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ENGINEERING AND APPLIED SCIENCE

RECENT RESEARCH REPORTS

August 1980

ENTRIES 1046-1174

DIRECTORATE FOR ENGINEERING AND APPLIED SCIENCE
NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C.

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Introduction

This report contains abstracts of new technical reports, journal articles, and other documents resulting from research supported by the Directorate for Engineering and Applied Science (EAS) of the National Science Foundation. These citations have been compiled to alert members of the scientific and technical community to current research results.

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- stimulate the application of fundamental scientific and engineering knowledge to the solution of significant problems in the public and private sectors, and shorten the time between scientific discoveries and their application for societal use;
- focus U.S. scientific and technological capabilities on selected problems of national significance where NSF can make a unique contribution, such as earthquake hazards mitigation, human nutrition, and others;
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- provide mechanisms to increase the effectiveness of the public and private sectors in appropriately utilizing science and technology;
- facilitate the integration of scientific and technical resources into the activities of state and local governments;

- explore new ways to improve cooperation between universities and industry in research and industrial innovation; and

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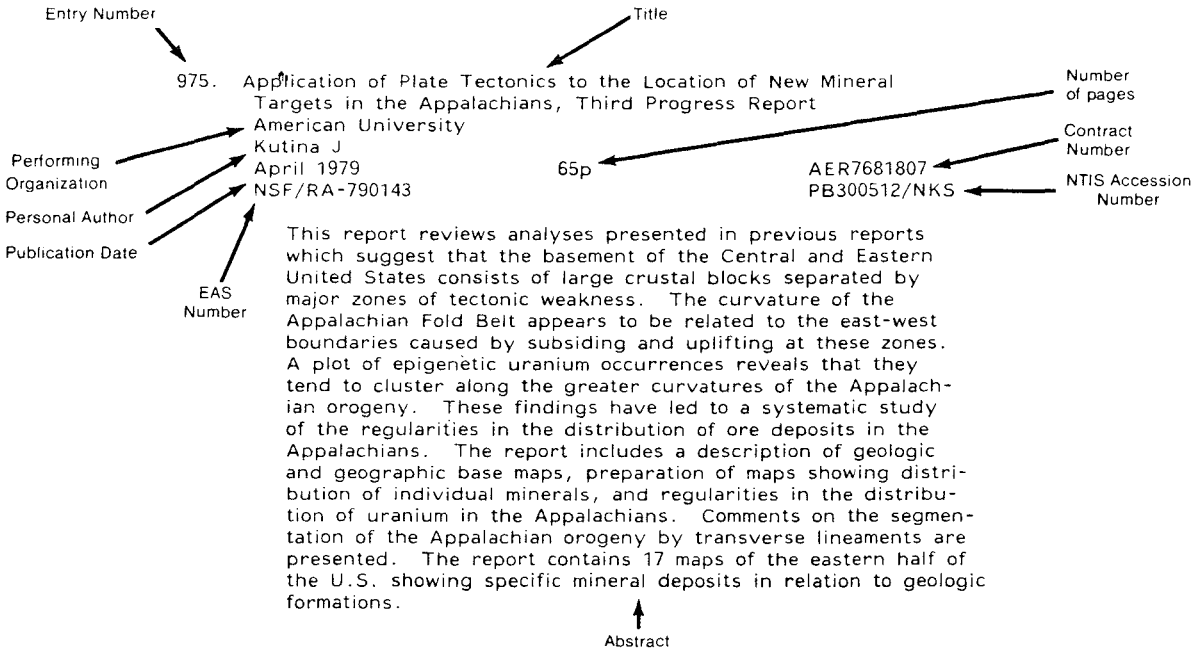

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Citations are arranged in broad subject categories. Entry numbers are assigned consecutively beginning with the first issue, published in October 1976. Indexes following the main body provide access by subject, performing organization, ASRA number, contract/grant number, and author and refer to the entry number of the document.

RESEARCH REPORTS FROM CURRENT PROGRAMS

Automation, Bioengineering and Sensing

1046. Interrelations of the Communicative Senses, Proceedings of a Conference (Asilomar, California, September 29-October 2, 1978)
Case Western Reserve University, Department of Biomedical Engineering
Harmon LD
June 1979 375p ENG7826248
NSF/RA-790299 PB80-147895/NKS

An interdisciplinary team of 55 leaders in perceptual psychology, ethology, physiology, blind and deaf education, and systems engineering reviewed what is known about sensory and perceptual processing in order to project effective research directions in the field based on needs for fundamental and applied knowledge. The central concern was to examine problems and potentials for presenting information normally available to one input channel to some other channel. The first presentations dealt with normal human adult performance in perceiving, recognizing, and comprehending objects and events of the environment. Topics discussed included similarities and differences among sensory modalities, relations between the dimensions of spatial and sequential patterns, and characteristics of short-term memory. Other discussions were devoted to examining developmental aspects of sensory information processing with emphasis on perceptual learning. Attention focused on concepts of space-time dimensions, intervention strategies, special relations between perception and motor-production systems, and special benchmarks in the maturation process.

1047. Studies on the Microwave-Induced Auditory Effect, Final Report
Wayne State University
Lin JC
January 1979 80p ENG7515227
NSF/RA-790470 PB290598/NKS

The mechanism of microwave-induced auditory effect in humans and animals who are exposed to short rectangular pulses of microwave energy has been studied. Assuming that the effect arises from sound waves generated in the tissues of the head by rapid thermal expansion caused by microwave absorption, the governing thermoelastic motion equation is solved for a spherical model of the head. Results indicate that the frequency of the auditory signal is a function of the size and acoustic property of tissues in the head. Using microwave-induced auditory brainstem responses, it has been found that the experimentally observed characteristics

agree well with theoretical predictions in regard to pulse width and frequency of impinging microwaves, pattern of absorbed microwave energy, frequency of vibration, and threshold of sensation. The use of a small contact applicator eliminates the need for the specially designed recording instrumentation necessitated by conventional microwave exposure techniques. The authors show that the interference due to direct pickup of microwave artifacts by the recording electrode is reduced substantially from the interference resulting from other experimental protocols.

Electrical and Optical Communications

1048. Optical Channel Waveguide Arrays Coupled to Integrated Charge-Coupled Devices and their Applications
University of Cincinnati
Boyd JT, Ramey DA
1979 23p ENG7617145
NSF/RA-790462 ADAO77394/NKS

Device configurations of optical channel waveguide arrays coupled to integrated charge-coupled devices (CCDs) are presented. Optical and electrical performance of these devices is discussed. A channel waveguide array formed in a fan-out pattern is introduced as a means of enhancing optical waveguide focal plane resolution in integrated optical devices utilizing optical waveguide lenses. High spatial resolution can thus be obtained without making detector spacings too small, thus avoiding detector problems with regard to fabrication, cross talk linearity and charge transfer efficiency. To fabricate the fan-out channel waveguide array, a new differential heating and photoresist lift-off process is discussed which allows high resolution patterns to be reproducibly formed in polyurethane. Propagation of light from a HeNe laser in these fan-out channel waveguide arrays has been demonstrated with only a small amount of scattering. Low scattering is consistent with the smooth channel waveguide surfaces apparent in scanning electron microscope pictures presented. Applications of optical channel waveguide arrays coupled to integrated CCDs to fiber multiplexing and transversal filtering is also discussed.

1049. Source Coding with Side Information and Universal Coding
Massachusetts Institute of Technology
Gallager RG
September 1979 41p ENG7719971
NSF/RA-790464 PB80-108343/NKS

Two problems concerning noiseless source coding with side information are considered. The first is a problem earlier considered by Slepian and Wolf in which the decoder has access to the side information but the encoder does not. It is shown that not only

is the maximum reliable transmission rate unaffected by whether or not the encoder has access to the side information, but also that the block error probability is essentially unaffected and that, in a sense, all the encoder needs to know about the source is the alphabet size. The second problem considered is tha where neither the encoder nor decoder knows the side information, good performance is required for all values of side information (i.e., universal coding). It is shown that the minmax redundancy and the maxmin redundancy, as defined by Davisson, are essentially the same for variable length codes. Finally, a similar minmax, maxmin equivalence for error probability with block codes is established.

System Theory and Operations Research

1050. Simple Alternative to the Out-of-Kilter Algorithm, Technical Report
Stanford University, Department of Operations Research
Zadeh N
May 1979 40p ENG7612266
NSF/RA-790435 ADA073795/NKS

It is shown that any problem solvable by the Out-of-Kilter method may be simplified to an ordinary minimum cost flow problem (meaning a problem with zero lower bounds). To perform the simpliflication, one considers the equivalent problem of optimally augmenting the original flows and then eliminates the lower bounds from this problem. In linear programming terms, as many as Abs. val. A is the number of arcs. The following procedure is suggested to replace the Out-of-Kilter method: Transform to a minimum cost flow problem, eliminate negative cycles if any, then efficiently augment along a sequence of shortest paths.

1051. Transient Effects in M/G/1 Queues: An Empirical Investigation, Technical Report
Stanford University, Department of Operations Research
Middleton MR
June 1979 154p ENG7514847
NSF/RA-790436 ADA073744/NKS

The research provides numerical results for time-dependent expected server load (mean virtual waiting time) in single-server queues with Poisson arrivals and gamma distributed service times. The results are presented in tabular form to facilitate their use by practitioners involved in the study of operating systems. This research considers groups of server load processes whose parameters are selected so that the first and second moments of their net input processes are matched. An existing Laplace transform expression is employed to obtain transient expected server load at specified epochs. The tabulated results allow a comprehensive study of the error associated with using the Wiener process as an approximation of server

load in queues. This study confirms that the Wiener process is always an upper bound and that the approximation is best for queues with a traffic intensity parameter near unity. The scaled results also indicate that the gamma input process and queueing process with deterministic service times provide tight lower and upper bounds, respectively, for expected server load in all queues with Poisson arrivals and gamma distributed service times.

1052. Gradient Algorithms for the Optimization of Dynamic Systems,
Interim Report
Rice University
Miele A
1979 85p ENG7918667
NSF/RA-790448 ADA079816/NKS

Recent advances in the area of gradient methods for optimal control problems are reviewed. Single-subarc problems are treated. Specifically, two classes of optimal control problems, called Problem P1 and Problem P2 for easy identification, are solved. Problem P1 consists of minimizing a funtional I which depends on the n-vector state x(t), the m-vector control u(t), and the p-vector parameter 3.14. The state is given at the initial point. At the final point, the state and the parameter are required to satisfy q scalar relations. Problem P2 differs from Problem P1 in that the state, the control, and the parameter are required to satisfy k additional scalar relation along the interval of integration. Algorithms of the sequential gradient-restoration type are given for both Problem 1 and Problem 2. Problem P2 enlarges the number and variety of problems of optimal control which can be treated by gradient-restoration algorithms. Eight numerical examples are presented to illustrate the performance of the algorithms associated with Problem P1 and Problem P2. The numerical results show the feasibility as well as the convergence characteristics of these algorithms.

1053. Optimal Investigation as a Regenerative Stopping Problem
University of California at Los Angeles, Department of System Science
Buckman AG, Miller BL
May 1979 25p ENG7612250
NSF/RA-790449 ADA078510/NKS

This report discusses the problem of dynamic optimal investigation of a two-state (in control, out of control) system. The true state can only be inferred from reported costs and the time since the last correction. It is demonstrated that when the parameters satisfy certain conditions, such problems can be efficiently solved as regenerative stopping problems. Some general results for regenerative stopping problems are also obtained. In the last section the problem is generalized to n two-state systems. By combining simulation with the Regenerative Stopping Algorithm, a problem with 20 state variables is solved with a small error term.

1054. Countable State Average Cost Regenerative Stopping Problems
University of California at Los Angeles, Department of System Science
Miller BL
April 1979 31p ENG7612250
NSF/RA-790457 ADA078509/NKS

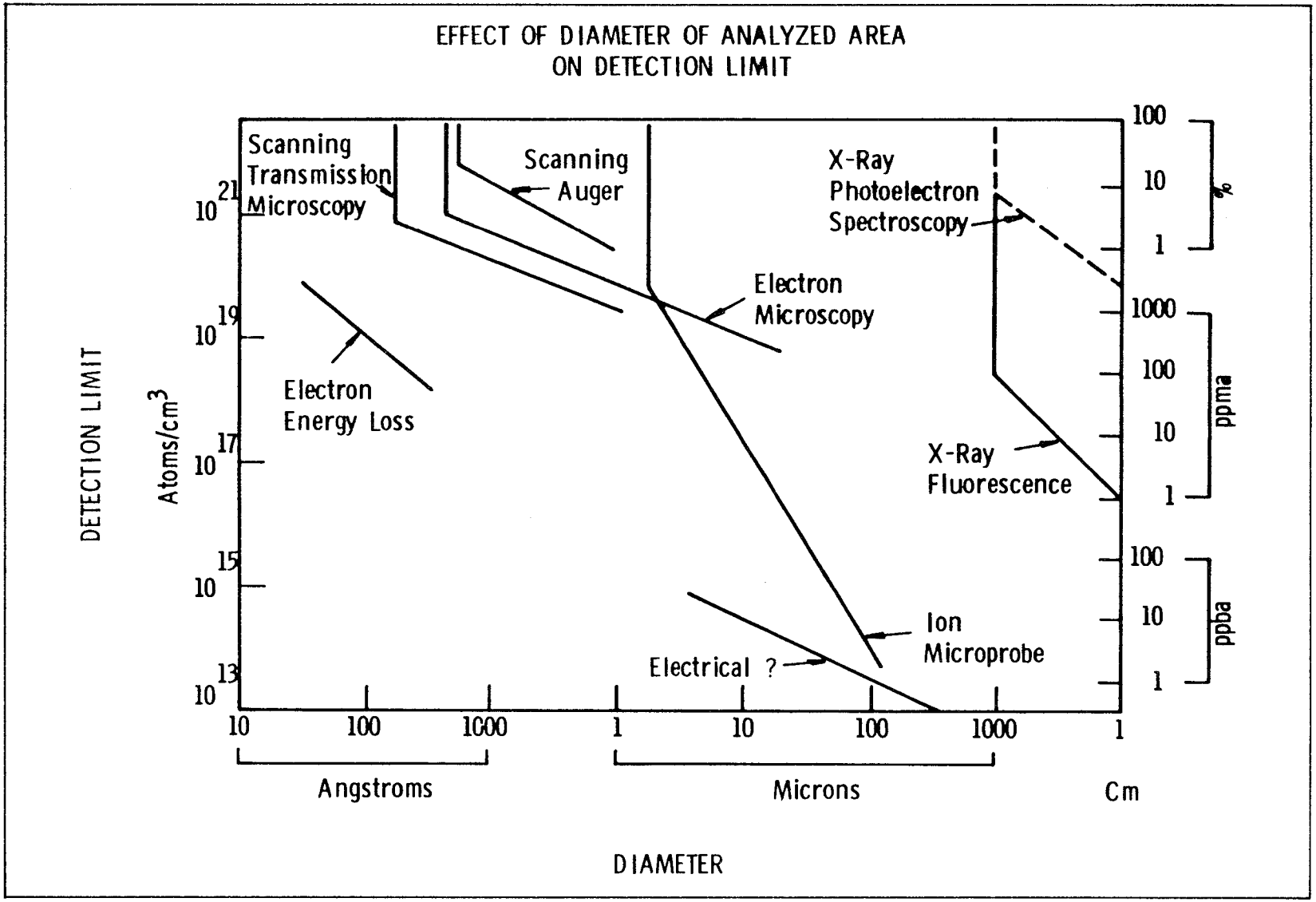
Regenerative stopping problems are stopping problems which recommence from the initial state upon stopping. An algorithm is presented which solves a semi-Markov regenerative stopping problem with a finite number of continue actions by solving a sequence of stopping problems. New results for the optimal stopping problem are obtained as well as for the regenerative stopping problem. Two models in the literature are used as detailed examples of the algorithm.

1055. On Optimization of Query Processing Strategies, Technical Report
Harvard University, Division of Applied Science
Chiu DM, Ho YC, Bernstein PA
October 1979 59p ENG7815231
NSF/RA-790458 ADA078470/NKS

This report examines the formulation of the query processing problem as an optimization problem. The real problem, which involves database states as parameters, is an intractable one. The problem can, however, be transformed into equivalent and simplified versions by making certain assumptions. In order to state these assumptions and the problem transformation on a formal basis, the notion of characterization is introduced. A characterization is a mapping of the database state space into a simplified parameter space. Meaningful simplification of the original problem is possible only when suitable characterizations can be found. The problem formulations in several important papers are reviewed and a detailed example is represented to illustrate some ideas.

1056. Sensitivity Adaptive Control of a Magnetic Suspension System
University of Illinois at Urbana-Champaign
Chan YM
May 1979 97p ENG7420091
NSF/RA-790465 ADAO77148/NKS

This project is concerned with the study of the behavior of a particular stochastic system, the magnetic suspension system, under the application of the Sensitivity Adaptive Feedback with Estimation Redistribution (SAFER) Control Algorithm. Matrix factorization techniques are used in the controller and estimator design for the system. Simulation results indicate that the magnetic suspension system can operate satisfactorily under the SAFER control method; and factorization techniques indeed enhance the numerical stability of computations. However, due to the complex structure of the SAFER control method, real time application of the



See Entry 1058.

algorithm may require a faster computing device or a simplified mathematical model. Its application will be most pertinent to a system with slow time constants.

1057. Some n by dn Linear Complementarity Problems Solvable by a Principal Pivoting Algorithm with Applications
Carnegie-Mellon University
Kaneko I, Pang JS
April 1979 39p ENG7711136
NSF/RA-790468 ADA073929/NKS

The purpose of this paper is to study some recent applications of the n by dn LCP solvable by a parametric principal pivoting algorithm (PPP algorithm). First, it is shown that by analyzing the n by dn LCP one could study the problem of solving a system of equations and the (nonlinear) complementarity problem when the function involved is separable. Next, conditions are examined under which the PPP algorithm is applicable to a general LCP, and then present examples of LCPs arising from various applications satisfying the conditions are determined; included among them is the n by dn LCP with a certain P-property. Finally, a special class of n by dn LCPs are studied which do not possess the P-property but to which the PPP algorithm is still applicable; a major application of this class of problems is a certain economic spatial equilibrium model with piecewise linear prices.

Solid-State and Microstructures Engineering

1058. Microstructure Science, Engineering, and Technology
National Academy of Sciences
Einspruch NG
1979 306p C310T0400
NSF/RA-790301 ADA070308/NKS

Presented are findings of a study on national needs and opportunities in thin-film microstructure science and technology. Special emphasis was devoted to opportunities most appropriate for university-based research and to cooperative efforts between universities and industry. Impetus for this project was provided by the rapid pace at which technical applications in the semiconductor electronics industry are outstripping the scientific base. The basis for modern semiconductor electronics is microstructure science, engineering, and technology (MSET), which encompasses the fabrication and utilization of composite thin-film structures having lateral features with dimensions of less than about 10 m. The following subjects are covered: materials aspects of microfabrication; pattern generation and transfer; devices, integrated circuits, and integrated systems design; and science opportunities. It is felt that a sustained long-range research program directed toward

providing an understanding of the scientific and engineering base on which future technological developments will rest is essential. The appendix comprises a collection of expert assessments of the materials aspects of MSET.

Quantum, Electronics, Waves and Beams

1059. Theoretical and Experimental Study of the Temperature and Dopant Density Dependence of Hole Mobility, Effective Mass, and Resistivity in Boron-Doped Silicon, Final Report
University of Florida, Department of Electrical Engineering
Li SS
November 1979 54p ENG7681828
NSF/RA-790461 PB80-120041/NKS

Theoretical expressions for resistivity and conductivity mobility of holes as functions of dopant density and temperature have been derived for boron-doped silicon. The model is applicable for dopant densities from 10 to the 13th power/ cc to 3 times 10 to the 18th power/cc and temperatures between 100K and 400K. Resistivity measurements on nine boron-doped silicon slices with dopant densities from 4.5 times 10 to the 14th power/cc to 3.2 times 10 to the 18th power/ cc were performed for 100K < or = T< or = 400K, using a planar four-probe square-array test structure. Finally, formulations for the density-of-states effective mass, conductivity effective mass, and Hall effective mass are described, and the results are applied to the calculations of hole masses in boron-doped silicon for 10 to the 14th power/cc < or = N sub A< or = 10 to the 18th power/cc and 50K< or = T< or = 500K.

Engineering Energetics

1060. Theoretical Properties of One-Dimensional Discrete Ordinates
Texas Tech University
Nelson P Jr, Victory HD Jr
April 1979 14p ENG7508407
NSF/RA-790445

It is argued that there exist two distinct versions of the discrete-ordinates approximation to the linear transport equation. These are termed Nystrom and interpolatory discrete-ordinates. The former has been studied extensively mathematically, while the latter seems to be used exclusively in practice. The two versions are compared in the simple case of monoenergetic transport in azimuthally symmetric one-dimensional slab geometry. It is shown that the Nystrom approximation scheme is stable and both consistent with and convergent to the transport equation, while many interpolatory schemes are inconsistent with the transport equation. From the viewpoint of numerical implementation, the Nystrom scheme points to the idea of choosing a different (presumably larger) set of quadrature points in the approximation to the streaming operator than is used in the scattering and fission operators. The previously calculated flux serves as an initial flux guess in the scattering term for one sweep through the space-angle mesh with the newer set of (angular) quadrature points.

Note: Available from SIAM Journal of Numerical Analysis, Volume 16, Number 2, April 1979, pp 270-283.

1061. On Criticality Problems in Energy Dependent Neutron Transport Theory
Texas Tech University
Victory HD Jr
January 1979 18p ENG7508407
NSF/RA-790456

The criticality problem for energy dependent neutron transport in an isotropically scattering, homogeneous slab is considered. Under a positivity assumption on the scattering kernel, an expression can be found relating the thickness of the slab to a parameter characterizing production by fission. This is accomplished by exploiting the Perron-Frobenius-Jentsch characterization of positive operators (i.e. those leaving invariant a normal, reproducing cone in a Banach space). Those techniques work for classes of multigroup problems where the Case singluar eigenfunction approach is not as feasible as in the one-group theory, which is also analyzed.

Note: Available from the Journal of Mathematical Analysis and Applications, Volume 67, Number 1, January 1979, pp 140-157.

1062. Design of Pneumatic Conveying Systems
University of Illinois at Urbana Champaign
Soo SL
1980 11p ENG7812796
NSF/RA-800073

Problems in pneumatic conveying systems can be avoided by concerns in design details to avoid plugging, wear, and attrition, and to produce a safe system. Formulations are discussed for the purpose of rational designs and checking of designs. Design parameters include mass flow ration, minimum transport velocity, and pressure drop, leading to the overall power consumption. Details of gravity and electrostatic deposition, heat transfer and humidity control, electrostatic charges and their elimination, erosion of piping system and attrition of materials with attendant dust generation can become deciding factors in designing for the transport of a given material.

Note: Available from Journal of Powder and Bulk Solids Technology, 4 (1980) 2/3, pp 33-43.

Geotechnical Engineering

1063. Conservatism in Summation Rules for Closely Spaced Modes (EERC-79/11)
University of California at Richmond, Earthquake Engineering Research Center
Kelly JM, Sackman JL
May 1979 35p ENG7705197
NSF/RA-790184 PB301328/NKS

It is shown that the method recommended by the Nuclear Regulatory Commission to be used to combine spectral response in the case of closely spaced modes arises in structures from symmetry, and also where there is a light appendage with a frequency close to one of the natural frequencies of the structure. The approach proposed is that the modes that are not closely spaced be treated by modal analysis and the closely spaced modes, in the case of two closely spaced modes, be treated as a coupled two-degree-of-freedom system. If this is done, the beat phenomenon, the most important characteristic of the interaction between the two closely spaced modes, is evident, as is the associated result that the peak response of the coupled system is developed much later than the peak responses obtained in the individual modes by standard analysis.

1064. User's Manual for the 1.7 MPA Multiaxial or Truly Triaxial Cubical Testing Apparatus
Virginia Polytechnic Institute and State University, Department of Civil Engineering
Mould JC, Sture S
August 1979 59p ENG7717047
NSF/RA-790440 PB300447/NKS

The report considers the manual and automated procedures required for laboratory operation of the multiaxial cubical test cell and its ancillary equipment. The detailed procedures which are discussed are made with reference to the current apparatus and data-acquisition configurations (Spring-Summer 1979). The specimen preparation, sample insertion, text execution, and data reduction techniques are described briefly with particular emphasis on events, whose outcome have a crucial influence on the success of the test. An appendix describing pore water pressure measurement features and an appendix showing typical data acquisition program printout are listed in the end. Apparatus deformational characteristics and typical data acquisition forms and schedules are also shown in appendices.

1065. Digital Simulation of Nonlinear Random Waves
Oregon State University, Department of Civil Engineering
Hudspeth RT, Chen M
February 1979 23p ENG7510496
NSF/RA-790459 PB80-126865/NKS

Digital realization of unidirectional nonlinear random seas correct to second order in the ocean of finite depth are simulated from three types of two-parameter theoretical spectra and are compared with measured hurricane-generated realizations by means of chi-square goodness-of-fit measures computed from the Gram-Charlier probability distribution in which the statistical measures of skewness and the excess of kurtosis are determined from the measured hurricane-generated relizations. The finite Fourier transform (FFT) algorithm is shown to be an efficient method for nonlinear simulations since the FFT coefficients are complex and, therefore, capable of retaining the nonlinear random phase interactions. The second-order nonlinear simulations demonstrate improved third-order and fourth-order statistical moments compared to the linear Gaussian simulations. Previous comparisons with measured wave forces on cylindrical pilings have demonstrated improvements in the statistics of random wave force predictions computed by digital filter methods as a result of these improved nonlinear random sea simulations.

1066. Efficient FFT Simulation of Digital Time Sequences
Oregon State University, Department of Civil Engineering
Hudspeth RT, Borgman LE
April 1979 17p ENG7510496
NSF/RA-790460 PB80-126857/NKS

A stacked inverse finite Fourier transform (FFT) algorithm is presented that will efficiently synthesize a discrete random time sequence of N values from only N/2 complex values having a desired known spectral representation. This stacked inverse FFT algorithm is compatible with the synthesis of discrete random time sequences that are used with the more desirable periodic-random type of dynamic testing systems used to compute complex-valued transfer functions by the frequency-sweep method. An application to the generation of large random surface gravity waves by a hinged wavemaker in a large-scale wave flume demonstrates excellent agreement between the desired theoretical spectral representation and the smoothed, measured spectral representation for two types of two-parameter theoretical spectra as a result of the lengthier realization made possible by the stacked FFT algorithm.

1067. Hydraulic Geometry Relations for ACOP (Alluvial Channels Observation Project) Channels, Final Report
George Washington University
Mahmood K, Tarar RN, Masood T
July 1979 271p ENG7682100
NSF/RA-790463 PB80-109002/NKS

Downstream-hydraulic geometry relations for stable sections and the regime theory equations represent an inductive approach to stable channel design. This approach essentially duplicates the successful designs and forms a useful and popular method. The equilibrium-state experimental data from 14 stable study reaches on five ACOP canals from winter 1974 to summer 1977 have been analyzed. The analysis includes screening of data to exclude non-uniform flow runs and derivation of at-station hydraulic geometry relations for water surface width, hydraulic depth, average velocity, energy gradient, and Manning and Froude number as power functions of discharge. These relations are then used to extrapolate the values of these variables for the design discharge. Downstream-hydraulic geometry relations for the variables are developed from the extrapolated values. The downstream relations represent stable channel design equations applicable to the range of data analyzed.

1068. Mechanisms of Decreased Digestibility in Chemically-Coagulated Wastewater Sludges, Final Report
Cornell University, Dept. of Environmental Engineering
Gossett JM, Dentel SK, Schruben JJ
March 1979 182p ENG7706091
NSF/RA-790467 PB80-106495/NKS

Previous studies have indicated that coagulants used in wastewater treatment (principally alum or ferric chloride) caused resulting sludges to be less biodegradable in subsequent anaerobic digestion. The objectives of this research were to determine the types of organic materials whose digestibility is most affected by coagulants and to investigate the effect of coagulants on enzymatic hydrolysis of complex organic material. Substrates studied include: raw wastewater, activated sludge, three proteins, glycine, cellulose, glucose, butyric acid, and palmitic acid. In general, those substrates whose digestibilities were most affected were those that are insoluble in water and/or are known to form complexes with iron or aluminum. Thus, amino acids, proteins, and long-chain fatty acids were particularly affected, while glucose and butyric acid were not. Cellulose was moderately affected, suggesting that physical enmeshment as well as chemical interactions may be important in determining extent of coagulant effects.

1069. Study of a Density Cell to Measure Suspended Load, Final Report
George Washington University
Mahmood K, Niaz T, Hassan SA
January 1979 88p ENG7682100
NSF/RA-790471 PB292954/NKS

A need exists for a simple and automated procedure to provide a continuous real time measurement of suspended sediment concentration at a point in the channel. For this purpose, a density cell has been tested in the Sedimentation Laboratory at the George Washington University. In the measuring scheme, an Alluvial Channels Observation Project pumping sampler withdraws a continuous point sample that is circulated through the density cell. The cell measures changes in sediment concentration by sensing the change in density of the water-sediment mixture pumped from the stream. The report outlines the tests made on the unit and the results obtained.

Fluid Mechanics

1070. Consistent Second-Order Theory of Wave/Structure Interaction, Final Report
Naval Postgraduate School, Monterey, California
Garrison CJ
September 1979 45p ENG7304019
NSF/RA-790466 ADAO76550/NKS

The consistent second-order theory of the interaction of regular gravity waves with a fixed object in water of finite depth is developed. The theory is carried out for the most general case of a body of arbitrary shape which may extend through the free-surface or be completely immersed. The incident wave evolves in the development as a second-order Stokes' wave. Boundary-value problems are established for both the first- and second-order velocity potentials, and a numerical method based on the Green's function is outlined. The determination of forces exerted by gravity waves on large structures immersed in the sea has become of great practical interest in recent years; for example, in the design of bottom-mounted oil storage facilities or large ocean caissons, the wave-induced horizontal and up-lift forces and overturning moments are factors of primary importance. The effect of large amplitude waves in particular is of importance in the determination of the permanence of an ocean structure and, therefore, a higher-order theory appears to have significant practical value. For example, Apelt and Macknight (1976) found measured forces on a ocean caisson model in fairly large-amplitude shallow-water waves to be considerably in excess of calculations based on linear diffraction theory.

1071. Unsteady Laminar-Flow Separation in Tubes. II. The Effect of Variations in the Frequency and Amplitude of Flow Oscillations, Final Report
Virginia Polytechnic Institute and State University
Schneck DJ, Walburn FJ
June 1979 138p ENG7420142
NSF/RA-790469 PB296968/NKS

A laser Doppler anemometer technique has been developed and used to study steady and unsteady flow through rigid circular tubes. Steady flow results are in complete agreement with those presented analytically by Blasius. Investigation of the symmetry of the separation pattern revealed a marked dependence on the Reynolds number. The trajectory of the point of flow separation (defined by Despard and Miller) as a function of the unsteady Reynolds number is reported. Finally, applicability of current flow separation criteria is discussed in view of fluid behavior upstream of the separation point.

1072. Pulsatile Flow through an Orifice, Final Report
West Virginia University
Bajura RA, Pellergrin MT, Ferguson KR, et al
January 1979 105p ENG7410399
NSF/RA-790472 PB292194/NKS

Experimental and analytical studies were performed to determine the flow metering error for a standard sharp-edged orifice installation under pulsatile flow conditions. The main test facility utilized water as the working fluid and was constructed using a 4-inch (10-cm) diameter pipe for the metering run, which was fitted with orifices with diameter ratios of 0.35, 0.50 and 0.70 compared to the diameter of the pipe. Velocity measurements near the orifice were obtained using hot film anemometers and a laser doppler velocimeter. Differential pressure measurements were obtained with a variety of low- and high-frequency response instruments. The vortex shed from the orifice in pulsatile flow markedly distorts the downstream jet flow field. An analytical model was formulated based upon a traveling wave description of the motion of the vortex. Flow metering error predictions based upon this model are in good agreement with the experimental calibration tests which show that less fluid is discharged under pulsatile flow conditions than for steady flow at the same average differential pressure across the orifice. The flow metering error is proportional to the amplitude of pulsation and was found to be a weak function of the flow rate (Reynolds number) and a complex function of the frequency of pulsation (Strouhal number).

Heat Transfer

1073. Prediction of Laminar and Turbulent Flow Heat Transfer in Annular Passages, Technical Report
Iowa State University, Heat Transfer Laboratory
Malik MR, Pletcher RH
March 1979 282p ENG7422193
NSF/RA-790439 PB299867/NKS

Presented is a finite-difference numerical procedure for treating variable property laminar and turbulent convective heat transfer in straight annular passages. The calculation scheme is evaluated for both laminar and turbulent flow including laminar upward forced flow with buoyancy. A major part of the study is devoted to the development and evaluation of turbulence models. Models using an ordinary differential equation for the transport of mixing length scale in the outer (central) part of the flow and employing a transport equation for turbulence kinetic energy are considered. Predictions are compared to experimental data. The experimentally observed nonmonotonic development of centerline velocity and other flow parameters in a plane duct are well predicted by the model using the transport equation for length scale.

Solid Mechanics

1074. Optimum Hole Shapes in Finite Plates under Uniaxial Load
Oakland University, School of Engineering
Durelli AJ, Rajaiah K
February 1979 38p ENG7707974
NSF/RA-790473 ADA064616/NKS

This paper presents optimized hole shapes in plates of finite width subjected to uniaxial load for a large range of hole to plate widths (D/W) ratios. The stress concentration factor for the optimized holes decreased by as much as 44 percent when compared to circular holes. Simultaneously, the area covered by the optimized hole increased by as much as 26 percent compared to the circular hole. Coefficients of efficiency between 0.91 and 0.96 are achieved. The geometries of the optimized holes for the D/W ratios considered are presented in a form suitable for use by designers. It is also suggested that the developed geometries may be applicable to cases of rectangular holes and to the tip of a crack. This information may be of interest in fracture mechanics.

1075. Quasi-Square Hole with Optimum Shape in an Infinite Plate Subjected to In-Plane Loading
Oakland University
Durelli AJ, Rajaiah K
January 1979 35p ENG7707974
NSF/RA-790474 ADAO64615/NKS

This paper deals with the optimization of the shape of the corners and sides of a square hole, located in a large plate and subjected to in-plane loads, with the object of minimizing stress concentrations. Appreciable disagreement has been found between the results obtained previously by other investigators. In this paper new tests have been conducted and discrepancies have been corrected. Using an optimization technique, the authors have developed a quasi square shape which introduces a stress concentration of only 2.54 in a uniaxial field, the comparable value for the circular hole being 3. The efficiency factor of the proposed optimum shape is 0.90 whereas the efficiency factor of the best shape developed previously was 0.71. The shape also is developed that minimizes the stress concentration in the case of biaxial loading when the ratio of biaxiality is 1: -1.

Applied Social and Behavioral Sciences

Public Management and Service Delivery

1076. Urban Travel Demand Forecasting Project, Final Report Series, Volume 1, Overview and Summary, Research Report
University of California, Institute of Transportation Studies
McFadden DL, Reid FA, Talvitie AP, et al
June 1979 106p GI43740, APR7420392
NSF/RA-790256 PB80-125016/NKS

Summarized are the results of a project conducted to provide transportation engineers and planners with the information required to select and utilize policy-oriented travel demand models developed from observations on behavior of individual households. Emphasis focused on refining and testing methods for applying these models and determining the limits of their validity. Consideration has been given to all aspects of a transportation planning effort from survey and network data collection, through model specifications, calibration and validation, to issues of aggregation and policy forecasting as well as to policy applications on region-wide, corridor, and local areas. Each phase has been explored at two levels: specific studies in each aspect of the project, and assessment of the merits and limitations of the methodologies employed with suggested preferable strategies for planning. The project focused on the introduction of rail rapid transit service (BART) in the San Francisco Bay area. Information is presented in the form of executive summaries of Volumes 2-11 of the project, plus an introductory overview and appendices containing lists of other published papers, publicly available data files, and contents of the QUAIL special purpose computer program.

1077. Urban Travel Demand Forecasting Project, Final Report Series, Volume 4, QUAIL 4.0 User's Manual, Research Report
University of California, Institute of Transportation Studies
Berkman J, Brownstone D, et al
June 1979 162p GI43740, APR7420392
NSF/RA-790257 PB80-125024/NKS

Instructions for using the QUAIL special computer program are detailed. QUAIL is the acronym for Qualitative, Intermittent and Limited Dependent Variable Statistical Program, employed to analyze statistical models involving non-continuous dependent variables

and to manipulate storage of associated arrays of data. QUAIL is written in FORTRAN IV and is designed so that most errors in command statements are detected before data are recorded or results are compiled. Running a QUAIL program involves two steps: the QUAIL compiler scans the program for syntax errors and also creates a list of variables used but not created by the program; and the interpreter performs indicated operations, automatically loading any needed permanent variables from QUAIL tape or disk files. The manual describes selection of subsamples, the IDCASE/IDALT structure, manipulation of variables, input and output of variables, QUAIL files, stop, end, list, MACROS in QUAIL, advanced features in DIMEN and SMPL, logit estimation, other statistical procedures, matrix operations, and QUAIL statements.

1078. Forecasting Local Government Budgets (Occasional Paper No. 38)
Syracuse University, Maxwell School of Citizenship and Public Affairs
Bahl R, Schroeder L
December 1979 83p DAR7820256
NSF/RA-790259 PB80-151632/NKS

The state of the practice of local government fiscal forecasting is reported. Major objectives include the following: (1) laying out the issues central to effective forecasting and describing the conceptual and technical problems which must be faced; and (2) describing, analyzing, and contrasting what has been found to be the best of the practice, based on field work and an intensive study of practices in a selected set of cities. The scope is limited to a consideration of larger local governments (most of the cities studied here had populations in excess of 200,000) and to a discussion of the practice in those cities which are known to do effective forecasting. The purposes and uses of a forecast are considered along with the general approaches taken to develop a forecast. Also discussed are the problems and practices of revenue and expenditure forecasting and the organizational and administrative frameworks under which projections can be made.

1079. Assessment of the Impact of a Segment of the Interstate Highway on Businesses and Households in a Low-Income Minority Community
Southern University, Economic Research and Transportation Center
Thornton CH
November 1979 108p APR7203451
NSF/RA-790332 PB80-147358/NKS

This study addresses the socioeconomic implications of relocation on a sample number of black households and businesses in a residential area of Baton Rouge, Louisiana. The survey method was designed to enhance understanding of the impact of urban redevelopment projects on displaced minorities under the new Federal relocation assistance program. Interviews with 172 relocated households and 14 relocated businesses were taken. Results were used

to establish facts relative to the amount of assistance given, the problems encountered, and the levels of satisfaction of household heads and businessmen with the relocation assistance program. Additionally, a study was made of minority businessmen who were not displaced, but who were expected to experience changes in operation resulting from the highway construction project. The study concluded that relocation of the affected residents to make way for a new segment of the interstate highway system was generally favorable. However, small businesses of black owners who were displaced were nearly eliminated rather than relocated. Recommendations are offered to address more adequately the needs of affected households and businesses.

1080. Vocational Education-Basic Grants Formula, Distributional and Equalization Effects of the VEBG Formula and VEBG Formula Alternatives, Working Paper #4
Center for Governmental Research, Inc.
Grasberger FJ, Smith JO
December 1979 APR7715726
NSF/RA-790328 PB80-153844/NKS

Presented is an analysis of the distributional and equalization effects of the present and alternative formulas for the determination of Federal matching grants for the Vocational Education-Basic Grants program. The paper contains a synoptic review of background information focusing on the existing formula, a brief discussion of major formula issues, a description of the frameworks utilized in the analysis of the present and alternative formulas, and a series of tables depicting the effects of various formula modifications. The major objective of the analysis is the development of formula modifications to significantly increase the effectiveness of the Federal aid formula in the achievement of equalization relative to fiscal capacity and need among the states. The criterion developed to measure the achievement of such equalization is the state-local revenue gap, the difference in yield arising from the application of a specified level of state-local effort to each state's capacity/need ratio. The analyses show that some improvement in the equalization power of the Vocational Education-Basic Grants program can be attained by substituting income per need unit for the present per capita income formula element, by adjusting for interstate cost-of-government differentials, and by updating the formula elements. Significant improvements were achieved through a formula redesign into a capacity equalization version.

Note: This report is available from NTIS in microfiche only.

1081. New York Economy: 1960-1978 and the Outlook (Occasional Paper No. 37)
Syracuse University, Maxwell School of Citizenship and Public Affairs
Bahl RW
October 1979 149p DAR7820256
NSF/RA-790358 PB80-151889/NKS

The implications of structural changes in the economy for the State of New York's future is studied by describing and analyzing population, employment, income, and fiscal trends since 1960, and by laying out a range of possible growth paths. The report examines those changes in the level and composition of income, employment, and population that define New York as a "declining" economy, and describes those factors which promote and retard the State's movement toward a new economic equilibrium. Detailed descriptions are provided along with an analysis of trends in post-1960 population, employment, and income growth and the fiscal adjustments which have accompanied this economic and demographic change. The evidence on trends toward convergence and comparisions of existing forecasts are discussed. A concluding section speculates about these findings for New York's transition to a new equilibrium and about the condition of New York in the 1980's and 1990's.

General

1082. Permanent Disability Benefits in the Workers' Compensation Program, Final Report (Evaluation of State Level Human Resource Delivery Programs: Disability Compensation Programs)
Worker's Disability Income Systems, Inc.
October 1979 879p APR7501067
NSF/RA-790251 PB80-127483/NKS

The adequacy and equity of the benefits and the efficiency of the procedures and standards used to provide compensation for permanent disabilities are addressed. A general introduction to permanent partial disability and workers' compensation includes a conceptual framework for the sources of disability among the working age population. The Ten-State Study presents the results of field work and includes an analysis of both standards and procedures to compensate permanent disabilities in ten jurisdictions. The Wage-Loss Study provides data on the earnings losses experienced and the workers' compensation benefits received by samples of injured workers from three states. Conceptual material and data are used to evaluate the permanent disability benefits in the workers' compensation program. Finally, possible reform for permanent disability benefits in workers' compensation is discussed. Included are more than 100 tables and charts.

Production Research

1083. Computer-Aided Injection Molding System, Progress Report No. 6 (September 1, 1978-August 31, 1979)
Cornell University, College of Engineering
Wang KK, Shen SF, Cohen C, et al
September 1979 215p DAR7818868
NSF/RA-790280 PB80-140668/NKS

Progress is reported on development of an integrated computer program for mold design and manufacture and the simulation and production of optimum process controls. A systematic and unified approach is described for modeling the filling, packing, and cooling stages of the injection-modeling process as well as for delineating the distinguishing characteristics of these stages. An investigation of viscoelastic modeling of the filling and cooling stages is reported, together with the finite-element/finite difference inelastic cavity-filling simulation. In both studies, the predictions compared favorably with experimental values obtained. Further work is described on modeling the "fountain effect" problem with the pressure drop in cold runners and on the viscoelastic modeling of pressure losses in juncture and gate regions. Research has been initiated to develop a simplified model for molecular orientation. Preliminary studies of residual stresses and mechanical properties of molded parts are described as are propsed experiments involving flow birefringence and birefringence in molded parts. Progress in developing an automated mesh generation program for cavity-filling simulation is summarized.

1084. Design for Forging (Design for Manufacturability, Report 5)
University of Massachusetts, Department of Mechanical Engineering
Connolly R, Poli C, Boothroyd G
September 1979 105p APR7710197
NSF/RA-790282 PB80-150774/NKS

Factors that affect the cost of hot impression die forging, and information regarding economical design of forged parts for this method of forming are outlined and discussed. Specific technical information regarding shape, temperatures, materials, and dimensional tolerancing is included. A classification system is outlined for use in designing hot impression die forged parts. This system reflects forging difficulty for a proposed design. Forging data indicate relationships between various important factors in forging design and cost, and these relationships are incorporated into the proposed classification system to indicate relative cost information regarding a forging design. Extensive diagrams, tables, and graphs are included together with a list of references.

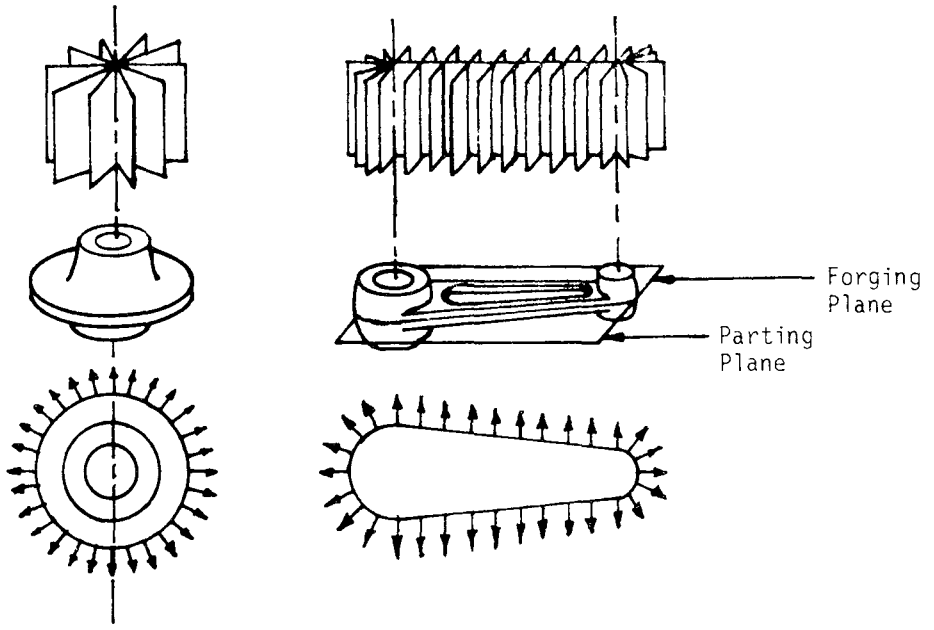


Fig. 3.9 Planes and Directions of Metal Flow of two Shapes

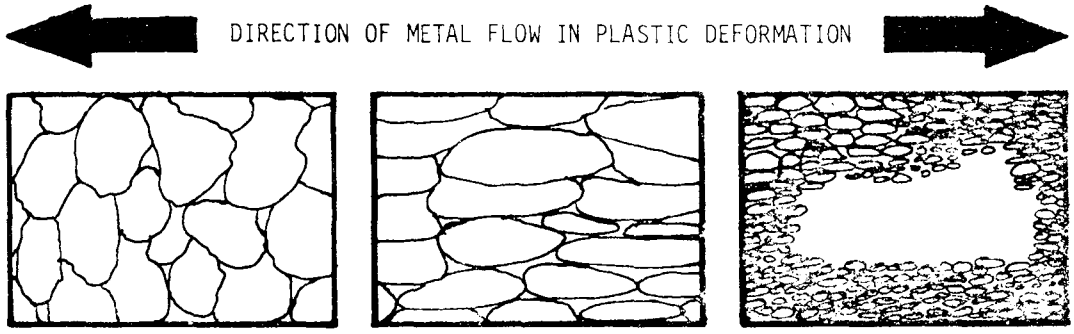


Fig. 3.10 Typical Development of Grain Flow by Plastic Deformation of Metals[8]

See Entry 1084.

1085. Applying "Design for Assembly Handbook" (Design for Manufacturability, Report 6)
University of Massachusetts, Department of Mechanical Engineering
Ellison B, Boothroyd G
October 1979 48p APR7710197
NSF/RA-790283 PB80-148026/NKS

Progress is reported on a handbook for use by industrial product designers. The book is based on the premise that manual handling and assembly consists of a discrete number of varieties of part conditions common to all industries. A scheme has been developed whereby a part may be coded on the basis of its function, handling, and assembly characteristics. Each part addition has a time penalty associated with it. An entire assembly may be coded, one part at a time, using this approach. Information thus obtained is being consolidated, tested, and compiled into a handbook for easy access by industrial designers. Its practical application has been tested on an existing tool known as Supersaw. Analysis resulted in a redesign of the product with marked improvement in the saw together with substantial savings in time and costs. Criticism of the handbook, suggestions for its improvement, and its further application to other products are outlined. Diagrams, worksheet forms, and a bibliography are included.

1086. Production Research and Technology, Seventh NSF Grantees' Conference on (Cornell University, September 1979)
Cornell University
September 1979 175p APR7411490
NSF/RA-790336 PB80-159692/NKS

A series of papers report recent developments in production research on automation and new process technology. As an applied science program, this project is concerned with the technical problems which underlie the physical transformations required to understand, model, control, and influence manufacturing operations. The utilitarian goal is to provide a knowledge base needed to generate new production technologies which may yield major increases in industrial productivitiy. Of special interest is the class of versatile, programmable, computer-based production technologies that will be required for automating the manufacturing of products made in small batches. Specific topics discussed include computer-aided injection molding, computer-aided design systems for casting, optimal planning of computerized manufacturing systems, the PADL-2 Project, advanced industrial robot control systems, machine intelligence research applied to industrial automation, micro-isotope tool wear detection, and the work of a machine tool task force.

1087. Machine Intelligence Research Applied to Industrial Automation, Ninth Report (August 1, 1978-July 31, 1979)
SRI International
Nitzan D, Rosen C, Agin G, et al
August 1979 204p APR7513074, DAR7827128
NSF/RA-790337 PB80-147879/NKS

Exploratory research in advanced automation is described. Principal objectives of the program are to explore and develop general-purpose, cost-effective techniques and hardware/software modules for computer-controlled systems of manipulators, sensors, and other components that are flexible, adaptable, and easily trained to perform material-handling, inspection and assembly tasks, and to transfer this technology to industry. The report covers developments in six technical areas: SRI's latest Vision Module; visual tracing of a free-swinging part on a hook using a Vision Module and an x-y table; three programmable part presentation methods; analysis of local visual features such as holes and corners; an initial study of a strategy for object recognition with planar light in three dimensions; and improvements in Robot Programming Language.

Applied Geophysical Sciences

1088. Sonar Probing as a Mining and Tunneling Tool, Progress Report (December 21, 1978 - September 30, 1979)
Texas A & M University
Unterberger RR
September 1979 95p APR7621764
NSF/RA-790255 PB80-159239/NKS

This report concerns "seeing" into rock by means of sonar. Because sound waves are coupled into rock by means of a fluid to avoid the transducer detecting transverse sound waves, and this fluid has a velocity lower than that of rock salt, the salt causes the original sonar beam to diverge. The result is that a large mass of rock is insonified leading to multiple signals which are difficult to interpret. A successful method is described to overcome this problem by producing a narrow beam in salt to determine the azimuth and elevation of the various targets seen in time. It involves the use of a high frequency transducer driven to two frequencies that causes the salt itself to go non-linear and generate the difference frequency which is comparable to that of the high frequency beam. It is believed that this breakthrough could drastically improve the ability of the sonar probing system to discriminate reflected signals in salt in azimuth and elevation. Unsuccessful experiments on attentuation measurements of sound in salt are described, as well as successful tests, to improve the signal to noise ratio of the signals reflected from discontinuities in the salt. Measurements on the amount of noise in salt as a function of frequency are briefly discussed.

1089. Experimental Investigation of the Effect of Time Delays on Fragmentation in Homogeneous Models
University of Maryland
Singh BP
1979 27p APR7705171
NSF/RA-790277 PB80-134786/NKS

The effect of delay blasting on fragmentation is studied. The optimum delay sequence for fragmentation was determined. Homogeneous two-dimensional transparent polymeric models were employed so that high-speed photography in conjunction with dynamic photoelasticity could record the full field state of stress associated with the explosive loadings. The transparent material also allowed observation of the initiation and extension of cracks. Two ranges of delays were selected for study. Short delays were used to investigate the effect of interaction of stress waves from the second hole with the stress waves from the first hole. In a second series, utilizing relatively long delays, cracks from the first hole were allowed to propagate a finite distance before the second explosion was set off. This was done to investigate the effect of interaction of stress waves from the second hole with the cracks from the first hole. It was found that there was a significant increase in fragmentation when the second hole was initiated as the cracks resulting from the first detonation reached it.

Applied Physical Sciences

1090. Laser Photoelectron Spectrometry of the Negative Ions of Iron and Iron Carbonyls. Electron Affinity Determination for the Series $(CO)_n$ n = 0,1,2,3,4
University of Colorado; National Bureau of Standards
Engelking PC, Lineberger WC
1979 5p AER7420552
NSF/RA-790446

With a fixed-frequency Ar ion laser, the photoelectron spectra of the negative ions Fe^-, $FeCO^-$, $Fe(CO)_2^-$, $Fe(CO)_3^-$, and $Fe(CO)_4^-$ have been obtained. The electron affinity of iron is found to be (0.164 ± 0.035) eV while the electron affinities for other members of this series increase roughly as the number of ligands. Thus for FeCO the EA is (1.26 ± 0.02) eV; for $Fe(CO)_2$, (1.22 ± 0.02) eV; for $Fe(CO)_3$, (1.8 ± 0.2) eV; for $Fe(CO)_4$, (2.4 ± 0.3) eV. In addition, the photoelectron spectra provide information on vibration frequencies, electronic states, and Fe-CO bond strengths in these compounds.

Note: Available from the Journal of the American Chemical Society, Volume 101, 1979, pp 5569-5573.

Alternative Biological Sources of Materials

1091. Biosources Digest, A Journal on Biomass Utilization, Volume 1, Number 1
NEUS, Inc.
Sobel H, ed
January 1979 90p PFR7712500
NSF/RA-790088 PB80-140973/NKS

The Biosources Digest is a new quarterly periodical which covers biomass utilization, enzyme technology as it relates to it, renewable resources, industrial chemicals, fuels and energy from biomass, biological nitrogen fixation, and biophotolysis. This first issue is dedicated to energy derived from biomass. One of two special articles, "Solar Energy Grows on Trees," describes some of the benefits derived from stored solar energy collected from forests, and presents a theory and methodology for quantifying them. The second article proposes several novel alternatives to the presently-utilized processes for large-scale regeneration of ATP from ADP as required by biosynthetic processes. Included in this issue are descriptions of recent biomass utilization grants awarded by the National Science Foundation (NSF), the United States Department of Agriculture (USDA), and the Department of Energy (DOE). The DOE grants are divided into production and collection of biomass and conversion of biomass. Other features include a meeting report and update of the 1978 Washington Symposium on Energy from Biomass and Wastes, pertinent patents, future meetings, and a program solicitation announcement.

1092. Biosources Digest, A Journal on Biomass Utilization, Volume 1, Number 2
NEUS, Inc.
Sobel H, ed
April 1979 73p PFR7712500
NSF/RA-790175 PB80-157662/NKS

This issue of Biosources Digest is devoted to marine topics. An article entitled, "Expected Yields and Optimal Harvesting Strategies for Future Oceanic Kelp Farms," surveys current and potential developments in ocean farming which utilize the giant kelp (Macrocystis pyrifera). This rapidly growing species may be converted anaerobically into substitute natural gas and may produce enormous quantities of minerals, fertilizers, livestock and human feed. It also enhances local fish crops. Estimates indicate that

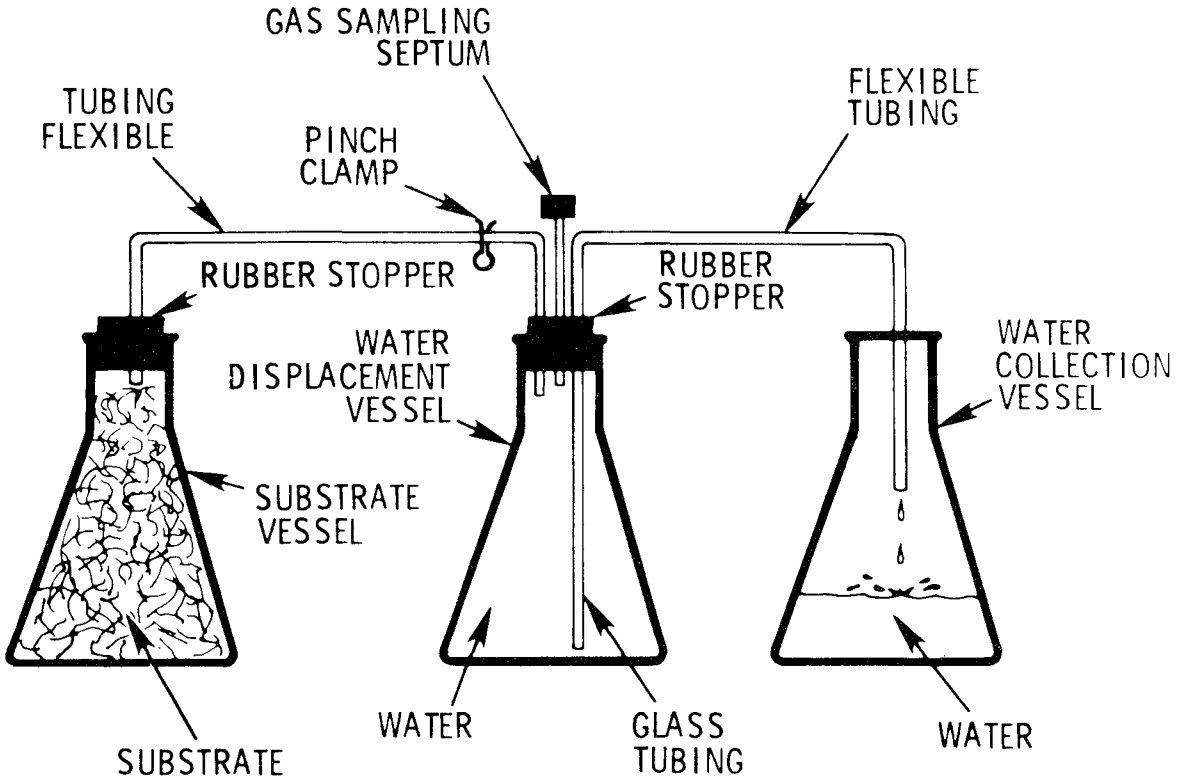


Figure 1. Laboratory Batch Bio-Digester

See Entry 1094.

a 470-square-mile marine area could produce enough kelp to yield sufficient methane to supply the total U.S. demand for gas based on 1975 consumption. A study of the economic feasibility of this program is underway. Preliminary cost estimates show this process of gas production to be competitive with alternate gas supply sources. Other papers discuss some of the technical and economic factors of ocean farming together with a report on obtaining chemicals from a northern kelp. This issue also lists books and papers received, grants awarded by the National Science Foundation (NSF), the Department of Energy (DOE), and the United States Department of Agriculture (USDA), pertinent patents, NTIS publications, research announcements, and future meetings.

1093. Biosources Digest, A Journal on Biomass Utilization, Volume 1, Number 3
NEUS, Inc.
Sobel H, ed
July 1979 65p PFR7712500
NSF/RA-790296 PB80-139306/NKS

Recent utilization grants by the National Science Foundation (NSF), the Department of Energy (DOE), the United States Department of Agriculture (USDA), and miscellaneous grantors are identified as to researcher and institution. A rubber analysis procedure inaugurates a new feature section which publicizes laboratory instructions and details for pilot plant operations. A paper on gasohol is reprinted together with abstracts of papers presented at two professional meetings. One paper describes four new egg-shaped digesters being constructed by the City of Los Los Angeles, and another discusses multi-use oil and hydrocarbon-producing crops in adaptive systems for food, materials, and energy production. Recent books and other publications in the field are listed by title, author, cost, and report number. A section on "Short Courses" outlines a course in "Fundamentals of Biochemical Engineering." Documents received are identified by author, title, and availability. Also listed are patents pertinent to biomass utilization, sources of new available information, and a schedule of future professional meetings.

1094. Biosources Digest, A Journal on Biomass Utilization, Volume 1, Number 4
NEUS, Inc.
Sobel H, ed
October 1979 61p PFR7712500
NSF/RA-790297 PB80-140981/NKS

In this issue, a letter from the editor calls attention to the role of biomass for energy as the dominant contemporary theme. A section on important announcements is devoted to the Department of Energy's plea for public input to a program which will support municipal facilities designed to convert solid wastes into fuel.

Recent biomass related grants are abstracted and listed giving the title, sponsor, organization, grant number and project investigator. Articles are presented on "Thermochemical Conversion of Biomass to Gasoline," "Predicting Solar Energy Fluxes in Polluted Urban Areas," "Principles, Equipment and Operation of Two Lab-Scale Biodigesters," "Energy Farming in New Zealand," and "A General Procedure for Converting Latex-Bearing Crops to Glucose, Lignin and Rubber." Also incuded are miscellaneous documents received and a report on forestation as a renewable energy source and one on the photoproduction of hydrogen. Other sections cover papers received, an annotated energy bibliography, books, patents, and future meetings.

1095. Joint US/USSR Conference on the Microbial Enzyme Reactions Project of the US/USSR Joint Working Group on the Production of Substances by Microbiological Means, Proceedings of the Fourth Conference (New Orleans, October 29-November 3, 1978)
University of New Orleans
Guilbault GG, ed
1979 514p INT7719256
NSF/RA-790177 PB80-132913/NKS

These proceedings summarize the work presented at the conference. Included are 31 papers of which 15 are based on studies involving conventional enzymology, nine are concerned with fixed enzymes, five describe biomass conversions, and one involves affinity chromatography. Presentations cover new enzyme sources, isolation techniques, purification methods, industrial, medical, and analytical uses of enzymes, and new concepts such as bio-fuel cells. Topics of papers include: scaling and optimization of technological processes by means of immobilized enzymes; serine proteinases of bacteria; cost reduction for producing ethanol from cellulosic biomass; and affinity chromatography by proteinases.

1096. Biological and Synthetic Systems for Production of Hydrogen from Water, Semi-Annual Progress Report (March 1, 1979-August 31, 1979)
Columbia University, Department of Biochemistry
Krasna AI
August 1979 9p AER7408381
NSF/RA-790221 PB80-146269/NKS

The focus of this research is the production of hydrogen from water to organic compounds using light as the source of energy. Two systems are studied for producing hydrogen from water: intact hydrogenase containing algae; and spinach chloroplasts coupled to hydrogenase or synthetic catalysts. Since both systems produce oxygen by photolysis of water, a major objective is to develop methods for continuous removal of oxygen which will permit sustained production of hydrogen. The report describes photoproduction of hydrogen by intact algae, a coupled

system of chloroplasts and hydrogenase, and the development of partial and completely synthetic systems for photoproduction of hydrogen. The report refers to recent publications describing this research and related studies in greater detail.

1097. Purification and Characterization of an Endo-Xylanase from Aspergillus Niger
Iowa State University
Angel RF
1979 125p PFR7700198
NSF/RA-790252 PB80-127699/NKS

Development of a method for the purification and partial characterization of endoxylanase obtained from the fungus Aspergillus niger is reported. This xylanase hydrolyzes xylan, a component of the hemicellulose complex found in large amounts in cereal. Hence, the enzymatic process has important implications as a potential source of food and energy. The thesis reviews previous work in this field and outlines the objectives and approach for this study. Experimental methods describe purification of endoxylanase from A. niger by centrifugation, column chromatography, and ultrafiltration. Results obtained indicate a final enzyme yield of 0.24 percent and a 4-fold purification. Optimum pH and temperature for activity were 5.1 and 42 C respectively. The molecular weight was 28,000 daltons. Its amino acid composition showed a high proportion of acidic and aromatic amino acids. Calcium ion activates the enzyme and mercuric ion inhibits it. Carbohydrate content of the enzyme was 22 percent. The enzyme hydrolyzed soluble and insoluble xylan to a mixture of xyloologosaccharisedes.

1098. Chemicals from Western Hardwoods and Agricultural Residues, Annual Report
University of Washington, College of Forest Resources and Chemical Engineering
Sarkanen KV, Hoo LH, Allan GG, et al
October 1979 228p PFR7708979
NSF/RA-790253 PB80-118474/NKS

Research accomplishments during the latter phases of a three-part program to utilize biomass material are reported. Methods of delignification and characterization of by-product lignins and conversion processes of biomass components to chemical feedstocks are described. The former involves catalyzed organosolv pulping of hardwood and bagasse, and the isolation and characterization of organosolv lignins. The latter includes a discussion of the potential of lignins in polymeric applications and reactions of lignin and biomass when undergoing microwave plasma and dielectric-loss pyrolysis. Results of this research program are of interest to biomass investigators, the chemical industry, and a number of pulp and paper manufacturers. Earlier research on the chemical characterization and pre-extraction of biomaterials is summarized.

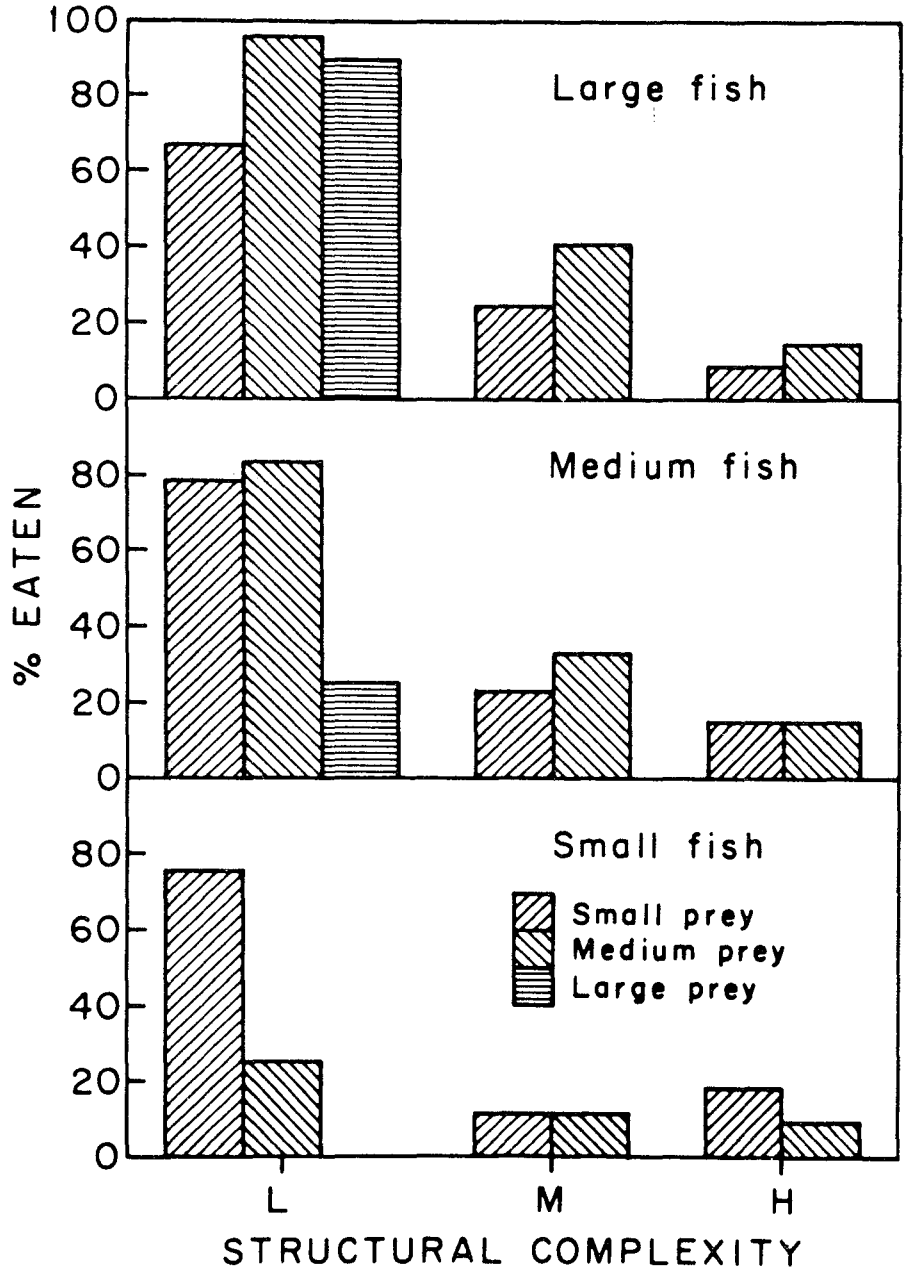
1099. Symbiotic Nitrogen Fixation in the Management of Temperate Forests, Proceedings of a Workshop (Oregon State University at Corvallis, Oregon, April 2-5, 1979)
Oregon State University
Gordon JC, Wheeler CT, Perry DA, eds
April 1979 507p PDR782220
NSF/RA-790254 PB80-126923/NKS

Considerations involved in developing systems of biological nitrogen inputs to forestry are presented. Specific attention focused on three aspects: (1) assessment and enhancement of symbiotic nitrogen fixation, especially by nonlegumes, in temperate forestry; (2) compilation of a state-of-the-art document on the role of symbiotic nitrogen fixation in temperate forest ecology and management; and (3) the convening of a panel, including both applied and basic forestry researchers, engaged in symbiotic nitrogen fixation to assess priorities and levels of effort. Individual workshops dealt with various phases of nitrogen fixation and forestry from biochemistry of the fixation process to the results of field trials with nitrogen fixing plants. The role and improvement of alders are described in detail because of the shrub's symbiotic capability to fix nitrogen coupled with its rapid growth and suitable wood characteristics. Individual sections of the symposium discussed economic and biological problems, actinomycetous root nodules, physiology and biochemistry, symbiosis in forest ecosystems, silvicultural and utilization potential, and a poster session.

1100. Develop Biological Systems for Lignocellulose Conversion, Sixth Progress Report (November 16, 1978-July 31, 1979)
U.S. Department of Agriculture; University of Wisconsin
Kirk TK, Zeikus JG
1979 88p AER7522789
NSF/RA-790304 PB80-147580/NKS

Specific tasks were conducted to investigate the optimization of lignin decomposition by Phanerochaete chrysosporium in thermomechanical pulps in solid substrate fermentations, and the bleaching of kraft pulp by ligninolytic fungi. Development of a continuous assay method for the measurement of enzymatic defibrillation of cellulose and the purification and characterization of C. thermocellum cellulose were also pursued. In the solid substrate fermentations and in liquid fermentations, a suppressive effect of added nutrient nitrogen was observed. Elimination of this nitrogen repression should greatly accelerate the rate of lignin metabolism and is the focus of continuing research. Research established that unbleached kraft pulp is partially delignified (bleached) on incubation under specified conditions with ligninolytic fungi. This decreases the requirements for bleaching chemicals, and has potential for reducing pollution due to byproducts or current chemical bleaching.

FIGURE 5. Feeding rates of three sizes of salt marsh killifish on various prey sizes as mediated by levels of structure (*Spartina* spp.) in the environment. Experiments were done in the lab and all are scaled to a 1-hour feeding period (Vince et al. 1976).



See Entry 1101.

1101. Aquatic Plants, Lake Management, and Ecosystem Consequences of Lake Harvesting, Proceedings of Conference (Madison, Wisconsin, February 14-16, 1979)
University of Wisconsin at Madison, Institute for Environmental Studies
Breck JE, Prentki RT, Loucks OL, eds
August 1979 420p ENV7710188
NSF/RA-790335 PB80-160450/NKS

Research is reported of all related experience on the growth of macrophytes, efficacy of harvesting treatment, and their effect on lake environments. Macrophyte aquatic flowering plants can become a nuisance in culturally modified or highly eutrophic lakes. Mechanical management (harvesting) of heavy macrophyte growths, though recognized as an economically sound way to reduce directly the nuisance levels of aquatic vegetation, has not been evaluated with respect to cost or effectiveness. This study provides such an assessment by addressing five major areas: (1) an examination of macrophyte biology focusing on questions of seasonal development in macrophyte development; (2) an examination of nutrient loading and flux of phosphorous from sediment covering the role of submerged macrophytes in lake nutrient cycles, particularly the phosphorous cycle; (3) an examination of the effects of harvesting on the consumer community exploring the consequences of a change in macrophyte cover for fish and invertebrate populations with respect to consumers; (4) an examination of mechanical harvesting options reporting the feasibility of using improved mechanical harvesting to alleviate nuisance conditions created by excessive macrophyte growths; and (5) an examination of institutional settings considering the goals and approaches by which Federal and state institutions provide assistance to communities desiring aquatic plant resources control.

1102. New Polymers Based on Industrial Oils from Renewable Resources, Semi-Annual Progress Report (May 15, 1979 - November 30, 1979)
Lehigh University, Materials Research Center
Manson JA, Sperling LH
1979 12p PFR7827336
NSF/RA-790341 PB80-146053/NKS

Progress is reported on a project to investigate and develop new high polymers based on industrial oilseeds. Objectives included the following: (1) selection of appropriate raw materials; (2) synthesis and characterization of rubber-like products from natural oils; (3) characterization of final polyblends in terms of fundamental morphology; and (4) evaluation of cost effectiveness and transfer of processes developed to industrial organizations. Based on previous success with novel techniques for combining rubber-like polymers with other polymers such as polystyrene in the form of interpenetrating polymer networks (IPNs), this approach was selected as a route to the new products desired. Results demonstrated that several epoxy-containing oils could be converted to

elastomeric materials and then to IPNs with polystyrene. Also, it was possible to epoxidize olefinic bonds by a convenient method. Both reinforced elastomers and rubber-modified plastics were produced. Experimental methods are described together with properties of the products obtained. Future plans and financial aspects are presented.

1103. Lignocellulose Degrading Bacteria, Progress Report
University of Minnesota, Gray Freshwater Biological Institute
Crawford RL
December 1979 18p PFR7906772
NSF/RA-790342 PB80-154313/NKS

Research on lignin-degrading Streptomyces is reported. Use of Streptomyces strain T7A to develop an efficient UV254 mutagenesis procedure is described. The bacterium produces copious quantities of spores which are readily usable in mutagenesis procedures. Experiments show that mutant T7A-1 degrades both wood lignin and wood cellulose more rapidly during the early stages than does the wild type T7A strain. Such an organism has the distinct advantage over the wild strain in many industrial bioconversion processes in which speed processing is important. This development also is noteworthy in demonstrating that it is possible to select mutant bacterial strains which degrade lignin more readily than the wild type. Other mutants of Streptomyces T7A are described. Elemental IP and U/V visible spectrophotometric analyses are reported of lignin decayed by Streptomyces T7A. Decayed lignin also was examined by gel exclusion chromatography. Future research is planned in three areas: (1) capability of T7A dehydrodivanillin mutants to degrade labelled lignins; (2) production and isolation of more T7A mutants; and (3) characterization by analytical procedures of lignins decayed by wild-type and mutant strains of T7A.

1104. Energy and Resource Recovery from Solid Waste: Report from a Workshop Considering Problems Identified by the Intergovernmental Science, Engineering, and Technology Advisory Panel (September 24-26, 1979, Lanham, Maryland)
American Association for the Advancement of Science
1979 237p OPA7824464
NSF/RA-790345 PB80-150790/NKS

Problems areas considered include institutional and economic issues; environment and health issues; production technology issues; and use technology issues. Separate working groups, set up to consider each of these issues, prepared draft reports which constitute the report. Each section begins with a statement by the Intergovernmental Science, Engineering, and Technology Advisory Panel (ISETAP) describing the problem area. A generalized statement of all the problem areas identified by the ISETAP Task Force on Energy precedes a summary of conclusions and recommendations

by the four working groups. The appendices consist of a list of members of the workshop and workshop planning group, the workshop agenda, information on ISETAP, and background papers on the various problem areas.

1105. Arid Land Plant Resources, Proceedings of the International Arid Lands Conference on Plant Resources (Texas Tech University, October 8-15, 1978)
Texas Tech University, International Center for Arid and Semi-Arid Land Studies
Goodin JR, Northington DK, eds
July 1979 735p AER7624472, ISP7704295
NSF/RA-790353 PB80-147937/NKS

Presentations by international experts cover developments of new and unused arid land plant resources for food, forage, medicinal, and industrial uses. The subject is especially pertinent in view of the alarming rate at which an ever-increasing global population consumes existing developed resources. The origin and evolution of arid and semi-arid lands are described with emphasis on desert soils and vegetation. Examples of papers on plant resources for the various applications include studies of the jojoba, guayule, and juncus plants, woody plants and fuels from biomass, and salt tolerant crops (the latter harvested for direct human consumption). The workshops comprise research topics together with plant ecology, management, and improvement.

Earthquake Hazards Mitigation

1106. Probabilistic Model for Seismic Slope Stability Analysis
Rensselaer Polytechnic Institute, Department of Civil Engineering
A-Grivas D, Howland J, Tolcser P
June 1979 95p ENV7716185
NSF/RA-790130 PB301369/NKS

A model for probabilistic stability analysis of earth slopes under earthquake loading is presented. Significant uncertainties associated with conventional pseudo-static methods of seismic stability analysis are recognized and probabilistic tools are introduced for their description and amelioration. The proposed method of analysis accounts for: the variability of material strength parameters; the uncertainty in the exact location of potential failure surfaces; and the uncertainty in the value of the maximum slope acceleration during an earthquake. The soil material comprised in the slope is assumed to be probabilistically homogeneous with strength parameters being identically distributed random variables with given statistical values. Potential failure surfaces are considered to have an exponential shape defined with the aid of three random variables. Slope safety is measured in terms of its probability

of failure. The seismic load is introduced into the analysis through the maximum horizontal acceleration experienced by the slope during an earthquake. Two different attenuation relationships are employed to determine the maximum horizontal ground acceleration and the corresponding results are compared and discussed.

1107. Analysis of Tentative Seismic Design Provisions for Buildings
National Bureau of Standards
Harris JR, Fenves SJ, Wright RN
July 1979 602p AEN7614698, AEN7619033
NSF/RA-790269 PB80-129182/NKS

Study results are presented of the internal logic of the Tentative Provisions for the Development of Seismic Regulations for Buildings developed by the Applied Technology Council. The methods of analysis employed provide objective measures of clarity, completeness, and consistency and an alternative form in which to examine the technical validity of the provisions, information networks for representing the precedence among provisions, and classification of the provisions to study their scope and arrangement. A formal representation of the provisions is presented by the data items, decision tables, networks, and classification systems developed in the study. An index and several alternate arrangements of the provisions also are included. Opportunities for improvement of the tentative provisions are identified and discussed, and considerations for their future development and implementation within various national standards are highlighted.

1108. Shear Behavior of Reinforced Concrete Members Under Bidirectional Reversed Lateral Loading
University of Texas at Austin, Department of Civil Engineering
Maruyama K, Jirsa JO
August 1979 133p ENV7720816
NSF/RA-790270 PB80-140395/NKS

The influence of lateral load or deformation history on shear behavior was examined. Ten specimens having identical dimensions and reinforcements were subjected to different loading histories. Each load path or load sequence was imposed on the specimens using a specially fabricated servo-controlled loading system which applied lateral translations perpendicular to the longitudinal axis of the specimen. Rotation of the ends of the specimens was controlled to simulate a column between stiff floors. The influence on load and deformation history was examined by comparing performance in terms of shear strength deterioration, stiffness reduction, strain distribution in transverse reinforcement, and crack patterns. Based on test results, a conceptual model was developed for analyzing the shear behavior of

members under multi-directional loading. The model was based on the concept of a damage index which was developed to help describe the shear failure mechanism. A sand-spring analogy was introduced as one component of the model. Details of the analytical procedure were based on measured response of the members. The model was used to estimate the shear response under various deformation histories and it is limited to members which have geometry similar to that of the members tested.

1109. LASS-III, Computer Program for Seismic Response and Liquefaction of Layered Ground Under Multi-Directional Shaking, Technical Report (UILU-ENG-79-2012)
University of Illinois at Urbana Champaign
Ghaboussi J, Dikmen SU
July 1979 146p ENV7600626
NSF/RA-790271 PB80-134554/NKS

A new method of analysis is described for evaluation of seismic response and liquefaction of horizontally layered ground subjected to three components of earthquake base acceleration. Previously, only one component--the horizontal one with highest peak acceleration--was chosen for analysis. However, it is generally agreed that the potential for liquefaction under the simultaneous action of both horizontal earthquake components is often higher than the liquefaction potential under the strongest horizontal component of earthquake base acceleration. Accordingly, saturated sand below the water table was modeled as a two-phase medium, with the porous granular solid and pore water as constituent materials. A new material model was introduced for the behavior of sand under cyclic bi-axial shear stresses. Results of analyses indicate the following: (1) the vertical component of base acceleration has minimal influence on the development and pattern of liquefaction; (2) interaction between the two horizontal components of shaking significantly influences the development and pattern of liquefaction; (3) increasing the amplitude of base acceleration in a one-directional analysis does not completely reproduce the major effects present in a two-dimensional analysis; and (4) interaction between the two horizontal components of shaking produces surface response spectra somewhat different from that of one-dimensional analysis.

1110. Seismic Analysis and Design of Buried Pipelines (Seismic Vulnerability, Behavior and Design of Underground Piping Systems, Technical Report 10)
Rensselaer Polytechnic Institute, Department of Civil Engineering
Wang LR
August 1979 17p PFR7815856
NSF/RA-790272 PB80-141260/NKS

Increasing attention is being devoted to the earthquake damage of buried pipelines because of the impact of disturbed conveyor systems on the citizenry during and after major earthquakes.

These involve loss of fire fighting capability, disruption of energy transportation, and disease hazard resulting from damage to water, oil or gas, and sewer/pipelines respectively. To evaluate the adequacy of existing systems and improve the design of future systems, "Simplified Analysis" and "Quasi-static Analysis" approaches are presented for use in computing pipe strains and relative joint displacements due to seismic ground shaking. Related parameters to fulfill analysis requirements are described. Both active and passive design procedures and considerations to reduce seismic damage of buried pipelines are presented. The most important factor in designing buried pipelines is ductility or flexibility which permits buried pipelines movement with ground displacement.

1111. Statistical Analysis of the Response of Nonlinear Systems Subjected to Earthquakes (UILU 79-2016)
University of Illinois, Department of Civil Engineering
Riddell R, Newmark NM
August 1979 312p AEN7508456, ENV7707190
NSF/RA-790273 PB80-134810/NKS

The dynamic response of single degree of freedom nonlinear systems subjected to earthquake motions is considered with the purpose of deriving factors for constructing inelastic design spectra, and of evaluating the effect of damping combined with inelastic behavior and the influence of the type of material nonlinearity on inelastic response. Inelastic response spectra for elastoplastic systems with 2, 5, and 10 percent damping, and for bilinear and stiffness degrading systems with 5 percent damping, are computed for a number of frequencies ranging from about 0.03 cps to 35 cps, for ductility values from 1 to 10, and for ten strong-motion earthquake records. A statistical procedure is developed to analyze the data. From this analysis, factors for deriving the characteristic trapezoidal design spectrum are obtained.

1112. Response of Simple Structural Systems in Traveling Seismic Waves, Technical Report (UILU-ENG-79-2015)
University of Illinois, Department of Civil Engineering
Morgan JR, Hall WJ, Newmark NM
September 1979 127p AEN7508456, ENV7707190
NSF/RA-790274 PB80-134000/NKS

The use of a traveling seismic wave procedure to study the translational and rotational responses of a building is investigated. This project was conducted with a view to assessing current building code procedures and to establish bounds for the interrelationship between torsional and translational response. The theory and procedure for both superposition and coupled reaction models used in the study are described together with results obtained. Three assumptions were made throughout the investigation: (1) only systematic motions over the base were taken into account; (2) only horizontally propagated plane waves with vertical

wave fronts of motions were considered; and (3) only rigid foundation systems were considered. Results indicate that, in general, the coupling of translational and rotational response leads to increased scatter in the computed responses obtained and less certainty in the types of trends noted for the superposition model. This study indicates that the 5 percent building code value for accidental eccentricity appears reasonable. Results clearly indicate the need for instrumentation to obtain a more detailed picture of the translation and rotation experienced by a building during earthquake excitation.

1113. Earthquake Resistant Structural Walls - Tests of Isolated Walls - Phase II, Final Report
Construction Technology Laboratories
Osterle RG, Aristizabal-Ochoa JD, Fiorato AE, et al
October 1979 335p ENV7715333
NSF/RA-790275 PB80-132418/NKS

Behavior of structural walls for use in earthquake resistant buildings is studied. Included is a presentation of results from sixteen tests on isolated walls. The tests were conducted in an attempt to develop design criteria for reinforced concrete structural walls in earthquake resistant buildings. The objective is to determine ductility, energy dissipation capacity, and strength of a wide variety of walls. Isolated walls representing those found in structural wall systems were tested. Controlled variables included shape of the wall cross-section, amount of main flexural reinforcement, amount of hoop reinforcement around the main flexural reinforcement, amount of horizontal shear reinforcement, axial compressive load, concrete strength, and load history. Two walls were repaired and retested. The following observations were based on test results: (1) structural walls designed according to the 1971 American Concrete Institute Building Code will attain their design strength in both flexure and shear; (2) properly detailed structural walls will behave in a ductile manner; (3) maximum shear stress that can be developed in a wall is limited by web crushing capacity; (4) presence of confined boundary elements significantly improves inelastic behavior; (5) construction joints in structural walls will perform adequately if made following the standard practice of roughening and cleaning the surface to remove laitance and loose particles; (6) displacements caused by shear distortions are a significant portion of the total inelastic displacements in structural walls subjected to reversing loads; and (7) structural wall performance under reversals is a function of load history.

1114. A Look at Opportunities for Community College Dissemination of Earthquake Hazard Mitigation Information, The California Experience
Ron Davis, Research and Management Consultant
Davis R
September 1979 81p 79SP0334
NSF/RA-790295 PB80-147820/NKS

California's community, junior, and technical colleges (CJT) seek appropriate techniques for dissemination of earthquake hazard mitigation (EHM) information to the state's lay public. The report reviews California's history of earthquakes and profiles the state's community college system. A section delineates the need for EHM information to increase public awareness of the problem and to enlist support for a realistic hazards reduction program. The potential for using CJT and other agencies to disseminate EHM information is outlined together with the problems involved in such a project. Foremost of these are the impact of Proposition 13 and CJT lack of involvement in or commitment to earthquake studies. However, these problems are more than offset by findings that CJT are geared to communicate with the lay public, and have the most flexible and community-responsive curricula of higher education institutions within the state. The report concludes that CJT could play a significant role in EHM dissemination with respect to practical needs of the state's many communities.

1115. Will Local Government Be Liable for Earthquake Losses? What Cities and Counties Should Know About Earthquake Hazards and Local Government Liability
Association of Bay Area Governments
Margerum T
January 1979 34p AEN7707496
NSF/RA-790338 PB80-157308/NKS

The possible liability of a local government for injuries or losses resulting from an earthquake caused by or made more likely by the government's failure to eliminate a known hazard is examined. Pertinent terms are defined including liability, injury, and earthquake hazards. Seven major judicial decisions affecting California tort doctrines between 1960-1977 are cited in view of the potential problem of liability for earthquake hazards. In an outline of the problems, the report includes a clarification of the extent and nature of local government's liability, and an advisement as to how to cope with that liability, and a recommendation of ways that tort law could be changed to encourage local governments to reduce hazards without increasing their liability. The basic structure and principle of modern tort law is reviewed. Other issues are examined such as how tort law affects local government decisions about earthquake hazards, the problem of uncertainty, the responses to perceived liability, the problem of disincentives, and general awareness of the issue. Three major recommendations are offered to make the law better.

1116. Experimental Study on the Seismic Behavior of Industrial Storage Racks
Stanford University, John A. Blume Earthquake Engineering Center
Krawinkler H, Cofie NG, Astiz MA, et al
November 1979 155p ENV7516931
NSF/RA-790340 PB80-150899/NKS

The development of seismic design criteria for industrial storage racks is reported. The development of loading criteria, the testing and interpretation of results of a series of experiments on full size rack assemblies, subassemblies, and rack components are described. Forced vibration tests are needed to obtain information on natural frequencies, mode shapes, and damping characteristics, while the behavior of connections and members as well as the stability of the frame-type racks are studied from cyclic loading tests. Objectives of the study include: (1) determination of the load-deformation response of cold formed steel members and their connections under cyclic loading similar to that expected under severe seismic excitations; (2) development of mathematical models of response characteristics as needed for subsequent analytical studies; and (3) development of standard seismic testing procedures which can be utilized by the rack manufacturing industry for seismic qualification testing. Types of tests include cantilever, portal, full-size rack (including longitudinal and transverse tests), and dynamic tests.

1117. Seismic Engineering Program Report, January-April 1979 (Geological Survey Circular 818-A)
U.S. Geological Survey
Porcella RL, ed
April 1979 27p CA114
NSF/RA-790354 PB80-149909/NKS

The document informs strong-motion data users of available current data recovered by the Seismic Engineering Branch of the U.S. Geological Survey (USGS). Included is a summary of accelerograms recovered from the USGS's National Strong Motion Network during the period January 1 through April 30, 1979. Described is strong-motion instrumentation in Imperial Valley, California. The seismicity of this region has been characterized by both earthquake swarms as well as mainshock-aftershock activity. Summaries of recent reports include information on earthquakes at Milford Sound, New Zealand; Santa Barbara, California; Bishop, California; St. Elias, Alaska; and Monte Negro, Yugoslavia. The availability of strong-motion information data reports, digitalized data, and additional information pertinent to USGS and other strong-motion programs is presented. The data summary includes accelerograms arranged chronologically and selected accelerograms from Imperial Valley. Maps identify accelerograph stations in Alaska and Imperial Valley.

1118. Axisymmetric Buckling of Buried Pipelines by Seismic Excitation
University of Notre Dame, Department of Aerospace and Mechanical Engineering
Lee LHN, Ariman T, Chen CC
December 1979 25p ENV7723236
NSF/RA-790356 PB80-151954/NKS

A quasi-bifurcation theory of dynamic buckling and a simple flow theory of plasticity are employed to analyze the axisymmetric, elastic-plastic buckling behavior of buried pipelines subject to seismic excitations. Using the seismic records of the 1971 San Fernando earthquake, a series of numerical results have been obtained, which show that, at strain rates prevalent in earthquakes, the dynamic buckling axial stress or strain of a buried pipe is only slightly higher than that of static buckling.

1119. Reliability of Existing Buildings in Earthquake Zones, Final Report
Purdue University, School of Civil Engineering
Yao JTP
December 1979 55p PFR7705290
NSF/RA-790366 PB80-153067/NKS

Results are reported of a research project designed to formulate reliability criteria and to analyze available test data for the safety evaluation of complex existing structures. A literature review was conducted in three areas: (1) system identification involving techniques developed to obtain a mathematical representation of a specific physical system when both input and output are known, (2) damage assessment of existing structures, and (3) structural identification with respect to damage and reliability functions and equations of motion. Formulation of reliability evaluation is discussed with respect to damage function, application of pattern recognition, and application of fuzzy sets. Preliminary analysis of available test data is described whereby two simple methods identified linear parameters as a function of a strong-motion earthquake in San Fernando's 42-story Union Bank which sustained minor damage during the 1971 earthquake. Results indicate that although the linear and slightly nonlinear behavior of structures can be successfully analyzed mathematically, the analysis of structures through various stages of damaging loading conditions remains unsolved. Hence, classification and identification of damage states for complex systems require further study.

1120. Earthquake Engineering and Hazards Reduction in China: A Trip Report of the American Earthquake Engineering and Hazards Reduction Delegation
National Academy of Sciences
Jennings PC, ed
1980 195p ENV7991116
NSF/RA-800005 PB80-150865/NKS

The U.S. Earthquake and Hazards Reduction Delegation reports its 1978 visit to learn about earthquake engineering, prediction, mitigation and research in China. The delegation comprised mostly earthquake engineers plus two geoscientists and a China scholar. The itinerary covered visits to six major cities beginning with the State Seismological Bureau, Tsinghua University and three construction sites at Peking. At Harbin the team visited the Institute of Engineering Mechanics which has principal responsibility for earthquake engineering research in China. At Canton, Chinese engineers presented earthquake studies on the analysis of tall buildings. In turn, delegation members presented 24 technical lectures during the tour. Various features of earthquake engineering and practice in China and information learned about specific earthquakes; i.e., the disastrous earthquake at Tangshan and the 1976 Sungpan-Pingwu earthquakes, are reported. Photographs of earthquake resistant structures and scenes of earthquake damage in China are included.

1121. Method for the Analysis of Seismic Reliability of Lifeline Systems, Technical Report
University of Illinois, Department of Civil Engineering
Mohammadi J, Ang AH
February 1980 117p ENV7709090
NSF/RA-800015 PB80-157738/NKS

A fault-rupture model applied to the seismic risk analysis of a lifeline system and a companion model is developed for evaluating the hazard of fault-rupture strike on a lifeline system to potential earthquakes. Because of the importance of near-source regions in the seismic risk analysis of a lifeline system, an attenuation equation for the near-source region was developed based on an analytical study. Two modes of failure were considered: the fault-rupture striking one or more links of a lifeline, and the overstressing of sections of a lifeline caused by high ground shaking during an earthquake. The term "lifeline system" refers to networks of man-made or engineered systems (oil pipelines, water distribution systems, communication, and transportation networks) covering vast surface areas. The method presented for evaluating seismic safety of lifeline systems in two modes is useful and necessary for a risk-based approach to the design of lifelines against earthquake hazards. In evaluating seismic reliability of the entire lifeline system, correlation between different paths is important and must be considered.

Intergovernmental Program

Local Government

1122. Oklahoma Innovation Group, 1979 Final Report
Oklahoma State University, Center for Local Government Technology
September 1979 61p ISP7719056
NSF/RA-790247 PB80-126048/NKS

This report summarizes the activities of a project to encourage the implementation and use of innovations by local government in general, and specifically, to create an expanded program of technical assistance via the Oklahoma Innovation Group. Following a list of funding sources and a description of membership selection, the report outlines projects involving equipment management, street maintenance, scheduling of parks, recreation and utilities programs, accounting systems, cost distribution of solid waste disposal, police and fire information systems, water distribution accounting, and improved forms management. Specific measures to expand computer capability are described. Other subjects considered are rural bridges, municipal safety, waste collection, and county training programs. The appendix consists of separate descriptive documents on several of the projects studied and conference agenda.

1123. Training Manual for Setting Street Maintenance Priorities
Texas Innovation Group
Biles S, Kerbel R
August 1979 39p ISP7807604
NSF/RA-790259 PB80-131410/NKS

This manual was written to help city staff learn a method of describing street surface conditions which indicates maintenance need. By following the step-by-step process in this manual, a survey team can gather all the necessary data for the ranking of street maintenance needs. This method is a tool that can be used to help a city's decisionmakers allocate funds. The manual contains four sections: preparing to survey; doing the survey; analyzing the survey results; and developing possible applications and recommendations. Terms used in training are described as are the steps to take before surveying the city's

streets. The surface conditions to be observed are outlined and their meaning and usefulness described. Photographs are used to illustrate each condition. A system to analyze the survey's results by assigning points is presented. These points show the relative severity of distress conditions observed on street surfaces. Finally, applications of the survey results are discussed.

State (Executive) Government

1124. Science, Engineering, Technology, and Florida's Government, Management Summary (SSET)
Florida, State of, Department of Administration
Gerry JH, Thomas MP
April 1979 32p ISP7805131
NSF/RA-790310 PB80-144397/NKS

This summary results from a project to examine the structure and process of Florida's executive branch in relation to science, engineering, and technology (SET), and to determine a strategy to facilitate improvements in the way state resources are used in SET endeavors. The report provides a description of the Federal direction in SET; an organizational profile of Florida's executive branch; an overview of programs relating to SET; an explanation of the relationship between state policies and SET; a description of how SET is implemented in other states; and summaries of interviews and questionnaires. One section discusses the important considerations and deductive reasoning processes leading to the development of a state strategy relating to SET. A recommended alternative organizational structure to meet Florida's needs is presented. It is suggested that the most important element for effective innovation requires leadership from the Governor and other elected officials.

1125. Science, Engineering, Technology, and Florida's Government (SSET)
Florida, State of, Department of Administration
Gerry JH, Thomas MP
April 1979 99p ISP7805131
NSF/RA-790311 PB80-139389/NKS

The structure and process of Florida's executive branch in relation to science, engineering, and technology (SET) is examined in order to determine a strategy to facilitate improvements in the way state resources are used in SET endeavors, and to provide assistance in the improvement of the policy formation process within Florida. The report includes an organizational profile of Florida's executive branch; a review of the overall relationship of the State Comprehensive Plan to SET; a synthesis of significant observations from respondents participating in interviews and survey questionnaires;

an overview of the activities of other states including findings to be considered for Florida's improvement in SET; the author's analysis of considerations affecting Florida's utilization of and relationship with SET; development of strategic requirements and a proposal for an organizational structure for Florida; and conclusions. Included in the appendices are a project description and an overview of the development of SET in the United States.

1126. Potential for Coal in Massachusetts' Energy Future (SSET)
Massachusetts General Court
Rubin K, Zeemont M, Ergeta T
1979 171p ISP7804614
NSF/RA-790312 PB80-141898/NKS

Technological alternatives are identified for the implementation of coal and coal-derived fuels for future use primarily in the utility and other industrial sectors across Massachusetts. Included is a discussion of the legislative precedent for and regulation of coal utilization at both the Federal and state levels. Demand forecasts are made for overall energy and for coal under several different sets of assumptions. The conversion of the Brayton Point electric generating station to coal is discussed as exemplary of one way to increase local coal use. Coal supply options are explored including a discussion of location, quantity, costs of extraction, sulfur content, heat content, environmental impacts, and applicable regulations. Transportation alternatives also are considered. Finally, end use technology options and pollution control technologies are discussed in detail. Illustrative graphic and tabular material is provided.

1127. State Science, Engineering, and Technology Study of the Nevada Executive Branch (SSET)
Nevada Governor's Office of Planning and Coordination
August 1979 251p ISP7802506
NSF/RA-790313 PB80-145964/NKS

Examined in this report are alternative means whereby the Nevada Executive Branch can improve the flow and utilization of science, engineering, and technology (SET) resources in the decisionmaking process of the Governor. Emphasis was directed toward currently available university resources. The historical background of past scientific mechanisms for the executive branch in Nevada is reviewed. A survey of the state's population of scientists and engineers revealed that extensive SET resources are available. To date slight attention has been paid to future research and data needs of a scientific nature. Some of the major issues involved in effectively transferring SET Information to the executive policymaking process are discussed. The existing planning process was reviewed and found to be a workable one. Four alternative and two subalternative SET advisory mechanisms were studied and ranked. First preference calls for an Office of State Science Advisor and a

Science and Technology Advisory Council. After recommendations were presented to the Governor, he decided to appoint a science advisor from the university system to work with the State Planning Coordinator to fill SET needs.

1128. Science and Technology Information and Advice: A Policy Management Instrument for the Governor of Oregon (SSET)
Oregon, State of, Executive Department
Feinstein SH
April 1979 50p ISP7802505
NSF/RA-790314 PB80-139280/NKS

This project is part of a program designed to provide governors and legislatures with the opportunity to plan for maximum utilization of scientific and technical resources in the policy management or development processes. The SSET project focuses on a series of selected policy management projects presented as case studies, each of which are described in terms of problem, response, and observations. They include the United States Department of Labor ban on strawberry harvesting by children less than 12 years of age; the use of herbicides containing Dioxin in Oregon forests; potential dry rot as a result of retrofitted wall insulation; efforts to develop lineament and structural maps of Oregon; and evaluation of grant proposals submitted to the Pacific Northwest Regional Commission (PNRC). The creation and effectiveness of an experimental office of S&T within the executive branch is described and recommendations are presented. Also included is a chapter on the cost of implementation.

1129. Rhode Island SSET Report, Final Report (SSET)
Rhode Island, State of, Office of the Governor; University of Rhode Island
Kumekawa G, Reenstra R
May 1979 45p ISP7802499
NSF/RA-790315 PB80-139728/NKS

The Rhode Island Executive State Science, Engineering, and Technology (SSET) Project has undertaken an evaluation of the Governor's policy staff's need for science and technology (S&T) information. A review of the functions carried out by the policy staff and of their information requirements suggests that a direct linkage is not appropriate. Instead, policy analysts should have direct access to contact individuals within research organizations who can identify the appropriate specialists for a given topic. Examples of untapped resources are reviewed in this report, as are a set of procedural guidelines for identifying information, organizing information requests, identifying appropriate specialists, and insuring relevance of the response. A breakdown of the Governor's policy office is diagrammed as is the proposed path of external information retrieval by the state government. Other topics covered include:

other states' approaches to S&T information needs; existing information flow; accessibility of S&T information; case studies; a computer-based analysis of land management options; big river development; and a summary review of findings.

1130. Iowa Science, Engineering, and Technology Project: A Study to Identify the Means by Which the Executive Branch of State Government Can Improve Its Capability for Using Science, Engineering, and Technology in Meeting the Needs of the Citizens of Iowa, Final Report (SSET)
Iowa, State of, Office for Planning and Programming
Hanson RW
February 1979 52p ISP7725351
NSF/RA-790318 PB80-138969/NKS

The Iowa State Science, Engineering, and Technology (SSET) project report describes the work of a task force commissioned to improve access of the Governor and government agencies to scientific and technological information. The study addresses two questions: 1) To what extent would a better understanding of scientific and technological concepts improve the ability of elected or appointed public officials to make policy decisions? and 2) To what extent would a specific science and technology information system be a significant addition to information resources currently available to policymakers? Tasks involved developing an inventory of science and technology resources available to the executive branch of the Governor's Science Advisory Council (GSAC); and developing means by which the executive branch could access this inventory to obtain advice and information for the public policy process. Various mechanisms, including those of other states, were examined and recommendations were offered.

1131. State of Wisconsin State Science, Engineering and Technology Project, Final Report (SSET)
University of Wisconsin at Madison
Born SM, Butler KS
May 1979 282p ISP7892502
NSF/RA-790326 PB80-148018/NKS

Developed is a plan of action to improve the use of scientific and technological (S&T) resources in policy formation and decisionmaking in the executive branch of Wisconsin government. The project focuses on the long, productive relationship of the University of Wisconsin to state government activities. The work plan emphasized identifying means of enhancing or expanding existing ties. Approaches used were case study analysis, and an inventory of mechanisms for accessing S&T resources. The final set of case studies and selection factors were tabulated. Findings revealed a diverse array of S&T advisory mechanisms used in Wisconsin.

Consultative approaches for accessing S&T resources were the most widely used ones. There appears to be no single "best" mechanism, but rather a variety of valid approaches which can serve well in particular situations.

State (Legislative) Government

1132. Development of a Science and Technology Information System - Supplement
Nebraska Legislative Council
Rodgers J, Pelster JM, Fisher S
May 1979 229p ISP7803119
NSF/RA-790112 PB80-132293/NKS

The supplement contains background papers developed by four professional interns who sought to test the usefulness of persons with science and technology expertise on the legislative staff and to see how they could be integrated into staff activities; to perform legislative foresight activities; and to write background papers on four areas of interest to the Legislature. A study on retention of, patient access to, and privacy of medical records attempts to review the status of medical records in the following areas: (1) the period of time individual records must be retained by the record holder; (2) patient access to their own records; and (3) the confidential treatment those records are given by the record holder and various users. A study on water erosion diagnoses the problem and prescribes potential remedies for the state of Nebraska. A study on product liability insurance and product liability law examines the issue nationwide as well as in Nebraska. Negligence, warranty, and strict liability in tort are discussed. The review of methods for forecasting demand for electric power and peak loads surveys a variety of forecasting techniques. The suitability of each technique for a given set of circumstances is evaluated.

1133. Wisconsin Legislative Council Staff Science and Technology Intern Program, 1979 Final Project Report
Wisconsin Legislative Council Staff
June 1979 137p ISR7518812
NSF/RA-790141 PB80-157183/NKS

Activities of the Science and Technology (S&T) Intern Program of the Legislative Council Staff of the State of Wisconsin and an evaluation of these activities are presented. They deal with issues such as the management of hazardous wastes, environmental controls for future mining development, the use of toxic chemicals, and the state's reliance on nuclear, coal and alternative sources of energy. The first section of the report describes the Legislative Council and the history of the Council's S&T program.

The second section describes activities undertaken to meet the objectives of the intern program; to provide S&T information to S&T information to Wisconsin legislators and their staff; to provide public policy career development opportunities for scientists and engineers; and to increase cooperative efforts between the state legislature and the University of Wisconsin system. An evaluation of the project, in the third section, consists of evaluation activities, indications that the program succeeded in meeting the objective, limitations of the program in meeting the objective, and areas for further research. Twelve appendices are included.

1134. Technical Studies: The Massachusetts Legislative Science, Engineering and Technology Project (SSET)
Massachusetts, Commonwealth of, Science Resource Office
1979 74p ISP7804614
NSF/RA-790306 PB80-153174/NKS

The technical studies program identified all legislation filed in the General Court in 1977 which had a scientific and/or technical content. The impact of that legislation upon the Legislature's Committees was also identified by quantifying the number of scientific and technology bills for which each committee was responsible. Six legislative committees were assigned legislation which consisted of 15 percent or greater science and technology related materials: energy, health care, joint rules, national resources, human services, and public safety. Activities of legislative committees or special commissions for which expertise could be provided through technical studies were identified. The program became involved in three of these activities: the Special Study Commission on Automobile Emission Inspection and Maintenance, the Special Legislative Commission on Liquefied Natural Gas, and the Joint Committee on Energy with regard to the prospective uses of coal as an energy source in Massachusetts. Sources of participation by university faculty and graduate students in technical studies proved successful. Numerous models for performing technical studies in other states were reviewed and studied, notably those in Minnesota, Wisconsin, Illinois, Pennsylvania, Connecticut, and New York. A recommendation was made for the development of a Visiting Scientist Program.

1135. West Virginia State Science, Engineering and Technology Program, Final Report (SSET)
West Virginia, State of; West Virginia University
April 1979 13p ISP7802515
NSF/RA-790309 PB80-147531/NKS

The program concentrated on energy issues for the design of an efficient science and technology transfer mechanism for West Virginia. A survey of the perceived needs with regard to scientific information was circulated to all state legislators. The survey

was drawn from the needs analysis developed by the staff of Michigan's State Science, Engineering and Technology Program. A more informal analysis was made with the executive branch personnel. Systems for technology transfer in existence in other states were examined. To assess these programs in a comprehensive manner, a survey of the pertinent literature was conducted to gain a historical perspective. On-site visits to other states' science and technology offices and policymakers were made to examine the effectiveness and benefits of their programs as well as their applicability to West Virginia's unique position. An evaluation of alternative mechanisms for implementation in West Virginia is presented.

1136. Identification of Rhode Island and Northeast Area Scientific and Technical Resources, Appendix (SSET)
Rhode Island, State of, Office of the Governor
1979 118p ISP7802499
NSF/RA-790316 PB80-139736/NKS

This directory attempts to facilitate the way in which science and technology (S&T) resources of the State of Rhode Island and of the Northeast area are used. A bibliography of University of Rhode Island (URI) faculty experts in environmental energy, transportation, economics, labor relations, health, and social services is provided. URI research and information centers are identified and their services are listed. Topics include coastal and water resources; business; economics; ocean management; agricultural experimentation; government research; scientific criminal investigation; marine resource development; poison control; curriculum research and development; drug information service; gerontology; oil spills; and psychological consultation. Also included is a list of contact people at New England-based Federal R&D laboratories, a list of national professional associations, members of the URI faculty, and a summary of ongoing research at URI.

1137. Meeting the Information Needs of the Alabama Legislature, Final Report
Auburn University, School of Engineering
Cox JG, Haneman VS Jr, Cain JL, et al
June 1979 58p DI39498
NSF/RA-790317 PB80-151608/NKS

Results of a project to provide the Alabama Legislature with technical assistance of university faculty expertise are summarized. An overview reviews development of the program during 1973-1979. The first phase involved development and implementation of a model for linking university expertise to legislative needs. The second program, Legislative Technical Assistance Program (LTAP), was involved in establishing an office of legislative technical assistance. The three-year LTAP grant was extended for a year. The technical assistance and information program administered by Auburn University's School of Engineering offered technical assistance to

the Alabama Legislature. The report concluded the following: (1) NSF grants for science and technology transfer should be made on at least a five-year basis. (2) The timing of NSF grants is important. (3) Technical assistance must be readily available through a prestigious individual. (4) Science is an all-inclusive term to a legislator. and (5) University administrators also must be mobilized. Two appendices contain legislative resolutions and details of development resources in science-engineering and technology for the Alabama Legislature.

1138. Scientific and Technological Information for Indiana State Legislators, Final Project Report (SSET)
Butler University, Holcomb Research Institute
Beranek W Jr, Becker S, Clark M, et al
July 1979 74p ISP7820364
NSF/RA-790319 PB80-153059/NKS

This study examines the needs of the Indiana General Assembly for scientific and technological (S&T) information and ways to meet those needs. The investigation addressed three basic questions: (1) What do Indiana legislators consider to be present and future S&T needs? (2) How do legislators currently access useful S&T information? and (3) What alternative means of obtaining information may be of use to the legislators? Interviews were conducted with those outside the legislature who furnish scientific or technological information to state legislators and also with legislative staff members and political caucus staff personnel. Legislators concur that S&T issues are becoming increasingly important in decisionmaking, and that although such information is available, they have neither the time nor scientific background to interpret it. Accordingly, legislators expressed a preference for direct contact with persons who provide S&T information. A directory of S&T resource expertise was suggested as a practical means of meeting current needs of Indiana state legislators for rapid access to useful S&T information.

1139. Selected Scientific and Technical Expertise In Arizona, Resource Catalogue (SSET)
Arizona State University, College of Engineering and Applied Sciences
Lewis WE, Moor WC
May 1979 244p ISP7804612
NSF/RA-790321 PB80-147440/NKS

This directory is organized in 35 subject categories and subcategories. Arizona resource persons are identified by name, title, professional affiliation, address, and phone number. Specific major categories include problem solving for state and local government, health planning and communication, physics, ocean technology and engineering, natural resources and earth sciences, electrotechnology, civil engineering, aeronautics and aerodynamics, astronomy and

astrophysics, atmospheric sciences, medicine and biology, computers, detection and counter measures, environment, administration, materials science, mathematical sciences, military sciences, missile technology, navigation, nuclear science and technology, ordnance, propulsion and propellants, photography and recording devices, space technology, transportation, library and information services, building industry technology, government inventions and licensing, urban and regional technology and development, behavior and society, NASA earth resources and survey program, industrial and mechanical engineering, biomedical technology, business and economics, energy, agriculture and food, and chemistry.

1140. State Science, Engineering and Technology Program, State of Utah, Final Report (SSET)
Utah, State of, Office of State Planning Coordinator
Nielson DW
January 1979 167p ISP7725886
NSF/RA-790323 PB80-142722/NKS

The report summarizes work completed on nine tasks of an overall evaluation of the Utah State Advisory Council on Science and Technology and the Science Advisor with respect to where they fit into the state's governmental network. Past activities of the Council and their relationship to the planning and decisionmaking process were reviewed. The structure and function of the Council were re-examined to ascertain the optimum utilization by both legislative and executive branches. Systems of other states utilizing a science and technology mechanism were evaluated for possible incorporation into the Utah setup. The role of the State Science Advisor was reviewed and found to be relevant to the full range of issues of concern to the governor and legislature. An inventory was made of resources which are available to the science and technology mechanism within the state government, universities, industry, Federal laboratories, and local government associations. An interface was established between the Energy Council and the Science Council. An effective mechanism was devised to provide technical input into the policymaking processes of the executive and legislative branches. An academic fellowship program is proposed to expose academic experts to state governmental processes. Extensive appendices are included.

1141. Science and Technology, Improving the Processes of Communication in the Minnesota Legislature, Final Report (SSET)
Minnesota Legislature, Science and Technology Project
Stolen P
March 1979 100p ISP7802510
NSF/RA-790324 PB80-150295/NKS

The report reviews current science and technology (S&T) communication practices in the Minnesota legislature and suggests possibilities for improvement. Four methods of providing technical information and analysis to the legislature were explored. The first

involved the use of consultants, based on results of an interview survey with experienced consultants and a case study summary of consultant assistance to the State Joint Committee on Solid and Hazardous Wastes. The second approach examined alternative means of communicating in forms other than written documents, including visual techniques, conferences and workshops, and computers. The last two aspects dealt with technology assessment and legislative foresight. The latter entails full evaluation of legal, economic, health, environmental, and social effects of a given technology whether extant or in prospect. Additionally, the report provides background information on the experiences of other states, with particular emphasis on Pennsylvania's Legislative Office of Research Liaison. General comments are presented on the S&T Project's role in communicating technical subjects to the legislature and on future activities by the S&T project.

1142. Establishment of a State Science, Engineering, and Technology Program for Connecticut, Final Report of the Steering Committee (SSET)
Connecticut, State of, Office of Policy and Management
February 1979 50p ISP7725876
NSF/RA-790327 PB80-147812/NKS

The establishment of a joint legislative and executive science and technology (S&T) information system is proposed for the State of Connecticut. This proposed system is intended to improve the access of state policymakers to S&T information. The system replaces the current largely informal and ad hoc method of gathering and disseminating S&T information with a more formal structure designed to meet the specific needs of Connecticut. An examination was conducted of S&T information systems and practices in other states and in Connecticut. Also performed was a theoretical analysis of the characteristics of an effective external source of S&T information. The following conclusions were reached: (1) the S&T inquiry and research capability of the General Assembly should be strengthened; (2) the S&T inquiry and coordinating capability of the Executive Branch should be improved; and (3) a primary external source of S&T information should be designated and its capacity to respond to S&T questions strengthened.

Federal Laboratories

1143. 1979 Technology Transfer Directory of People, A List of Persons Interested in the Process of Technology Transfer
Naval Weapons Center
McFall J, Dugger C, Jolly JA, et al
1979 67p ISP7822221
NSF/RA-790360 PB80-151830/NKS

The revised edition of a 1977 directory lists people in the United States and abroad who are involved in the process of technology transfer. Included are instructions for use, indexes, and a form provided for registration, update, and change of address. Persons are indexed first in alphabetical order, then alphabetically by state or country, and then by ascending occupational codes. To the right of each name appears the person's title, phone number, and three-digit codes for both area of expertise and occupation. These codes are defined at the beginning of the indexes. Complete addresses are given under each name. The expanded occupation codes are an important change in the revised directory.

Industrial Program

University/Industry Research Centers

1144. Utah Innovation Center
University of Utah
1979 22p ISP7801821
NSF/RA-790258 PB80-118565/NKS

The Utah Innovation Center is an interdisciplinary undertaking organized to help strengthen the free enterprise system by providing an atmosphere within the University in which innovation and entrepreneurship are stimulated. The Center will extend education and service, in both management and technical disciplines, directed toward improving the success rate of technological entrepreneurs, and will provide clearly needed assistance toward preserving the historic function of individuals and small businesses as a most productive source of innovative concepts. In its examination of the Innovation Center, the text describes the Center's concept, the importance of innovation, the Center's services, the personnel, and the value of innovation and entrepreneurship education. Also described are the affiliated laboratories such as the Instrumentation Research Laboratory (IRL), the Center for Biomedical Design, and the Hedco Microelectronics Laboratory.

1145. Furniture R&D Applications Institute, 1973-1978
North Carolina State University, School of Engineering
Ekwall JA
1979 157p CG00004
NSF/RA-790262 PB80-120504/NKS

Results of a five-year joint industrial-academic research and development program in the furniture manufacturing industry are reported. Established as the Furniture Research and Development Applications Institute centered at North Carolina State University, the Institute investigated (1) the efficacy of stimulating a mutually profitable industry-university R&D applications organization, and (2) the relative effectiveness of various methods of implementing and catalyzing innovation by the furniture industry. The Institute conducted projects involving practical and theoretical approaches to a wide range of industry products, processes, materials, and methods. Individual projects comprised the Clark chair frame, upholstery frame innovations, finger-jointing, robots in furniture finishing, a quality control manual, plymate joint reinforcement, moisture cycling of dowel joints, molder yield study, materials handling, lumber drying and yield, short-term problem solving, equipment file, production control workshops, operator training surveys, and carve-emboss. The organization of the Institute is described together with problems faced in relating to the furniture industry. Results achieved and methods of communicating with the furniture industry and of dealing with external factors are detailed. An extensive appendix elaborates on the text.

1146. Furniture R&D Applications Institute, 1973-1978, Supplemental Volume: Reports and Publications
North Carolina State University, School of Engineering
1979 485p CG00004
NSF/RA-790263 PB80-126816/NKS

Sixteen research project reports and publications resulting from the five-year joint industrial-academic research and development program in the furniture manufacturing industry are reported. These projects, supported by the Furniture R&D Applications Institute at North Carolina State University, represent practical and theoretical approaches to a variety of furniture industry concerns. Reports vary in format depending on the nature of the project. Practical empirical investigations such as the development of a new, inexpensive manufacturing method and assembling parts for the Clark upholstery frame provide detailed instructions and illustrations. Theoretical studies including the economic analysis of finger-jointed upholstery frames involve computer simulation programs. These projects present extensive input data covering different strategies with respect to cutting bills and their impact on costs. The reports encompass a broad spectrum of projects ranging from development of a wiping tool to highrise storage for furniture manufacturing.

1147. Summer Study of Research and Development Needs of the Tailored Clothing Industry, Final Report
Harvard University, Division of Applied Sciences
Abernathy FH, Dunlop JT
January 1980 55p ISP7902288
NSF/RA-800002 PB80-159833/NKS

A study of the men's tailored clothing industry (TCI) was conducted to ascertain the industry's interest in undertaking an in-depth five-to-ten year research development program. Through a series of plant visits and discussions with suit manufacturers, labor leaders, academic researchers, equipment suppliers, textile chemists, trade representatives, and Federal agency personnel interested in the garment industry, the investigators obtained information to compile a composite of the status and attitudes of the tailored clothing industry toward technology. After identifying hurdles which retard development of manufacturing technology and reviewing prior industry R & D efforts, the team developed an R & D plan having three major thrusts: (1) material or piece goods handling, (2) new options in manufacturing, and (3) operations research and computer modeling of the manufacturing process. Specific program objectives are identified together with recommended guidelines. The appendix includes information on a two-day workshop at Harvard on the research and development needs of the men's tailored clothing industry.

1148. Coal-to-Coke Transformation for Blast Furnace Fuels (Proceedings of a Workshop held on November 18-20, 1979, Morgantown, West Virginia), Summary Report
West Virginia University, Energy Research Center
Aldridge MD
January 1980 23p OPA7024217
NSF/RA-800003 PB80-142391/NKS

Recommendations were submitted to identify basic research areas and to stimulate research in the academic community in the field of coal-to-coke transformation for blast furnace fuels. Such knowledge is urgently needed to ensure future availability of high-quality domestic coke in an environmentally acceptable manner. Working groups developed broad areas for research on coal-to-coke transformation. These included finding improved methods for characterizing coals and other raw materials in coke production, studying the effect of the chemical composition of coal surface on coking potential, and examining the characteristics of coal oxidation. The working groups also offered suggestions concerning the carbonization process with respect to mesophase, plasticity, chemistry, physical changes, bonding mechanisms, binders and inclusions, formcoking, and coking pressure generation. Other proposed research areas are monitoring and instrumentation, heat transfer and thermodynamics, mechanical design, selection of improved materials, environmental control technology, and particulate systems technology.

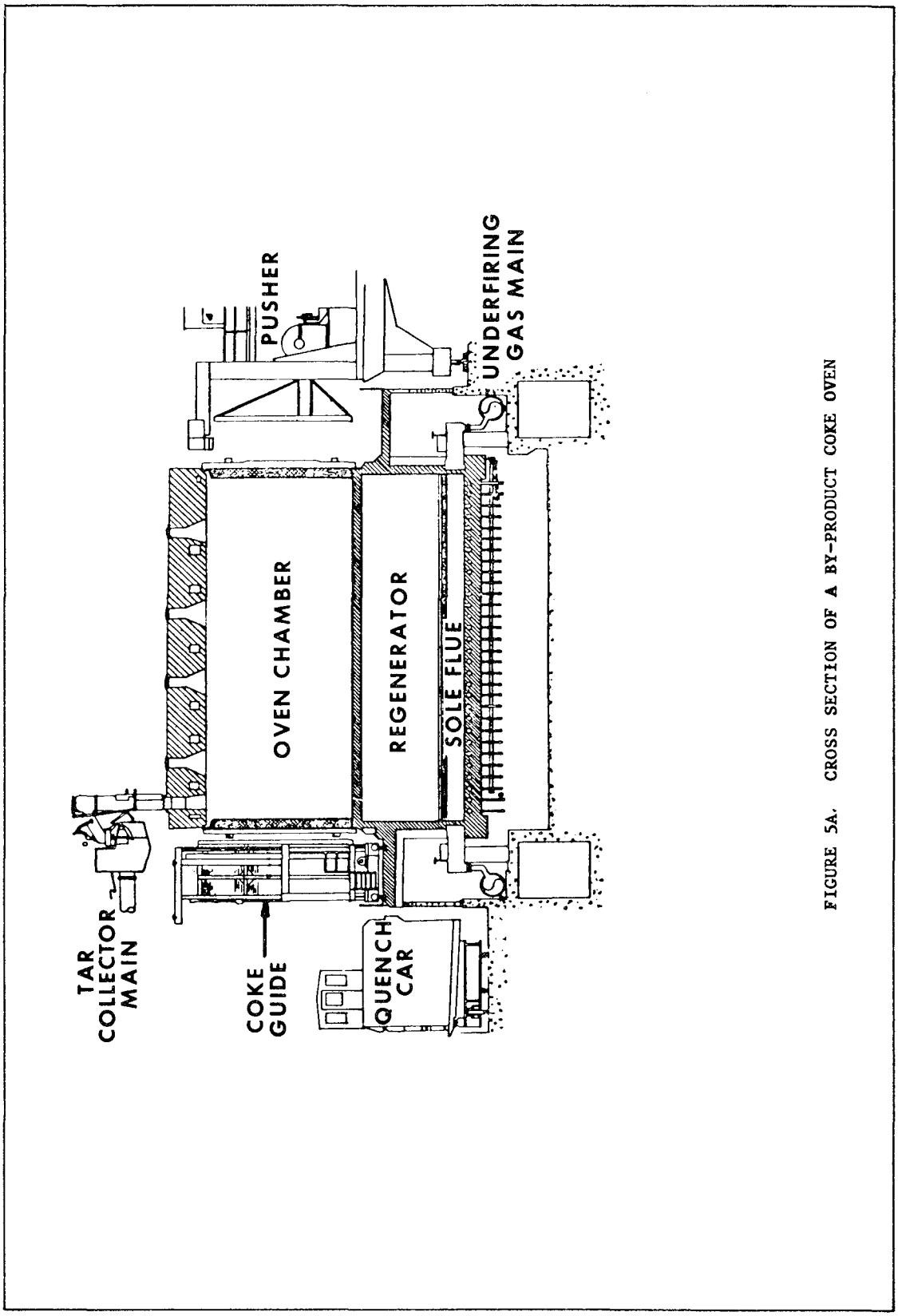


FIGURE 5A. CROSS SECTION OF A BY-PRODUCT COKE OVEN

See Entry 1149.

1149. Coal-to-Coke Transformation for Blast Furnace Fuels (Proceedings of a Workshop held on November 18-20, 1979, Morgantown, West Virginia), Technical Report
West Virginia University, Energy Research Center
January 1980 115p OPA7024217
NSF/RA-800004 PB80-142409/NKS

The workshop was intended to identify and recommend research objectives that could directly benefit the area of coal-to-coke transformation and thereby help to alleviate the problem of growing dependence on imported coke. Fundamental steps were outlined to serve as a foundation for problem solving. Included are issue papers that provide the following: (1) an overview of coke making and the role coke plays in the steelmaking process; (2) a description of research needs in the basic and engineering sciences; and (3) a description of the history and operation of the Northern Carbon Research Laboratories at the University of Newcastle Upon Tyne in the United Kingdom. A program plan is included in the appendix.

Small Business

1150. Small Business Awards, Completed Projects from Phase I of the First Small Business Solicitation (Awarded in October 1977)
National Science Foundation
September 1979 29p ISP7522472
NSF/RA-790160 PB80-147341/NKS

This brochure provides information about 42 awards made by the National Science Foundation to small business firms under the program, "Small Business Innovation Applied to National Needs." These awards reflect the interest and support of the National Science Foundation for the Nation's small business community which has strong research capabilities in applied science and engineering. Research projects described are the results of Phase I awards of the First Small Business Solicitation. Phase I awards were for feasibility research efforts ranging from $17,500 to $25,000. Information is provided about each of the awards and the availability of final reports. Also provided is an abstract summarizing each report. Citations are arranged by subject categories and alphabetically by grant title within each subject area. Categories include the following: (1) hydrometallurgical and solvent extraction of minerals; (2) food crops better adapted to environmental stress; (3) chemical threats to man and the environment; (4) societal demand technology; (5) improving the productivity of the physically handicapped; and (6) resources, environment, and productivity. Indexes following the main body provide access by performing organization, EAS number, contract/grant number, principal investigator and report title.

1151. Community Colleges and Appropriate Technology, Report of a Roundtable
American Association of Community and Junior Colleges
1979 36p 79SP0851
NSF/RA-790265 PB80-131634/NKS

Appropriate technology as defined here is alternate, intermediate, small-scale, light-capital, and neighborhood technology, and includes hardware, such as a wood stove, small wind machine, cider press, or thermal window shutter, and software, such as processes, systems or organizations. Appropriate technology places a high priority on local needs, resources, skills, and benefits. Because of their strong community base, community colleges are in an ideal position to capitalize on this local orientation. Appropriate technology places heavy emphasis on practicality, on developing and employing useful tools to do constructive work. Many community college curricula also stress practical applications, skills training, and provision of services. Community colleges, being closer to their roots, are often more flexible and responsive than larger and more bureaucratic institutions. Some avenues for community college involvement in appropriate technology are: job training; hands-on workshops; public education; resource centers; demonstration sites; research; and appropriate technology entrepreneurship. Two strategies for launching appropriate technology programs are characterized as the add-on approach, involving tacking on individual courses or projects wherever there is a need or opportunity, and the institutional approach, entailing a far more systematic effort involving the entire college and the local community.

1152. Southern Profiles, Appropriate Technology in the Southeast
Georgia Institute of Technology
Tiller J, Creech D
1979 120p ISP7822994
NSF/RA-790367 PB80-146020/NKS

The need for an increased exchange of information on appropriate technology in the Southeast and for increased public education on its advantages has led to the development of this handbook. Activities of people who have become involved in designing, building, and demonstrating appropriate technology are described. Emphasis is placed on the local application of technologies and on the use of local resources in an energy efficient manner having minimal environmental impacts. Both human and material resources are considered. Individual chapters concern housing and community design, energy, water and waste utilization, agriculture, and health. Two additional chapters, one on general appropriate technology and another on how and where to obtain funding, supplement the more specific ones. Each chapter includes activities, demonstrations, references, and organizations related to appropriate technology in the Southeast.

1153. Regional Forums on Appropriate Technology, Final Report
Georgia Institute of Technology, Engineering Experiment Station
Tiller JS, Clifton DS Jr, Cassanova RA
February 1979 97p ISP7822994
NSF/RA-790380 PB80-157191/NKS

This report collates and summarizes the proceedings of seven regional forums on appropriate technology (AT) sponsored by the National Science Foundation (NSF). These forums investigated the potential for adoption of appropriate technology, characterized the needs of appropriate technology practitioners and advocates, and determined the role of the National Science Foundation in appropriate technology. Each regional forum is reported with respect to publicity, advisory committee, forum agenda, mechanism for public input, and attendees. The following major critical needs are identified for more widespread adoption of appropriate technologies: (1) education and information dissemination; (2) social science research; (3) determination of economic feasibility; (4) removal of institutional barriers; (5) technical research; (6) marketing and business strategies; and (7) evaluation of holistic technology development. Views on these issues are presented. The report concludes with a discussion of the NSF's role in appropriate technology including recommendations for future AT programs.

RESEARCH REPORTS FROM PREVIOUSLY SUPPORTED
RESEARCH APPLICATIONS PROGRAMS

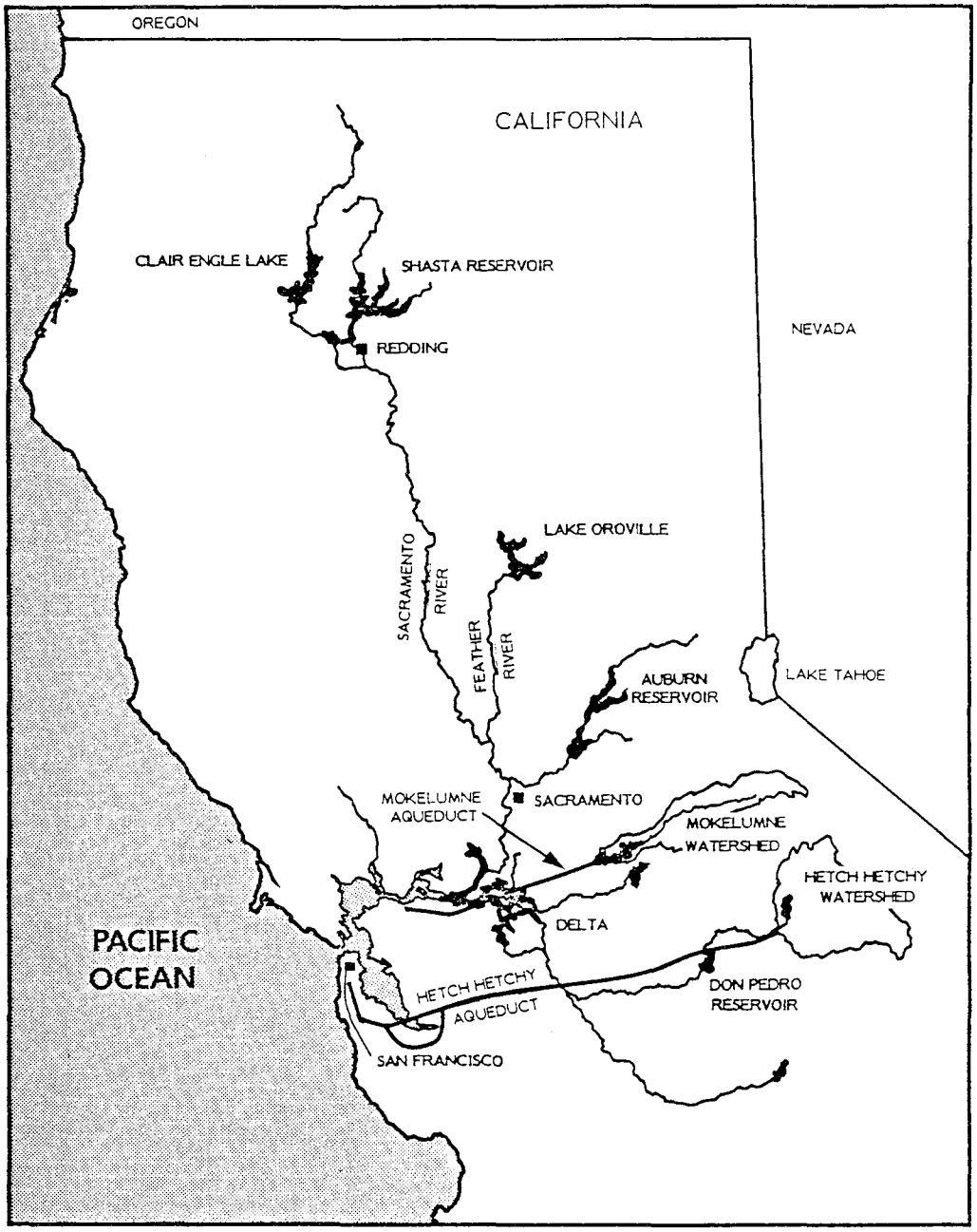
1154. Application of Sequencing Batch Reactors for Treatment of Municipal and Industrial Wastewaters, Final Project Report (July 11, 1976 - April 30, 1979)
University of Notre Dame, Department of Civil Engineering
Irvine RL
October 1979 25p PFR7610381
NSF/RA-790276 PB80-133218/NKS

Conventional wastewater treatment facilities operate in a continuous mode with little or no variation in the liquid levels of the tanks. This study investigates the value of intermittent operations, including marked variations in liquid levels within tanks, on the consistency and reliability of wastewater treatment. Considerations were limited to both small flow situations common to rural areas and unusual treatment problems such as the removal of priority pollutants. Desk top, computer, bench-scale, and pilot-scale studies were conducted under the periodic review of an Advisory Committee composed of potential users from both industry and government. A utilization plan was developed to disseminate the results as they became available through theses, publications, and presentations. Basic information with respect to sequencing batch reactor (SBR) design, operation, cost, research potential, and user areas was developed. Findings clearly indicate that SBRs represent a viable treatment alternative, which, because of the periodic nature of SBR operation, expand significantly the treatment technology spanned by conventional continuous flow systems alone. Many of the results obtained may be applied directly to the design and operation of continuous flow systems.

1155. Evaluation of Coliform Bacteria and Bacteriophage Relationships in Assessment of Water Quality, Final Technical Report
Atlantic Research Corporation
Scott WM, O'Neill PE, Wilkinson MJ, et al
December 1979 99p PFR7819196
NSF/RA-790333 PB80-146277/NKS

Research program results are presented that are designed to improve the ARCAT (A Rapid Coliphase Analysis Technique) so that it can provide water treatment plant personnel with an easy, rapid, reliable, and inexpensive method of determining the sanitary quality of drinking water before it leaves the plant. The program had four major goals: (1) to increase the sensitivity of the ARCAT test to detect the presence of one fecal coliform per 100 ml; (2) to simplify the test procedure and readout; (3) to obtain knowledge of factors influencing coliphage replication and plaque formation; and (4) to determine the effects of disinfectants on the coliphage/coliform relationship. In general, these goals have been achieved. The replicability of the ARCAT procedure

FIGURE E-1
PRINCIPAL NORTHERN CALIFORNIA
WATER SUPPLY FACILITIES



See Entry 1156.

has been improved and the procedure simplified. Sensitivity of the new ARCAT test is two to three times greater than its predecessor. Disinfection studies provided new information about the effectiveness of disinfectants on coliphages. The need for further research in certain areas is indicated. The report discusses bacteriophages as indicators of fecal pollution, describes ARCAT improvement procedure studies, describes the effects of disinfection on bacteria and bacteriophages, and summarizes the current status of ARCAT technology.

1156. Urban Drought in the San Francisco Bay Area: A Study of Institutional and Social Resiliency
Teknekron, Inc.
Hoffman M, Glickstein R, Liroff S
December 1979 344p AEN7716283
NSF/RA-790334 PB80-158140/NKS

The study explores how, why, and to what effect eight agencies supplying water to over three million customers in the San Francisco Bay Area responded to a two-year drought. The study had four objectives: to identify the ways in which urban districts defined and then responded to the drought, together with the information used in these tasks; to describe the policymaking process whereby urban water districts choose from among alternative strategies to cope with drought and how their initial responses may change; to assess the effectiveness, cost, equity, and administrative feasibility of different drought policies, especially supply augmentation policies as compared with demand reduction policies; and to identify which traditional urban water management practices might undergo fundamental change as a result of the drought experience, and why. Based on the findings, recommendations are offered to reinforce the public's perception of a water shortage crisis. These include maintaining contact with the public during drought, insuring that the rationing program is appropriate, relying on an allotment plan which permits users to decide how it will be used, informing the public about financial policies and the impact of rationing on water rates, and pursuing both structural and behavioral aspects to achieve conservation.

1157. Urban Runoff and Section 208 Planning (Proceedings of a Special Session, Spring Annual Meeting, American Geophysical Union, Washington, DC, May 29, 1979)
American Society of Civil Engineers, Urban Water Resources Research Council
McPherson MB, ed
October 1979 49p ENV7715668
NSF/RA-790357 PB80-158579/NKS

Viewpoints representing three levels of government report on the effectiveness of the Federal Water Pollution Control Act of 1972 with respect to urban runoff. This act encourages areawide planning for water pollution management. The initial phase of areawide

studies was completed, and a series of reports discuss the results. One presentation entitled, "Federal Perspective on Urban Water Planning for Water Quality Management," assesses the current status of urban planning with respect to stormwater runoff. Another paper, "U.S. Geological Survey (USGS) - U.S. Environmental Protection Agency Urban Hydrology Studies Program," describes USGS studies to provide urban-hydrology data and methods of analysis to support management decisions. An approach is described which is used to provide instrumentation for typical urban watersheds in several metropolitan areas. A state perspective is offered in a paper entitled "Urban Runoff and Areawide Water Quality Planning in Wisconsin." Local aspects are considered in two presentations: "The Future of Water Quality Management Strategies in the Washington Metropolitan Area," and "Urban Runoff and Section 208 Planning - How Effective Has It Been? - The Local Perspective." The latter paper analyzes stormwater problems in Denver, Colorado.

1158. Mechanism of Plant Virus Inactivation in Soil Injected with Municipal Wastewater and Treatment Plant Sludge, Interim Report
Los Angeles State and County Arboretum, Research Division
Cheo PC
January 1980 42p PFR7682743
NSF/RA-800012 PB80-157209/NKS

This paper reports studies of the soil's persistent capacity to degrade the tobacco mosaic virus (TMV). The major tasks involved were: (1) continued testing of bacterial isolates in an autoclave soil-vial system and other modified systems; (2) a second field plot experiment; and (3) detection of TMV degradation products by means of gel electrophoresis separation. Results indicate that under normal field conditions, application of TMV twice weekly at a 4.5 mg rate per application does not result in accumulation of virus in the soil. At the end of 20 weeks following the last application, no virus infectivity was recovered. Virus degradation product was detected as a diffuse spot, slower than the integral TMV band on gel electrophoresis. This spot is comparable to alkaline degraded TMV when developed on a gel. Alkaline degradation of TMV resulted in the production of five different size particles, the proportion depending on treatment time and temperature. Heat denatured TMV moves slower than normal TMV on gel. Evidence indicates a similar existence of different size particles during TMV degradation in soil as for alkaline degradation.

1159. National Science Foundation Agenda, Environmental Design Research Program Recommendations
Virginia Polytechnic Institute and State University, College of Architecture and Urban Studies
Kilper D
1979 107p 78SP1170
NSF/RA-790289 PB80-142417/NKS

This project attempts to define the field of environmental design, the state of the art in environmental design research, and an environmental design research agenda. The study addressed professional implications and special rural needs of environmental design research and was conducted by 20 university faculty members in group discussions and via questionnaires. Current paradigm development was examined from the perspective of Thomas Kuhn's work, The Structure of Scientific Revolutions. Research for design studies generated new information and validated prior information pertinent to the comprehension of specific design problems. Research for design dealt with mysteries associated with the nature and value of design. Research by design investigated new prototype environments where present models are inadequate. Special rural problems, and needs in western Virginia were identified. Protocol was outlined for involving NSF in funding specific environmental design research programs through development grants.

1160. Programming for Research in Design and Behavior, Within the Building Sciences, Final Report
Massachusetts Institute of Technology, Department of Architecture
Howell SC, Vernez-Moudon A
April 1979 109p 78SP1163
NSF/RA-790290 PB80-140676/NKS

A case study is presented of a process of cross-discipline development of an applied research strategy in building sciences with the MIT School of Architecture and Urban Studies. Although it broadly addresses concerns of fields considered to be within the domain of the building sciences, its focus is on the potential of two specific areas, architecture and behavioral science, as they might link in a long-term academic research enterprise. The study is divided into four sections: planning and preparation, which includes identification of problems in interdisciplinary research in building sciences, arraying of primary issues, and a statement of interdisciplinary issue; development of an information base involving society, physical environment and change, and theories and methods of building morphology; and formulation of interdisciplinary strategy which includes a staging of collaborative research and a proposal for a collaborative project. The appendices consist of a report for the National Endowment for the Arts on neighborhood

revitalization, an investigation of regulatory barriers to the re-use of existing buildings, a preliminary and critical review of residential energy consumption and family life styles, and a working paper on research in behavior in the build environment.

1161. Environmental Design Research: A Faculty View
University of Michigan, College of Architecture and Urban Planning
King J, Guregian SA
February 1979 78p 78SP1162
NSF/RA-790291 PB80-147028/NKS

This report describes the development of a definition of environmental design research (EDR), discusses priority setting for EDR, and outlines proposals for environmental projects based on philosophy and theory, performance, and process. High priority research areas include the development of more successful methods of obtaining user input and incorporating it effectively in the design process, and the communication of design information to designers and planners. Examples of proposals identify the relative importance of the physical environment in determining worker effectiveness and explore employee participation in faculty planning and workplace design. Each of the proposals includes background information, objectives, and methodology.

1162. Future Research Directions in Environmental Design: an Exploration Using the Experience of University of California's College of Environmental Design, Final Report
University of California, Center for Planning and Developing Research
Bender R, Rand G
March 1979 158p 78SP1161
NSF/RA-790292 PB80-139876/NKS

The culmination of six months of exploration in the field of experimental design (ED) is reported. The College of Environmental Design at the University of California is used as a case study. Research topics which were derived from a broad range of professional and research concerns are discussed and developed into a preliminary research agenda. The agenda includes the following series of editorial proposals and papers: a case analysis approach to the study of forces shaping the physical environment; integration of health and safety criteria into ED; the growth and decline of areas of human settlement; taxonomy of settings; technology transfer; building performance evaluation; futures mapping; design of regulatory systems for design; professional media--definition of research area; and research for design participation.

1163. Environmental Design Research: The Problems and Needs of the Environmental Design Professions
American Institute of Architects
Burnette CH
January 1979 93p 78SP1164
NSF/RA-790293 PB80-135544/NKS

Research needs of the environmental design (ED) profession are documented in the following: a conference of leading design professionals to identify major present and future ED research needs; a survey of architectural firm principals to determine their major concerns regarding the built environment, their clients, the economy, government, energy, information, technology, and human needs; an analysis of the research agendas of American Institute of Architects (AIA) committees concerned with various aspects of architectural design and practice to determine their current research needs; a survey of AIA components to determine the needs and potentials for research and information transfer of local professional organizations; and a compilation of research programs of other design professions to identify their goals and present research activity. Two additional studies reported are a digest for the future to identify trends which will influence research needs, and an outline of the building process and major participants in the building industry to indicate scope and structure of the constituency to be served. The appendices constitute a list of conference participants, questionnaires, addresses of research organizations, and the American Planning Association research program status report.

1164. Tall Buildings and Urban Habitat, Bibliography of Council Reports, 1979 Supplement
Lehigh University
Yuceoglu U, Pang AK, Chu PY, et al
November 1979 139p PFR7816324
NSF/RA-790392 PB80-151152/NKS

This bibliography is a collection of documents about the planning and design of tall buildings and their role in the urban habitat. They are prepared by those who have participated in Council activities and whose writings were published by or under the auspices of the Council. The bibliography is a supplement to "Bibliography of Joint Committee Reports (National/Regional Conferences)," 1976, Joint Committee Report No. M180. It includes not only additional reports of proceedings of National/Regional Conferences but also those of international conferences, seminars, and symposia. The bibliography is arranged alphabetically by author. A subject index is also included. Appendices include the following: (1) bibliographic sources, (2) national, regional, and international conferences, (3) V-files, (4) a list of group and committee titles, and (5) a list of committees.

1165. Implications of Potential Resource and Environmental Constraints for Economic Growth, Final Report
Resources for the Future, Inc.
Krutilla J, Smith VK
June 1979 184p ERS7715083
NSF/RA-790284 PB80-152002/NKS

This study considers the research necessary to assess whether past economic analyses have accurately represented the constraints imposed on economic growth by natural resources. Concurrent activities are reported. The first deals with research directed towards analyzing issues associated with the importance of natural and environmental resources in economic activity and some related technical modeling issues. Another is related to the selection of an advisory committee and its active participation in advising project investigators. During the course of the investigation, a more general definition of the set of natural resources was adopted. This expanded the project's perspective and called for a multidisciplinary effort. Broad concerns are identified which underlie specific research topics for further inquiry. One analytical section considers research elements and develops issues. The final chapter presents implications of the studies for some general approaches to addressing problems for future research.

1166. Implications of Potential Resource and Environmental Constraints for Economic Growth, Final Report, Appendix G, Volume I
Resources for the Future, Inc.
Krutilla J, Smith VK
June 1979 213p ERS7715083
NSF/RA-790285 PB80-152010/NKS

Research papers presented at a conference constitute this report. The first paper reviews the state of economic theory with respect to optimal growth, optimal extractive resource exploitation, and optimal pollution, focusing on the literature that accommodates combinations of these features. Prototypical dynamic economic models are described in each of these areas. Optimal aggregative planning in the presence of both exhaustible extractive resources and common property environmental resources is outlined. A second paper reports the findings of an evaluation of the neoclassical methodology for measuring the degree of substitution between factor inputs. The primary focus is on the role of natural resources in a specific technology: iron and steel production. A third paper examines whether and how the quantity of new materials inputs may be measured at the plant, firm, industry, and economic levels. The final paper concerns the development of research strategies to identify and quantify the relationships between residuals, discharges, and health effects to gain a better understanding of their nature and magnitude. Also studied was how they have changed over time as the economy adjusts to changing patterns of resource availability and use.

1167. Implications of Potential Resource and Environmental Constraints for Economic Growth, Final Report, Appendix G, Volume 2
Resources for the Future, Inc.
Krutilla J, Smith VK
June 1979 265p ERS7715083
NSF/RA-790286 PB80-152028/NKS

This appendix consists of research papers presented at a conference. The first paper considers the problem of how to achieve an efficient package of public goods, described as to qualities and quantities, when preferences are unknown and must be elicited by the choice mechanism. Two mechanisms with different emphases and underlying assumptions are defined to solve the problem. These are presented in separate, self-contained papers whose results are compared. Other papers concern the economic issues associated with the use of free access or common property goods such as air, oceans, fisheries, etc.; measures of natural resource scarcity under uncertainty; and the assessment of long-term supplies of minerals.

Regional Environmental Management

1168. Analysis of Adoption and Implementation of Community Land Use Regulations for Floodplains, Final Report
Woodward-Clyde Consultants
Hutton JR, Mileti DS, et al
October 1979 216p ENV7713908
NSF/RA-790278 PB80-133150/NKS

Objectives of the research were: (1) to develop a theory of local policy adoption and implementation which could ultimately enhance the adoption of local community land use controls for hazard mitigation and upgrade the implementation of those controls when adopted; and (2) to extend the findings and to explain local adoption and implementation of land use management techniques for other purposes, such as other natural or man-made hazards or population growth management. An exploratory study was conducted to develop a theoretical model that defined and explained policy adoption and implementation in local jurisdictions, and to develop a research design to test the model for land use controls on a representative national sample of floodprone communities. The methods used in this study were qualitative for the study of land use regulation implementation and quantitative for the study of adoption. Major sources of information were literature review, discussions with a variety of consulting experts, and tapping the actual experience of communities with adopting and implementing floodplain land use controls to comply with regulations of the National Flood Insurance Program.

1169. Resource Conserving Agricultural Production Methods, Progress Report (August 1978 to January 1979)
Washington University
Shearer G, Kohl DH, et al
February 1979 AER7717031
NSF/RA-790148 PB80-130149/NKS

A comparison of organic and conventional farms in the United States corn belt is presented. Grain yields (corn, soybeans, and wheat) on pairs of organic and conventional fields, which were matched by location, soil type, cultivar and planting date, were measured. Several factors were identified which help to explain the surprisingly small difference in the productivity of organic and conventional farms. The higher proportion of legume forages grown on organic farms alleviates part of the yield advantage which conventional farms otherwise would enjoy. This conclusion is based on the higher organic corn yields (relative to conventional corn yields) on fields in which the test crop was preceded by legume forage on the organic field only, than on fields in which legume forage preceded the test crop on neither organic nor conventional fields. Conventional corn fields were found to have statistically higher infestations of European corn borer and Diplodia stalk rot. The population of carabids which include important predators of insect pests is higher on organic than on conventional corn fields. Both organic corn yields and the total value of organic crop production is higher (compared to conventional corn yields and the total value of crop production) under poor growing conditions than under favorable conditions. Earlier work describing maize yields and soil nutrient levels with and without pesticides or commercial fertilizers is presented in the appendix.

1170. Northeast Agricultural Leadership Assembly (Cherry Hill, New Jersey, March 20-22, 1979), Proceedings, Volume I
University of Massachusetts, Environmental Institute
Davis HC, McMurtry G
March 1979 100p ERS7722216
NSF/RA-790151 PB80-154743/NKS

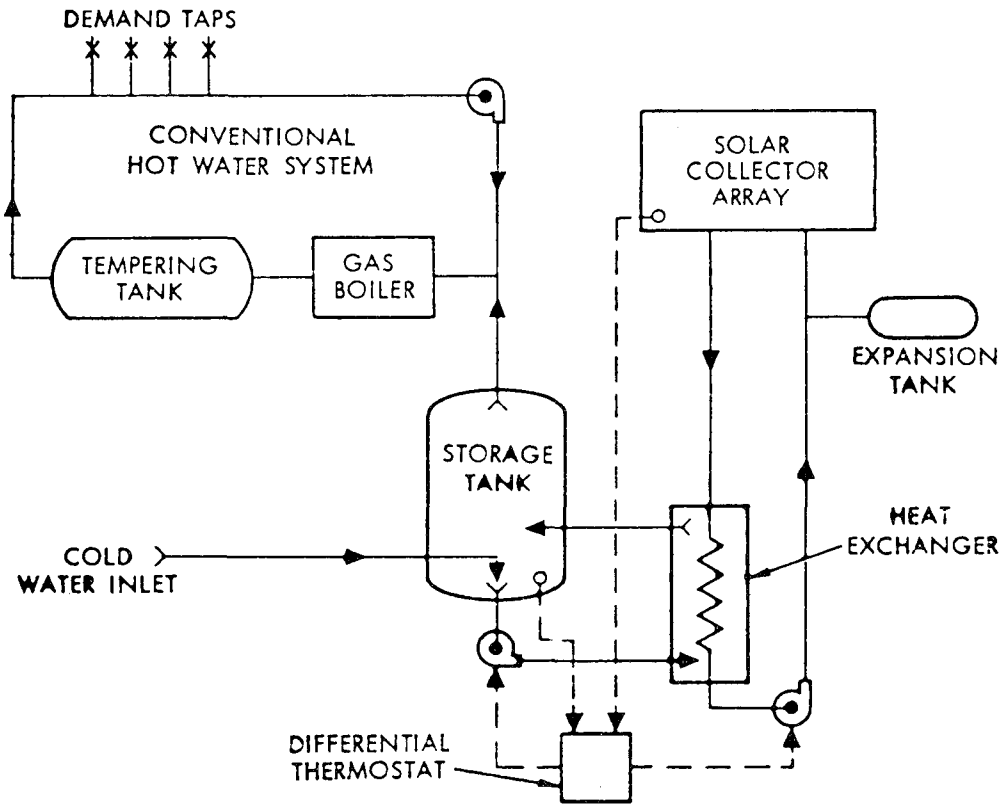
Delegates were gathered at this conference to express their concerns and views on the future needs of agriculture in the Northeast and the quality of rural life. Divergent views ranged from advocacy of producing food for people and not for profit, to cynical apprehension that the Northeast Agricultural Leadership Assembly (NALA) is being used by government and the establishment to defuse those who have a different lifestyle and set of values. The Proceedings include two lists of Executive Board agricultural policy recommendatons: those of top priority which demand immediate attention, and those of secondary priority which, though important,

are not as immediately critical. These are followed by a brief essay on agricultural research and the Research Committee's 20 recommendations. Major speeches at NALA discussed Federal farm policy, agricultural and rural policy, endangered resources, and ways of improving the competitive position of agriculture in the Northeast. Abstracts of NALA background papers cover the broad areas of government and finance, rural life, production, energy, land, and marketing.

1171. Northeast Agricultural Leadership Assembly (Cherry Hill, New Jersey, March 20-22, 1979), Proceedings, Volume 2
University of Massachusetts, Environmental Institute
Davis HC, McMurtry G, Garey D
March 1979 439p ERS7722216
NSF/RA-790152 PB80-154750/NKS

Rural and agricultural leaders discuss issues related to the gradual decline in agriculture in the Northeast. A background paper, "People, Land and Farms: 125 Years of Change in the Northeast," highlights relevant research data for the ensuing papers presented at the conference of the Northeast Agricultural Leadership Assembly (NALA). Presentations on government and finance deal with the impact of Federal regulations on Northeast agriculture, taxation, credit sources, and financing. Papers on rural life discuss the land grant system, growth, change, and quality of life in the Northeast, migration impacts, and rural community research and data needs. Discussions on production cover the Northeast's competitive position, agricultural self-sufficiency, and employment trends and policies for funding agricultural research. Energy papers consider new approaches to food production, preservation and distribution, use of fertilizers, energy in cropping and dairy systems, and biomass as an energy source. Land issues encompass public interest in farmland preservation, landownerships as policy, and soil type and quality for Northeastern agriculture. Marketing experts discuss agricultural marketing, community leadership and direct marketing, and alternative marketing systems. Papers on appropriate technology describe its relationship to energy use, marketing, and agriculture.

EXHIBIT I-2
Schematic Diagram of SAGE Water Heating System, The Timbers



See Entry 1172.

1172. SAGE, Solar Assisted Gas Energy, Summary
Southern California Gas Company
Cunningham SJ, Rice J
September 1979 34p PTP7503457
NSF/RA-790330 PB80-144363/NKS

A summary of Phase III of Project SAGE (Solar Assisted Gas Energy) includes the following: (1) field installations and tests to evaluate new vs. retrofit installations; (2) market assessment of the potential for a SAGE water heating system in apartment buildings; and (3) policy analysis of strategies that would contribute to widespread utilization of SAGE water heating. Technical results of field installations and tests are described for two installations using the system configuration chosen from pilot plant analysis. SAGE cost analysis showed that "The Timbers" retrofit installation cost about $1,500 per apartment unit compared to $850 per unit for a new and similar installation called "Timberlane." Cost estimates and cost reduction methods are described and amplified by a table of cost estimates for six major SAGE components. System performance and maintenance analysis results are provided. A market analysis to assess potential profitability and market penetration of SAGE-type systems was performed and estimated for each of 20 years beginning in 1978. Also, a discussion of SAGE policy analysis dealing with legal and public policy issues related to solar energy implementation is included.

1173. SAGE Solar Assisted Gas Energy, Final Report
Southern California Gas Company
Cunningham SJ, Rice J
September 1979 225p PTP7503457
NSF/RA-790331 PB80-153836/NKS

Phase 3 of Project SAGE (Solar Assisted Gas Energy) involves establishing a technical and economic baseline for assessing the practical potential of solar water heating for apartments. The project comprises several steps: installing and testing two SAGE water heating systems; assessing the market potential for a SAGE water heating system and possible business arrangements; and analyzing strategies that would contribute to widespread utilization of SAGE water heating. Project findings are reported with respect to technical results, cost analysis, system performance and maintenance results, market assessment, and policy analysis. The study indicated that the cost of a new SAGE installation in 1975 was $42 per square foot. Market assessment suggests that the cost of SAGE must be reduced at least 50 percent and its performance increased 15 percent to achieve appreciable market penetration. Estimates indicate it may take 20 years or more for a new technology such as SAGE to penetrate the building industry, and

that a public education program is needed to orient potential users and professional builders and architects about the practical potential of SAGE and solar energy. The appendices include the SAGE market penetration results for five sizes of apartments.

Science and Technology Resources

1174. Public Works and Public Utilities, Report from a Workshop Considering Problems Identified by the Intergovernmental Science, Engineering, and Technology Advisory Panel (College Park, Maryland, September 5-7, 1979)
American Association for the Advancement of Science
September 1979 165p OPA7824464
NSF/RA-790344 PB80-159973/NKS

Problems in sewer system rehabilitation, project control, and noncorrosive methods of ice control were considered. State and local government representatives had identified those areas as being of special interest for Federal research and development. Sewer system rehabilitation can endanger local water qualities in communities throughout the country. The causative factors, technological improvements, recommendations, and future research areas are discussed. The inadequacies in controlling capital improvement project programs are of concern to state and local government officials. Research programs are recommended to keep officials and others up to date on improvements. The undesirable side effects of using large quantities of sodium and calcium chlorides for snow and ice control are described. Noncorrosive methods of ice control require attention. Research includes studies on ice adhesion, chemical application rates, alternative chemicals, measurement of deicing effectiveness, improved spreading equipment, and technology transfer.

AUTHOR, SUBJECT, AND PERFORMING ORGANIZATION INDEX

References Refer to Entry Numbers

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949-1045	April 1980	PB80-201866/NKS	9.00