

Biology Board Of Studies

Determining Core Capabilities in Chemical and Biological Defense Science and Technology National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Board on Chemical Sciences and Technology, Committee on Determining Core Capabilities in Chemical and Biological Defense Research and Development. 2013-01-13 The goal of the U.S. Department of Defense's (DoD's) Chemical and Biological Defense Program (CBDP) is to provide support and world-class capabilities enabling the U.S. Armed Forces to fight and win decisively in chemical, biological, radiological, and nuclear (CBRN) environments. To accomplish this objective, the CBDP must maintain robust science and technology capabilities to support the research, development, testing, and evaluation required for the creation and validation of the products the program supplies. The threat from chemical and biological attack evolves due to the changing nature of conflict and rapid advances in science and technology (S&T), so the core S&T capabilities that must be maintained by the CBDP must also continue to evolve. In order to address the challenges facing the DoD, the Deputy Assistant Secretary of Defense (DASD) for Chemical and Biological Defense (CBD) asked the National Research Council (NRC) to conduct a study to identify the core capabilities in S&T that must be supported by the program. The NRC Committee on Determining Core Capabilities in Chemical and Biological Defense Research and Development examined the capabilities necessary for the chemical and biological defense S&T program in the context of the threat and of the program's stated mission and priorities. *Determining Core Capabilities in Chemical and Biological Defense Science and Technology* contains the committee's findings and recommendations. It is intended to assist the DASD CBD in determining the best strategy for acquiring, developing, and/or maintaining the needed capabilities.

Learning and Understanding National Research Council, Division of Behavioral and Social Sciences and Education, Center for Education, Committee on Programs for Advanced Study of Mathematics and Science in American High Schools. 2002-08-06 This book takes a fresh look at programs for advanced studies for high school students in the United States, with a particular focus on the Advanced Placement and the International Baccalaureate programs, and asks how advanced studies can be significantly improved in general. It also examines two of the core issues surrounding these programs: they can have a profound impact on other components of the education system and participation in the programs has become key to admission at selective institutions of higher education. By looking at what could enhance the quality of high school advanced study programs as well as what precedes and comes after these programs, this report provides teachers, parents, curriculum developers, administrators, college science and mathematics faculty, and the educational research community with a detailed assessment that can be used to guide change within advanced study programs.

Implementing the New Biology National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Planning Committee on Achieving Research Synergies for Food/Energy/Environment Challenges: A Workshop to Explore the Potential of the. 2010-12-16 As the second decade of the 21st century begins, the challenge of how to feed a growing world population and provide sustainable, affordable energy to fulfill daily needs, while also improving human health and protecting the environment, is clear and urgent. Increasing demand for food and energy is projected at the same time as the supply of land and other resources decrease. Increasing levels of greenhouse gases alter climate, which, in turn, has life-changing implications for a broad range of plant and animal species. But promising developments are on the horizon—scientific discoveries and technologies that have the potential to contribute practical solutions to these seemingly intractable problems. As described in the 2009 National

Research Council book, *A New Biology for the 21st Century*, biological research has experienced extraordinary scientific and technological advances in recent years that have allowed biologists to collect and make sense of ever more detailed observations at ever smaller time intervals. With these advances have come increasingly fruitful collaborations of biologists with scientists and engineers from other disciplines. *A New Biology for the 21st Century* called for a series of workshops to provide concrete examples of what New Biology research programs could look like. The present volume summarizes the first of those workshops, *Implementing the New Biology: Decadal Challenges Linking Food, Energy, and the Environment*.

Catalyzing Inquiry at the Interface of Computing and Biology National Research Council, Division on Engineering and Physical Sciences, Computer Science and Telecommunications Board, Committee on Frontiers at the Interface of Computing and Biology. 2005-12-01 Advances in computer science and technology and in biology over the last several years have opened up the possibility for computing to help answer fundamental questions in biology and for biology to help with new approaches to computing. Making the most of the research opportunities at the interface of computing and biology requires the active participation of people from both fields. While past attempts have been made in this direction, circumstances today appear to be much more favorable for progress. To help take advantage of these opportunities, this study was requested of the NRC by the National Science Foundation, the Department of Defense, the National Institutes of Health, and the Department of Energy. The report provides the basis for establishing cross-disciplinary collaboration between biology and computing including an analysis of potential impediments and strategies for overcoming them. The report also presents a wealth of examples that should encourage students in the biological sciences to look for ways to enable them to be more effective users of computing in their studies.

Discipline-Based Education Research National Research Council, Division of Behavioral and Social Sciences and Education, Board on Science Education, Committee on the Status, Contributions, and Future Directions of Discipline-Based Education Research. 2012-08-27 The National Science Foundation funded a synthesis study on the status, contributions, and future direction of discipline-based education research (DBER) in physics, biological sciences, geosciences, and chemistry. DBER combines knowledge of teaching and learning with deep knowledge of discipline-specific science content. It describes the discipline-specific difficulties learners face and the specialized intellectual and instructional resources that can facilitate student understanding. Discipline-Based Education Research is based on a 30-month study built on two workshops held in 2008 to explore evidence on promising practices in undergraduate science, technology, engineering, and mathematics (STEM) education. This book asks questions that are essential to advancing DBER and broadening its impact on undergraduate science teaching and learning. The book provides empirical research on undergraduate teaching and learning in the sciences, explores the extent to which this research currently influences undergraduate instruction, and identifies the intellectual and material resources required to further develop DBER. Discipline-Based Education Research provides guidance for future DBER research. In addition, the findings and recommendations of this report may invite, if not assist, post-secondary institutions to increase interest and research activity in DBER and improve its quality and usefulness across all natural science disciplines, as well as guide instruction and assessment across natural science courses to improve student learning. The book brings greater focus to issues of student attrition in the natural sciences that are related to the quality of instruction. Discipline-Based Education Research will be of interest to educators, policy makers, researchers, scholars, decision makers in universities, government agencies, curriculum developers, research sponsors, and education advocacy groups.

The Odyssey of a Woman Field Scientist JEAN H. LANGENHEIM. 2010-02-22 Here, Jean Langenheim presents her odyssey as a woman field scientist, who crossed boundaries of botany, geology, and chemistry in doing ecological studies. The book includes almost two hundred photographs and maps and uses a unique timeline as context for her story in relation to relevant historical events, significant changes in the status of women, and

milestones in ecology from the 1920s to the present. Her research spans five continents and ranges from arctic-alpine to tropical environments. It includes many adventures (such as a forced plane landing in Amazonia and working in the midst of a coup d'état in Colombia) and interactions with diverse cultures, from Alaska Eskimo to Ghanain family life. She tells the story of a rich life of learning and discovery, through difficult and good times, which she has shared with her husband and later with her students, colleagues, and many friends many around the world.

INITIAL REVIEW STATEMENTS Anyone who reads this rich and wonderfully interesting memoir will be inspired by what Jean Langenheim has accomplished scientifically and personally during her long and distinguished career at the interface of multiple scientific fields. This is more than a personal memoir by a leading scientist. It is a deeply insightful reflection on how major scientific disciplines have developed over the past half century and how the culture of scientific research itself has changed. John Thompson, Distinguished Professor of Ecology and Evolution, University of California, Santa Cruz (quoted in UCSC press release <http://press.ucsc.edu/text.asp?pid=3771>) The title of this good read is truly apropos---it is an odyssey of the mind as well as life of a self-confessed adventurous woman, someone always open to the next chapter in an ever-changing life, lived during a period of significant social and technological changes. There's a solid dose of real scientific research and discovery, tempered by the authors vivid descriptions of her travels, of the wonders of the natural world, and of the cultures she encounters in some amazing places she finds herself. Provocatively, you may recognize and view elements of your own life in ways you never thought about before. Susan Martin, retired researcher US Department of Agriculture, Colorado State University. I liked very much your life metaphor about weaving threads in your life tapestry. It was delightful to read how those threads were constructed and woven. Your life has been very rich, impacting and inspiring many people with your thoughts and action. Francisco Espinosa-Garcia, Professor, National University of Mexico Center for Ecosystem Research, Morelia, Mexico.

A Strategy for Research in Space Biology and Medicine into the Next Century Committee on Space Biology and Medicine, Space Studies Board, Division on Engineering and Physical Sciences, National Research Council. 1998-09-30 Construction of the international space station, scheduled to start in late 1998, ushers in a new era for laboratory sciences in space. This is especially true for space life sciences, which include not only the use of low gravity as an experimental parameter to study fundamental biological processes but also the study of the serious physiological changes that occur in astronauts as they remain in space for increasingly longer missions. This book addresses both of these aspects and provides a comprehensive review of ground-based and space research in eleven disciplines, ranging from bone physiology to plant biology. It also offers detailed, prioritized recommendations for research during the next decade, which are expected to have a considerable impact on the direction of NASA's research program. The volume is also a valuable reference tool for space and life scientists.

A Proposed Framework for Identifying Potential Biodefense Vulnerabilities Posed by Synthetic Biology National Academies of Sciences, Engineering, and Medicine, Division on Earth and Life Studies, Board on Life Sciences, Board on Chemical Sciences and Technology, Committee on Strategies for Identifying and Addressing Biodefense Vulnerabilities Posed by Synthetic Biology. 2017-12-20 Building on an increasingly sophisticated understanding of naturally occurring biological processes, researchers have developed technologies to predictably modify or create organisms or biological components. This research, known collectively as synthetic biology, is being pursued for a variety of purposes, from reducing the burden of disease to improving agricultural yields to remediating pollution. While synthetic biology is being pursued primarily for beneficial and legitimate purposes, it is possible to imagine malicious uses that could threaten human health or military readiness and performance. Making informed decisions about how to address such concerns requires a comprehensive, realistic assessment. To this end, the U.S. Department of Defense, working with other agencies involved in biodefense, asked the National Academies of Sciences, Engineering, and Medicine to develop a framework to guide an assessment of the security concerns related to advances in synthetic biology, to assess the level of concern warranted for various advances and

identify areas of vulnerability, and to prioritize options to address these vulnerabilities. This interim report proposes a framework for identifying and prioritizing potential areas of concern associated with synthetic biology—a tool to aid the consideration of concerns related to synthetic biology. The framework describes categories of synthetic biology technologies and applications—such as genome editing, directed evolution, and automated biological design—and provides a set of initial questions to guide the assessment of concern related to these technologies and applications.

Assessment of the NASA Astrobiology Institute National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on the Review of the NASA Astrobiology Institute. 2008-04-20 Astrobiology is a scientific discipline devoted to the study of life in the universe - its origin, evolution, distribution, and future. In 1997, NASA established an Astrobiology program (the NASA Astrobiology Institute - NAI) as a result of a series of new results from solar system exploration and astronomical research in the mid-1990s together with advances in the biological sciences. To help evaluate the NAI, NASA asked the NRC to review progress made by the Institute in developing the field of astrobiology. This book presents an evaluation of NAI's success in meeting its goals for fostering interdisciplinary research, training future astrobiology researchers, providing scientific and technical leadership, exploring new research approaches with information technology, and supporting outreach to K-12 education programs.

Report of the Workshop on Biology-based Technology to Enhance Human Well-being and Function in Extended Space Exploration National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Commission on Physical Sciences, Mathematics, and Applications, Steering Group for the Workshop on Biology-based Technology for Enhanced Space Exploration. 1998-05-13

Opportunities in Biology National Research Council, Division on Earth and Life Studies, Commission on Life Sciences, Board on Biology, Committee on Research Opportunities in Biology. 1989-01-01 Biology has entered an era in which interdisciplinary cooperation is at an all-time high, practical applications follow basic discoveries more quickly than ever before, and new technologies—recombinant DNA, scanning tunneling microscopes, and more—are revolutionizing the way science is conducted. The potential for scientific breakthroughs with significant implications for society has never been greater. *Opportunities in Biology* reports on the state of the new biology, taking a detailed look at the disciplines of biology; examining the advances made in medicine, agriculture, and other fields; and pointing out promising research opportunities. Authored by an expert panel representing a variety of viewpoints, this volume also offers recommendations on how to meet the infrastructure needs—for funding, effective information systems, and other support—of future biology research. Exploring what has been accomplished and what is on the horizon, *Opportunities in Biology* is an indispensable resource for students, teachers, and researchers in all subdisciplines of biology as well as for research administrators and those in funding agencies.

Privacy Issues in Biomedical and Clinical Research National Research Council, Division on Earth and Life Studies, Commission on Life Sciences, Board on Biology. 1998-11-10 After discussions with the National Cancer Institute and the Department of Energy the Board on Biology of the National Research Council agreed to run a workshop under the auspices of its Forum on Biotechnology entitled *Privacy Issues in Biomedical and Clinical Research* on November 1, 1997. The organizers want to stress the forum was not intended to cover the full gauntlet of issues concerning Genomics and the Privacy of Medical Records. The emphasis of this forum was to look at pending legislation in Congress (Fall, 1997) and consider, if enacted as written, how this would affect genetic research. The broad language of this legislation written to protect the individual could inadvertently restrict research intended to help these same individuals. Scientific progress requires the sharing of information for the validation of results and the dissemination of gained knowledge to be effective. Other issues which were touched upon in this forum but not fully explored include; the trust of individuals involved in genetic studies in the manner their genetic information could be used, the practice of the generalized linking of particular

ethnic groups with specific genetic traits, and the potential for positive and negative impact on the quality of life by having knowledge of one's genetic potential. These and other issues which have come upon us in the age of genomics require separate, focused efforts to explore their potential effect on society.

Research in the Life Sciences with Dual Use Potential Bibliotheca Alexandrina, National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Committee on Developing a Framework for an International Faculty Development Project on Education about Research in the Life Sciences with Dual Use Potential. 2012-04-26 In many countries, colleges and universities are where the majority of innovative research is done; in all cases, they are where future scientists receive both their initial training and their initial introduction to the norms of scientific conduct regardless of their eventual career paths. Thus, institutions of higher education are particularly relevant to the tasks of education on research with dual use potential, whether for faculty, postdoctoral researchers, graduate and undergraduate students, or technical staff. Research in the Life Sciences with Dual Use Potential describes the outcomes of the planning meeting for a two-year project to develop a network of faculty who will be able to teach the challenges of research in the life sciences with dual use potential. Faculty will be able to incorporate such concepts into their teaching and research through exposure to the tenets of responsible conduct of research in active learning teaching methods. This report is intended to provide guidelines for that effort and to be applicable to any country wishing to adopt this educational model that combines principles of active learning and training with attention to norms of responsible science. The potential audiences include a broad array of current and future scientists and the policymakers who develop laws and regulations around issues of dual use.

A Strategy for Research in Space Biology and Medicine in the New Century National Research Council, Division on Engineering and Physical Sciences, Space Studies Board, Committee on Space Biology and Medicine. 1998-09-16 Construction of the international space station, scheduled to start in late 1998, ushers in a new era for laboratory sciences in space. This is especially true for space life sciences, which include not only the use of low gravity as an experimental parameter to study fundamental biological processes but also the study of the serious physiological changes that occur in astronauts as they remain in space for increasingly longer missions. This book addresses both of these aspects and provides a comprehensive review of ground-based and space research in eleven disciplines, ranging from bone physiology to plant biology. It also offers detailed, prioritized recommendations for research during the next decade, which are expected to have a considerable impact on the direction of NASA's research program. The volume is also a valuable reference tool for space and life scientists.

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Achievements of the National Plant Genome Initiative and New Horizons in Plant Biology National Research Council, Division on Earth and Life Studies, Board on Agriculture and Natural Resources, Board on Life Sciences, Committee on the National Plant Genome Initiative: Achievements and Future Directions. 2008-03-20 Life on Earth would be impossible without plants. Humans rely on plants for most clothing, furniture, food, as well as for many pharmaceuticals and other products. Plant genome sciences are essential to understanding how plants function and how to develop desirable plant characteristics. For example, plant genomic science can contribute to the development of plants that are drought-resistant, those that require less fertilizer, and those that are optimized for conversion to fuels such as ethanol and biodiesel. The National Plant Genome Initiative (NPGI) is a unique, cross-agency funding enterprise that has been funding and coordinating plant genome research successfully for nine years. Research breakthroughs from NPGI and the National Science Foundation (NSF) Arabidopsis 2010 Project, such as how the plant immune system controls pathogen defense, demonstrate that the plant genome science community is vibrant and capable of driving technological advancement. This book from the National Research Council concludes that these programs should continue so that applied programs on agriculture, bioenergy, and others

will always be built on a strong foundation of fundamental plant biology research.

High-School Biology Today and Tomorrow National Research Council, Division on Earth and Life Studies, Commission on Life Sciences, Committee on High-School Biology Education. 1989-02-01 Biology is where many of science's most exciting and relevant advances are taking place. Yet, many students leave school without having learned basic biology principles, and few are excited enough to continue in the sciences. Why is biology education failing? How can reform be accomplished? This book presents information and expert views from curriculum developers, teachers, and others, offering suggestions about major issues in biology education: what should we teach in biology and how should it be taught? How can we measure results? How should teachers be educated and certified? What obstacles are blocking reform?

Inspired by Biology National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Division on Engineering and Physical Sciences, Board on Physics and Astronomy, Solid State Sciences Committee, Committee on Biomolecular Materials and Processes. 2008-06-17 Scientists have long desired to create synthetic systems that function with the precision and efficiency of biological systems. Using new techniques, researchers are now uncovering principles that could allow the creation of synthetic materials that can perform tasks as precise as biological systems. To assess the current work and future promise of the biology-materials science intersection, the Department of Energy and the National Science Foundation asked the NRC to identify the most compelling questions and opportunities at this interface, suggest strategies to address them, and consider connections with national priorities such as healthcare and economic growth. This book presents a discussion of principles governing biomaterial design, a description of advanced materials for selected functions such as energy and national security, an assessment of biomolecular materials research tools, and an examination of infrastructure and resources for bridging biological and materials science.

Public Engagement on Genetically Modified Organisms National Research Council, Division of Behavioral and Social Sciences and Education, Board on Science Education, Division on Earth and Life Studies, Board on Life Sciences, Roundtable on Public Interfaces of the Life Sciences. 2015-07-07 The National Research Council's Roundtable on Public Interfaces of the Life Sciences held a 2-day workshop on January 15-16, 2015, in Washington, DC to explore the public interfaces between scientists and citizens in the context of genetically engineered (GE) organisms. The workshop presentations and discussions dealt with perspectives on scientific engagement in a world where science is interpreted through a variety of lenses, including cultural values and political dispositions, and with strategies based on evidence in social science to improve public conversation about controversial topics in science. The workshop focused on public perceptions and debates about genetically engineered plants and animals, commonly known as genetically modified organisms (GMOs), because the development and application of GMOs are heavily debated among some stakeholders, including scientists. For some applications of GMOs, the societal debate is so contentious that it can be difficult for members of the public, including policy-makers, to make decisions. Thus, although the workshop focused on issues related to public interfaces with the life science that apply to many science policy debates, the discussions are particularly relevant for anyone involved with the GMO debate. *Public Engagement on Genetically Modified Organisms: When Science and Citizens Connect* summarizes the presentations and discussion of the workshop.

Industrialization of Biology National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Board on Chemical Sciences and Technology, Committee on Industrialization of Biology: A Roadmap to Accelerate the Advanced Manufacturing of Chemicals. 2015-06-29 The tremendous progress in biology over the last half century - from Watson and Crick's elucidation of the structure of DNA to today's astonishing, rapid progress in the field of synthetic biology - has positioned us for significant innovation in chemical production. New bio-based chemicals, improved public health through improved drugs and diagnostics, and biofuels that reduce our dependency on oil are all results of research and innovation in the biological sciences. In the past decade, we have witnessed major advances made possible by biotechnology in areas such as rapid, low-cost DNA

sequencing, metabolic engineering, and high-throughput screening. The manufacturing of chemicals using biological synthesis and engineering could expand even faster. A proactive strategy - implemented through the development of a technical roadmap similar to those that enabled sustained growth in the semiconductor industry and our explorations of space - is needed if we are to realize the widespread benefits of accelerating the industrialization of biology. Industrialization of Biology presents such a roadmap to achieve key technical milestones for chemical manufacturing through biological routes. This report examines the technical, economic, and societal factors that limit the adoption of bioprocessing in the chemical industry today and which, if surmounted, would markedly accelerate the advanced manufacturing of chemicals via industrial biotechnology. Working at the interface of synthetic chemistry, metabolic engineering, molecular biology, and synthetic biology, Industrialization of Biology identifies key technical goals for next-generation chemical manufacturing, then identifies the gaps in knowledge, tools, techniques, and systems required to meet those goals, and targets and timelines for achieving them. This report also considers the skills necessary to accomplish the roadmap goals, and what training opportunities are required to produce the cadre of skilled scientists and engineers needed.

Review of NASA's Biomedical Research Program National Research Council, Commission on Physical Sciences, Mathematics, and Applications, Space Studies Board, Committee on Space Biology and Medicine. 2000-08-09 The 1998 Committee on Space Biology and Medicine (CSBM) report A Strategy for Research in Space Biology and Medicine in the New Century assessed the known and potential effects of spaceflight on biological systems in general and on human physiology, behavior, and performance in particular, and recommended directions for research sponsored over the next decade by the National Aeronautics and Space Administration (NASA). The present follow-up report reviews specifically the overall content of the biomedical research programs supported by NASA in order to assess the extent to which current programs are consistent with recommendations of the Strategy report for biomedical research activities. In general, NASA programs concerned with fundamental gravitational biology are not considered here. The committee also notes that this report does not include an evaluation of NASA's response to the Strategy report, which had only recently been released at the initiation of this study. Review of NASA's Biomedical Research Program summarizes the committee's findings from its review of (1) NASA's biomedical research and (2) programmatic issues described in the Strategy report that are relevant to NASA's ability to implement research recommendations.

Positioning Synthetic Biology to Meet the Challenges of the 21st Century Committee on Science, Technology, and Law, Policy and Global Affairs, Board on Life Sciences, Division on Earth and Life Studies, National Academy of Engineering, National Research Council. 2013-08-19 Synthetic biology -- unlike any research discipline that precedes it -- has the potential to bypass the less predictable process of evolution to usher in a new and dynamic way of working with living systems. Ultimately, synthetic biologists hope to design and build engineered biological systems with capabilities that do not exist in natural systems -- capabilities that may ultimately be used for applications in manufacturing, food production, and global health. Importantly, synthetic biology represents an area of science and engineering that raises technical, ethical, regulatory, security, biosafety, intellectual property, and other issues that will be resolved differently in different parts of the world. As a better understanding of the global synthetic biology landscape could lead to tremendous benefits, six academies -- the United Kingdom's Royal Society and Royal Academy of Engineering, the United States' National Academy of Sciences and National Academy of Engineering, and the Chinese Academy of Science and Chinese Academy of Engineering -- organized a series of international symposia on the scientific, technical, and policy issues associated with synthetic biology. Positioning Synthetic Biology to Meet the Challenges of the 21st Century summarizes the symposia proceedings.

Scientific Frontiers in Developmental Toxicology and Risk Assessment National Research Council, Division on Earth and Life Studies, Commission on Life Sciences, Board on Environmental Studies and Toxicology, Committee on Developmental Toxicology. 2000-11-21 Scientific

Frontiers in Developmental Toxicology and Risk Assessment reviews advances made during the last 10-15 years in fields such as developmental biology, molecular biology, and genetics. It describes a novel approach for how these advances might be used in combination with existing methodologies to further the understanding of mechanisms of developmental toxicity, to improve the assessment of chemicals for their ability to cause developmental toxicity, and to improve risk assessment for developmental defects. For example, based on the recent advances, even the smallest, simplest laboratory animals such as the fruit fly, roundworm, and zebrafish might be able to serve as developmental toxicological models for human biological systems. Use of such organisms might allow for rapid and inexpensive testing of large numbers of chemicals for their potential to cause developmental toxicity; presently, there are little or no developmental toxicity data available for the majority of natural and manufactured chemicals in use. This new approach to developmental toxicology and risk assessment will require simultaneous research on several fronts by experts from multiple scientific disciplines, including developmental toxicologists, developmental biologists, geneticists, epidemiologists, and biostatisticians.

A New Biology for the 21st Century National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Committee on a New Biology for the 21st Century: Ensuring the United States Leads the Coming Biology Revolution. 2009-11-20 Now more than ever, biology has the potential to contribute practical solutions to many of the major challenges confronting the United States and the world. A New Biology for the 21st Century recommends that a New Biology approach—one that depends on greater integration within biology, and closer collaboration with physical, computational, and earth scientists, mathematicians and engineers—be used to find solutions to four key societal needs: sustainable food production, ecosystem restoration, optimized biofuel production, and improvement in human health. The approach calls for a coordinated effort to leverage resources across the federal, private, and academic sectors to help meet challenges and improve the return on life science research in general.

Annual Report for Fiscal Year ... National Science Foundation (U.S.). 1983

Life in the Universe National Research Council, Board on Life Sciences, Space Studies Board, Committee on the Origins and Evolution of Life. 2003-04-14 The past decade has seen a remarkable revolution in genomic research, the discoveries of extreme environments in which organisms can live and even flourish on Earth, the identification of past and possibly present liquid-water environments in our solar system, and the detection of planets around other stars. Together these accomplishments bring us much closer to understanding the origin of life, its evolution and diversification on Earth, and its occurrence and distribution in the cosmos. A new multidisciplinary program called Astrobiology was initiated in 1997 by the National Aeronautics and Space Administration (NASA) to foster such research and to make available additional resources for individual and consortium-based efforts. Other agencies have also begun new programs to address the origin, evolution, and cosmic distribution of life. Five years into the Astrobiology program, it is appropriate to assess the scientific and programmatic impacts of these initiatives. Edward J. Weiler, NASA's associate administrator for the Office of Space Science, tasked the Committee on the Origins and Evolution of Life (COEL) with assessing the state of NASA's Astrobiology program.

Developing Capacities for Teaching Responsible Science in the MENA Region Committee on Developing a Framework for an International Faculty Development Project on Education About Research in the Life Sciences with Dual Use Potential, Board on Life Science, Division on Earth and Life Studies, National Research Council, The World Academy of Sciences (TWAS). 2013-07-12 Spurred on by new discoveries and rapid technological advances, the capacity for life science research is expanding across the globe—and with it comes concerns about the unintended impacts of research on the physical and biological environment, human well-being, or the deliberate misuse of knowledge, tools, and techniques to cause harm. This report describes efforts to address dual use issues by developing institutes around the world that will help life sciences faculty learn to teach about the responsible conduct of science. Based on the successful National Academies Summer Institute for Undergraduate Biology Education and on

previous NRC reports on effective methods for teaching about dual use issues, the report's authoring committee designed a general framework for the faculty institutes and chose the Middle East-North Africa (MENA) region to test a prototype faculty institute. In September 2012, the first Institute was held in Aqaba, Jordan, bringing together 28 participants from Algeria, Egypt, Jordan, Libya, and Yemen to engage with effective, evidence-based teaching methods, develop curricular materials for use in their own classrooms, and become community leaders on dual use and related topics. *Developing Capacities for Teaching Responsible Science in the MENA Region: Refashioning Scientific Dialogue* offers insights from the institute that will help in the design and implementation of future programs in the MENA region, and in other parts of the world.

Biology Syllabus, 2 Unit New South Wales. Board of Studies.1994-01-01

Contributions to Canadian Biology and Fisheries Biological Board of Canada.1901

Enhancing the Value and Sustainability of Field Stations and Marine Laboratories in the 21st Century National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Committee on Value and Sustainability of Biological Field Stations, Marine Laboratories, and Nature Reserves in the 21st Century Science, Education, and Public Outreach.2014-09-11 For over a century, field stations have been important entryways for scientists to study and make important discoveries about the natural world. They are centers of research, conservation, education, and public outreach, often embedded in natural environments that range from remote to densely populated urban locations. Because they lack traditional university departmental boundaries, researchers at field stations have the opportunity to converge their science disciplines in ways that can change careers and entire fields of inquiry. Field stations provide physical space for immersive research, hands-on learning, and new collaborations that are otherwise hard to achieve in the everyday bustle of research and teaching lives on campus. But the separation from university campuses that allows creativity to flourish also creates challenges. Sometimes, field stations are viewed as remote outposts and are overlooked because they tend to be away from population centers and their home institutions. This view is exacerbated by the lack of empirical evidence that can be used to demonstrate their value to science and society. *Enhancing the Value and Sustainability of Field Stations and Marine Laboratories in the 21st Century* summarizes field stations' value to science, education, and outreach and evaluates their contributions to research, innovation, and education. This report suggests strategies to meet future research, education, outreach, infrastructure, funding, and logistical needs of field stations. Today's technologies - such as streaming data, remote sensing, robot-driven monitoring, automated DNA sequencing, and nanoparticle environmental sensors - provide means for field stations to retain their special connection to nature and still interact with the rest of the world in ways that can fuel breakthroughs in the environmental, physical, natural, and social sciences. The intellectual and natural capital of today's field stations present a solid platform, but many need enhancements of infrastructure and dynamic leadership if they are to meet the challenges of the complex problems facing the world. This report focuses on the capability of field stations to address societal needs today and in the future.

Responsible Research with Biological Select Agents and Toxins National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Committee on Laboratory Security and Personnel Reliability Assurance Systems for Laboratories Conducting Research on Biological Select Agents and Toxins.2010-01-12 The effort to understand and combat infectious diseases has, during the centuries, produced many key advances in science and medicine-including the development of vaccines, drugs, and other treatments. A subset of this research is conducted with agents that, like anthrax, not only pose a severe threat to the health of humans, plants, and animals but can also be used for ill-intended purposes. Such agents have been listed by the government as biological select agents and toxins. The 2001 anthrax letter attacks prompted the creation of new regulations aimed at increasing security for research with dangerous pathogens. The outcome of the anthrax letter investigation has raised concern about whether these measures are adequate. *Responsible Research with Biological Select Agents and Toxins* evaluates both the physical security of select

agent laboratories and personnel reliability measures designed to ensure the trustworthiness of those with access to biological select agents and toxins. The book offers a set of guiding principles and recommended changes to minimize security risk and facilitate the productivity of research. The book recommends fostering a culture of trust and responsibility in the laboratory, engaging the community in oversight of the Select Agent Program, and enhancing the operation of the Select Agent Program.

BIO2010 National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Committee on Undergraduate Biology Education to Prepare Research Scientists for the 21st Century. 2003-01-13 Biological sciences have been revolutionized, not only in the way research is conducted—with the introduction of techniques such as recombinant DNA and digital technology—but also in how research findings are communicated among professionals and to the public. Yet, the undergraduate programs that train biology researchers remain much the same as they were before these fundamental changes came on the scene. This new volume provides a blueprint for bringing undergraduate biology education up to the speed of today's research fast track. It includes recommendations for teaching the next generation of life science investigators, through: Building a strong interdisciplinary curriculum that includes physical science, information technology, and mathematics. Eliminating the administrative and financial barriers to cross-departmental collaboration. Evaluating the impact of medical college admissions testing on undergraduate biology education. Creating early opportunities for independent research. Designing meaningful laboratory experiences into the curriculum. The committee presents a dozen brief case studies of exemplary programs at leading institutions and lists many resources for biology educators. This volume will be important to biology faculty, administrators, practitioners, professional societies, research and education funders, and the biotechnology industry.

Biological Collections National Academies of Sciences, Engineering, and Medicine, Division on Earth and Life Studies, Board on Life Sciences, Committee on Biological Collections: Their Past, Present, and Future Contributions and Options for Sustaining Them. 2021-01-29 Biological collections are a critical part of the nation's science and innovation infrastructure and a fundamental resource for understanding the natural world. Biological collections underpin basic science discoveries as well as deepen our understanding of many challenges such as global change, biodiversity loss, sustainable food production, ecosystem conservation, and improving human health and security. They are important resources for education, both in formal training for the science and technology workforce, and in informal learning through schools, citizen science programs, and adult learning. However, the sustainability of biological collections is under threat. Without enhanced strategic leadership and investments in their infrastructure and growth many biological collections could be lost. *Biological Collections: Ensuring Critical Research and Education for the 21st Century* recommends approaches for biological collections to develop long-term financial sustainability, advance digitization, recruit and support a diverse workforce, and upgrade and maintain a robust physical infrastructure in order to continue serving science and society. The aim of the report is to stimulate a national discussion regarding the goals and strategies needed to ensure that U.S. biological collections not only thrive but continue to grow throughout the 21st century and beyond.

Thinking Evolutionarily National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Planning Committee on Thinking Evolutionarily: Making Biology Education Make Sense. 2012-05-31 Evolution is the central unifying theme of biology. Yet today, more than a century and a half after Charles Darwin proposed the idea of evolution through natural selection, the topic is often relegated to a handful of chapters in textbooks and a few class sessions in introductory biology courses, if covered at all. In recent years, a movement has been gaining momentum that is aimed at radically changing this situation. On October 25-26, 2011, the Board on Life Sciences of the National Research Council and the National Academy of Sciences held a national convocation in Washington, DC, to explore the many issues associated with teaching evolution across the curriculum. *Thinking Evolutionarily: Evolution Education Across the Life Sciences: Summary of a Convocation* summarizes the goals, presentations,

and discussions of the convocation. The goals were to articulate issues, showcase resources that are currently available or under development, and begin to develop a strategic plan for engaging all of the sectors represented at the convocation in future work to make evolution a central focus of all courses in the life sciences, and especially into introductory biology courses at the college and high school levels, though participants also discussed learning in earlier grades and life-long learning. *Thinking Evolutionarily: Evolution Education Across the Life Sciences: Summary of a Convocation* covers the broader issues associated with learning about the nature, processes, and limits of science, since understanding evolutionary science requires a more general appreciation of how science works. This report explains the major themes that recurred throughout the convocation, including the structure and content of curricula, the processes of teaching and learning about evolution, the tensions that can arise in the classroom, and the target audiences for evolution education.

Opportunities in Biology Committee on Research Opportunities in Biology, Board on Biology, Commission on Life Sciences, Division on Earth and Life Studies, National Research Council. 1989-01-15 Biology has entered an era in which interdisciplinary cooperation is at an all-time high, practical applications follow basic discoveries more quickly than ever before, and new technologies--recombinant DNA, scanning tunneling microscopes, and more--are revolutionizing the way science is conducted. The potential for scientific breakthroughs with significant implications for society has never been greater. *Opportunities in Biology* reports on the state of the new biology, taking a detailed look at the disciplines of biology; examining the advances made in medicine, agriculture, and other fields; and pointing out promising research opportunities. Authored by an expert panel representing a variety of viewpoints, this volume also offers recommendations on how to meet the infrastructure needs--for funding, effective information systems, and other support--of future biology research. Exploring what has been accomplished and what is on the horizon, *Opportunities in Biology* is an indispensable resource for students, teachers, and researchers in all subdisciplines of biology as well as for research administrators and those in funding agencies.

Challenges and Opportunities for Education About Dual Use Issues in the Life Sciences National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Committee on Education on Dual Use Issues in the Life Sciences. 2010-12-16 The Challenges and Opportunities for Education About Dual Use Issues in the Life Sciences workshop was held to engage the life sciences community on the particular security issues related to research with dual use potential. More than 60 participants from almost 30 countries took part and included practicing life scientists, bioethics and biosecurity practitioners, and experts in the design of educational programs. The workshop sought to identify a baseline about (1) the extent to which dual use issues are currently being included in postsecondary education (undergraduate and postgraduate) in the life sciences; (2) in what contexts that education is occurring (e.g., in formal coursework, informal settings, as stand-alone subjects or part of more general training, and in what fields); and (3) what online educational materials addressing research in the life sciences with dual use potential already exist.

Biology for the AP® Course James Morris, Domenic Castignetti, John Lepri, Rick Relyea. 2022-02-18 Explore *Biology for the AP® Course*, a textbook program designed expressly for AP® teachers and students by veteran AP® educators. *Biology for the AP® Course* provides content organized into modules aligned to the CED, AP® skill-building instruction and practice, stunning visuals, and much more.

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Algae from the Arid Southwestern United States William Hewitt Thomas. 1983 This report is a bibliography of papers pertaining to algae found in the arid southwestern United States. Also included are some related papers that pertain to the habitats where the algae occur. Following each reference is an annotation describing the contents of the paper. The annotation, in most cases, consists of the author's abstract. Sometimes we have written an abstract, particularly for long review papers and books. The report is organized by state (California, Nevada, Utah, etc.) and papers on

algae are separated from related papers on their habitat. Keywords are included for each paper and the bibliography is set up on microcomputer disk for searching by these keywords.

The Role of Theory in Advancing 21st-Century Biology National Research Council, Division on Earth and Life Studies, Board on Life Sciences, Committee on Defining and Advancing the Conceptual Basis of Biological Sciences in the 21st Century. 2008-01-22 Although its importance is not always recognized, theory is an integral part of all biological research. Biologists' theoretical and conceptual frameworks inform every step of their research, affecting what experiments they do, what techniques and technologies they develop and use, and how they interpret their data. By examining how theory can help biologists answer questions like What are the engineering principles of life? or How do cells really work? the report shows how theory synthesizes biological knowledge from the molecular level to the level of whole ecosystems. The book concludes that theory is already an inextricable thread running throughout the practice of biology; but that explicitly giving theory equal status with other components of biological research could help catalyze transformative research that will lead to creative, dynamic, and innovative advances in our understanding of life.

Delve into the emotional tapestry woven by Crafted by RJ Shavelson in **Biology Board Of Studies** . This ebook, available for download in a PDF format (Download in PDF: *), is more than just words on a page; it is a journey of connection and profound emotion. Immerse yourself in narratives that tug at your heartstrings. Download now to experience the pulse of each page and let your emotions run wild.

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