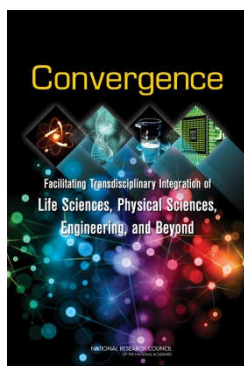


Convergence: Optimizing Cross-Sector & Interdisciplinary Partnerships

Government-University-Industry Research Roundtable Meeting
June 2-3, 2014

List of selected reports from the National Academies related to the topic Convergence



Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond (2014)

Convergence of the life sciences with fields including physical, chemical, mathematical, computational, engineering, and social sciences is a key strategy to tackle complex challenges and achieve new and innovative solutions. However, institutions face a lack of guidance on how to establish effective programs, what challenges they are likely to encounter, and what strategies other organizations have used to address the issues that arise. This advice is needed to harness the excitement generated by the concept of convergence and channel it into the policies, structures, and networks that will enable it to realize its goals. *Convergence* investigates examples of organizations that have established mechanisms to support convergent research. This report discusses details of current programs, how organizations have chosen to measure success, and what has worked and not worked in varied settings. The report summarizes the lessons learned and provides organizations with strategies to tackle practical needs and implementation challenges in areas such as infrastructure, student education and training, faculty advancement, and inter-institutional partnerships.

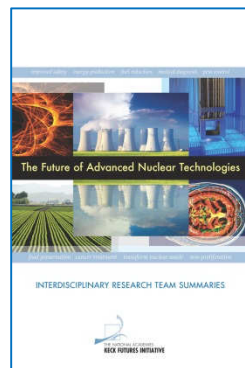
Establishing Transdisciplinary Professionalism for Improving Health Outcomes: Summary of a Workshop (2014)

Establishing Transdisciplinary Professionalism for Improving Health Outcomes is a summary of a workshop convened by the Institute of Medicine Global Forum on Innovation in Health Professional Education to explore the possibility of whether different professions can come together and whether a dialogue with society on professionalism is possible. Most of the 59 members making up the Global Forum were present at the workshop and engaged with outside participants in active dialogue around issues related to professionalism and how the different professions might work effectively together and with society in creating a social contract. The structure of the workshop involved large plenary discussions, facilitated table conversations, and small-group breakout sessions. In this way, the members - representing multiple sectors, countries, health professions, and educational associations - had numerous opportunities to share their own perspectives on transdisciplinary professionalism as well as hear the opinions of subject matter experts and the general public.



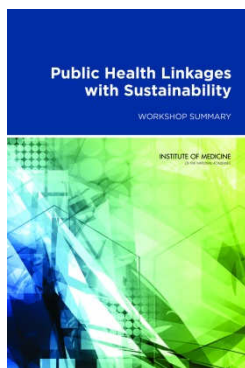
The Future of Advanced Nuclear Technologies: Interdisciplinary Research Team Summaries (2014)

The National Academies Keck Futures Initiative (NAKFI) Conference in 2013 focused on the Future of Advanced Nuclear Technologies to generate new ideas about how to move nuclear technology forward while making the world safer and more secure. Beyond the public's apprehension concerning the safety of nuclear power, which calls out for better communications strategies, several challenges lie ahead for the nuclear enterprise in the United States. The workforce in nuclear technology is aging, there is an overreliance on large, high-risk reactor designs, and the supply of radioisotopes for nuclear medicine remains unstable--all problems crying out for solutions. *The Future of Advanced Nuclear Technologies* summarizes the 14 Interdisciplinary Research (IDR) teams' collaborations on creative solutions to challenges designed to propel the policy, engineering, and social aspects of the nuclear enterprise forward.



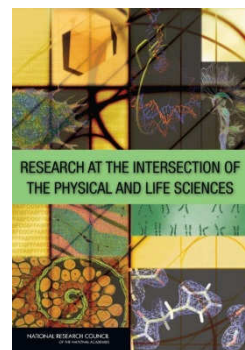
Public Health Linkages with Sustainability: Workshop Summary (2013)

In 1992 world leaders met at the Earth Summit in Rio de Janeiro to reaffirm the Declaration of the United Nations Conference on the Human Environment that was established on June 16, 1972 in Stockholm. The meeting resulted in the adoption of Agenda 21 by the member states which is a framework for the transition to a more sustainable world. In 2012 the members gathered to assess and reaffirm the importance of progress towards the efforts of Agenda 21. In response to this the Institute of Medicine's (IOM's) Roundtable on Environmental Health Sciences, Research, and Medicine held a workshop to inform the policies that are discussed at the 2012 Earth Summit. The workshop, held in Woods Hole, Massachusetts on July 25-26, 2011, focused on the issue of sustainability and health as well as the linkages that are currently present between the two. The workshop included presentations and discussions which are summarized in *Public Health Linkages with Sustainability: Workshop Summary*. The report presents how different areas of public health, such as food and water resources, link to sustainability and opportunities or venues that can be examined.



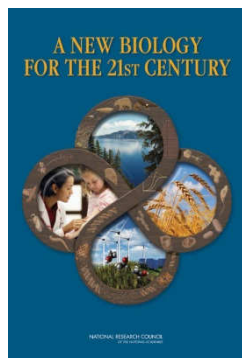
Research at the Intersection of the Physical and Life Sciences (2010)

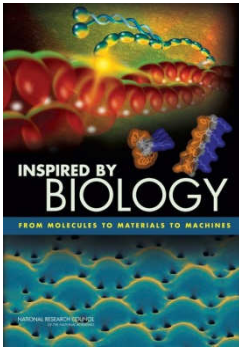
Traditionally, the natural sciences have been divided into two branches: the biological sciences and the physical sciences. Today, an increasing number of scientists are addressing problems lying at the intersection of the two. These problems are most often biological in nature, but examining them through the lens of the physical sciences can yield exciting results and opportunities. For example, one area producing effective cross-discipline research opportunities centers on the dynamics of systems. Equilibrium, multistability, and stochastic behavior--concepts familiar to physicists and chemists--are now being used to tackle issues associated with living systems such as adaptation, feedback, and emergent behavior. *Research at the Intersection of the Physical and Life Sciences* discusses how some of the most important scientific and societal challenges can be addressed, at least in part, by collaborative research that lies at the intersection of traditional disciplines, including biology, chemistry, and physics.



A New Biology for the 21st Century (2009)

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.



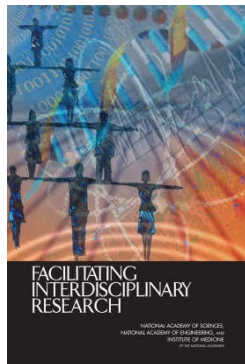
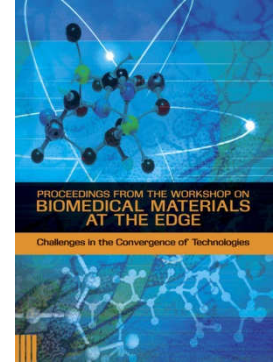


Inspired by Biology: From Molecules to Materials to Machines (2008)

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.

Proceedings from the Workshop on Biomedical Materials at the Edge: Challenges in the Convergence of Technologies (2006)

Recent advances in biomedical materials technology hold the promise of a revolution in clinical medicine. These advances are being made possible by a convergence of technologies arising from a wide array of scientific discoveries. This convergence, however, is presenting new challenges as well as new opportunities. To explore these findings and to discuss possible ways to overcome the challenges, a workshop on this topic was held under the auspices of the NRC's Roundtable on Biomedical Engineering Materials and Applications. This report and accompanying CD provides a summary and the proceedings of the workshop. They present discussions of the context for new biomedical materials and of the three emerging technologies that were covered at the workshop: stem cells as biomaterials of the future, biomolecular materials composites, and superamolecular/nanoscale engineering and design.

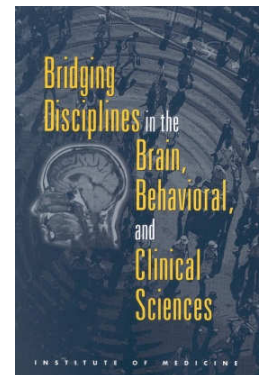


Facilitating Interdisciplinary Research (2004)

Facilitating Interdisciplinary Research examines current interdisciplinary research efforts and recommends ways to stimulate and support such research. Advances in science and engineering increasingly require the collaboration of scholars from various fields. This shift is driven by the need to address complex problems that cut across traditional disciplines, and the capacity of new technologies to both transform existing disciplines and generate new ones. At the same time, however, interdisciplinary research can be impeded by policies on hiring, promotion, tenure, proposal review, and resource allocation that favor traditional disciplines. This report identifies steps that researchers, teachers, students, institutions, funding organizations, and disciplinary societies can take to more effectively conduct, facilitate, and evaluate interdisciplinary research programs and projects. Throughout the report key concepts are illustrated with case studies and results of the committee's surveys of individual researchers and university provosts.

Bridging Disciplines in the Brain, Behavioral, and Clinical Sciences (2000)

Interdisciplinary research is a cooperative effort by a team of investigators, each an expert in the use of different methods and concepts, who have joined in an organized program to attack a challenging problem. Each investigator is responsible for the research in their area of discipline that applies to the problem, but together the investigators are responsible for the final product. The need for interdisciplinary training activities has been detailed over the last 25 years in both public and private reports. In recognition of this, the need to train scientists who can address the highly complex problems that challenge us today and fully use new knowledge and technology, and the fact that cooperative efforts have proved difficult, the National Institute of Mental Health (NIMH), the National Institutes of Health (NIH) Office of Behavioral and Social Sciences Research (OBSSR), the National Institute on Nursing Research (NINR), and the National Institute on Aging (NIA) requested that an Institute of Medicine (IOM) examine the needs and strategies for interdisciplinary training in the brain, behavioral, social, and clinical sciences, defining necessary components of true interdisciplinary training in these areas, and reviewing current educational and training programs to identify elements of model programs that best facilitate interdisciplinary training.



*The reports listed do not include all National Academies' reports on convergence. To find more on this topic or browse other National Academies reports go to: www.nationalacademies.org.