

## Project 2061 Marks 20 Years of Science Education Reform

Two decades after the launch of Project 2061, educators, researchers, and other friends and supporters of the project gathered in Washington, DC, to join AAAS in celebrating the 20th anniversary of its far-reaching initiative to reform science, mathematics, and technology education. Events to mark the occasion reflected the influence the project has gained within the nation's science and education communities. Beginning with a Capitol Hill briefing for members of Congress on Monday, October 17, and followed by a program and celebration at the AAAS headquarters, the events provided opportunities to look back on accomplishments and inspiration for the work ahead.

The 20th anniversary events also coincided with a Project 2061 professional development workshop on "Using *Atlas of Science Literacy*," which was attended by nearly 50 science educators from K-12 schools and from colleges, universities, science centers, and museums around the country. Many of the workshop attendees were able to participate in the 20th anniversary celebrations, helping to remind those gathered that to be successful, reform measures must take account of classroom realities and the day-to-day challenges they present to teachers and students alike.

### Continue to Do What You Are Doing

Bringing together leaders from both sides of the aisle, the Capitol Hill briefing organized by AAAS's Center for Science, Technology, and Congress focused on Project 2061's contributions so far and confirmed the central role that science, mathematics, and technology are likely to play in the years to come. Providing today's

students with the knowledge and skills they need in these areas is of "critical importance to the nation's long-term security," said Rep. Sherwood Boehlert (R-N.Y.), who chairs the House Science Committee. It is also "about the future of our children and grandchildren," Boehlert noted.

Reps. Vernon Ehlers (R-Mich.) and Mark Udall (D-Colo.), co-founders of the bipartisan STEM (Science, Technology, Engineering and Mathematics) Education Caucus in 2004, agreed. Remarking on the heightened interest in science education among his congressional colleagues, Ehlers urged AAAS and Project 2061 to "continue to do what you are doing" to push for improvements in the science curriculum and teaching. Also attending was Rep. Rush Holt (D-N.J.), another STEM Caucus member and, like Ehlers, a physicist by training. Holt endorsed Project 2061's emphasis on science literacy, pointing out that science education is essential "not just for the scientists and engineers of the future" but for everyone. He also had high praise for Project 2061's 1993 publication *Benchmarks for Science Literacy*, describing it as one of the "best books on any subject in the last two decades." Rep. Donald Payne (D-N.J.) also joined the briefing along with congressional staff with responsibilities related to education or science and technology.

While reminding those gathered that "2061 was never intended to be an end date but more of a metaphor," Project 2061's director

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*Dr. Jo Ellen Roseman, director of Project 2061, and Dr. F. James Rutherford, founder of Project 2061*

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Jo Ellen Roseman

“You have embraced change and are not overwhelmed by the long-term nature of reform.”

FROM THE  
Director

## The People Behind Reform

Project 2061’s celebration of its 20th anniversary was in part a celebration of an idea—universal science literacy. At our AAAS events and on Capitol Hill, we looked back at what has been accomplished toward this goal since 1985—most importantly, the definition of what constitutes science literacy and the creation of reform tools to help educators in their efforts to improve science teaching and learning for all students. We also considered the challenges facing science education reform today and looked ahead to what new contributions Project 2061 can make.

But seeing the groups gathered for this occasion reminded me that the anniversary was also a celebration of people. Three years of cooperation among scientists produced our first tool, *Science for All Americans*, and four years of work by hundreds of scientists and educators went into *Benchmarks for Science Literacy* and its specific goals for what students need to know and when.

Over the past twenty years Project 2061 has created numerous tools to help educators do the painstaking work of clarifying learning goals and aligning curriculum, instruction, and assessment to them. The work is not easy! Yet thousands of individuals—education researchers, curriculum materials developers, assessment specialists, pre-service and in-service teacher educators, and classroom teachers—have collaborated with us in developing these tools and have used these new, rigorous and thought provoking approaches in their own efforts. Their commitment to take standards seriously is reforming the way science is taught and learned across the country.

*Science For All Americans* states, “Ultimately, reform is more about people than it is about policies, institutions, and processes. And most people—not only educators—tend to change slowly when it comes to attitudes, beliefs, and ways of doing things.” I want to thank those of you who have worked with us to bring better science texts, tests, and teaching to the classroom and those of you now critical to our present and future R&D efforts. You have embraced change and are not overwhelmed by the long-term nature of reform. Demanding excellence, you have learned the importance of using high-quality resources, seeking evidence of their effectiveness, and taking the time to adjust materials and teaching accordingly. Your dedication will ensure that one day all students in all classrooms will be learning what they need to know about science, mathematics, and technology.

*Jo Ellen Roseman*

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To contact Project 2061 staff, visit [www.project2061.org/about/contact.htm](http://www.project2061.org/about/contact.htm).

# AAAS Resources for Educators

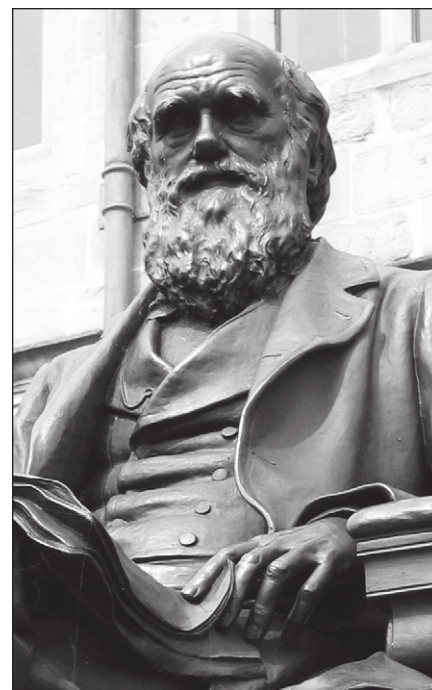
## Guarding the Integrity of Science in Classrooms

Over the past year, AAAS has been playing a prominent role in countering efforts in Kansas, Georgia, Pennsylvania, and elsewhere to weaken or compromise the teaching of evolution in U.S. public school science classrooms. To help educators and the public make sense of the current controversies and to clarify AAAS's position, AAAS has assembled a collection of resources and AAAS news articles on its "Evolution on the Front Line" Web page.

Resources include:

- Q & A on evolution and intelligent design
- AAAS board resolution on intelligent design theory
- "Science Classes are for Science, Not Faith," AAAS CEO Alan I. Leshner's commentary in the *Philadelphia Inquirer* (2 February 2005)
- Background from Project 2061, including chapter 5 "The Living Environment" from *Science for All Americans* and *Benchmarks for Science Literacy*
- Evolution resources from the National Academies

You can access these and other evolution resources at [www.aaas.org/news/press\\_room/evolution](http://www.aaas.org/news/press_room/evolution).



Naturalist Charles Darwin



## SB&F: Your Guide to Science Resources for All Ages

Since 1965, *Science Books & Films* (SB&F) has been the authoritative guide to science resources, bringing teachers the expert information they need to make the best decisions when choosing science materials for their classroom. Published bimonthly by AAAS, SB&F is the only critical review journal devoted exclusively to science. Every issue contains timely features and more than 150 evaluations of books, videos and DVDs, software, and Web sites for general audiences, teachers, and students from kindergarten through college. Two annual SB&F guides—"Science Fair Resources" (September/October issue) and the "Best Books" list (January/February issue)—provide additional resources. In 2005, AAAS and Subaru launched the SB&F Prizes for Excellence in Science Books, which celebrate outstanding science writing and illustration for children, young adults, and general audiences.

► To request a sample copy and learn more about SB&F, including how to subscribe, visit [www.sbsonline.com](http://www.sbsonline.com). Also available is the SB&F Science Teacher's Resource Page at [www.sbsonline.com/teacherresourcepage.htm](http://www.sbsonline.com/teacherresourcepage.htm), which includes a listing of recommended books for children, young adults, and teachers organized by the chapters in Project 2061's *Benchmarks for Science Literacy*.





From top to bottom:

(1) Dr. Alan I. Leshner, CEO of AAAS, Dr. Gilbert S. Omenn, president of AAAS, and Dr. Jo Ellen Roseman, director of Project 2061.

(2) Dr. Iris Weiss, president of Horizon Research Inc., and Dr. Alan I. Leshner, CEO of AAAS.

(3) Linda Froschauer, president-elect of the National Science Teachers Association.

Photos by Joe Shymanski

## Project 2061 Marks 20 Years ...

*Continued from page 1*

Dr. Jo Ellen Roseman acknowledged that there are no shortcuts to real reform. “We can’t test our way out of this problem,” she said. Instead, Project 2061 will continue to promote science literacy goals that are important for all students and to develop tools that educators can use to help them reach those goals.

### Radical and Visionary

For the AAAS staff and guests gathered on Tuesday, October 18, in the auditorium of the association’s Washington, DC, headquarters, the celebration of Project 2061’s 20th anniversary was an occasion to reunite with old friends, colleagues, and supporters. They came together to reflect on the progress of science education, to consider the relevance of “science literacy for all” in today’s context, and to propose some promising directions for future work.

As evidence of Project 2061’s unique role in science education reform, Dr. Gilbert S. Omenn, president of AAAS and member of the project’s original advisory group, pointed out that “no organization had previously addressed the issue of what was needed in K-12 schooling by putting aside the traditional curriculum and starting by debating and deciding what every adult citizen needed to know and be able to do.” A professor in the University of Michigan Medical School and its School of Public Health, Dr. Omenn was one of four speakers at the anniversary celebration. The others were Dr. Alan I. Leshner, CEO of AAAS; Dr. Iris Weiss, president of Horizon Research Inc., a firm that specializes in science and math education research and evaluation; and Linda Froschauer, president-elect of the National Science Teachers Association.

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Dr. Jo Ellen Roseman, director of Project

2061, and Dr. F. James Rutherford, founder of Project 2061, also addressed the audience.

Although all the speakers praised the significant contributions of Project 2061 to science education in this country, the general sentiment was that the overall performance of U.S. schools remains far from satisfactory.

Among challenges facing science education today, according to Weiss of Horizon Research, are those related to the quality of teacher education programs designed to prepare new teachers and provide ongoing professional development. Today’s teachers need more extensive knowledge of the science content as well as the ability to work with diverse learners. How to provide these kinds of programs cost-effectively to many more teachers is a key issue. But the root problem, Weiss believes, is that the amount of learning material often packed into science curricula is overwhelming and unrealistic. “We say less is more,” she said, “but we don’t really believe it.”

As a longtime member of the project’s advisory group, 8th grade science teacher Linda Froschauer helped to guide Project 2061 as it translated the vision of *Science for All Americans* into the grade level learning goals in *Benchmarks for Science Literacy*. Recalling how her school colleagues at first asked about the meaning of Project 2061, she noted that she no longer has to explain. “When I mention Project 2061 to any science educator, they know exactly what I’m talking about. Last month I met with science educators in Japan. To my amazement they began talking about Project 2061.” What makes Project 2061’s work

“radical and visionary,” said Froschauer, was its decision not simply to produce more material but to “produce tools and models that can be used by others—expanding the nation’s (and the world’s) capacity for reform.”

The anniversary celebration concluded with the presentation to Rutherford of a framed poster displaying the covers of Project 2061 books that were published during his tenure as director. He was honored for creating Project 2061 in 1985, guiding it through significant achievement, and continuing to be an eloquent advocate for science literacy around the world.

After praising AAAS and Project 2061 for the work that they’ve done, Rutherford warned that science education still needs a lot of attention. “Project 2061 can be proud of the unrivaled contributions it made to the advancement of science education during its first 20 years, and now, in the next 20, it must continue to press forward with the same strategy, energy, and inventiveness in its crucial effort to make nationwide science literacy a reality in America,” said Rutherford. He is currently distinguished visiting professor at Mills College in Oakland, California. He’s also engaged in establishing an interdisciplinary center for the advancement of science literacy; principal investigator of Resources for Environmental Literacy, a NSF-funded project; and consultant on several projects, including “In the Wake of the Western Flyer,” a science film based on John Steinbeck’s research in the Sea of Cortez.

Roseman agreed that much work remains to be done. “With a strong foundation to build on,” she said, “a clear focus on the most important science ideas and skills, and a set of practical tools that can help educators select appropriate materials and monitor their students’ progress, Project 2061 is well-positioned to help make its guiding vision of science literacy for all a reality.”

(Lonnie Shekhtman of the AAAS Office of Public Programs contributed to this article.)

## Milestones in the Pursuit of Science Literacy for All

Over the past two decades, Project 2061 has taken a long-term systemic approach to education reform. Here are highlights from our efforts to define science literacy, develop K–12 benchmarks for student learning, and produce innovative, research-based tools to help educators in their reform efforts.

**1985:** In the year Halley’s Comet was last visible from earth, AAAS establishes Project 2061 to help all Americans become literate in science, mathematics, and technology. Children starting school now will see the return of the Comet in 2061—a reminder that today’s education will shape the quality of their lives as they come of age in the 21<sup>st</sup> century amid profound scientific and technological change.

**1989:** Project 2061’s landmark publication, *Science for All Americans*, sets out recommendations for what all students should know and be able to do in science, mathematics, and technology by the time they graduate from high school.

**1993:** *Benchmarks for Science Literacy* translates the science literacy goals in *Science for All Americans* into learning goals or benchmarks for grades K–12. Many of today’s state and national standards documents have drawn their content from *Benchmarks*.

**1996:** A study of Project 2061’s influence on reform reveals that many state curriculum documents cite the program and its publications as key resources, quote directly from the project’s publications, or organize their own recommendations to parallel the Project 2061 documents. Framework writers interviewed for the study report that *Benchmarks* strongly influenced their decisions on what science content to include.

**1998:** With funding from the Carnegie Corporation of New York, Project 2061 begins the first in a series of four evaluative studies of middle and high school science and mathematics textbooks. The studies’ widely reported findings reveal that only a handful of textbooks are likely to help students learn the ideas and skills that are essential to science literacy.

**2000:** A Spanish version of the popular Project 2061 Web site debuts, showcasing the Spanish language editions of *Science for All Americans* and *Benchmarks for Science Literacy*.

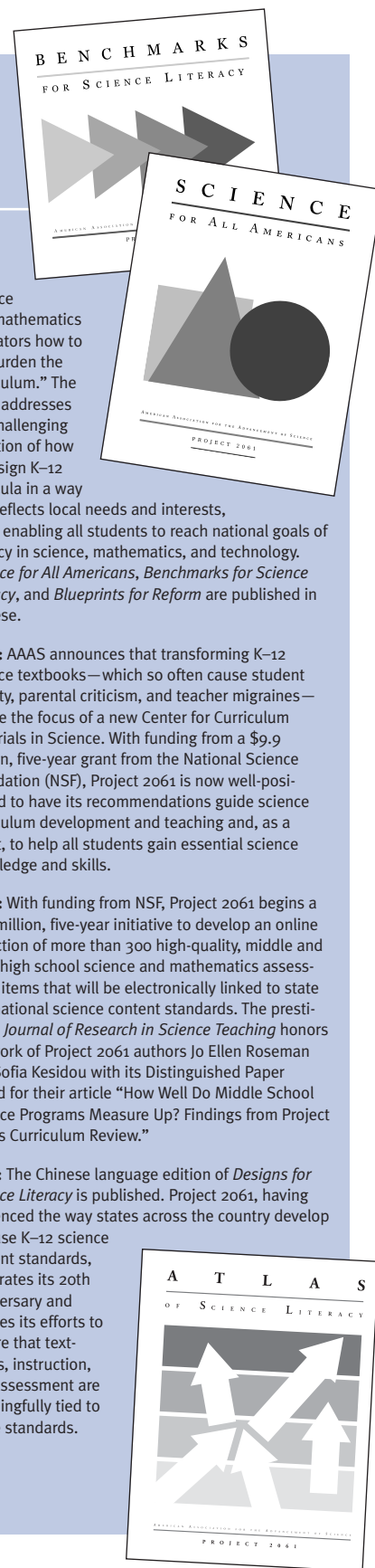
**2001:** In a first-ever joint publishing arrangement, AAAS and the National Science Teachers Association produce *Atlas of Science Literacy*, providing educators with an innovative tool that graphically depicts connections among key learning goals for students in kindergarten through grade 12. AAAS also publishes *Designs for Science Literacy*, which tells

science and mathematics educators how to “unburden the curriculum.” The book addresses the challenging question of how to design K–12 curricula in a way that reflects local needs and interests, while enabling all students to reach national goals of literacy in science, mathematics, and technology. *Science for All Americans*, *Benchmarks for Science Literacy*, and *Blueprints for Reform* are published in Chinese.

**2002:** AAAS announces that transforming K–12 science textbooks—which so often cause student anxiety, parental criticism, and teacher migraines—will be the focus of a new Center for Curriculum Materials in Science. With funding from a \$9.9 million, five-year grant from the National Science Foundation (NSF), Project 2061 is now well-positioned to have its recommendations guide science curriculum development and teaching and, as a result, to help all students gain essential science knowledge and skills.

**2003:** With funding from NSF, Project 2061 begins a \$4.1 million, five-year initiative to develop an online collection of more than 300 high-quality, middle and early high school science and mathematics assessment items that will be electronically linked to state and national science content standards. The prestigious *Journal of Research in Science Teaching* honors the work of Project 2061 authors Jo Ellen Roseman and Sofia Kesidou with its Distinguished Paper Award for their article “How Well Do Middle School Science Programs Measure Up? Findings from Project 2061’s Curriculum Review.”

**2005:** The Chinese language edition of *Designs for Science Literacy* is published. Project 2061, having influenced the way states across the country develop and use K–12 science content standards, celebrates its 20th anniversary and focuses its efforts to ensure that textbooks, instruction, and assessment are meaningfully tied to those standards.



## About AAAS and Project 2061

Publisher of the peer-reviewed journal *Science*, the AAAS is the largest general scientific organization in the world. Its education initiative, Project 2061, has been at the forefront of the K–12 reform movement:

- Defining science literacy and promoting it as a goal for all Americans;
- Developing K–12 benchmarks for student learning in science, mathematics, and technology;
- Producing a wide range of innovative tools for educators—books, CD-ROMs, and online resources—to guide their reform efforts; and
- Conducting research on the design and use of curriculum materials, assessment, professional development, and other areas of science teaching and learning.

AAAS gratefully acknowledges the following who have supported Project 2061 over the past 20 years: Carnegie Corporation of New York, Hewlett-Packard Company, John D. and Catherine T. MacArthur Foundation, Andrew W. Mellon Foundation, Noyce Foundation, David and Lucile Packard Foundation, Pew Charitable Trusts, Siemens Foundation, and the National Science Foundation.

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### For more information:

AAAS Project 2061  
1200 New York Avenue, NW  
Washington, DC 20005  
Phone: 202-326-6666  
Fax: 202-842-5196  
E-mail: [project2061@aaas.org](mailto:project2061@aaas.org)  
Web site: [www.project2061.org](http://www.project2061.org)

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# Learning from the Students

## Interviews Bring Student Feedback into Assessment Development

Project 2061's latest research collaborators don't have Ph.D.'s in physics, biology, or chemistry, and they don't have years of classroom experience. What they do have is a unique perspective—one that Project 2061 is counting on in its effort to develop more effective tools for assessing science learning. Over the past year, Project 2061 researchers have been interviewing middle and high school students in New Jersey, North Carolina, and Pennsylvania to find out how well they comprehend specific test items and to gain insights into their thinking that can then be used to improve the diagnostic power of those items.

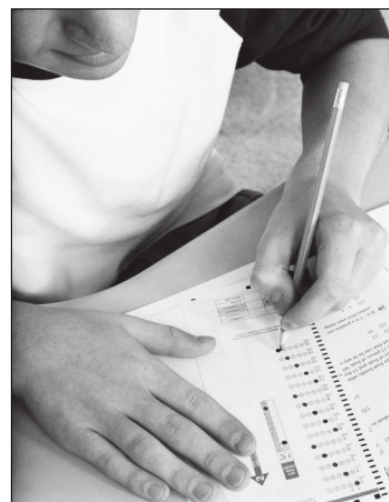
The student interviews are part of Project 2061's effort to create an online collection of high-quality middle school and early high school science assessment items that are well aligned to national, state, and local content standards for science and mathematics.

The items can serve as models or be used directly in large-scale assessment programs and in classrooms. Funded by the National Science Foundation, the work is based on the premise that to be useful in a standards-based context, assessment items need to be linked explicitly to the *exact* ideas and skills that students are expected to learn, not just to broadly defined topical areas.

For Project 2061 research associate Arhonda Gogos, interviewing students about individual test questions is essential. "The interviews tell us whether the items are successful or not in giving information about what students know. If students choose the correct answer, do they really understand the particular science concept? If students choose a wrong answer, what is their rationale? These are the kinds of questions we simply cannot answer on our own," said Gogos. "Talking with students early in the development process gives us valuable—and sometimes unexpected—insights into what students think. We can then revise each item so that it more effectively targets the learning goal."

The online collection will be comprised mostly of selected-response questions, with a few short open-ended questions, and will cover a wide range of science topics, including Nature of Science; Forces and Motion; Changes in the Earth's Surface; Flow of Matter and Energy in Living Organisms; and Heredity. For open-ended questions, the discussion with the student is focused on student thinking as it relates to each question. For selected-response items, interviewers ask a series of questions:

- Could you tell me in your own words what the question is asking?
- Why did you choose the answer you chose?
- Were there other answer choices that you almost chose? Why?
- Were there any answer choices that you did not even consider? Why?
- Was there an answer choice you were expecting to see, but did not? What was it?
- Were there any words or diagrams you did not really understand, or situations that made the question confusing? Do you think something would be confusing to your classmates?
- Are you familiar with the situation that is presented in the question?
- Where did you learn about the topic in this question? Have you seen a question like this before?





When carefully chosen, the distractors (wrong answer choices) in selected-response questions can be especially revealing of what students think and, when used as part of a pre-instruction assessment, can show teachers which student pre-conceptions should be addressed during instruction. In developing and revising items, Project 2061 incorporates distractors that are identified in the existing (though sometimes sparse) literature on students' commonly held ideas. Through the interviews, Gogos and her colleagues often uncover additional pre-conceptions. These insights can be used to formulate distractors that may be more effective in detecting what students are thinking and why.

### Answering Correctly without Understanding

Consider how students responded to the following item in the Nature of Science topic, which Project 2061 found in the research literature and modified slightly before testing. The item targets the key idea that "A claim about a group should not be based on examples that are not representative of the group":

The teacher brought a box containing different kinds of metal and non-metal rods. He asked a student to find out whether the metal rods were better heat conductors than the non-metal rods. The student chose a steel rod and held the tip of the rod in the flame of a Bunsen burner. After a short time, the rod was too hot to hold.

Before the student could tell his teacher that he believed that all the metal rods were better heat conductors than all the non-metal rods, he should:


- A. heat one more metal rod.
- B. heat all the metal rods, but none of the non-metal rods.
- C. heat all the non-metal rods, but none of the metal rods.
- D. heat all the metal and non-metal rods.

Researchers interviewed six 7th and 8th graders from a suburban school in the Northeast, all of whom chose the correct answer (D). Yet only one student recognized that there could be variability among the metal rods and among the non-metal

## Project 2061's Assessment Analysis Criteria

Project 2061's interviews with students about individual assessment items are designed not only to elicit student ideas but also to give researchers information related to the following research-based criteria, which Project 2061 uses to determine an item's alignment to a content standard:

- **Necessity:** Is the knowledge or skill specified in the learning goal needed to answer the item correctly or can the student get the correct answer using other knowledge?
- **Sufficiency:** Is the knowledge or skill specified in the learning goal enough by itself to answer the item correctly or is additional knowledge needed?



- **Comprehensibility:** Are students likely to understand the task statement, diagrams, symbols, etc.?
- **Appropriateness of Context:** Is the task context appropriately familiar, engaging, and realistic to students?
- **Resistance to Test-Wiseness:** Could students respond satisfactorily to the task by guessing or employing other general test-taking strategies?
- **Cost-Effectiveness:** Is what we learn about the student's knowledge about the learning goal worth the "cost" of the task in terms of time and effort?

rods: "D, because if one thing does not follow the theory then the theory is wrong. If it said "steel rods" it would be different. They could be copper, or some other metal. The non-metals could be wood, rubber ..."

The rest of the students chose the right answer but for an incorrect reason or because another answer consistent with their thinking wasn't offered. One student would have accepted "one non-metal" as the answer because "he already did a metal one" and therefore heating one non-metal "would be enough to make a conclusion." Two other students

referred to the representativeness of the sample; one indicated that heating two more metal rods would be sufficient, and the other that heating two metal rods and two non-metal rods would be sufficient. Two students chose "all rods" to account for lab errors: "you could mess up the first time, so you might want to do them all anyway"; "if you do a whole bunch of both you get a better idea, because it's unlikely that something went wrong in all trials." Based on these explanations, the interviewers learned that students would have considered options such as "heat one more metal rod and two non-metal rods," "heat one non-metal rod," and "heat two more metal rods." The item is being modified to include such answer choices so that it can more successfully provide information on student thinking.

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From helping researchers pinpoint a confusing word or phrase to revealing that a correct answer does not mean a student understands the targeted science concept, the student perspectives gained from interviews are invaluable.

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From helping researchers pinpoint a confusing word or phrase to revealing that a correct answer does not mean a student understands the targeted science concept, the student perspectives gained from interviews are invaluable. Once items are revised, they are taken through another round of student interviews and, eventually, through extended field testing and expert item review and analysis. Going forward, the Project 2061 research team plans to interview additional students and to field-test items with students from different geographic areas and backgrounds so that the assessment items are appropriate for students nationally.

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**Project 2061 is actively seeking middle and high school students to interview about assessment items. Interested teachers or school districts may contact Project 2061 deputy director George DeBoer at [gdeboer@aaas.org](mailto:gdeboer@aaas.org) or (202) 326-6624.**

## Online Update

Visit [www.ScienceMaterialsCenter.org](http://www.ScienceMaterialsCenter.org) for the latest information about the Center for Curriculum Materials in Science (CCMS). Find out about the 2005 Knowledge Sharing Institute, learn about the new postdoctoral fellows and graduate students, and read presentations and papers by CCMS researchers.

## Moving?

Help *2061 Today* keep up with you! Send your change of address to [project2061@aaas.org](mailto:project2061@aaas.org) or call us at 202-326-6666. You may also visit [www.project2061.org/confirm](http://www.project2061.org/confirm) to update your address, switch from print to electronic delivery, and sign up for other FREE Project 2061 newsletters.

## AAAS Annual Meeting

Join thousands of top educators, scientists, and science policy experts at the 2006 meeting, 16–20 February 2006, St. Louis, Missouri: [www.aaasmeeting.org](http://www.aaasmeeting.org).

# Announcements & Events

### Connecting Family Science to Standards

AAAS's Partnership for Science Literacy has created five new community-based brochures to help parents support their children's science learning outside of school. The brochures build on the Partnership's previous outreach to parents in five key partner sites—Austin, TX; Chicago, IL; Lehigh Valley, PA; Los Angeles, CA; and Tampa, FL—and extend parents' familiarity with community science resources to their awareness of the science learning goals that states expect children to achieve. The English/Spanish brochures explain how exhibits and activities at local science centers, museums, zoos, and parks can help children learn particular state standards. Each brochure also gives parents the Web site address for learning more about their state's science standards. The five sites distributed the brochures at their spring 2005 family science events and continue to use them in educational programming for families. To view the brochures online, visit [www.project2061.org/publications/articles/psl](http://www.project2061.org/publications/articles/psl).

### Collaborations with China Continue

Project 2061 and the China Association for Science and Technology (CAST) continue to strengthen their mutual commitment to promoting education and public engagement in science, mathematics, and technology. CAST has been working with China's Popular Science Press to translate Project 2061's resources into Chinese. In May, Madam Cheng Donghong, executive secretary of CAST, presented copies of the Chinese translation of *Designs for Science Literacy* to Project 2061 during a visit to Washington, DC. CAST previously published translations of *Science for All Americans*, *Benchmarks*

*for Science Literacy*, and *Blueprints for Reform* and is currently completing the Chinese language edition of *Atlas of Science Literacy*. In a new collaboration, Project 2061 hopes to share some of its online resources with China through CAST's Web site. This work is part of a larger memorandum of understanding being negotiated between AAAS and CAST that encompasses three strategic areas—science education, communicating science to the public, and sustainability.

### Introducing ...

Project 2061 welcomes three new research associates. **Cari Herrmann Abell** is AAAS's new postdoctoral fellow for the Center for Curriculum Materials in Science. She comes to Project 2061 from the University of Colorado at Boulder, where she was a postdoctoral research associate in the Department of Mechanical Engineering and the Department of Chemistry and Biochemistry. She holds a Ph.D. in physical chemistry and materials science from the University of North Carolina at Chapel Hill.

**An Michiels** is contributing to the development of Project 2061's assessment resources. Previously, she was a postdoctoral researcher at the International Food Policy Research Institute. She holds a Ph.D. in applied biological and agricultural science and an M.A. in education from K.U. Leuven, Belgium. **Thomas Regan** is contributing to the development of goals-based curriculum resources. He earned his Ph.D. in applied physics and his M.A. in education from Stanford University. His experience includes working as a technical instructor and applications engineer for KLA-Tencor Corporation and teaching middle school and high school physics and mathematics.



American Association for  
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1200 New York Avenue, NW  
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