Modern agricultural practice, as productive as it appears to be, generally yields less total biomass than the native systems which were there before it. Additionally, it has serious problems with soil loss, fossil fuel consumption, pests and aesthetics that are not present in the climax ecosystem.

There are two potential solutions: learn to effectively harvest native ecosystems and to convert the harvest to more useful (for mankind) products by an expansion of leaf separation methodology, or with modified current crops create a complex artificial ecosystem which would enjoy the stability and aesthetic advantages of the native system. In their development, concentration should be in the reduction of mass in cultivation and harvest systems; a very large reduction in energy and other resource inputs is possible. The systems are flexible; they can be made either labor or machine intensive.

Seed money to begin the process would come from both public and private sources; the changeover would eventually be sponsored by the profit motive. Integral to the conversion is the development of interest. This could come from the much closer involvement of the artistic community, and hence of art in all its phases, into the general pattern of life, aided by continued improvements in communication.

MALCOLM J. BLACKIE
MURRAY HORN
P. S. TENG

TOWARDS A SYMBIOTIC FUTURE

The paper reviews the place of agriculture in the national development of New Zealand. While New Zealand's agricultural production has continued to increase over the last 30 years, it has incurred a significant social cost. The population of the country has become concentrated in four main centres and agriculture has come to be heavily reliant on industrial inputs for its continued growth.

The ecological consequences of the large-scale use of synthetic fertilisers and pesticides are reviewed and the proposition made that viable, alternative means of agricultural production do exist. The forces behind the current trend towards industrial agriculture are analysed with the conclusion that agriculture based on sound biological principles requires a greater rural population than exists at present.

A method of land use (the "shared farm") based on the existing owner-operator pattern but with multiple users working a common area of land is proposed as a socially acceptable and viable base for an ecologically stable agriculture. Methods whereby this new land use could be encouraged are reviewed in the context of the present New Zealand situation.

SAMUEL SCHWARTZ
JANNA DE LUE

THOUGHTS ON A "NATIONAL COUNCIL,"

A FOURTH BRANCH OF GOVERNMENT

In many critical areas involving the interplay of human and natural resources, the patterns of analysis and decision making by our governing bodies have not been (and perhaps cannot be!) conducive to the type of long-range thinking and planning to which this century must become committed. Creation of an autonomous "National Council" as a fourth branch of government is, therefore, proposed, with specific responsibility to facilitate development and choice of wise alternatives needed to improve our "Art of Living."

Twenty problem areas, including "all" areas of national concern, will each be represented by three or more members who are chosen by citizen and professional groups for their expertise, social concerns, and creativity. Through a variety of procedures and liaison activities with government and citizen groups, the Council will stimulate necessary studies, issue periodic reports and recommendations, propose legislation and/or specific actions, and serve as active guide and conscience to government agencies and citizens alike.

BRUCE E. SUNDQUIST

THE CASE FOR REPLACING THE 40-HOUR WEEK

BY A REDUCED WORKWEEK AND JOB-SHARING

In order to maintain full employment and permit unrestrained technological creativity while holding constant the rate of consumption of material resources, it is argued that a reduced workweek is vital. Other options such as expanded services and recycling and improved internalization of external costs, while of comparable importance in their own roles, offer inefficient substitutes for the role envisioned for the reduced workweek. To show this, technological advances are categorized according to their effects on capital, labor and material resources. It is then argued that one or two options are capable of dealing with each category significantly more efficiently than the remaining options. Thus a given set of new technologies defines quite precisely the optimal mix of options needed to accommodate and/or counter the net economic growth bias involved.

In order to avoid an ever-decreasing efficiency of capital utilization that would otherwise result from a reduced workweek, it is further argued that greater emphasis must be placed on multiple shifts (job-sharing). In order to benefit from increased utilization efficiency of the broadest possible range of capital facilities, the bulk of the labor force should take part in the reduced workweek.

A plan is offered for a reduced workweek of effectively 36 hours that permits each job facility to be shared by two people working in daytime shifts. An analysis is given of the proposed 10 percent cut in working hours in terms of the major costs and benefits. The major costs, including reduced real wages and job-coordination, amount to about $\$83 \times 10^9$ per year. The major benefits, including the value of the increased leisure, the increase in capital utilization efficiency, reduced job-travel costs and reduced unemployment total about $\$115 \times 10^9$ per year. A reduced rate of material resource consumption results. There are numerous other benefits to a reduced workweek of a more subjective nature and these are outlined.

PATRICIA J. YOUNGBLOOD
TIMOTHY McGARRY

THE ROLE OF LAW, THE LEGAL SYSTEM AND
LEGAL EDUCATION IN A TRANSITION TO A STEADY STATE

The focus of this paper is the nature and manner of institutional change in the law and the legal system necessary to realize the transition to a steady state. Law functions in a political and economic environment characterized by growth and as such has come to embody the growth ethos in its rules. Particular ways in which the substantive law has done this include examples from such distinct areas as tort, corporate, tax, labor, contract and property law.

The nature of the legal process also is particularly ill-suited for a transition to a steady state. Examples of the limitations of the legal process are the adversary system, strict jurisdictional requirements, and reliance on precedent in judicial reasoning.

The task of redesigning legal institutions to function as a vehicle for change is a difficult one. Revitalizing legal education is a beginning. There must be a new emphasis in the learning process. There must be a shift from rule learning to consideration of theory. Also law schools must consider values and moral issues in their educational models. Finally law schools must attempt to identify the ways in which law is integrated with other social institutions and not present itself as an isolated independent discipline. Introduction of new courses with limits-to-growth themes (example, Technology and the Law), as well as reconsideration of the old ones (example, Property Law), is an important first step in this process.

Through revitalized legal education, lawyers, judges, legal educators and politicians will gain the impetus and ability to redefine the substantive and procedural rules of law that stand as a fundamental obstacle to achieving an equitable steady state.

GREGORY WILLIAMS

ALTERNATIVE ALTERNATIVES TO GROWTH:

A MODEST PROPOSAL

In his analysis of the population explosion as a "Tragedy of the Commons," Garrett Hardin identifies two possible solutions to the Tragedy: purely altruistic voluntary self-restraint (rejected by Hardin as self-eliminating) and mutually agreed upon coercion (proposed by Hardin as the only workable solution). In this paper, I consider possible solutions to the "Growth Tragedy," which results from economic overgrowth driven by short-term interests, and which is particularly apparent in the "rich" countries. Both pure altruism and mutual coercion are shown to be unlikely solutions to the Growth Tragedy. Utilizing results from game theory and sociobiology, a third possible solution is developed: "self-interested altruism" (behavior with short-term benefits to the individual performing it, and with short-term and long-term benefits to others).

The theoretically necessary conditions for a voluntary self-interested altruistic solution to the Growth Tragedy are shown to be highly improbable within the mainstream socioeconomic context of overgrowth. These conditions, including facilitation of altruist-altruist interactions and prevention of altruist-nonaltruist interactions, can be achieved in communities with high densities of individuals committed to sustainable lifestyles.

I propose that an initially small number of such communities be developed in the United States, to serve as highly visible examples of the short-term, as well as long-term, benefits to individuals living in sustainable lifestyle societies. Hopefully, these short-term individual benefits would be sufficiently high, relative to the short-term individual benefits of overgrowth, that additional communities would arise, attracting more and more "converts" from the overgrowth society. Possibly in a short time, sustainable lifestyles would be adopted by most people in the U.S.

W. GILES MELLON
EPHRAIM F. SUDIT

TOWARD AN INTEGRATED ECONOMIC THEORY
OF A LIMITED GROWTH WORLD

The aim of this paper is to make some suggestions about a general economic theory of a limited growth world. The paper is divided into three sections. The first reviews four aspects of economic and mathematical analysis which are especially relevant in the context of limited growth. These are:

. . Factors limiting the upward slope of the optimal growth path, including the finiteness of physical resources, non-physical limits to growth, and the role of the financial system.

. . The role of risk and uncertainty in growth theory, and the analysis of "catastrophes."

. . The role of market mechanisms in growth, as stabilizing or destabilizing factors.

. . Problems of distribution over space and time--i.e., between generations--with applications from the theories of justice, games and social discounting.

The second section contains the outline of a general mathematical model of growth and growth policy.

The third, and final, section presents some conclusions and some recommendations for policy and future research.

FREDERIC O. SARGENT

PROPOSAL FOR NATIONWIDE ENVIRONMENTAL PLANNING

Survival of a people in the long run requires achievement of a balance between the rate of use and the supply of the natural resource base. A series of research projects were conducted to develop concepts and methods of natural resource planning for rural areas which would be politically acceptable, financially feasible, and conducive to obtaining a sustainable man/land ratio.

Part I reports the results of this research program. Produced was a new method of environmental planning designed for rural areas. Features of the new rural-relevant, natural resource, growth control environmental planning procedure are: (1) new methods of public goal discovery, (2) new methods of growth control for rural areas, (3) new methods of classifying and evaluating the natural resource base, (4) new methods of determining the carrying capacity of watersheds, (5) a new institutional organization that combines the expertise of state agencies and state universities with local leadership, and (6) a procedure of democratic advocacy planning which permits interested citizens to initiate the planning process.

Part II explains how these new concepts and procedures can be translated into a national policy without new appropriations and within the framework of present institutions and attitudes. It presents a proposal for applying rural-relevant planning to all rural and undeveloped areas to protect them from further despoliation and abuse, and to suburban areas to strengthen the conservation content of urban planning. Also presented is desirable enabling legislation and several ways to implement the proposal even before adoption of enabling legislation.

THOMAS EVAN JONES

TOWARD A PLANETARY ECOLOGICAL ETHIC

Dramatic changes in cultural values and beliefs--changes that would promote the adoption of appropriate policies--are required for a successful transition from the unrestricted growth of industrialization and population to selective growth that is sustainable on this small planet. Several future-oriented thinkers have integrated suitable revisions of values and beliefs into an ecological ethic that is global in its outlook. However, none of them has undertaken the task of this essay: the formulation of a planetary ecological ethic from the important perspective of philosophical ethics.

First, the "good reasons approach" is selected as a credible method for formulating the ethic, and fundamental conclusions of philosophical ethics are summarized. Then the outmoded values and beliefs of the unrestricted quantitative growth orientation are shown to be inadequate for coping with inter-related global ecological problems.

A planetary ecological ethic that would relate human beings to the environment and to each other in satisfactory ways is then characterized. This sustainable selective growth ethic, established on the moral principles of beneficence and justice, would promote the equitably distributed satisfaction of basic human needs. The ethic would help its proponents adapt the goals and strategies of their different regions to diverse environmental and socio-cultural conditions in ways that are compatible with long-term world-interest. As the ethic is developed in this essay, a number of policy objectives are derived from it.

Finally, a strategy is suggested for surmounting the formidable barriers that block voluntary implementation of the ethic. At first, the ethic can be regarded primarily as a guide for personal action. Efforts must be made to implement some of its objectives on the local and regional levels. Especially important to the growth of commitment to the ethic and its accompanying objectives is widespread awareness of the sustainable, humane future that could be reached by feasible steps. Also crucial to fostering the cooperative implementation of the ethic is the enlargement of self-interest to include a satisfying, sustainable future for the human species.

DONALD QUAYLE INNIS

RESTORING RURAL LIFE

Peasant agriculture does not destroy the resources on which it depends, as it does not consume gasoline or commercial mineral fertilizers. Twentieth Century modern agriculture with tractors, phosphates, potash, herbicides, and pesticides depends on depletion of the earth's limited stockpile of accumulated mineral resources. As these nonrenewable resources become scarcer and more expensive, it becomes more obvious that modern agriculture has only a short future. The population problem must soon be solved and the soil of the earth must be put in the hands of people who can and will cultivate it on a permanent basis. Growing several different crops simultaneously or with partial overlap in each field with hand tools, as peasants do, uses sunlight and water resources uniformly over a long period and reduces soil erosion. Peasant agriculture with diverse species reduces the spread of insects and plant diseases, uses nutrients from several soil levels, and uses several layers of leaves to utilize solar energy with the greatest efficiency.

Intercropping (growing several crops at once in the same field) protects the soil from physical erosion better than monocropping (growing a single crop) can. Peasants harvest crops sequentially and practice relay cropping (planting new crops while others are not yet harvested), so that the soil is protected by leaf cover for a long period of time. In the tropics nutrients in useable form are quickly removed from soil by chemical neutralization, or by removal in solution as rainwater or irrigation water percolates down through the soil. The presence of several crops in a field means that when one crop is harvested and its remaining leaves, stems, and roots start to decay, there are other crops present with fully developed root systems to utilize nutrients as soon as they become available. In this way nutrients are used instead of being lost, and downward percolating nutrients are brought back to the surface where they can eventually be used by still other plants. Peasant farmers recreate with useful crops the ecologic systems which operate in multi-specied tropical forests. In temperate lands, also, intercropping can improve the use of land by the more effective use of organic or chemical nutrients which would otherwise be lost through soil leaching. In countries like the United States where farms are large, intercropping will also prove useful as mineral fertilizers become scarcer.

The author's 25 years of research on peasant techniques has shown that peasant methods are the best suited to maintaining soil fertility and crop yields over a long period of time. The process of replacing small peasant farms with large mechanized farms should be stopped. The small farmers driven by mechanization from their farms to the slums of big cities should be helped to return to the land. They can provide themselves permanently with a balanced diet instead of subsisting on hand-outs of mass produced staples. The catastrophe that will result as modern agriculture uses up the resources on which it depends can be mitigated if more farmers start using accumulated peasant wisdom, together with modern plant-breeding of disease-resistant crops, to return the earth's agriculture to a permanent way of life.

C. H. RICHARDS

ENERGY SYSTEMS AND POLICIES FOR THE SUSTAINABLE STATE:

A FRAMEWORK

The future of energy use in the industrialized West is explored in its economic and ecological context. Current energy policy is found wanting in terms of foundation, perspective and direction. In an effort to recast basic policy, minimum criteria for selection of future energy systems are developed from a consideration of the key operational aspects of the sustainable state.

From a detailed review of energy systems likely to satisfy these criteria, and assuming a reasonable future energy demand schedule, a transition path scenario is constructed, showing the changes in supply mix over time. Technical, economic, institutional, and cultural barriers to the achievement of this transformation of the energy sector are identified.

To meet the timetable will require an expanded R&D effort, within the next decade or two, to resolve the remaining technical uncertainties and fully assess the ecological impacts of the many sustainable energy options, so that the optimum mix can be deployed. Control of resource flow rates, and establishment of a resource reserve during the remaining growth phase of the transition, may be necessary to avoid shortages of capital required for the continuing substitution of sustainable energy systems for conventional sources during the near-equilibrium phase.

A method of accomplishing both tasks is suggested. Dominance of the political process by special interests is seen as the most intractable institutional barrier, but this study sees in the increasing adoption of resource-conserving values and lifestyles the basis for the sustained political effort required to overcome this resistance.

PREFACE TO AN ECOLOGICAL POLITICAL THEORY

...The current intellectual climate calls for two different kinds of prescriptive social science, each attuned to a different and, at this point, legitimate view of the future: one kind preparing for a relatively stable world that presents no unmanageable challenges to contemporary institutions, the other kind preparing for a dramatically different world that swamps today's institutions with a series of devastating shocks. Policy studies fit the first need, because they assume that contemporary institutions are capable of dealing with problems that require generally incremental policy changes. Policy studies cannot and should not prepare people for the radically new world that many intellectuals foresee largely as a result of sustained ecological crisis. This second intellectual task assumes great political challenges and asks whether contemporary institutions can meet them. Since institutional survivability is not assumed, this second school must propose new alternatives, including new institutions that probably can meet these powerful challenges. For this theorizing to be useful, it must show that its proposals are politically realizable as well as ecologically sound. The public ought to demand two things of both policy analysts and prescriptive theorists: that they call the shots as they see them and that they produce ideas that are immediately or potentially useful. These two criteria are quite sufficient, and even they can have disastrous consequences for intellectual work...

This paper belongs to the second type of prescriptive social science, because it outlines an ecological political theory that assumes deep ecological crisis. The past few years have witnessed much progress in this field of theory, making possible this paper's attempt to move in two new directions. First, the paper tries to provide more than a menu of ecological political values, because this has been done often enough in the past. Identifying core values is a necessary first step, but values without organizational principles and structures are next to worthless. With the preliminary work out of the way, now is the time to think seriously about the organizations that must realize ecological values. Second, the paper suggests a new way of coping with ecological constraints other than simple reliance on governmental coercion. Doubtlessly, this new approach could not have been developed had not earlier works elaborated the costs and possibilities inherent in the authoritarian model.

Although written with American society predominantly in mind, it is hoped that the ideas presented in this paper apply with great force to the other advanced industrial societies that are both capitalist and democratic...The paper argues that liberal society cannot reach the steady state because it has only one instrument to take it there, and that instrument, public bureaucracy, is impotent due to lack of sufficient public support. Only a charismatic mass movement, born in crisis, can arouse the passions needed for such dramatic social change, but this charismatic imperative conflicts with many of the values basic to liberal political culture. The theory of active democracy describes how to manage the conflict between charisma and liberal values. The charismatic movement is given the mission of leading society to the steady state, but the movement must restrict its claims on society in keeping with liberal preferences. To insure a reliable supply of assets needed to fulfill its mission, the movement must build an enclave of faithful members within society but separate from it. Secure within its enclave, the movement can then act upon the rest of society, including the government, guiding the whole system into a steady-state framework. Relations between the movement and the government in the new society are strained but not necessarily explosive.

DOUGLAS V. SMITH

ENERGY AND RESPONSIBILITY

The theme of this paper is stated simply. Persons without responsibility are without care. This statement is examined within the topical framework of energy use and the geographic framework of the State of New Hampshire.

It is argued that the transformation of peoples' attitudes towards resource use (and towards themselves) requires a shift in the loci of decision making to devolve responsibility for decisions upon the persons most directly affected. This implies the need for a major shift in power from its presently centralized form to a decentralized form acting to augment personal and community responsibility.

Current patterns of energy use in New Hampshire provide a timely and convenient means to discuss the issue of responsibility. Specific measures are proposed as elements of the social transformation required to a society where paramount value is placed on the worth of human beings--a worth enhanced by recognition of the spiritual equality of all sentient beings.

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