

Introduction to Frontiers of Science

Since 1989, the National Academy of Sciences (NAS) has organized annual symposia on Frontiers of Science. The goal of these symposia is to bring together some of the very best young U.S. scientists to discuss exciting advances and opportunities in their fields in a format that encourages informal collective discussions among participants, both in groups and one-on-one. Speakers present their talks on cutting-edge research in their disciplines to colleagues who are outside of their fields and address questions such as: “What are the major research problems and distinctive tools of your field?” “What are the current limitations in advancing your field?” and “How might insight derived from other fields contribute to overcoming these limitations?”

Formulating and answering these questions involve surmounting the barriers imposed by the specialized terminologies and techniques that characterize the different branches of science. This approach poses formidable challenges that these symposia are addressing with success.

The first Frontiers symposium was held at the Academy’s Arnold and Mabel Beckman Center in Irvine, CA, in March of 1989. It was organized by a committee of young scholars with the support of the National Science Foundation, the Alfred O. Sloan Foundation, and the NAS. The positive response to this meeting prompted the NAS to organize a second symposium in 1990 and annually thereafter. The symposia, which are held each November, are attended by approximately 80–100 scholars under 45 years of age, a dozen senior colleagues, and several science writers. Participants include leading researchers from academic, industrial, and federal laboratories.

At each symposium, some 25 young scientists report on current research within their disciplines to an academically

trained and scientifically diverse audience. They highlight major research challenges, methodologies, and limitations to progress at the frontiers of their respective fields. All attendees participate actively in a general discussion period, during which they learn from and form collaborative relationships with other young scientists in different fields.

The success of the Frontiers symposium series has spawned similar programs, such as the series on Frontiers of Engineering by the National Academy of Engineering and the German–American Frontiers of Science, under the auspices of the German–American Academic Council in coordination with the Alexander von Humboldt Foundation. Beginning in 1998, the Academy has cosponsored similar international Frontiers of Science symposia with Japan and China. Thus, the Frontiers of Science symposia have become a major instrument in bringing together the best young researchers (the next generation of leaders) in the natural sciences and engineering in the United States and in other countries.

Summaries of presentations from the 1990 symposium (1), and the 1991 and 1992 symposia (2) have been published by the National Academy Press. Starting with the 1995 Frontiers of Science symposium (3–7), the collected summaries of the papers presented at these symposia, including the German–American Frontiers of Science (8–11), the Japanese–American Frontiers of Science (12–14), and the Chinese–American Frontiers of Science (15–17) have been published in the *Proceedings of the National Academy of Sciences* (PNAS). The following papers summarize sessions of the 12th annual symposium on Frontiers of Science held November 2–4, 2000, at the Arnold and Mabel Beckman Center of the National Academies of Science and Engineering in Irvine, CA.

1. Greenwood, A., ed. (1989) *Science at the Frontier* (Natl. Acad. Sci./Natl. Acad. Press, Washington, DC).
2. Bartusiak, M. F., Burke, B., Chaikin, A., Greenwood, A., Heppenheimer, T. A., Hoffman, M., Holzman, D., Maggio, E. J. & Moffat, A. S., eds. (1994) *A Positron Named Priscilla: Scientific Discovery at the Frontier* (Natl. Acad. Sci./Natl. Acad. Press, Washington, DC).
3. Seventh Annual Symposium on Frontiers of Science (1997) *Proc. Natl. Acad. Sci. USA* **94**, 6579–6590.
4. Eighth Annual Symposium on Frontiers of Science (1997) *Proc. Natl. Acad. Sci. USA* **94**, 2773–2795.
5. Ninth Annual Symposium on Frontiers of Science (1998) *Proc. Natl. Acad. Sci. USA* **95**, 11027–11042.
6. Tenth Annual Symposium on Frontiers of Science (1999) *Proc. Natl. Acad. Sci. USA* **96**, 9982–9996.
7. Eleventh Annual Symposium on Frontiers of Science (2000) *Proc. Natl. Acad. Sci. USA* **97**, 12956–12964. (First Published October 31, 2000, in PNAS Early Edition)
8. Third Annual Symposium on German–American Frontiers of Science (1997) *Proc. Natl. Acad. Sci. USA* **94**, 12733–12750.
9. Fourth Annual Symposium on German–American Frontiers of Science (1999) *Proc. Natl. Acad. Sci. USA* **96**, 8327–8337.
10. Fifth Annual Symposium on German–American Frontiers of Science (1999) *Proc. Natl. Acad. Sci. USA* **96**, 14196–14209.
11. Sixth Annual Symposium on German–American Frontiers of Science (2001) *Proc. Natl. Acad. Sci. USA* **98**, 10524–10532.
12. First Symposium on Japanese–American Frontiers of Science (1999) *Proc. Natl. Acad. Sci. USA* **96**, 8818–8828.
13. Second Annual Symposium on Japanese–American Frontiers of Science (2000) *Proc. Natl. Acad. Sci. USA* **97**, 12402–12412. (First Published October 17, 2000, in PNAS Early Edition)
14. Third Annual Symposium on Japanese–American Frontiers of Science (2001) *Proc. Natl. Acad. Sci. USA* **98**, 12337–12345. (First Published October 16, 2001, in PNAS Early Edition)
15. First Symposium on Chinese–American Frontiers of Science (1999) *Proc. Natl. Acad. Sci. USA* **96**, 11062–11076.
16. Second Annual Symposium on Chinese–American Frontiers of Science (2000) *Proc. Natl. Acad. Sci. USA* **97**, 11140–11148.
17. Third Annual Symposium on Chinese–American Frontiers of Science (2001) *Proc. Natl. Acad. Sci. USA* **98**, 11844–11850. (First Published September 18, 2001, in PNAS Early Edition)