1. Record Nr. UNINA9910953850703321

Titolo	Directions in engineering research : an assessment of opportunities and needs / / report of the Engineering Research Board, Commission on Engineering and Technical Systems, National Research Council
Pubbl/distr/stampa	Washington, D.C., : National Academy Press, 1987
ISBN	9786610246892 9781280246890 1280246898 9780309555104 0309555108 9780585006673 0585006679
Edizione	[1st ed.]
Descrizione fisica	1 online resource (363 p.)
Disciplina	620/.0072
Soggetti	Engineering - Research - United States Research - United States
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Bibliographic Level Mode of Issuance: Monograph
Nota di bibliografia	Includes bibliographies and index.
Nota di contenuto	Directions in Engineering Research -- Copyright -- Acknowledgments -- ENGINEERING RESEARCH BOARD -- PANEL ON BIOENGINEERING SYSTEMS RESEARCH -- PANEL ON CONSTRUCTION AND STRUCTURAL DESIGN SYSTEMS RESEARCH -- PANEL ON ENERGY, MINERAL, AND ENVIRONMENTAL SYSTEMS RESEARCH -- PANEL ON INFORMATION, COMMUNICATIONS, COMPUTATION, AND CONTROL SYSTEMS RESEARCH -- PANEL ON MANUFACTURING SYSTEMS RESEARCH -- PANEL ON MATERIALS SYSTEMS RESEARCH -- PANEL ON TRANSPORTATION SYSTEMS RESEARCH -- Preface -- ENGINEERING RESEARCH BOARD -- PANEL ON BIOENGINEERING SYSTEMS RESEARCH -- Contents -- Directions in Engineering Research: An Assessment of Opportunities and Needs -- EXECUTIVE SUMMARY -- Introduction and Background -- The Nature of Engineering Research -- Funding Outlook -- Human Resources -- Institutional Considerations -- Recommendations -- Key Research Opportunities and Needs --

Conclusion -- INTRODUCTION AND BACKGROUND -- What is Engineering Research? -- What is the Value of Engineering Research to Society? -- Past Accomplishments -- Future Possibilities -- Why is Engineering Research Essential? -- What is the Current Status of Engineering Research? -- KEY ENGINEERING RESEARCH OPPORTUNITIES -- The "Systems" Context -- Criteria For Selecting Research Needs -- Selected Research Areas -- Bioengineering Systems -- Construction and Structural Design Systems -- Energy, Mineral, And Environmental Systems -- Information, Communications, Computation, and Control Systems -- Manufacturing Systems -- Materials Systems -- Transportation Systems -- Cross-Cutting Research Needs -- Computers -- Modeling and Simulation -- Systems Integration -- Processes and Processing -- ISSUES THAT DETERMINE THE HEALTH OF ENGINEERING RESEARCH -- Summaries: The Health of the Selected Fields -- Bioengineering -- Construction and Structural Design -- Energy, Minerals, and the Environment.
Information, Communications, Computation, and Control -- Manufacturing -- Materials -- Transportation -- Funding Issues -- Support for R&amp -- D -- Support for Engineering Research -- The NSF's Role -- Factors Affecting Support -- Research Facilities -- Adequacy of Personnel Resources -- Ph.D. Production -- Faculty -- POLICY ISSUES REGARDING SUPPORT OF ENGINEERING RESEARCH -- Federal Government Policies -- Basis for Federal Support of Research -- Need for Stability -- Need for Better Coordination -- Mission Orientation and Overmanagement -- Importance of the Individual Project Grant -- Role of the Federal and National Laboratories -- The DOD: Policies Toward Research -- Encouragement of Research in Industry -- University Policies -- Encouraging Faculty Flexibility -- Junior Faculty -- Senior Faculty -- Cross-Disciplinary Research and Education -- Maximizing the Use of Facilities -- Policies Toward Graduate Study -- Attracting High-Quality Students -- New Programs -- Policy Issues for Industry -- Increased Support of Fundamental Research -- Professional Development -- Cooperation -- Improving Interaction Among the Sectors -- REFERENCES -- Bioengineering Systems Research in the United States: An Overview -- EXECUTIVE SUMMARY -- Recommendations -- INTRODUCTION -- Rationale for a Study -- Scope of the Study -- Background -- ESPECIALLY IMPORTANT OR EMERGING AREAS OF BIOENGINEERING SYSTEMS RESEARCH -- Biomedical Engineering -- Systems Physiology and Modeling -- Neural Prostheses for Human Rehabilitation -- Biomechanics -- Biomaterials -- Biosensors -- Metabolic Imaging -- Minimally Invasive Medical Procedures -- Artificial Organs -- Biochemical Engineering -- Biocatalysis/Bioreactors -- Separation and Purification -- Bioprocess Instrumentation and Control -- ISSUES DETERMINING THE HEALTH OF THE FIELD -- Impact of Federal Policy -- NSF Support.
NIH Support -- The National Academies -- Changing Emphasis in Funding -- Industry Involvement -- Biotechnology -- Biomedical Engineering -- Bioengineering in Other Countries -- Availability of Bioengineering Research Manpower in the United States -- Biomedical Engineering -- Biochemical Engineering -- CONCLUSIONS AND RECOMMENDATIONS -- REFERENCES -- APPENDIX RESPONSES TO THE ENGINEERING RESEARCH BOARD'S REQUEST FOR ASSISTANCE FROM UNIVERSITIES, PROFESSIONAL SOCIETIES, AND… -- Construction and Structural Design Systems Research in the United States: An Overview -- EXECUTIVE SUMMARY -- RECOMMENDATIONS -- INTRODUCTION AND BACKGROUND -- POLICY ISSUES REGARDING FEDERAL SUPPORT OF RESEARCH -- ISSUES THAT DETERMINE THE HEALTH OF THE FIELD -- The Adequacy of New Research Talent -- Factors Affecting Research

Support -- The Nature of the Product -- The Discipline's Status at Universities -- Industry Sponsorship of Research -- Attitudes of Practitioners and of the Public -- Perception of a Permanent U.S. Market Dominance -- ESPECIALLY IMPORTANT AREAS OF CONSTRUCTION AND STRUCTURAL DESIGN SYSTEMS RESEARCH -- Construction Robotics -- Computer-Aided Design -- Nonlinear Behavior and Analysis -- Proportioning of Elements of Structural Systems -- Coordination of Analysis and Experiment -- Realism in Design Analysis -- Interactive Computer Graphics -- Fabrication -- Synthesis of Alternatives -- Rapid Excavation -- Mixed Construction -- Marine Construction -- APPENDIX RESPONSES TO THE ENGINEERING RESEARCH BOARD'S REQUEST FOR ASSISTANCE FROM UNIVERSITIES, PROFESSIONAL SOCIETIES, AND… -- Energy, Mineral, and Environmental Systems Research in the United States: An Overview -- EXECUTIVE SUMMARY -- INTRODUCTION -- Background -- Scope -- POLICY ISSUES -- Basis for Federal Policies on the Support of Research -- Need for Long-Term Continuity in Support of Research.
Rethinking Roles -- ISSUES DETERMINING THE HEALTH OF ENERGY, MINERAL, AND ENVIRONMENTAL SYSTEMS RESEARCH -- Funding Trends -- Energy -- Environment -- Mineral Resources -- Overview -- Human Resources -- RESEARCH OPPORTUNITIES -- Environment -- Combustion -- Microbial Transformation -- Assimilative Capacity of the Global Environment -- Sensors and Measurement Methods -- Energy -- Alternative Fossil Fuel Sources and Technology -- Solar Energy -- Improved Petroleum Production Systems -- Improving the Nuclear Option -- Integrated Environmental Control Systems -- Efficient Use of Energy -- Fuel Quality -- Extending Plant Lifetimes -- Energy Storage -- Mineral Resources -- Sensors -- Systems Analysis and Control -- In-Situ Leaching and Burning -- Colloidal and Biological Processes -- Size Reduction Methods -- REFERENCES -- APPENDIX RESPONSES TO THE ENGINEERING RESEARCH BOARD'S REQUEST FOR ASSISTANCE FROM UNIVERSITIES, PROFESSIONAL SOCIETIES, AND… -- Research Needs -- Policy and Health Issues -- Information, Communication, Computation, and Control Systems Research in the United States: An Overview -- EXECUTIVE SUMMARY -- Recommendations -- INTRODUCTION -- RESEARCH NEEDS-THE MOST IMPORTANT AREAS OF INFORMATION, COMMUNICATIONS, COMPUTATION, AND CONTROL SYSTEMS RESEARCH -- Hardware Elements -- Computer Devices -- Integrated Circuits -- High-Density Structures and Fabrication -- Packaging and Interconnection Technology -- Magnetic and Optical Storage -- Hardware and Subsystem Testing -- Communications -- Sensors for Control of Systems -- System Architecture, Algorithms, and Software -- Communications -- Computer Software -- Parallel Computation -- Special Purpose Parallel Architectures -- Parallel Architectures for Numerical Computation -- General Purpose Parallel Architectures -- Man-Machine Interactions and Artificial Intelligence -- Rule-Based Expert Systems.
Knowledge-Based Systems -- Natural Language Understanding -- Robotics and Automation -- Control Systems -- POLICY ISSUES ON FEDERAL SUPPORT OF RESEARCH -- Scope -- Issues -- The NSF'S Role in Support of Academic Research in IC3 Systems Engineering -- The DOD's Role -- Recommendation -- The Federal Role in Encouraging Research in Industry -- Recommendation -- Industry-University Cooperation -- Recommendations -- THE HEALTH OF THE FIELD: AN ASSESSMENT -- The Health of the Educational System -- Faculty -- Recommendations -- Equipment and Facilities -- Recommendation -- Cross-Disciplinary Research -- Recommendation -- Human Resources:

Adequacy of New Talent -- The B.S. and M.S. -- The Ph.D. -- Recommendation -- REFERENCES -- APPENDIX RESPONSES TO THE ENGINEERING RESEARCH BOARD'S REQUEST FOR ASSISTANCE FROM UNIVERSITIES, PROFESSIONAL SOCIETIES, AND… -- Manufacturing Systems Research in the United States: An Overview -- EXECUTIVE SUMMARY -- INTRODUCTION AND BACKGROUND -- THE MANUFACTURING RESEARCH AGENDA -- Systems Integration -- Modeling, Simulation, Control, Networks -- Unit Processes -- ISSUES THAT DETERMINE THE HEALTH OF MANUFACTURING SYSTEMS RESEARCH -- Government Support of Manufacturing Systems Research -- Problems in Manufacturing Engineering -- Formation of Research Consortia: A High-Priority Need -- ASSESSMENT OF THE ADEQUACY OF NEW TALENT -- RECOMMENDATIONS -- Bibliography -- APPENDIX RESPONSES TO THE ENGINEERING RESEARCH BOARD'S REQUEST FOR ASSISTANCE FROM UNIVERSITIES, PROFESSIONAL SOCIETIES, AND… -- Materials Systems Research in the United States: An Overview -- EXECUTIVE SUMMARY -- INTRODUCTION AND BACKGROUND -- Introduction -- The Need -- Scope of the Report -- Background -- ESPECIALLY IMPORTANT OR EMERGING AREAS OF MATERIALS SYSTEMS RESEARCH -- Rationale for Selection -- Emerging Research Areas -- Material for Specific End Uses.
Advanced Ceramics.

Sommario/riassunto

Surveying the dynamic field of engineering research, Directions in Engineering Research first presents an overview of the status of engineering research today. It then examines research and needs in a variety of areas: bioengineering; construction and structural design; energy, mineralogy, and the environment; information science and computers; manufacturing; materials; and transportation. Specific areas of current research opportunity are discussed in detail, including complex system software, advanced engineered materials, manufacturing systems integration, bioreactors, construction robotics, biomedical engineering, hazardous material control, computer-aided design, and manufacturing modeling and simulation. The authors' recommendations call for funding stability for engineering research programs; modern equipment and facilities; adequate coordination between researchers; increased support for high-risk, high-return, single-investor projects; recruiting of new talent and fostering of multidisciplinary research; and enhanced industry support. Innovative ways to improve the transfer of discoveries from the laboratory to the factory are also presented.