APPLIED SCIENCE AND RESEARCH APPLICATIONS

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RECENT RESEARCH REPORTS

August 1978

Entries
559 — 655

Directorate for Applied Science and Research Applications
National Science Foundation
Washington, D.C.

1 a

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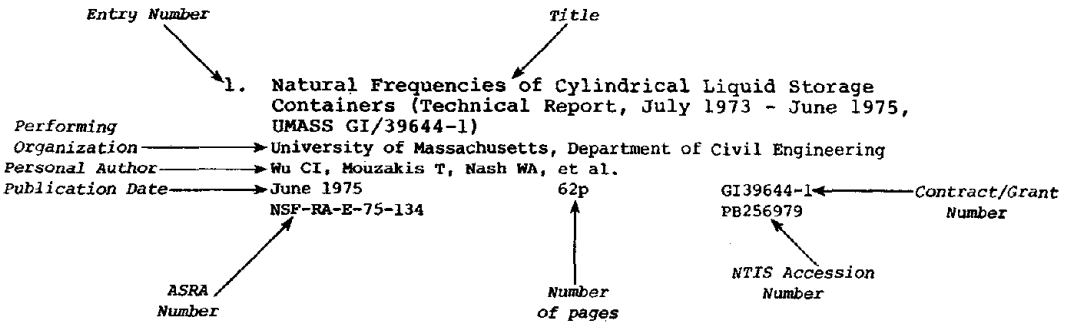
INTRODUCTION

This report contains citations of new documents received by the National Science Foundation resulting from research supported by the Directorate for Applied Science and Research Applications (ASRA). Citations have been compiled to alert members of the scientific and technical community to current research results.

Documents cited in Recent Research Reports may be ordered from the National Technical Information Service (NTIS). Ordering information is provided on page ii.

Organization of Recent Research Reports

Each citation is presented in a standard form illustrated below:



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.

Information on NSF Applied Science and Research Applications Directorate reports may be obtained by writing to

Ms. Carmeen P. Adams
ASRA Information Resources
Room 1108
1800 G Street, NW
Washington, DC 20550
Telephone (202) 634-4333.

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About ASRA

The Directorate for Applied Science and Research Applications (ASRA) identifies and supports research and related activities that can contribute to the understanding and resolution of significant national problems. ASRA both replaces and incorporates many of the functions of its predecessor, the Research Applied to National Needs (RANN) program.

The objectives of ASRA are to:

- Foster growth of fundamental scientific understanding and capability relevant to the resolution of emerging or existing national problems;

- Focus U.S. scientific and technological capabilities on selected problems of national significance where NSF can make a unique contribution;

- Encourage the application of fundamental scientific and engineering capabilities to the solution of significant problems in the public and private sectors, and shorten the time between scientific discoveries and the application of these discoveries; and

- Increase the utilization of science and technology in the public and private sectors.

ASRA incorporates four divisions and a staff office:

- The Integrated Basic Research Division supports selected areas of basic research which have special relevance to emerging or existing national problems. Projects considered for funding are initiated through the NSF basic research directorates.

- The Applied Research Division considers unsolicited, applied research proposals growing out of basic discoveries, in various fields of science and engineering, which have high potential for technical application or public policy utility. Research on public policy and regulation, including telecommunications, public service delivery, industrial organization and markets, and individual and group processes is supported by the Applied Social and Behavioral Sciences Section. The Applied Physical, Mathematical, Biological Sciences and Engineering Section supports research with a high potential for providing new instrumentation or technical processes based on basic advances in various scientific and engineering disciplines. Such research might include, but is not limited to, work on: computer-based technologies to improve manufacturing productivity; the modeling and management of ecosystems; techniques for utilizing coastal or estuary areas for resource production; and improved sensing devices for exploration and extraction of minerals.

- The Problem-Focused Research Applications Division brings scientific and technological capabilities to bear on selected societal problems where science and technology can make a unique contribution to timely, practical solutions. Programs currently include Earthquake Hazards Mitigation; Chemical Threats to Man and the Environment; Community Water Management; and Alternative Biological Sources of Materials.

- The Intergovernmental Science and Public Technology Division encourages the integration of science and technology into program and policy planning and execution by State and local government, and tests and evaluates selected incentives which the Federal Government may use to stimulate the infusion of new technology into the private sector.

- The Office of Problem Analysis identifies and analyzes major problems with significant scientific and technological content, and provides an assessment of the appropriate role of science and technology, the Federal Government, and NSF in their solution.

Proposals and Awards

ASRA awards grants and contracts for research projects within its areas of program interest. ASRA recognizes the importance of ideas for projects generated by the research community itself and therefore makes numerous awards based on unsolicited proposals. In addition, proposals in areas of priority concern are solicited from the research community.

To receive proposal solicitations or to obtain further information on submitting proposals, please contact the appropriate ASRA division, or:

Programs and Resources Officer
Directorate for Applied Science and
Research Applications
National Science Foundation
1800 G Street, NW
Washington, DC 20550
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Division of Applied Research

Geophysical and Environmental Applications

559. Environment-Enhanced Disintegration of Hard Rocks (Eighth Six-Monthly Progress Report, December 1, 1976 - May 31, 1977)

Martin Marietta Corporation, Martin Marietta Laboratories
Mills JJ

August 1977 38p APR7307787
NSF/RA-770218 PB272262/NKS

The purpose was to test, under simulated field conditions, the concept of the systematic approach to selecting chemomechanically active drilling aids, and to compare their influences on diamond life with that of currently used additives (e.g., Torque Trim). This approach was demonstrated as useful in the search for surfactant solutions which, under simulated field conditions, can effectively reduce the abrasive wear of diamonds compared with that obtained using water. A 0.25 wt.% solution of Marvansoft FBH can increase the life of the diamonds in a BX surface set bit by as much as fourfold over that obtained using water when drilling into a rhyolyte porphyry rock under simulated field conditions. The diamond failure mode may play a significant role in the application of the chemomechanical effects (CME) to diamond drilling. Oil additives tend to reduce diamond fracture by damping vibrations and fatty acid-based oil additives may be surface-active, producing a reduction in diamond wear similar to that obtained using chemomechanically active fluids.

560. Grooved Boreholes for Fracture Plane Control in Blasting

University of Maryland, Department of Mechanical Engineering
Fourney WL, Dally JW

June 1977 55p APR7307908A03
NSF/RA-770216 PB272294/NKS

This report describes a modified drill and blast procedure for achieving fracture plane control in hard rock excavation. The method uses conventional boreholes grooved longitudinally to control the initiation of cracks which form the fracture control plane. Dynamic photoelasticity and high-speed photography were used in a parametric study of the dimensions of the groove. For a 38mm diameter borehole the radius at the tip of the groove should be less than 1/2mm and the depth of the groove should exceed 1/6mm. Recommendations for the size of the grooves were made based on these experiments and anticipated field usage of the grooving tool. Cracks producing the fracture control plane propagated at relatively low velocity and with a relatively low stress intensity factor K. After initiation, the crack was driven by the residual gases from the explosives. The stress

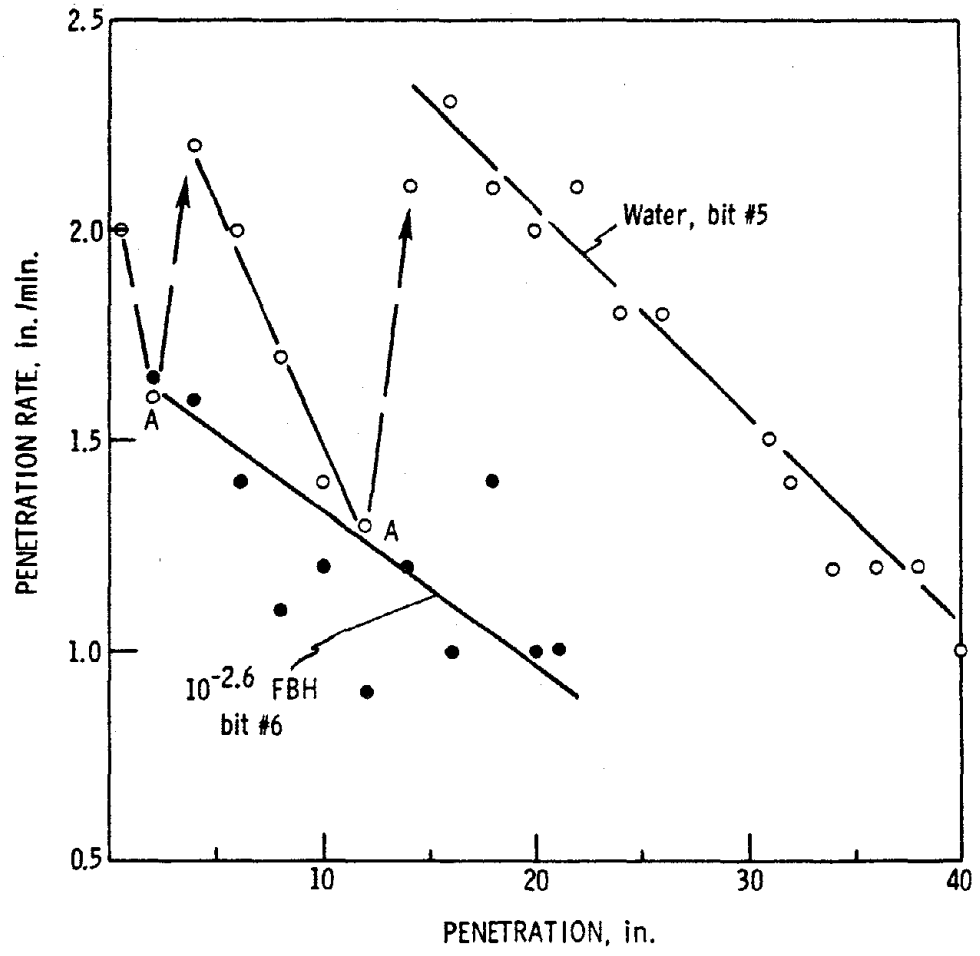


Figure 2. Penetration rate of BX surface set bits vs partial penetration into rhyolyte porphyry rock. Conditions were 500 rpm, 2000 lbs. and 15 gpm. Note both the sudden increases in penetration (at the points A) for the bit drilling using water and the lower slope obtained with the bit drilling using the 0.25 wt. % FBH solution as compared to that obtained using water.

See Entry 559

waves altered the K field which affected the velocity of the crack and produced minor deviations in the position of the control plane. When the reflected stress waves attenuated the cracks propagated significant distances (s/R>25) with increasing K fields.

561. Mechanical Tunnel Boring Prediction and Machine Design (Annual Report)

Colorado School of Mines, Excavation Engineering and Earth Mechanics Institute

Ozdemir L, Miller R, Wang F

1977 332p APR7307776A03

NSF/RA-770199 PB271978/NKS

Theoretical analysis of the interaction of a disc roller cutter with hard, brittle rocks was undertaken. Predictor equations were modified to consider the effect of cutter wear. Testing was undertaken with both sharp and artificially dulled disc cutters. Penetration, spacing, and edge angle are significant variables affecting cutter performance. The multiple cutter patterns found in the field were undertaken to experimentally study the effects of different modes of cutting. Theoretical force values calculated by using the developed predictor equations were found to agree with laboratory observations. The scaling of small- and large-scale cutting results appeared to be possible. The field boring data from an experimental tunnel boring site was used to check the validity of the predictor equations for field boreability predictions. A computer program to predict field boring performance was written.

562. Research in Excavation Technology (Proceedings of the NSF/RANN Grantee Conference, Houston, Texas, April 26 - 28, 1977)

Maurer Engineering, Inc.

1977 153p APR7709013

NSF/RA-770089 PB272050/NKS

The objectives of this conference were to (1) provide the opportunity for interaction and exchange of ideas among those interested in improved excavation technology; (2) permit NSF/RANN-sponsored researchers to present summaries of their projects for evaluation and discussion; and (3) invite industry experts to give their comments on these research programs and on future research needs for improving excavation technology. Attendees represented government agencies, educational institutions, equipment manufacturers, and engineering organizations. The 20 presentations covered such areas as excavation methods and costs, site investigation, rock fragmentation and improved excavation methods. An open discussion was held following the presentations. A panel of 10 industry experts gave short comments on the projects, the potential applications, the complementary industry research, and the research needs.

563. Research in Rock Mechanics in South Africa

University of Maryland, Department of Mechanical Engineering
Dally JW

July 1977 26p APR7307908A03
NSF/RA-770217 PB272275/NKS

A brief description of research facilities visited by the author and the type of research being performed at the various laboratories are presented. The tour of laboratories engaged in rock mechanics and mining technology in South Africa has shown that a large well-directed research program to improve productivity is being pursued vigorously. A unique feature of many of the research projects sponsored by the Chamber of Mines is the combined participation of researchers from the Chamber's laboratories, field personnel from one of the operating mines, and engineers from equipment manufacturers. This collective approach to the design of new equipment for improving mine productivity, affords effective communication between the innovator, the fabricator, and the user. With the establishment of the large in-house research program at the Chamber of Mines, the Rock Mechanics Division of the Council for Scientific and Industrial Research (CSIR) shifted its emphasis to geomechanics.

Physical, Mathematical and Engineering Applications

564. Effects of Fluxes and Mineralizers in Lowering Cement Kiln Temperatures (Progress Report No. 1, February 1, 1977 - July 31, 1977)

Martin Marietta Corporation, Martin Marietta Laboratories
Klemm WA, Holub KJ, Skalny J

July 1977 50p AER7707471
NSF/RA-770200 PB271407/NKS

An experimental study to explore the possibility of lowering cement clinker burning temperatures by the use of fluxes/mineralizers has been initiated. The approach was to study the influence of selected compounds on the kinetics and mechanism of formation of cement clinker minerals in the system CaA-Al_2O_3-FE_2O_3-SiO_2, particularly that of tricalcium silicate (C_3S, alite), the most important component of portland cements. The following preliminary conclusions were reached: (1) Fluxes effectively lowered the temperatures of melt formation in all compositions and permitted clinkering at 1300°C. (2) With flourine additions, the compound $C_{11}A_7.CaF_2$ formed at 1300°C. When the clinkering temperature was increased to 1400°C, it decomposed and C_3A was produced. (3) All compositions fluxed at 1300°C contained γ-C_2S which resulted from the inversion of β-C_2S during cooling. Clinkering at 1400°C increased the stability of the β-C_2S polymorph. (4) No evidence of significant fluorine volatilization or loss during the clinkering process was found.

565. Implications of Holographic Displays on the Method of Data Acquisition and Processing

Science Applications, Inc.

Haines KA, Maaseidvaag F

March 20, 1977 51p APR7621771

NSF/RA-770215 PB272367/NKS

Diagnostic and monitoring data collected by medical instrumentation is usually in a form dictated by easy acquisition. For holographic (three-dimensional) presentation schemes, this data is often of little use or must be extensively modified. The capabilities and limitations of appropriate holographic displays are established, the ideal data required to generate holograms is determined, and modifications to present devices for the data collection are suggested. An ideal system using a holographic display often requires different instrumentation and processing methods than are currently envisioned.

566. Investigation of Man/Computer Interactive Versus an Automatic Heuristic in Scheduling Job Shops

Purdue University, Schools of Engineering

Haider SW, Moodie CL, Buck JR

October 1976 225p APR7307822

NSF/RA-760599 PB272706/NKS

This research investigates the advantages of scheduling the manufacturing of discrete parts in a job shop in an environment where intimate interaction is permitted between the scheduler and the computer. The minicomputer used is supplemented with a real time disc operating system (RDOS) for storing the relevant information about the job statistics and shop status, etc. Each experimental subject runs a set of eight problems that represent a distinct job and shop characteristic. The effectiveness of the solution yielded interactively is compared with the solution provided by the slack/remaining operations heuristic. Included in this paper are: (1) the significant work done in a development of analytical, heuristic, and simulation methods of scheduling; (2) a description of the job shop used for experimentation and a detailed explanation of the simulation program; (3) the experimental design developed to analyze the results of the experimentation; and (4) the merits and demerits of the interactive model.

567. Methodology and Results of an Industrial Part Survey

University of Rochester, College of Engineering and Applied Science

Samuel NM, Requicha AAG, Elkind SA

1976 89p APR7203419

NSF/RA-761131 PB272429/NKS

The document describes the methodology and results of a survey of 128 representative mechanical parts drawn from a modern office machine. Its main goal was to assess the potential industrial

usefulness of part description languages based on constructive solid geometry, and in particular of PADL. The collection of data relevant to more general issues, e.g. geometric complexity and mechanical functionalism, was a secondary goal. A simple version of PADL offering only orthogonally positioned primitive blocks (parallelepipeds) and cylinders is sufficient to describe 30% of the parts surveyed. This figure increases to 60% if parts are redesigned without altering their mechanical function. By introducing an additional wedge, primitive coverage is increased to 85% without redesign. Although the practical usefulness of PADL systems has yet to be established, PADL itself is a powerful tool for studying quantitatively the properties of part populations because it has firm mathematical foundations and is geometrically complete. An initial exploration of geometric complexity and its relationship to functional complexity, manufacturing process, and cost is included.

568. Part and Assembly Description Languages: 1--Dimensioning and Tolerancing

University of Rochester, College of Engineering and Applied Science
Requicha AAG

May 1977	99p	APR7601034
NSF/RA-770234		PB272419/NKS

This memo summarizes and analyzes current industrial dimensioning and tolerancing practices, and presents a formal view of such practices in terms of part and assembly representational schemes based on constructive geometry. The formalization developed in the memo is amenable to computer implementation through software techniques of only moderate complexity. This memo provides: (1) the rationale for the syntactical constructs carrying dimensional and tolerancing information in the PADL language; and (2) a first step toward the creation of an acknowledged formal theory of dimensioning and tolerancing as an essential component of the "knowledge base" for automation engineering in the discrete manufacturing industries.

569. Scanning Acoustic Microscope (Annual Report, April 1, 1976 - March 31, 1977)

Stanford University, W.W. Hansen Laboratories of Physics
Quate CF

April 1977	175p	APR7507317
NSF/RA-770132		PB271443/NKS

This report contains: (1) a complete description of the scanning acoustic microscope design including lens element design, instrument electronics and sensitivity, specimen support confocal alignment, and mechanical scanning system; (2) a discussion of resolution performance which demonstrates that the large velocity difference obtained with available acoustic materials makes spherical aberration a negligible factor in limiting the resolution of the single-surface acoustic lens; (3) a consideration of the modifications of the thin lens model; (4) a discussion

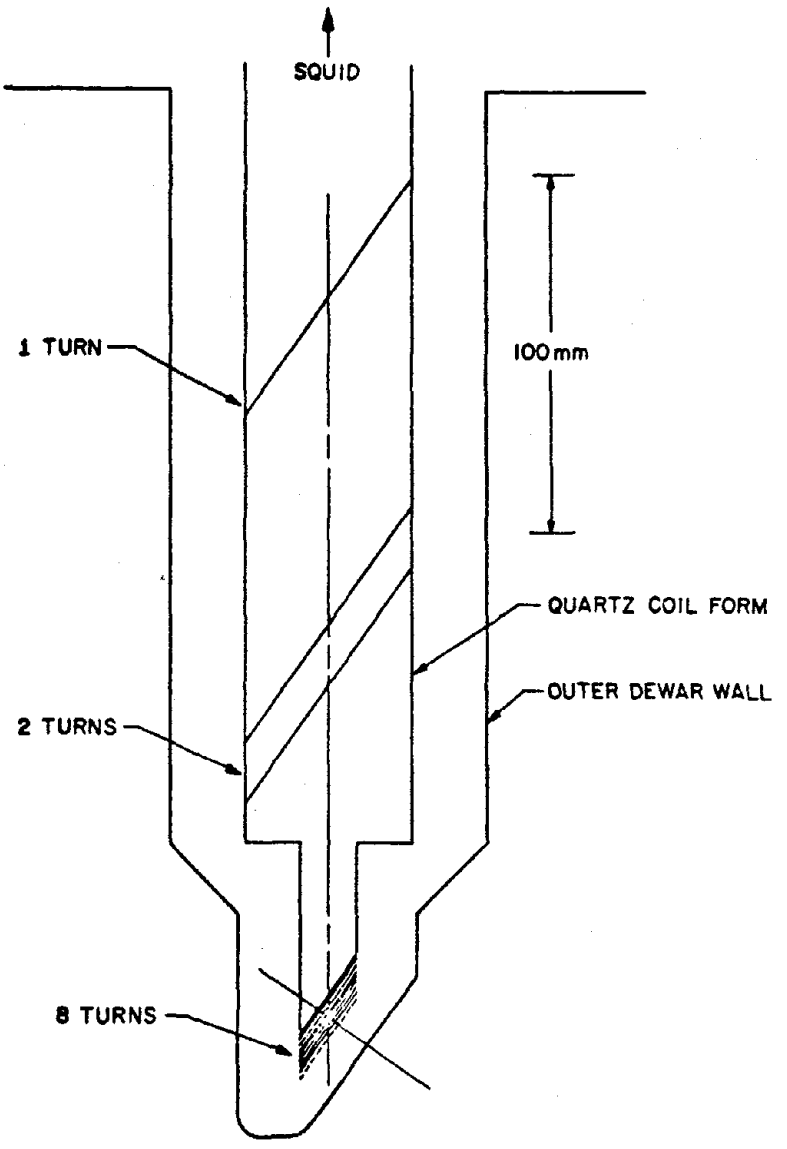


Fig. 16. A schematic representation of the pick-up coils and dewar tail of an asymmetric second-order vector differential magnetometer.

See Entry 520.

of the acoustic lens transfer functions that presents its effective theoretical pupil function; (5) examples of tissue micrographs to illustrate the latest results obtainable with the instrument working near 1000 MHz; (6) a study of the cells from the bloodstream; (7) advances in the acoustic microscope as an instrument; and (8) some suggestions for its application.

570. Superconducting Magnetometry for the Detection of Heart Disease (Final Technical Report)

Stanford University, Department of Physics
Fairbank WM, Harrison DC, Wikso JP Jr

July 1, 1977 96p APR7203447
NSF/RA-770197 PB271950/NKS

The authors developed instrumentation capable of efficient recording of high-quality vector magnetocardiograms (VMCG), a data processing facility and software that allow detailed analysis, comparison, and display of the VMCG, and a detailed theoretical understanding of the generation, detection, and analysis of the VMCG. Calculations and electrolytic tank studies were performed to clarify the spatial relationship of cardiac current sources to the external magnetic field. A magnetic dipole equivalent source, the Magnetic Heart Vector, could be determined by a single vector field measurement at a specific point outside the thorax. A technique was devised to determine the components and position of the best-fit moving magnetic dipole from VMCG data to study the spatial and temporal variation of the major features of the VMCG. The authors have begun a detailed comparison of the normal and abnormal electric and magnetic heart vectors. The relationship of the electric and magnetic signals varies during the cardiac cycle and is strongly affected by disorders in cardiac activation. Also developed is a new, non-invasive technique for studying cardiac mechanical activity, Magnetic Susceptibility Plethysmography (MSPG).

571. Users' Guide to GPAK: A Suite of FORTRAN Subprograms for Computational Geometry and Graphics

University of Rochester, College of Engineering and Applied Science
Hunt WA, Voelcker HB

January 1976 50p APR7203419
NSF/RA-761130 PB272430/NKS

GPAK is a collection of FORTRAN subprograms for computational geometry and graphics. It provides facilities for scaling, translating, rotating, and perspectively projecting vectors (points) in Euclidean three-dimensional space, and for computing such vector attributes as cross and dot products. Routines are also provided for writing the values of vectors, duos (pairs of vectors), and transforms, and for accessing them for other programmatic purposes, e.g. drawing. GPAK's low level drawing routines are defined in terms of a virtual display area that can be implemented on a variety of graphic output devices. Some higher level facilities are offered to aid the user in interfacing GPAK's geometry and drawing routines. GPAK offers conceptual as well as practical conveniences in that vectors, duos, and

transformations may be regarded as distinctive data types (logical entities) whose detailed representation in FORTRAN can be ignored. In addition, three user-selectable levels of error checking are available.

572. Users' Guide to STGPAK, A String Package for FORTRAN Programmers

University of Rochester, College of Engineering and Applied Science
Fisher WB
October 1976 21p APR7203419
NSF/RA-761132 PB272431/NKS

STGPAK is a software package consisting of FORTRAN subprograms which allow the user to manipulate character strings within a FORTRAN program in a natural and machine-independent manner. Subroutines and functions are provided to allow the user to concatenate strings, to search for substrings, to select and copy substrings, to determine string lengths, and to perform I/O and various miscellaneous string operations. While STGPAK itself may be dependent on the characteristics of its host computer, programs using STGPAK may be written in machine-independent ANSI FORTRAN. This guide provides users with the information needed to use STGPAK. The reader is assumed to be familiar with the FORTRAN language and with general concepts of character string manipulation.

Public Policy and Regulation

573. Economic and Legal Aspects of the Benefit-Cost Relationships of Federal, State, and Local Regulations Concerning the Production and Sale of Ground Beef, Phase 1, Executive Summary and Volumes 1-5

Pennsylvania State University, Institute for Research on Human Resources
Feller I, Sink J, Hu T, et al
June 1977 771p APR7618551
NSF/RA-770196SET PB271431SET

This study seeks to: identify the major federal, state, and local regulations which affect the manufacture, processing and distribution of ground beef products; develop a benefit-cost framework to assess the impact of these regulations; assemble a documented data base which will be used in a subsequent empirical study; and identify alternative regulatory approaches against which current regulations can be compared. Volume 1 describes the stages in the manufacture and distribution of ground beef and ground beef products. Volume 2 identifies major regulations affecting the price, supply, and quality of ground beef, and possible duplications, gaps, conflicts, and complementaries among regulations. Volume 3 presents: (1) possible private and social benefits and costs of regulations affecting

the manufacture and distribution of ground beef, and their distributional impacts; (2) alternative concepts, measures, methodologies, and assumptions for assessing the separate and cumulative benefit and cost impacts of regulation; (3) alternative regulatory approaches concerning the production and distribution of ground beef; and (4) research items to be included in the phase 2 study. Volume 4 presents a selected bibliography on the benefit-cost aspects of regulations concerning the production and distribution of ground beef. Volume 5 presents Task E, "Provision of a Documented Data Base."

574. Economic and Legal Aspects of the Benefit-Cost Relationships of Federal, State and Local Regulations Concerning the Production and Sale of Ground Beef, Phase 1, Executive Summary

Pennsylvania State University, Institute for Research on Human Resources
Feller I, Sink J, Hu T, et al.
June 1977 28p APR7618551
NSF/RA-770191 PB271432/NKS

See Entry 573 for abstract.

575. Economic and Legal Aspects of the Benefit-Cost Relationships of Federal, State and Local Regulations Concerning the Production and Sale of Ground Beef, Phase 1, Volume 1: Description of the Stages in the Manufacture and Distribution of Ground Beef and Ground Beef Products

Pennsylvania State University, Institute for Research on Human Resources
Feller I, Sink J, Hu T, et al.
June 1977 150p APR7618551
NSF/RA-770192 PB271433/NKS

See Entry 573 for abstract.

576. Economic and Legal Aspects of the Benefit-Cost Relationships of Federal, State and Local Regulations Concerning the Production and Sale of Ground Beef, Phase 1, Volume 2: Major Regulations Affecting Ground Beef and Possible Gaps, Conflicts, and Duplications Among Them

Pennsylvania State University, Institute for Research on Human Resources
Feller I, Sink J, Hu T, et al.
June 1977 182p APR7618551
NSF/RA-770193 PB271434/NKS

See Entry 573 for abstract.

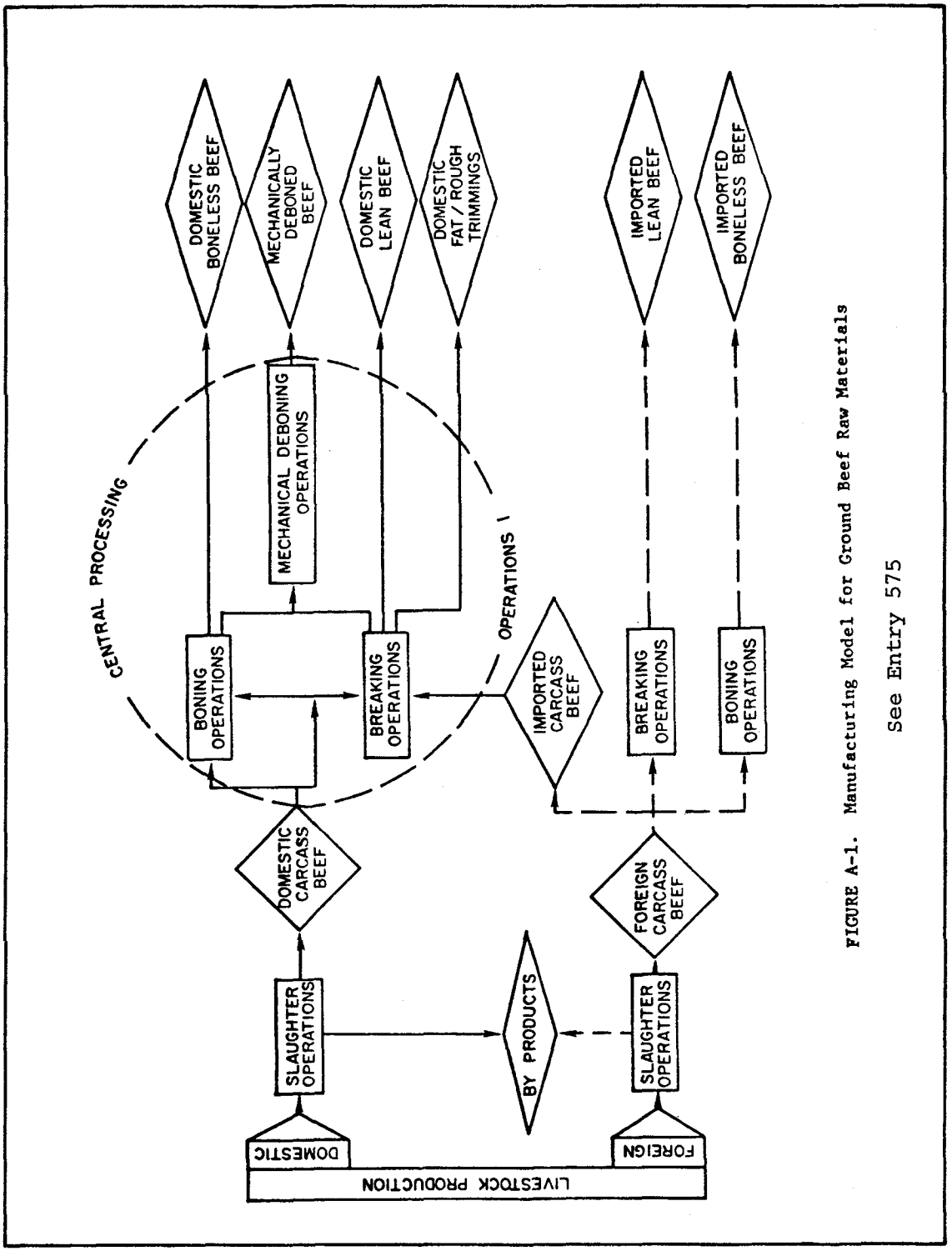


FIGURE A-1. Manufacturing Model for Ground Beef Raw Materials

See Entry 575

577. Economic and Legal Aspects of the Benefit-Cost Relationships of Federal, State, and Local Regulations Concerning the Production and Sale of Ground Beef, Phase 1, Volume 3: Private and Social Benefits and Costs of Regulations Affecting Ground Beef, and Alternative Approaches to Assessment and Regulation

Pennsylvania State University, Institute for Research on Human Resources
Feller I, Sink J, Hu T, et al.
June 1977 228p APR7618551
NSF/RA-770194 PB271435/NKS

See Entry 573 for abstract.

578. Economic and Legal Aspects of the Benefit-Cost Relationships of Federal, State and Local Regulations Concerning the Production and Sale of Ground Beef, Phase 1, Volume 4: Select Bibliography on the Benefit-Cost Aspects of Regulations Concerning the Production and Distribution of Ground Beef

Pennsylvania State University, Institute for Research on Human Resources
Feller I, Sink J, Hu T, et al.
June 1977 38p APR7618551
NSF/RA-770195 PB271436/NKS

See Entry 573 for abstract.

579. Economic and Legal Aspects of the Benefit-Cost Relationships of Federal, State, and Local Regulations Concerning the Production and Sale of Ground Beef, Phase 1, Volume 5: Provision of a Documented Data Base

Pennsylvania State University, Institute for Research on Human Resources
Feller I, Sink J, Hu T, et al.
June 1977 145p APR7618551
NSF/RA-770196 PB271437/NKS

See Entry 573 for abstract.

580. Environmental Analysis for Development Planning Chambers County, Texas, Technical Report, Volume 6, An Approach for Describing Natural Systems and for Assessing Natural Environmental Impact

Rice Center for Community Design and Research; Southwest Center for Urban Research
Rowe PG, Williams DL, Blackburn JB, et al.
March 1976 138p ERT730788A01
NSF/RA-760592 PB273020/NKS

This technical report evaluates how information about the natural environmental characteristics of a given geographic area can be integrated with information about various types of land use, to identify and evaluate the natural environmental impacts of land use activities. It is concerned with the development of a general approach for assessing the environmental impact of land uses and also one for specific application in Chambers County, Texas. The research objectives were to develop (1) techniques for describing the natural environmental system so that interrelationships between natural environmental characteristics can be identified and described; (2) a methodology for deriving a natural environmental description reflecting both the underlying framework of and the relationships between natural features and that allows visualization of the effects of proposed development and its impacts; (3) an approach for identifying and assessing the environmental effects of a range of land uses; and (4) to conduct four case study applications of this environmental impact assessment approach with state and local user agencies to assess the applicability of the techniques.

581. Environmental Analysis for Development Planning, Chambers County, Texas, Technical Report, Volume 7, Environmental Analysis Case Study Applications and Selected Technical Papers

Rice Center for Community Design and Research
Southwest Center for Urban Research
Rowe PG, Williams DL, Blackburn JB
March 1976 234p ERT730788A01
NSF/RA-760593 PB273021/NKS

This report presents three case study applications of an approach for assessing the natural environmental impacts of land uses, and several technical papers. Each paper describes an aspect of the Chambers County natural system that is of particular interest in understanding either the environmental resource capabilities of the study area or a specific type of land use related impact. They represent detailed support documentation for the impact assessment approach itself or for the case studies. The case study for the Houston Galveston Area Council attempted to show how the natural environmental impact assessment methodology developed by this project could be applied to the OMB A-95 review process associated with seven sewage treatment plants and two collection systems. The case study for the General Land Office's Coastal Zone Management Program formed part of an overall project response to several aspects of the Coastal Zone Management Act of 1973. The case study for the United States Steel Corporation presents a natural environmental evaluation of the plant extension and a further extension and application of the project's natural environmental impact assessment methodology.

582. Research on the Effects of Television Advertising on Children (A Review of the Literature and Recommendations for Future Research)

Harvard University

Adler RP, Friedlander BZ, Lesser GS, et al.

1977	244p	APR7510126
NSF/RA-770115		PB273074/NKS

This report recommends a plan of future research on the effects of television advertising upon children. It has four components: identification of major policy issues of current interest; review of existing research organized around these issues; recommendations for future relevant research; and compilation of a national roster of researchers on television advertising and children. Issues selected for evaluation include: (1) children's ability to distinguish television commercials from program material; (2) influence of format and audiovisual techniques on children's perceptions of commercial messages; (3) source effects and self-concept appeals in children's advertising; (4) effects of advertising containing premium offers; (5) effects of violence or unsafe acts in commercials; (6) impact on children of proprietary medicine advertising; (7) effects on children of food advertising; (8) effects of volume and repetition of commercials; (8) impact of advertising on consumer socialization; and (10) television advertising and parent-child relations. Reviews of existing research relevant to each of these issues are included. Research findings, general suggestions for future research, and a bibliography are presented.

583. U.S. Beef System, Research Opportunities: A Symposium to Identify R&D Needs of the U.S. Beef System, Final Report

Stanford Research Institute

Veblen TC

July 1977	121p	C1043
NSF/RA-770221		PB271919/NKS

This symposium attempted to identify and describe the research that is needed to improve the effectiveness of the United States Beef System; to produce a record of discussion that will help researchers identify problems that require further research; and to put together a well-reasoned list of "research opportunities." The symposium was a working session in which experienced leaders in the beef system--ranchers, feeders, processors, distributors, scientists, government officials, and other professionals--sought to describe in small-group sessions how the system works and to identify how research can improve its effectiveness. Leaders from other parts of the food system and other disciplines were invited to provide outside perspectives, which were useful during discussions on the criteria for system performance.

584. Urban Runoff Control Planning, Final Report

American Society of Civil Engineers, Urban Water Resources Research Council
McPherson MB
June 1977 123p APR7617604
NSF/RA-770184 PB271548/NKS

This report was prepared to assist agencies and their agents who are participants in the preparation of areawide plans, from the standpoint of major urban runoff technical issues in long-range planning. The importance of conjunctive consideration of urban runoff quantity and quality and the need to develop a factual basis that will support expected reliability of performance of proposed actions and programs is emphasized. While not intended as a handbook, the report analyzes some important technical issues that are often slighted or poorly handled, such as the use of simulation. Topics are viewed from the perspective and experience of the local government level where implementation takes place. Examples of leading local government projects are included and 310 selected references are cited.

Public Service Delivery

585. Kentucky Department of Revenue Real Estate Assessment and Land Records Systems Research Project, Phase 1, Final Report, Sections Included: 7-9

Kentucky Department of Revenue Real Estate Assessment and Land Records
1976 105p APR7420487
NSF/RA-760063 PB272976/NKS

This project attempts to evaluate real estate assessment and land record systems, and to make such a system available for general use. A real estate assessment system includes only those processes required to appraise and assess real property. Included in the final report are the following sections: (1) "Interface Systems - Land Records," REAL System design, an important component of which is the land records function that provides geographic information for assessment and other applications. (2) "Interface Systems - Tax Collection," administration of property tax, which requires a considerable degree of interface between the assessment and tax collection functions. The REAL System design is sufficiently generalized and modularized to incorporate tax collection functions. (3) "Information Program Design," contents of the program, phase needs and target users, and user documentation responsibilities. Included as attachments are a directory to the REAL Systems' manual, table of contents for the REAL System implementation guide, and an annotated table of contents for the REAL System Users' guide.

586. Kentucky Department of Revenue Real Estate Assessment and Land Records Systems Research Project, Phase 1, Final Report, Appendix I

Kentucky Department of Revenue Real Estate Assessment and Land Records

1976 81p APR7420487

NSF/RA-760064 PB272977/NKS

Appendix I includes REAL Systems design and the table of contents. The method of documentation used is called HIPO (hierarchy plus input-process-output). The HIPO method involves a design package that graphically describes functions of a system from the general to the detail level. The design and documentation emphasize organization of diagrams in a hierarchal structure where each diagram at any level is a subset of the level above it. This facilitates modularity of complex systems and programs. As part of the HIPO package, the visual table of contents includes the names and identification numbers of all the HIPO diagrams in the initial design package. See also entries 585 and 587-591.

587. Kentucky Department of Revenue Real Estate Assessment and Land Records Systems Research Project, Phase 1, Final Report, Appendix II - Part 1

Kentucky Department of Revenue Real Estate Assessment and Land Records

1976 98p APR7420487

NSF/RA-760065 PB272978/NKS

Appendix II - Parts 1 and 2, comprises initial design HIPO (hierarchy plus input-process-output) diagrams, which describe the functions of the REAL system to generate appraised and assessed values and output the data. Each diagram provides required inputs, processes, and outputs to complete a function. The process section of a HIPO diagram contains the steps that describe the function being performed. The input section contains those data items used by process steps. The output section contains those data items created or modified by the process steps. Extended descriptions elaborate on the process steps. See also entries 585, 586 and 589-591.

588. Kentucky Department of Revenue Real Estate Assessment and Land Records Systems Research Project, Phase 1 Final Report, Appendix II - Part 2

Kentucky Department of Revenue Real Estate Assessment and Land Records

1976 122p APR7420487

NSF/RA-760066 PB272979/NKS

See Entry 587 for abstract.

589. Kentucky Department of Revenue Real Estate Assessment and Land Records Systems Research Project, Phase 1 Final Report, Appendix III - Final Evaluation of Stratification Techniques - Tabular Addendum to Section IVA

Kentucky Department of Revenue Real Estate Assessment and Land Records

1976 | 90p | APR7420487
NSF/RA-760067 | | PB272980/NKS

Appendix III presents a final evaluation of stratification techniques in the form of a tabular addendum to Section IVA. See also entries 585-587 and 589-591.

590. Kentucky Department of Revenue Real Estate Assessment and Land Records Systems Research Project, Phase 1 Final Report, Appendix IV - Evaluation of Statistical Modeling Techniques

Kentucky Department of Revenue Real Estate Assessment and Land Records

1976 | 124p | APR7420487
NSF/RA-760068 | | PB272981/NKS

The objective of Appendix IV is to evaluate the use and application of alternative stratification techniques and techniques to minimize the multicollinearity problem under unique operating conditions. The methodology for evaluating the effectiveness of different techniques for dealing with the problems of multicollinearity, variable selection, stratification, and use of minimal versus adjusted sale price is presented. The three data bases, homogeneous, mixed, and heterogeneous, are presented. Major operating conditions and samples are drawn from each for the purpose of testing predictive accuracy. See also entries 585-589 and 591.

591. Kentucky Department of Revenue Real Estate Assessment and Land Records Systems Research Project, Phase 1 Final Report (Sections Included: 5-9, Appendix I-IV

Kentucky Department of Revenue Real Estate Assessment and Land Records

1976 | 1200p | APR7420487
NSF/RA-760068SET | | PB272975/Set

See entries 585-590 for abstracts. An abstract of Sections 5 and 6 and the availability of Sections 1 through 4 will appear in future issues of Recent Research Reports.

592. Municipal Fire Service Workbook

Research Triangle Institute; National Fire Protection Institute; International City Management Association

MacGillivray LA, Plotecia SS, Novak D, et al

May 1977 | 134p | C9000
NSF/RA-770155 | | PB271954/NKS

This workbook provides a means of measuring the total organizational performance of a local fire service delivery system. It is a step in establishing benchmarks for fire service and local administrators with respect to fire protection. The workbook serves as a description of fire protection services, a yardstick against which to compare the expenditures and fire losses of a locality, a reference book on state fire protection legislation, and a sourcebook on urban and fire service research projects. It treats (1) assessment of the fire problem in a community; (2) the data necessary to begin measurement, with instructions on how to use it; (3) measurement of the effectiveness of a fire service delivery system; (4) measurement of levels of effort and how to put them together with measures of effectiveness to calculate total organizational performance; and (5) the meaning of the performance scores. A list of sources which could offer assistance to local governments for performance improvement and a description of major fire service delivery arrangements including personnel issues, prevention activities, and public safety organizations are provided.

593. Productivity Measurement in Administrative Services: Budgeting and Management Analysis in Public Service Institutions

ABT Associates, Inc.
Merrill P, Kumar TK

June 1977 72p APR7520564
NSF/RA-770186 PB271377/NKS

The purpose was to investigate the potential for developing methods of measuring the productivity of budgeting and management analysis in public service institutions, specifically state governments, universities and hospitals. This study developed productivity ratios for a hospital and a university (showing the average product of labor overtime) and found the results to be unreliable and misleading. It then developed a "derived demand function" approach to measuring administrative productivity appropriate to the most relevant policy questions at issue in this field. This approach requires data on a cross-section of similar institutions, and measures the marginal product of administrative labor. Conclusions and recommendations are summarized and an overview of the activities undertaken is provided. Federal and state regulations and reporting requirements are discussed. Issues and problems related to the development of measurement techniques are reviewed and it is demonstrated that the derived demand approach is most relevant to the control problems.

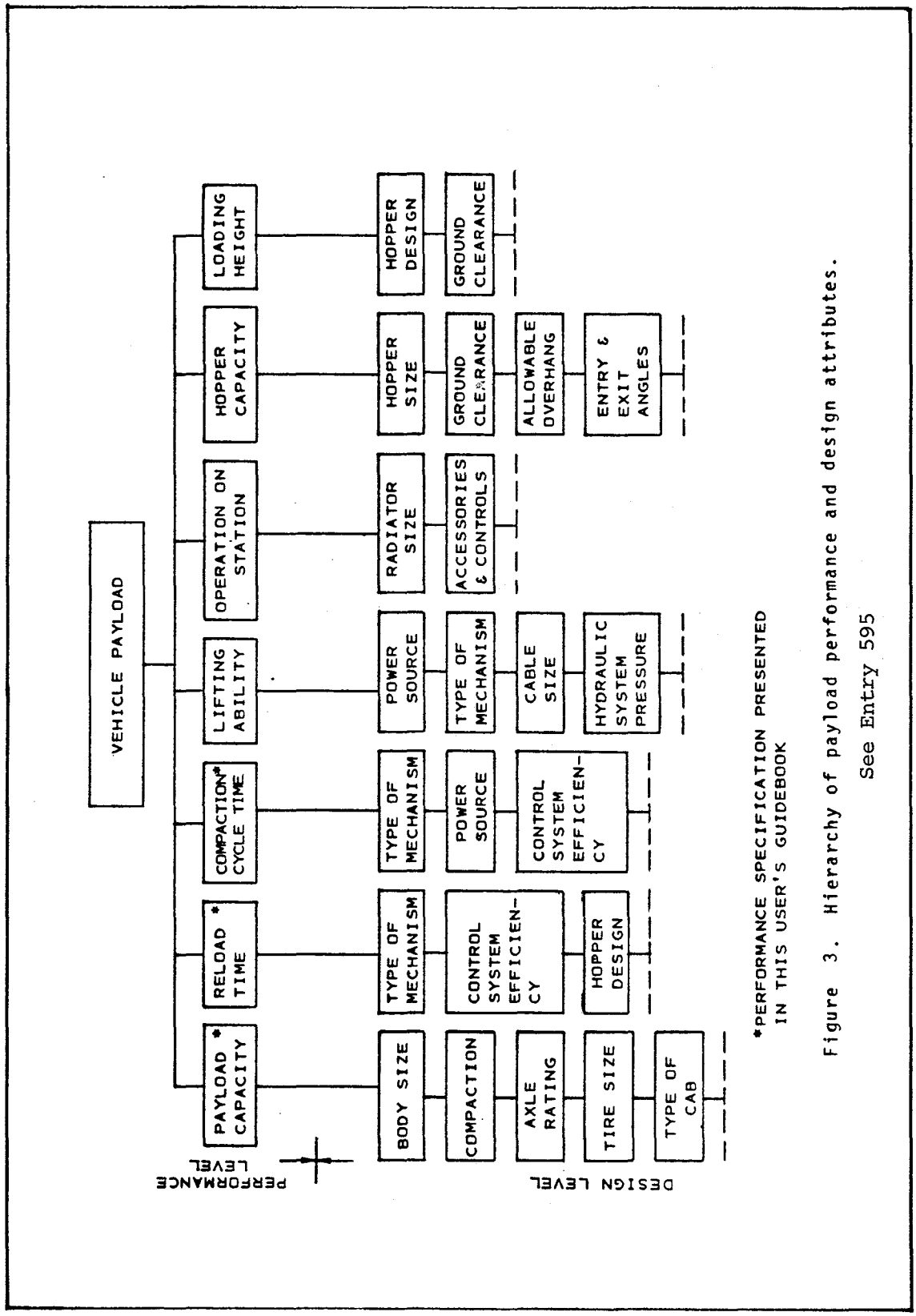


Figure 3. Hierarchy of payload performance and design attributes.

See Entry 595

594. Productivity Measurement in Administrative Services: Budgeting and Management Analysis in Public Service Institutions, Appendices

ABT Associates
Merrill P, Kumar TK
June 1977 | 103p | APR7520564
NSF/RA-770187 | PB271378/NKS

These appendices were referenced in the main volume of the report, "Productivity Measurement in Administrative Services: Budgeting and Management Analysis in Public Service Institutions." Appendix A presents some early attempts to produce measures of the productivity of the Budgeting and Management Analysis function (BAMA) in a hospital and a university. An explanation, by regression analysis, of the size of the BAMA function in state governments led to the derived demand approach to productivity measurement which was adopted in the second part of the project. Appendix B contains background to supplement the study of budget office productivity in the State University of New York and the University of California, contained in Volume I. Appendix C contains a preliminary estimation of the derived demand equation developed in Volume I, using partial data.

595. Refuse Collection Vehicle Performance Specification: User's Guidebook, Final Report

Stearns, Conrad and Schmidt Consulting Engineers, Inc.
September 20, 1977 | 71p | C7704424
NSF/RA-770265 | PB273766/NKS

This guidebook introduces the use of performance specifications in the procurement of refuse collection vehicles, presenting a methodology for developing such specifications for payload capacity, compaction cycle time, and reload time. In addition, the User's Manual is previewed. Included are discussions of: (1) the concept, overview, and data sources of the performance specification process; (2) the description and purpose of the User's Manual; (3) the performance specification of vehicle payload capacity; (4) the specification of compaction cycle and reload times; and (5) life cycle costing.

596. Stakeholder Methodology Applicability, Federal Assistance Delivery System Productivity, Executive Summary, SBA Guaranteed Loan Program - Small Business

Innocept, Inc.
July 15, 1977 | 28p | APR7620856
NSF/RA-770266 | PB273890/NKS

This project demonstrates the applicability of the "Stakeholder" methodology for research on productivity of Federal Assistance

Delivery Systems. The feasibility demonstration develops and tests the research design and methodology which identifies and allocates benefits and costs to participants in a particular delivery system, using as a case study financial assistance to small business via the United States Small Business Administration Loan Guarantee Program in the Dallas/Fort Worth, Texas area. Within this context, specific sub-objectives are to: (1) demonstrate an ordered approach and methodology for analysis of a complex delivery system as a first step in developing a transferable productivity improvement program; (2) define a total delivery system, relating roles and the players of the roles to system process events and timing, and identify gaps and overlaps in the system; (3) identify a recipient class by generally accepted criteria and the role and relative economic importance of that group to the overall national economy; and (4) relate elements of the delivery system to benefits and costs to the recipients.

597. Stakeholder Methodology Applicability, Federal Assistance Delivery System Productivity, Final Technical Report

Innocept, Inc.

July 15, 1977 180p APR7620856

NSF/RA-770235 PB272451/NKS

The applicability of the "Stakeholder" methodology for research on productivity of Federal Assistance Delivery Systems, specifically an ordered approach and methodology for analysis of a complex delivery system as a first step in developing a transferable productivity improvement program, is demonstrated. A total delivery system is defined, relating roles and role players to the system process events and timing. A recipient class and its role and relative economic importance to the overall national economy and changes in the system which have potential for improving the productivity of the system and of the recipients are identified.

598. Transportation: The Diverse Aged (Policy Report One)

University of Southern California, Andrus Gerontology Center, USC Research Program on Social and Cultural Context of Aging

Bengtson VI, Torres-GF, Newquist D, et al.

1976 87p APR7521178

NSF/RA-770023 PB271403/NKS

The goal of this research is to provide policy-relevant information about aging which reflects the diversity of human experience in maturity and old age, particularly among various social and ethnic groups in American society. The report is designed for transportation policymakers, planners, social service delivery personnel, and advocates for the aged. It investigates

the transportation patterns and problems of older persons. Three methods are employed: (a) an examination of available literature in the field of transportation and the aged; (b) an analysis of primary research data, reflecting two surveys conducted in 1973-1975; and (c) an analysis of past and current transportation policy. The report offers possible solutions to mobility problems of many senior citizens. Three studies were conducted: (1) a survey of 1,269 community residents, age 45-74, sampled from three ethnic groups in Southern California from various socioeconomic levels; (2) 316 decision-makers involved at various levels in establishing, implementing, or influencing policy regarding the elderly; (3) a cross-cultural anthropological investigation of aging in three foreign countries (Yugoslavia, Tanzania, and Mexico) and of the adaptations made by immigrants growing old in the American culture.

Division of Problem-Focused Research Applications

Chemical Threats to Man and the Environment

599. Air Quality and Center City Residential Development
Argonne National Laboratory, Division of Energy and Environmental Systems; University of Chicago, Center for Urban Studies
Santini DJ
July 1976 | 13p | AG352
NSF/RA-760526 | PB273015/NKS

This study was made to determine the existing air quality of six 1974-1975 EPA Air Quality Control Regions (AQCRs) where adequate center city and suburban monitoring of pollutants was available. The five pollutants measured were: suspended particulates; sulfur dioxide; carbon monoxide; ozone/oxidants; and nitrogen dioxide. Comparisons of actual measures of air quality in the center city and suburban locations were made by means of an overall air quality index incorporating the five air pollutants. These comparisons show that center cities more frequently have superior overall air quality. From a limited point of view, this analysis establishes the desirability of downtown residential development.

600. Biogenic Sulfur Sources and Air Quality in the United States (Final Report)
Arthur D. Little, Inc.
Hitchcock DR
August 1977 | 207p | AEN7514571
NSF/RA-770276 | PB273824/NKS

Particulate pollutant measurements from three air quality monitoring networks were analyzed to determine whether the regional, seasonal, and geographic distributions of measured particulate sulfate abundances are compatible with the hypothesis that biogenic sulfur produced as hydrogen sulfide by sulfate reducing bacteria contributes particulate sulfur to the atmosphere. Total suspended particulate (TSP), nitrate, and, where available, ammonium data were also analyzed. The particulate sulfur distributions were found to be compatible with the biogenic hypothesis, and the other constituents were observed to exhibit pronounced regional, seasonal, and geographic variations. Analyses of sulfate, nitrate, TSP, and ammonium levels of 33 non-urban sites in the National Air Surveillance Network revealed the dependence of sulfate levels on regional variations in precipitation and temperature to be expected if bacteriogenic hydrogen sulfide is an important source of atmospheric particulate sulfur. Sulfate, nitrate, and TSP levels in 11 New York cities were found to exhibit seasonal variations, with the highest sulfate and TSP levels and the lowest nitrate levels occurring in the summer. Analyses of intersite pollutant correlations and interpollutant correlations at each site also were conducted, and the influence of meteorological factors on pollutant levels at a rural and an industrialized site was examined.

601. Immobilization of Hazardous Residuals by Encapsulation (Semi-Annual Technical Report, July 1977)

Washington State University, Department of Materials Science and Engineering
Subramanian RV, Mahalingam R

July 1977 93p ENV7606583
NSF/RA-770183 PB271410/NKS

The objective of this research is to devise and evaluate methods for solidification in a polymer matrix of liquids containing hazardous substances. It seeks to: (1) evaluate the true immobilization of wastes encapsulated in the polyester matrix by long-range leaching studies; (2) evaluate the applicability of the process to a wide spectrum of actual hazardous wastes; (3) optimize the conditions for the emulsification and curing steps of the process; and (4) provide a sound basis for commercial exploitation of the process by detailed plant investigations. A variety of industrial wastes was obtained from chemical companies and waste treatment industries containing toxic components such as cyanide, arsenic, poisonous metal ions, PCB, kepone, and pharmaceutical wastes. The process was found to be generally applicable to solidify these wastes. The detailed results of the laboratory studies are in Part 1, and the pilot plant studies in Part 2.

602. Urban Design and Public Exposure to Carbon Monoxide
Argonne National Laboratory, Division of Energy and Environmental Systems; University of Chicago, Center for Urban Studies
Santini DJ
October 1976 | 11p | AG352
NSF/RA-760528 | | ANL-76-XX-22/NKS

This paper examines ways to reduce risk of exposure to carbon monoxide by the physical design of new downtown residential developments. In order to use physical design to protect the public from this exposure, the following questions need to be resolved: (1) where on a specific site will CO concentrations be the highest; (2) at what types of locations should the public be protected; and (3) what design alternatives are available to provide this protection. Distance from the source of emissions is the most effective way to reduce exposure risks, while vertical distance from the source seems to be a more effective means of avoiding high concentration than downwind horizontal distance, so multistory buildings would be the most desirable. Another suggestion is to construct parking facilities in the lower floors of high-rise residential structures because it increases vertical distance between high CO concentrations and living units. Careful selection of the locations of sidewalks, parking facilities, access roads, and buildings would have a significant effect on the public's exposure to carbon monoxide.

Community Water Management

603. Application of Sequencing Batch Reactors for Treatment of Municipal and Industrial Wastewaters (First Annual Report, July 1, 1976 - June 30, 1977)
University of Notre Dame, Department of Civil Engineering
Irvine RL
June 30, 1977 | 146p | ENV7610381
NSF/RA-770259 | | PB273846/NKS

This study evaluates fill and draw reactors in terms of their applicability to a variety of treatment areas and develops design and control procedures so that the batch technology developed can be considered by design engineers as a viable option to conventional continuous flow systems for satisfying present and future effluent requirements. The overall objective is to investigate application of controlled, unsteady-state operations and processes to treatment of wastewater for attainment of better consistency and reliability than is practically possible using conventional steady-state methods. The authors define user (market) areas which can benefit immediately from the investigations conducted. Their approach is to interface laboratory, desk top, and computer investigations with the user market such that batch reactor technology is developed in areas where immediate implementation is

possible. Three primary research products and user areas are being actively pursued: (1) microprocessor control system for batch or continuous flow treatment systems; (2) single tank batch reactors for small municipalities and small industries in rural areas; and (3) multiple tank batch reactors for larger municipalities and industries.

604. Concentrations of Ten Heavy Metals in Some Selected Lake Powell Game Fishes

University of New Mexico, Department of Biology
Bussey RE, Kidd DE, Potter LD
November 1976 78p GI34840
NSF/RA-761133 PB273026/NKS

Ten tissue samples from each of four species of fishes--large mouth bass, black crappie, walleye, and rainbow trout--from Lake Powell were analyzed and compared for the presence of concentrations of ten heavy metals: iron, calcium, magnesium, copper, chromium, cadmium, zinc, arsenic, selenium, and lead. Samples were digested with nitric and perchloric acids, and analyses were performed by atomic absorption spectrophotometry. Concentrations were expressed on a dry-weight basis for all tissues and were not corrected for percent recovery. The concentrations of cadmium, lead, arsenic, and selenium in the edible portions of Lake Powell fishes were compared to the maximum safety threshold levels established in several independent studies. None of the metals, aside from selenium, now appears in concentrations high enough to pose a health hazard and should not be cause for concern. However, the high selenium levels in fish flesh may constitute a possible health hazard, although little is known of the factors influencing selenium assimilation in humans.

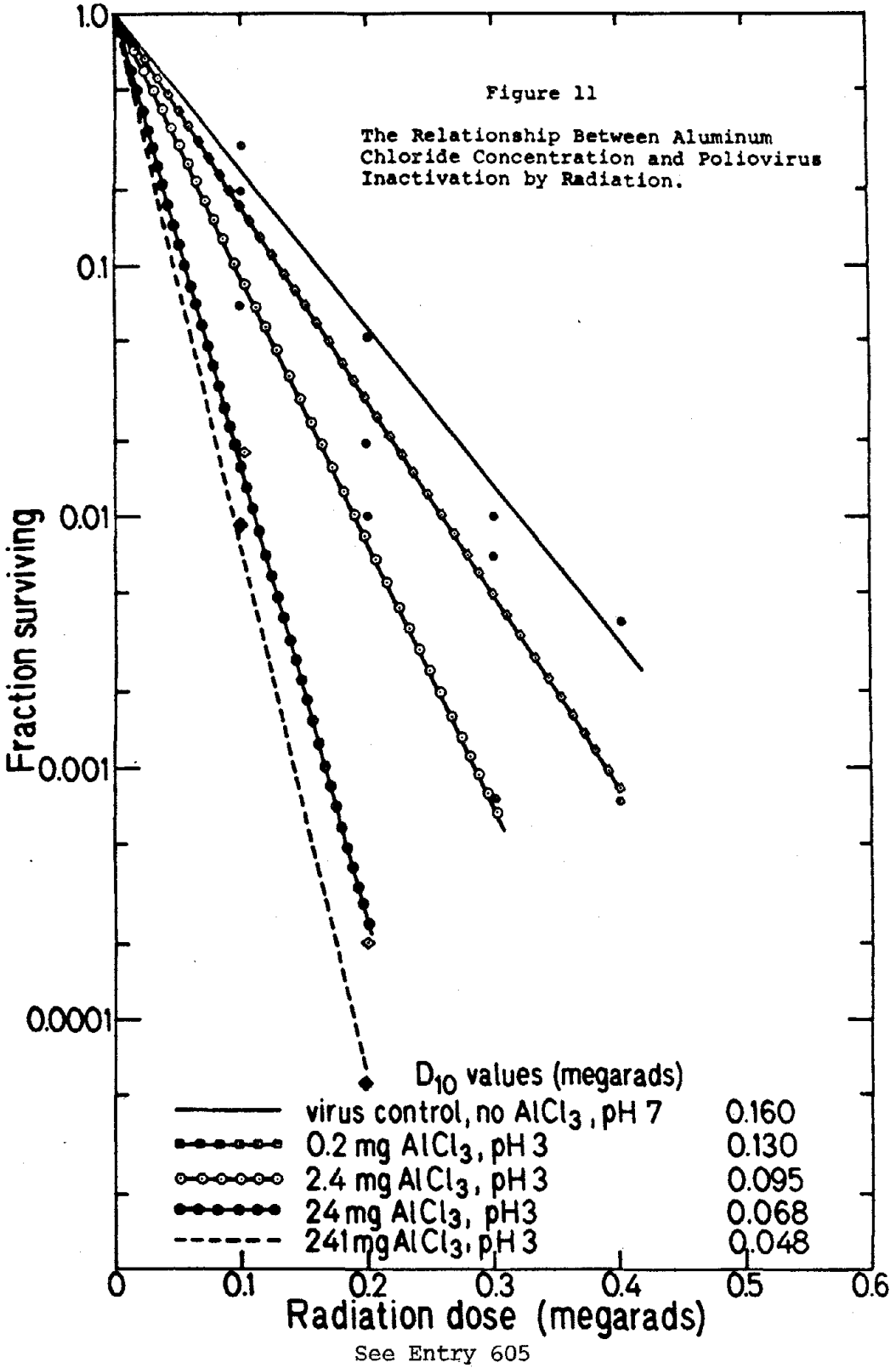
605. Control of Virus Pathogens in Municipal Wastewater and Residuals by Irradiation with High Energy Electrons (Final Report)

University of New Hampshire, Department of Microbiology
Metcalf TG
August 15, 1977 69p AEN75142793
NSF/RA-770223 PB272347/NKS

Disinfection of wastewater residuals by electron radiation by inactivation of enteric viruses was shown to be feasible. Inactivation of enteric viruses found during trials at the High Voltage Research Laboratory, MIT, was confirmed in trials with an in-line installed radiation unit at Boston's Municipal Waste Treatment Plant. Radiation doses needed for disinfection were calculated from D_{10} values determined for test enteric viruses, and natural virus numbers found per unit volume of a wastewater residual. Disinfection of fresh raw sewage was estimated to require at least 400 kilorads per ml doses, and conceivably as much

Figure 11

The Relationship Between Aluminum Chloride Concentration and Poliovirus Inactivation by Radiation.



See Entry 605

as 600 kilorads per ml during the summer months, based on peak virus concentrations of 1000 PFU per ml during that season. Disinfection during other seasons was estimated to require 400 to 450 kilorads per ml. Disinfection of wastewater effluents was estimated to require a maximum of 400 kilorads per gallon. Enhancement of radiation effectiveness was found theoretically possible by acid adjustment of a residual to pH 3.7, or addition of aluminum or ferric chlorides. A method was developed to recover test virus from large volumes of digested sludge which permitted recoveries of 50 percent of test virus incorporated into 5-gallon samples.

606. Cypress Wetlands for Water Management, Recycling and Conservation (Third Annual Report, November 1, 1975 - December 15, 1976)

University of Florida, Center for Wetlands
Odum HT, Ewel KC, Ordway JW, et al.
December 17, 1976 894p ENV7307823A02
NSF/RA-760508 PB273097/NKS

Studies of water budget and geology show how cypress domes store and save water compared to reservoirs. Experiments with recycling treated sewage water show that the cypress basins (domes) filter nutrients, microbes, heavy metals, and virus, improving the water as the sewage water recharges groundwater. Measurements and systems models show budgets of phosphorus, nitrogen, and carbon, and the role of trees, shrubs, sediments, duckweed, and sedimentation in processing materials, productivity, total metabolism, and building ecological patterns. Comparisons are made with strands and floodplains. Regional studies consider the quantitative role of swamps in water and nutrient budgets of four counties and the South Florida region. Detailed studies include measurements of encephalitis virus and mosquitoes, indices of insect abundance, chlorophyll, seedlings, litter, decomposition rates, and soil characteristics. Engineering costs for swamps to serve in place of tertiary treatment are low. The report includes a report of the Center for Wetlands and auxiliary projects, report of a workshop, report on theses and publications, and summaries.

607. Macroinvertebrates and Diatoms on Submerged Bottom Substrates, Lake Powell

University of New Mexico, Department of Biology
Potter LD, Lovderbough ET
March 1977 53p GI34840
NSF/RA-770232 PB272692/NKS

To collect and examine the organisms associated with newly inundated terrestrial vegetation in Lake Powell, small plastic Christmas trees were "planted" along a sloping sandy bottom at depths

of 2, 3, 4.5, 6, 8, and 10 meters (6.6 to 32.8 feet). For the 17 months from July 1973 through October 1974, the trees were harvested and replanted by SCUBA divers at 4- and 12-week intervals. The macroinvertebrate and diatom components of the periphytic community associated with each tree were collected and evaluated to determine the number of individuals per unit area (density) and species composition. A diversity index was computed for the diatom portion of each sample. The changes in composition and density patterns of the periphytic organisms were related to depth and time. The organisms associated with inundated vegetation make up an important part of the available fish food in the littoral zone of the lake. In addition, snails of the genus Physa were found to concentrate around trees submerged for 12 weeks. These snails can function as hosts for schistosome-dermatitis-producing cercariae, and therefore may present a potential problem in the recreational use of the lake, especially as the shoreline biomass favoring snail populations increases.

608. On-Land Disposal of Municipal Sewage Sludge: A Guide to Project Development (Interim Report)

Colorado State University, Department of Agricultural and Chemical Engineering

Lutkin MH, Smith JL, McWhorter DB

July 1977 145p AEN7408082

NSF/RA-770165 PB271144/NKS

A procedure was prepared that can be used as a guide in the development of a land application facility for municipal sewage sludge. A review of the literature provided a background on such subjects as the permits and approval processes; pathogenic microorganisms; inorganic and organic contaminants; surface conditions that can be expected at a field location; a cursory discussion of anticipated subsurface conditions including groundwater and soil-water movement, soil properties, and procedures for obtaining data; and the effect of sludge application and climate on operation. Consensuses from the review were used to develop pertinent points that should be considered in project development. Practical experience gained from current operations was used to provide guidance in site selection, general design, and monitoring procedures. Suggestions were made regarding application systems. A hypothetical project was used as a specific example of how this information might be applied by a designer or administrator in bringing a proposed land application facility to fruition.

609. Putting Wetlands to Work (Reprint, Mosaic, Volume 8, No. 3, May/June 1977)
June 1977
NSF/RA-770224 7p PB272453/NKS

This reprint reports on two research projects, conducted in Florida and Michigan, designed to ascertain the capability of wetlands to absorb partially treated wastewater from municipal facilities. These studies are part of a body of research that suggests that wetlands are ecological systems that not only can absorb treated effluents while treating them in a natural rather than energy-consuming, artificial way, but can benefit from the fertilization secondarily treated effluents provide. The research suggests that if the effort is based on understanding of the wetlands environments, it represents a way civilized man can return to a symbiotic relationship with an important part of his natural environment. There is substantial opportunity for small communities which occupy a large part of our geography to take advantage of the results of these experiments.

610. Utilization of Soil Invertebrates in Stabilization, Decontamination and Detoxification of Residual Sludges from Treatment of Wastewater (Interim Report)
State University of New York, School of Biology, Chemistry and Ecology
Hartenstein R, Mitchell MJ
June 1977 137p ENV7617225
NSF/RA-770138 PB271141/NKS

This research addresses the problem of reducing the organic matter content in sludge without destroying the value of sludge as a potential contribution to the soil ecosystem. Earthworms can be used effectively in a managerial sense to convert relatively infertile sludge into fertile, organic topsoil. Together with nematodes, bacteria, and other microorganisms, they can effect deodorization, destruction of Salmonella, and reduction of the unstable organic content of sludges. The soil system, with its diverse biological and stable physical components, is well adapted for the utilization of sludge. Research objectives focus on: (1) sludge toxicity to earthworms; (2) degradation and stabilization of sludge; (3) modification of certain chemical properties of sludge; (4) effect of soil macroinvertebrates on bacterial and nematode populations; and (5) effect of earthworms on salmonella typhimurium. Reports of the studies conducted during this project constitute the bulk of this document.

611. Water Policy and Decision-Making in the Colorado River Basin
University of California, Department of Political Science
Mann DE
July 1976 56p GI34840
NSF/RA-761128 PB273025/NKS

Traditional water policy in the Colorado River Basin has been under stress as new issues of water quality and energy development have arisen. Increasing salinity, demands from Mexico for improvements in the quality of water it receives from the basin, and 1972 water quality legislation have imposed new burdens on the decision-making system. The national demand for energy has led to competition for scarce water supplies and has threatened the existing pattern of resource use and style of living. The western states' public and their leaders appear to accept energy development but fear the consequences both for the environment and for their communities. The traditional politics of water development projects remains a strong feature of present decision-making, but there are significant weaknesses in the orientation and focus. There exist numerous organizations in the Rocky Mountain States and the Colorado River Basin that provide leadership and mobilize interests, but these organizations must be strengthened in order to meet the present political, environmental, and social challenges.

Earthquake Hazards Mitigation

612. Architects and Earthquakes
AIA Research Corporation
Botsai EE, Goldberg A, Fisher JL, et al.
1977 113p PFR7503286
NSF/RA-770156 PB271949/NKS

This primer attempts to: (1) develop a national awareness among the members of the architectural profession that earthquakes can and do occur east of the Sierra Nevada Mountains; (2) help architects understand the nature of earthquakes and the basic response of buildings to these unique forces; (3) emphasize how architectural planning and design affects the performance of buildings under earthquake conditions; (4) provide architects from geographical regions of varying degrees of seismic activity with a vocabulary with which to talk to clients and engineers about seismic resistance of buildings and their components; and (5) encourage further in-depth study by the architectural profession into the areas of building performance and seismic response. It begins with a discussion of basic geological and seismic phenomena that cause earthquakes, including types of structural systems and materials performance and interactions under earthquake forces. Following are discussions of how these basic structural movements translate into forces acting on building components, how these are likely to fail and what can be done. The final section discusses how these relatively simple technical design issues broaden into complicated social-economic-political issues.

613. Dynamic Soil Properties of Deep Pacific Ocean Clays

University of Washington, Department of Civil Engineering
Sherif MA, Khalid R, Ishibashi I

December 1976 200p AEN7515818
NSF/RA-761122 PB272432/NKS

The authors investigated the dynamic shear moduli and strength degradation for two seafloor sediments obtained from the deep Pacific Ocean; namely, a red clay (with high iron oxide content) and a yellowish brown pelagic clay. They succeeded for the first time in developing a viable dynamic test procedure for very soft clays. Based on the experimental data obtained on the red clay, they established a procedure by which only one experiment is needed to determine the complex shear modulus G* as a function of the strain level and the consolidation pressure. The following relationship was found: $G^* = \bar{\sigma}_c \left(\frac{1}{A\gamma_m + B}\right)$, where $\bar{\sigma}_c$ is the consolidation pressure and γ_m the applied shear strain. It was found that due to rearrangement of structure, the effect of the number of cycles on G* was negligible. Both clays lost strength when vibrated. The authors also discuss the damping of soils and the damping or energy loss coefficient.

614. Effect of Beam Strength and Stiffness on Dynamic Behavior of Reinforced Concrete Coupled Walls, Volume 1: Text

University of Illinois at Urbana-Champaign, Department of Civil Engineering
Lybas JM, Sozen MA

July 1977 255p ENV7422962
NSF/RA-770274 PB273876/NKS

This report attempted to develop an understanding of the response of reinforced concrete coupled wall systems to seismic loading. Five test structures (approximately one-twelfth scale) were subjected to one component of the earthquake base motion measured at El Centro, California (1940). The base motions caused yielding of the test structures. A sixth test structure was subjected to slowly applied cyclic lateral loading. The experimental program is outlined and the results presented. The details of experimental procedures, along with the characteristics of the test specimens and materials, are given in the appendix. An analytical study of the static hysteretic response of the test structures was undertaken. Equivalent viscous damping factors, consistent with the calculated overall structure hysteresis relation, were determined. The variation of damping factor with response mode and response amplitude and the feasibility of simulating the observed dynamic responses with a linear viscously damped analytical model were investigated. Both response-spectrum analyses and response-history analyses were performed. The experimental results were compared with the results of the analytical studies. Volume 2 contains tables and figures.

615. Effect of Beam Strength and Stiffness on Dynamic Behavior of Reinforced Concrete Coupled Walls, Volume 2: Tables and Figures

University of Illinois at Urbana-Champaign, Department of Civil Engineering
Lybas JM, Sozen MA

July 1977	340p	ENV7422962
NSF/RA-770275		PB273877/NKS

See Entry 614 for abstract.

616. Minimax Procedures for Specifying Earthquake Motion (Final Report)

Polytechnic Institute of New York
Drenick RF

December 20, 1976	91p	AEN7200219A01
NSF/RA-761124		PB272278/NKS

This research continued the development of a method which would enable earthquake engineers to make confident earthquake resistance guarantees. The method, applied to existing structures, leads to assessments of their earthquake resistance. They appear to be somewhat conservative but consistent with the design practices among experienced engineering firms. The method described in this report may be relied on by civil engineers in the design, and in design reviews, of structures in seismic regions. Several modifications and extensions of the method are possible. Their application in practice is likely to be most appropriate for structures whose social or economic value invites conservative design and some care and investment in the way it is achieved.

617. Pore Pressure Rise of Saturated Sands During Cyclic Loading

University of Washington, Department of Civil Engineering
Sherif MA, Tsuchiya C, Ishibashi I

February 1977	163p	AEN7515818
NSF/RA-770226		PB272433/NKS

A new method to predict the pore pressure rise in a sand deposit during dynamic loading is applicable to any type of dynamic loading (from uniform cyclic to random time history of loading such as imposed by actual earthquakes). The authors have found that the incremental rise in pore pressure for a given soil under a given condition during one cycle of loading is affected by stress history, cyclic effect, and stress intensity. These factors are defined in terms of pore pressure rise at the end of the preceding cycle, U_N-1, the equivalent number of cycles, N_{eq}, and the stress ratio, ζ_N/σ'N-1. The method presented is used to determine the liquefaction potential of sand with different densities under various types of loading, including actual earthquakes. Since this method is based on direct laboratory measurements, the authors believe that it is more dependable and easily applicable

to various sands. The liquefaction potential of partially saturated sands is also investigated and it is shown that they do liquefy and their liquefaction potential decreases with the decrease in the initial degree of saturation of the soil.

618. Reconstruction Following Disaster

Massachusetts Institute of Technology
Haas JE, Kates RW, Bowden JM
1977 363p APR7307898A02
NSF/RA-770018 PB272675/NKS

The sequence of events and processes by which a city recovers from disaster is explainable in terms of a few significant factors: emergency responses; restoration of the restorable; reconstruction of the destroyed for functional replacement; and reconstruction for commemoration, betterment and development. A four-stage model of recovery from disaster is presented, following which the authors examine the relevant evidence from Rapid City (South Dakota), Managua (Nicaragua), San Francisco (California), and Anchorage (Alaska). The study sought to determine: (1) if there are underlying forces which reshape a city and its institutions; (2) if city planning experts significantly influence disaster recovery or if early decisions by the more wealthy and powerful determine or inhibit what is done; (3) how extensively "outside" decision-makers and Federal policies determine what happens locally; (4) how families cope with their housing and disaster-related employment problems; (5) how early key decisions affecting land use and building codes have to be made; and (6) if predisaster reconstruction planning based on broad consensus speeds up postdisaster creation of a safer city with less potential conflict.

619. Saturation Effects on Soil Liquefaction

University of Washington, Department of Civil Engineering
Sherif MA, Ishibashi I, Tsuchiya C
February 1977 32p PFR7515818
NSF/RA-770227 PB272345/NKS

Liquefaction experiments are conducted with the Torsional Simple Shear Device on partially saturated loose Ottawa Sand with varying pore-pressure parameters $\bar{B}$ ranging from 0.25 to over 0.9. A relationship between the $\bar{B}$ value and the degree of soil saturation S_0 is established. Even soils with low degrees of saturation do liquefy and the pore-pressure build-up pattern in these soil samples is similar to that generated in fully saturated loose sands with densities less than 1.60 g/cm^3. Based on data acquired, the liquefaction potential for soils was found to decrease with decreasing degrees of saturation. In defining initial soil liquefaction potential, both the effective stress ratio and the effective stress path turnover point concepts yield the same results. Discussions of soil properties, the test device and test procedures followed during this investigation and the experimental data obtained are included.

Intergovernmental Science

620. California Innovation Group, Inc., CIG--A Special Report
California Innovation Group, Inc.
March 1977 71p ISP7624667
NSF/RA-770169 PB271420/NKS

The California Innovation Group (CIG) is concerned with the concept of applying scientific methodology toward the solution of municipal problems. Participants include local governments, high technology firms, universities, a full-time representative from the League of California Cities, and the individual Science Advisors resident in each participating jurisdiction. Coupled with this team is the technical resource of the Federal Laboratory Consortium, an association of over 70 major Federal Research Laboratories. Science and technology have become a much more acceptable and recognized source for new solutions to local government problems in the CIG cities. The Federal and local government investment for both the general operation of the program and special projects has been compared with the estimated cost savings, or cost avoidance, resulting from CIG activities. An implementation to savings ratio of 1.0:2.9 has been achieved to date for the CIG program. This report is limited to those projects that can show a clear cost savings. Summary estimates of costs and cost savings and a short explanation of the major projects covered are included.

621. Technology Transfer: Science and Technology Applied to Local Government Needs (National Symposium on Utilization of People-Related Research; Development, Test and Evaluation (RDT&E), San Diego, California, June 14-17, 1977
Navy Personnel Research and Development Center
1977 52p ISP7423795
NSF/RA-770220 PB272703/NKS

The purpose of this symposium was to assess the problems and needs of research utilization, principally within the military establishment. Special attention was given to an assessment of current problems in research utilization; an interchange of information on the state of the art from both outside and inside the military services; developing policy recommendations for improving research utilization within the military services; and projecting the parameters of requirements in and beyond the 1980's. This document contains speeches presented during a session devoted to technology transfer. Topics discussed include: (1) how to improve the planning process to achieve more effective technology transfer; (2) how to achieve a better match of overall city and state requirements and available technology; (3) the priority

needs of cities and states; (4) the characteristics of examples of successful technology transfer; and (5) measures to be taken to effect a two-way transfer process.

Research Reports From Former Programs

Energy Systems

622. Energy Based Analysis of Alternative Production Methods and Cropping Systems in the Corn Belt
Purdue University, Agricultural Experiment Station
Doering OC III
June 1977 47p AER7518726
NSF/RA-770125 PB273896/NKS

The main objective was to identify and evaluate cropping systems and production methods for major Corn Belt crops (corn, soybeans, wheat, and alfalfa) which would reduce the total energy inputs relative to the amount of product. The quantity and quality of inputs with respect to the quantity and quality of outputs were examined. Shifts in product quantity and quality were observed. It was necessary to account for the shifts in the quantity and quality of the total resources involved in the production process as energy based inputs were reduced, withdrawn, or applied at different times or places in the production processes. The approach was to broaden the scope of energy analysis to include variations and substitutions in resource use in the production process while monitoring changes in the final product. A data base and modeling approach were developed to account for some of the major interactions within and between agricultural systems: among basic natural environmental factors, among man-induced control factors, and between basic environmental and man-induced control factors.

623. Evaluating Alternative Energy Technologies in Agriculture
Purdue University, Agricultural Experiment Station
Doering OC III, Peart RM
June 1977 19p AER7518726
NSF/RA-770124 PB273895/NKS

The objective of this project was to identify and evaluate cropping systems and production methods for major Corn Belt crops (corn, soybeans, wheat, and alfalfa), which will reduce the total energy inputs required relative to production. The research attempts to: (1) analyze the technical feasibility of proposed systems; (2) analyze the economic feasibility of the energy-efficient systems; and (3) identify priority areas for implementation and for future research. Included in this paper are discussions of the crop energy simulator, the linear programming farm management model, and results, implementation and future research.

624. Industrial Demand for Energy

National Bureau of Economic Research, Inc.

Halvorsen R

May 1977 | 113p | SIA7516927

NSF/RA-770180 | PB271951/NKS

The characteristics of industrial demand for energy are examined. Chapter 2 reports the results on interfuel substitution in two-digit industries. Cost share equations derived from transcendental logarithmic (translog) unit cost functions are estimated with cross-section state data for 1971, 1962, and 1958. Results include estimates for each industry of own and crossprice elasticities of demand for electric energy, fuel oil, natural gas, and coal. The use of a unit cost function for energy assumes that energy inputs are separable from capital, labor, and other inputs. Separability is rejected for four of the eight industries for which it could be tested. The estimated price elasticities of demand are interpreted as long-run elasticities. In this study the model of demand for factors of production developed by Nadiri and Rosen (1969, 1973) is adapted to estimate dynamic demand equations for energy and other inputs for total U.S. manufacturing. All estimated short-run elasticities of demand for energy are statistically significant. Estimated long-run elasticities are similar to estimates in other studies.

625. Lorendas Model Documentation, Volume 1: Mathematical Concepts and Formulation*

Virginia Polytechnic Institute and State University

Rapoport LA, Boudrye CM, Edlund MC, et al.

May 1977 | 106p | SIA7418596A01

NSF/RA-770181 | PB272052/NKS

The worldwide Long-Range Energy Development and Supplies modeling system (LORENDAS System) is a computer-based system that serves to simulate all the operations and processes concerning the supply of energy, accounting for their technical and geographical interdependence and their evolution through time. The current Prototype I version of the model, the formulation and computer programs of which are presented in this report (Volume One of three) includes a simplified representation of gas supplies. This version encompasses the combination of the United States, Western Europe, and the principal oil exporting nations. The geographic system is modeled as detailed representations of 8 energy conversion/consumption areas, 14 energy producing areas, and 11 OPEC crude supply sources. The general approach is to exogenously stipulate the anticipated energy demands over time for the Consumption Areas, and seek the solution which meets these demands at a minimum present-valued cost. Mathematical-formulation overview; oil exploration, production, and transportation; coal production and transportation; nuclear fuel production formulation; oil refining; electric power generation and transmission; and distribution of energy to demand sectors are discussed.

*Volumes 2 and 3 will be available in the future.

626. Approach to Societal Risk Acceptance Criteria and Risk Management

University of California, School of Engineering and Applied Science
Okrent D, Whipple C

June 1977 38p OEP7520318
NSF/RA-770166 PB271264/NKS

A quantitative approach to risk acceptance criteria and risk management is proposed for activities involving risk to individuals not receiving direct benefits, such as employment, from the activity. Societal activities are divided into major facilities or technologies, all or part of which are categorized as essential, beneficial or peripheral, and a decreasing level of acceptable risk to the most exposed individual is proposed (say, 2×10^{-4}/year for essential, 10^{-5}/year for beneficial, and 2×10^{-6}/year for peripheral activity). The risk would be assessed at a high confidence level, providing an incentive to gaining better knowledge. Each risk-producing facility, technology, etc., would have to undergo assessment of risk to both the individual and society. The cost of the latter would have to be internalized, probably via a tax paid to the Federal government, which in turn would redistribute the benefit as national health insurance or reduced taxes to the individual. Risk aversion to large events would be built into the internalization of the cost of risk.

627. Catastrophic Events Leading to De Facto Limits on Liability

University of California, School of Engineering and Applied Science
Solomon KA, Okrent D

May 1977 37p OEP7520318
NSF/RA-770131 PB271427/NKS

This study conducts an overview of large technological systems in society to ascertain prevalence, if any, of situations that can lead to catastrophic effects where the resultant liabilities far exceed the insurances or assets subject to suit in court, thereby imposing de facto limits on liability. Several potential situations are examined: dam rupture, aircraft crash into a sports stadium, chemical plant accident, shipping disaster, and a toxic drug disaster. All of these events are estimated to have probabilities per year similar to or larger than a major nuclear accident and are found to involve potential liability far exceeding the available resources, such as insurance, corporation assets, or government revenues.

628. Look at Alternative Core Disruption Accidents in LMFBR's
University of California, School of Engineering and Applied Science
Chan CK, Min TK, Okrent D
February 1977 52p OEP7520318
NSF/RA-770130 PB267577/NKS

This report explores the course of a postulated accident scenario in an LMFBR involving rupture of all piping connected to the reactor vessel in the event of an earthquake (or an equivalent scenario involving both loss of heat removal and system rupture). The core is successfully shut down but decay heat imposes a threat to core integrity. A detailed outline of the analytical method used to evaluate the system response in the event of a loss of the piping integrity is presented. In the analytical model, a compromise is made between simplicity and accuracy, in order to bring out the significant physics of the problem. Numerical data are computed and presented where the design data of the CRBRP are chosen for the calculation, and discussion of the results is included. A list of references and the details of the technical information used are also included.

629. Some Aspects of the Fire Hazard in Nuclear Power Plants
University of California at Los Angeles, School of Engineering and Applied Science
Kazarians M, Apostolakis G
July 1977 70p OEP7520318
NSF/RA-770231 PB272686/NKS

This is an investigation of fire as a potential threat to the safety of a nuclear power plant. A qualitative description of ignition mechanisms and factors affecting the growth of fire (detection mechanisms, extinguishing efforts, etc.) is presented and an estimate of the frequency of fires in nuclear power plants is given. Variations of the Browns Ferry fire incident are analyzed probabilistically and the results of different models are compared. Finally, the effect of using water to extinguish the fire on the probability of core damage is studied, based on the Browns Ferry actual sequence of events.

630. Study of the Future: An Agenda for Research
Futures Group, Inc.
July 1977 328p GI37178
NSF/RA-770036 PB271303/NKS

This document addresses the research goals that must be pursued in order to: anticipate and cope with the future; perceive, evaluate and control the effects of our actions; and imagine and create more desirable futures. The report is concerned with the various beliefs, methods, practices and results associated with a kind of forecasting that is now referred to as "futures research." Part 1 presents a new perspective on forecasting

methodology, the validity of forecasting systems, and the nature of unforeseen developments. Part 2 discusses attitudes toward forecasting in political science and sociology, technological forecasting, forecasting in economics, forecasting and its impact on policymaking, problems in futures research, and forecasting when the future is known, such as in the Soviet Union. Part 3 presents the futures field: functions, forms and critical issues, communications in futures research and the monitoring of the future. Part 4 contains an agenda for futures research and a statement of research needs. An appendix presents results from a survey of current forecasting efforts.

Fire Research

631. Evaluation of the Cost-Effectiveness of Alternate Design Concepts for Reliable, Low-Cost Sprinkler Systems for Use in Low Fire Load Occupancies (Fourth Quarterly Progress Report)

Battelle Columbus Laboratories
Henderson NC
July 29, 1977 57p C7619323
NSF/RA-770188 PB271647/NKS

The purpose of this research program is to establish the technical design criteria for a low-cost sprinkler system through analytical and experimental research, and to evaluate the cost-effectiveness of alternate sprinkler design concepts suitable for use in low fire load occupancies. Research was directed toward these subtasks: (1) completion of thermal mapping data analysis; (2) thermal evaluation of spray nozzles with the propane fired burner; (3) thermal and gas data acquisition of water spray interaction with crib fires; (4) thermal and gas data acquisition of water spray interaction with upholstered furniture fires; and (5) preliminary draft of a residential sprinkler standard based on research results to date. An appendix, "Automatic Dwelling Sprinkler System Design Standard," is also included.

Non-Renewable Resources

632. Geophysics Applied to Detection and Delineation of Non-Energy Non-Renewable Resources (Workshop on Mining Geophysics)

University of Utah, Department of Geology and Geophysics;
U.S. Steel Corporation;
Cities Service Minerals Corporation;
Kennecott Exploration, Inc.;
Asarco, Inc.;
Bear Creek Mining Company
Ward SH, Campbell R, Corbett JD, et al.

March 1977 314p AER7680802
NSF/RA-770173 PB271952/NKS

This workshop was intended to explore the needs for research in mining geophysics related to non-energy non-renewable resources. Participants included mining geophysicists in the United States and Canada who are concerned with exploration for base metals. State-of-the-art reports were presented in the areas of induced polarization, resistivity, self-potential, electromagnetic, remote sensing and nuclear methods, and case histories. Participants compiled and presented a list of high priority research items.

633. Feasibility Studies of In-Situ Coal Gasification in the Warrior Coal Field (Semi-Annual Report)

University of Alabama, College of Engineering
Douglas GW, McKinley MD

February 1976 35p AER7504512
NSF/RA-760155 PB272476/NKS

This report describes a research project designed to simulate in-situ coal gasification to measure its feasibility. The current two-year project is the first phase of a two-phase program. Phase I is planned to conduct laboratory and analytical work with some preliminary field work to locate a potential gasification site in order to establish coal properties and identify geological variables. Included in the text are progress reports on site selection, heat effects, combustor design, groundwater contamination, instrumentation, coal pyrolysis, and hydraulic fracturing.

Renewable Resources

634. Analyses of Grain Reserves, A Proceedings

U.S. Department of Agriculture, Economic Research Service
Eaton DJ, Steele WS

August 1976 206p
NSF/RA-761118 PB271414/NKS

A conference was organized to bring together many of the active researchers studying grain reserves. Two sessions were held,

one dealing with the world, and the other with national, grain reserves. The papers presented suggest some major research directions in the area of grain reserves. A policy perspective to define the problems an international grain reserve is designed to resolve, the implications of establishing a national reserve, and frameworks for policy analyses are presented. The eight other papers present analytical approaches to world or national grain reserves. The authors have used several methodologies in developing their analyses, including stochastic supply, demand analysis, single objective, multi-objective optimization, systems dynamics, and multimodel simulation.

635. Development and Adaptation of Field Modulated Generator Systems for Wind Energy Applications (Final Report)
Oklahoma State University, School of Electrical Engineering
Ramakumar R, Hughes WL, Allison HJ, et al.
August 1976 420p AER7500647
NSF/RA-760484 PB272495/NKS

The objectives of this project are to develop a mathematical model and understanding of the field modulated generator system culminating in usable design curves for optimum performance over the selected operating speed range; and to study the problems and arrive at control philosophies and peripheral equipment needed to operate a wind-driven field modulated generator system in parallel with a conventional power system. The first objective is approached by dividing the modeling problem into several subproblems for separate studies: details of the analysis and results of the study of the parallel-bridge rectifier systems (PBRS) with capacitors at bridge-inputs; the development of the idealized model of the field modulated generator system; the results of the studies on the electronic subsystem; and the results of the filtering studies aimed at designing a band pass filter. The second project objective is approached both theoretically and experimentally. Preliminary theoretical considerations of the control problem and the test set-up and experimental facilities are described. Sixteen papers, attached as appendices, comprise a large portion of this technical report.

636. Heat Extraction from Hot, Dry Rock Masses (Progress Report, August 1, 1976 - January 31, 1977)
Northwestern University
Weertman J, Achenbach JD, Bazant ZP, et al.
March 1977 82p AER7500187
NSF/RA-770172 PB271411/NKS

In analytical studies of three-dimensional crack growth and shape, crack orientation has been studied and the condition of a circular crack has been relaxed; a method is under study to determine the crack shape when the pressure of fluid in the crack is prescribed. The growth and stability of parallel, thermally induced edge cracks have been investigated as a function

of a thermal wave progressing from a free surface, both analytically and by finite element numerical techniques. The geometrical theory of diffraction in three-dimensional elastodynamics has been applied to the problem of diffraction by a large crack of a signal emanating from a point source. Fluid flow paths have been calculated for flow within two-dimensional elliptical cracks with line source near one end and a line sink near the other end.

637. Impact of Solar Heating and Cooling on Electric Utilities (Final Report)

Puerto Rico Water Resources Authority, Electrical Planning and Research Division

Ortiz NR, Llavina R Jr, Sanchez JA, et al.

December 29, 1976 92p APR7518301

NSF/RA-760595 PB271415/NKS

This project investigated the possible effect of solar heating and cooling systems on the base load, peak demand, generating system, transmission system, and financial structure of the Puerto Rico Water Resources Authority (PRWRA) up to the fiscal year 1986-87. Heating and cooling loads were defined in terms of their number, their energy consumption, and their load pattern. Estimates of their load were validated through load survey measurements on a selected statistical sample of PRWRA's customers. The effect of solar heating and cooling on the utility was found to be of minor significance, although a revision of the existing rate structure would be required within three or four years.

638. Legal-Institutional Implications of Wind Energy Conversion Systems (WECS) (Executive Summary)

George Washington University, Program of Policy Studies in Science and Technology

Mayo LH

September 1977 39p APR7519137

NSF/RA-770203 PB273006/NKS

The legal issues presented by wind energy conversion systems (WECS) utilization are often closely related to its structural and technological features, as well as to its economic and social implications. Some information about wind systems and their likely applications and problems are briefly stated, and the most significant legal obstacles to the use of land-based WECS are described. The features of the existing legal structure which may facilitate the implementation of such systems are noted. The authors summarize the ways the legal situation varies with particular applications and suggest which applications pose the greatest legal difficulties. A separate section is devoted to the subject of offshore wind systems.

639. Microcrack Technology for Geothermal Exploration and Assessment (Progress Report)
Massachusetts Institute of Technology, Department of Earth and Planetary Sciences
Simmons G, Batzle ML
July 1, 1977 229p AER7509588
NSF/RA-770179 PB271940/NKS

The microcracks and various physical properties of cores of six geothermal areas are studied: Dunes, Heber, and Coso Hot Springs in California; Raft River, Idaho; Marysville, Montana; and Roosevelt Hot Springs, Utah. The fractures in the core samples and their characteristics are studied by a variety of techniques. The open fracture content is examined by differential strain analysis which provides a precise measure of fracture porosity as a function of pressure. Data can be interpreted in terms of fracture orientation, distribution, and shape characteristics. Petrographic methods, including optical microscopy, scanning electron microscopy, electron microprobe, and cathodoluminescence are being used to examine crack morphology, alteration and veining materials, and general textures. These methods are used to determine the relationships among open, healed, and sealed fractures. Resistivity and permeability measurements are essential for determining the effect of the measured and observed fracture characteristics on bulk rock properties.

640. Wind Energy Conversion Research, Recent Publications
National Science Foundation
March 1977 23p
NSF/RA-770202 PB271942/NKS

Fourteen reports, listed separately, are indicated by RANN number, including title, performing organization, author, date, grant number, abstract, descriptors, and availability. Also included in this bulletin is a list of 14 Sandia laboratory reports which address primarily the Darrieus vertical axis system and wind data. Author, title, report number, date, length, and price are provided for each. Nine other solar energy publications with wind energy sections also are listed, giving title, performing organization, grant number, date and availability.

641. Solar Energy Dehumidification Experiment on the Citicorp Center Building (Final Report)
Massachusetts Institute of Technology, Energy Laboratory
June 1977 160p PTP7505156
NSF/RA-760003 PB271174/NKS

The technical and economic feasibility of using solar energy to reduce conventional energy consumption of a large urban commercial

building was studied in depth. Specifically, solar assisted dehumidification of ventilation air to reduce conventional air conditioning requirements for the Citicorp Center in New York City was investigated. A detailed computer simulation of yearly operation was made on an hourly basis using New York City temperature, humidity and solar data. Several system configurations were examined and were defined, each operating in its most efficient fashion. Maximum energy savings could be achieved by the following, in order of decreasing impact: optimization of the operation of the conventional system; use of additional conventional equipment for energy savings, and use of the solar assisted system.

Resource Systems

642. Electric Power and Synthetic Fuels Industries in the Southwest: Production and Environmental Control Technologies

Resources for the Future, Inc.
Harrington W, Abbey D, Sawyer JW Jr
August 1977 229p AER7516163A01
NSF/RA-770233 PB273847/NKS

This report is concerned with the technologies most likely to be employed in the development of the vast coal and oil shale resources that underlie the arid and mountainous lands of the American Southwest. Electric power production, gasification and liquefaction of coal, and liquid fuels production from oil shale evoke a concern with the potential environmental impacts, particularly those relating to water consumption and the discharge of residuals, and with the extent to which these impacts can be mitigated by the application of control technology. This document focuses on: (1) the chemistry, reserves, and production of coal; (2) technologies for fossil fuels--electric power production, energy transportation, synthetic gas, syncrude from coal, and the oil shale industry; (3) control technologies; (4) cooling system functions; and (5) the changing energy picture in the Southwest.

Technology Assessment

643. Appropriate Technology in the United States - An Exploratory Study

Integrative Design Associates, Inc.
1977 59p ERS7621350
NSF/RA-770066 PB273099/NKS

The study surveys those in the United States active in the field of appropriate technology, describes their efforts, explores factors inhibiting the development and application of their innovations,

reports on their recommendations for Federal and National Science Foundation activities in support of appropriate technology, and assesses the policy implications of appropriate technology in relation to an environmentally and resource-constrained economy. Two hundred ninety-four individuals and groups from target populations concerned with issues related to the environment, local participation in planning and technology development, and unemployment/income stabilization responded to the survey. This report explains the methodology used to elicit and interpret information; presents the background information about the respondents; reports on major issues of several innovator constituencies; analyzes the survey experience and examines the social and economic trends in both the U.S. and the developing countries which are related to appropriate technology.

644. Assessing Biomedical Technologies: An Inquiry into the Nature of the Process

National Academy of Sciences, National Research Council

July 1, 1977	127p	C310
NSF/RA-770114		PB271162/NKS

This report is a critical and interpretive synthesis of the discussions, preparatory analyses, and subsequent comments resulting from the Hanover conference organized by the Committee on the Life Sciences and Social Policy (CLISSP) of the National Research Council. The purpose is to discover if and how technology assessment might be applied to biomedical technologies and what the intellectual and practical return from such an application might be. Technologies selected for study include in vitro fertilization of human oocytes and their subsequent nurture and growth; the predetermination of the sex of children; the retardation of aging; and modification of behavior by neurosurgical, electrical, or pharmaceutical means. Each study attempts to: (1) illustrate the range of questions required for a broad analysis of the physiological, psychological, and social implications of the technology; (2) illuminate some of the major issues at stake; and (3) identify areas of ignorance requiring further inquiry.

645. Extending the Human Life Span: Social Policy and Social Ethics

University of Chicago, Committee on Human Development

Neugarten BL, Havighurst RJ

1977	73p	GI39091
NSF/RA-770123		PB273845/NKS

This document contains papers and discussions dealing with extension of the human life span, which emanated from a conference attended by social and biological scientists, policymakers, and social ethicists. Authors were asked to focus on the general question of basic biological research that might lead to extending the longevity of the human species. Two papers

describe the state of knowledge regarding human longevity and the prospects for a major extension of the lifespan. Another describes two approaches to life extension and the possible social consequences of each. Another paper presents some of the social issues as seen by a government official and some of the problems of government regulation. Three papers are on the ethical issues of life extension, indicating how specific questions regarding life extension relate to what constitutes a good life in a good society.

646. Hail Suppression Impacts and Issues: Technology Assessment of the Suppression of Hail (Final Report)

Illinois State Water Survey
Changnon SA Jr, Davis RJ, Farhar BC, et al.
April 1977 443p ERP7509980
NSF/RA-770160 PB271547/NKS

The TASH (Technology Assessment of the Suppression of Hail) study is intended to gather all the considerations involved in the application of hail suppression in order to ascertain its net value to society. It attempts to describe the current knowledge of hail suppression; identify long-range expectations for such a technology; estimate the societal impacts that might be generated by its wide use; and examine public policy actions that would most equitably direct its beneficial use. Part 1 presents the problem of hail, how and where it occurs, and the damage it causes. Part 2 presents a historical overview, a description of the scientific principles and mechanisms of the technology, an identification of the direct, major stakeholders (farmers, the insurance industry, etc.), and an examination of the socio-political, legal, and environmental factors that affect the use of the hail suppression technology. Part 3 demonstrates the national concerns that could motivate use of a technology that could alleviate hail damage and presents the three scientific models that were developed in the study. Part 4 considers options and recommendations for public policy actions and for research.

647. Potential Impacts of Automation and User Fees Upon Technical Libraries (Final Report)

Forecasting International, Ltd.
Clayton A, Nisenoff N
June 30, 1977 185p ERP7509118
NSF/RA-770163 PB271418/NKS

This project examines the impacts of the introduction in technical libraries of some degree of automated data processing, and/or their adoption of a "fee for service" policy. The effort has concentrated upon libraries which form a link in the chain of STI dissemination, especially for research purposes. Both positive and negative impacts are considered, as they may concern various levels of societal units, from the individual library user

or employee, to the administrative, institutional, regional or national entities whose roles are affected. The study attempts to combine a discussion of broad consequences of automation or charging in research libraries, with narrowly focused examples of the impact of specific instances of such innovations.

648. Remote Sensing: A Partial Technology Assessment (Final Report)
Environmental Research Institute of Michigan
Zissis GJ, et al.
May 1977 790p ERS7614462
NSF/RA-770167 PB271278/NKS

This report is a partial assessment of remote sensing technology intended to: (1) define and structure the technology assessment problem; (2) compile the necessary data bases; (3) identify some possible impacts as they relate to remote sensing technology, with emphasis on the visible and infrared portions of the electromagnetic spectrum, especially in satellite systems like LANDSAT; (4) develop an assessment procedure; and (5) do pilot analyses to test the merits of this procedure. Section 1 presents recommendations, general and specific conclusions, and background material--including discussions on the value of information, our technology assessment procedure, and policy analysis. Sections 2 and 3 provide the data bases compiled for the study. The Physical Data Base covers remote sensing hardware, data processing and interpretation, and environmental applications. The Social Data Base covers social, political, and economic considerations vis-a-vis various programs, agencies and institutions.

649. Technology Assessment of Biological Substitutes for Chemical Pesticides (Final Report)
Midwest Research Institute
Lawless EW, Von Rumker R, Kelso GL, et al.
November 1976 516p C849
NSF/RA-760447 PB272073/NKS

The authors identified a group of pest control technologies that would not depend on extensive first-choice reliance on conventional chemical pesticides, and made the assessment for this group. The assessment began with a survey of the driving forces of using pest control in general, and of the reasons why biological and related methods might be substituted for chemicals. The types of pest problems that major pesticide user groups have, and the approaches they use to control various pests were reviewed, as were government regulations developed to control the use of chemical pesticides and of those that might apply to the proposed use of biological and related methods. Studies were made of the current state of development, production, and extent of use of chemical pesticides, and of the human health, environmental, economic, and other benefits or problems and controversies that

accompany this usage. Two scenarios were developed reflecting alternative growth patterns through the year 1990 for both chemical and biological methods.

650. Technology Assessment of Integration of the Hog-Pork Industry (Final Report)
Midwest Research Institute
Smith IC, Allen AD, Gadberry H, et al.
July 8, 1977 198p C850
NSF/RA-770162 PB271419/NKS

This is primarily a policy study designed to focus on the industrialization of the hog-pork industry through vertical integration or increased coordination. By identifying the consequences associated with various changes in industry structure, this document attempts to discover the advantages and disadvantages of industrialization and discusses the policy and action alternatives for channeling future industry changes. An overview of the hog-pork industry, new patterns of industry organization and their impact, and policy issues and options constitute the bulk of this report.

651. Technology Assessment of Telecommunications/Transportation Interactions, Volumes 1-3 (Final Report)
Stanford Research Institute
Harkness RC
May 1977 1366p C1025
NSF/RA-770159SET PB272693SET

See Entries 652-654 for abstracts.

652. Technology Assessment of Telecommunications/Transportation Interactions, Volume 1: Introduction, Scenario Development and Policy Analysis (Final Report)
Stanford Research Institute
Harkness RC
May 1977 195p C1025
NSF/RA-770157 PB272694/NKS

This "technology assessment" identified and analyzed the social, economic and environmental consequences of possible future changes in the relationships between telecommunications and transportation. Scenarios were used to describe these changes. Effort was focused on three types of scenarios: (1) audio or audio-video teleconferencing as a substitute for face-to-face meetings and business travel by air or auto; (2) increased decentralization of office employment from city centers to suburban locations resulting from more teleconferencing and thus less need for physical agglomeration; and (3) office employees using terminals to work at home or in neighborhood office centers near home. The scenarios were

found to have significant implications for energy conservation, urban development, commuting, mass transit, job accessibility for persons unable to commute, communications within organizations, residential locational freedom, the telecommunications industry, the airline industry, and other areas. This concept of moving information to people is offered for widespread consideration by planners, policy-makers, industry, and the public.

653. Technology Assessment of Telecommunications/Transportation Interactions, Volume 2: Detailed Impact Analyses (Final Report)

Stanford Research Institute
Harkness RC
May 1977 | 1058p | C1025
NSF/RA-770158 | PB272695/NKS

See Entry 652 for abstract.

654. Technology Assessment of Telecommunications/Transportation Interactions, Volume 3: Contributions of Telecommunications to Improved Transportation System Efficiency (Final Report)

Stanford Research Institute
Moon AE, Johnson JM, Meko ER, et al.
May 1977 | 127p | C1025
NSF/RA-770159 | PB272696/NKS

Telecommunications expenses constitute a small fraction (about 2%) of the monies paid out by the transportation industry; however, the role of telecommunications is vital in providing for safe and efficient operation. This report describes the use of telecommunications in the transportation industry by sectors, including pipelines, railroads, motor trucking, aviation, and urban transportation. Proposals for increased use of telecommunications are also examined and evaluated. The conclusions of the report are that there are several significant new applications for telecommunications to support transportation activities, but that the importance of telecommunications as a fraction of transportation expenses will not dramatically increase. Economically justified proposals for new applications will require an investment of about $3 billion over the next 20 years. This is less than the expected investment in current technology over the same period. The justifications for increased use of telecommunications are reduction in personnel needed to operate systems; reductions in the need for equipment through more efficient management of assets; and substitution of telecommunications investment for construction to increase capacity of highways, railways, and airways. The authors find that such a substitution will usually result in a savings of scarce material resources without the environmental and social disruption that would result from from construction.

655. Environment, Recent Awards for Problem-Focused Research Applications
National Science Foundation
December 1977 10p
NSF 78-9 and NSF/RA-780148

This is a quarterly publication listing recently awarded grants in the areas of Earthquake Hazards Mitigation, Chemical Threats to Man and the Environment, Alternative Biological Sources of Materials, and Community Water Management. Available free from the Division of Problem-Focused Research Applications, Directorate for Applied Science and Research Applications, Room 1136, National Science Foundation, Washington, D.C. 20550.

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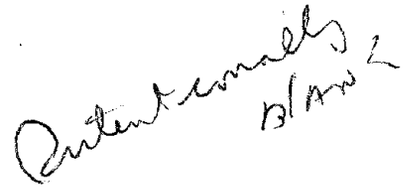

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PREVIOUS ISSUES UNDER TITLE RECENT RANN REPORTS

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1-67	October 1976	PB265973	$4.50
68-175	January 1977	PB265989	4.50
176-341	May 1977	PB268446	5.25
342-482	September 1977	PB274121	5.25

PREVIOUS ISSUES UNDER TITLE RECENT RESEARCH REPORTS

Inclusive Entry Numbers	Date of Publication	NTIS Number	Price
483-558	February 1978	PB278530	$4.50

Corrections to Previous Issues

It has been brought to our attention that entries 345 and 346 of the September 1977 issue and entries 487-490 of the February 1978 issue should have appeared under the heading "Regional Environmental Management" instead of under "Chemical Threats to Man and Environment."