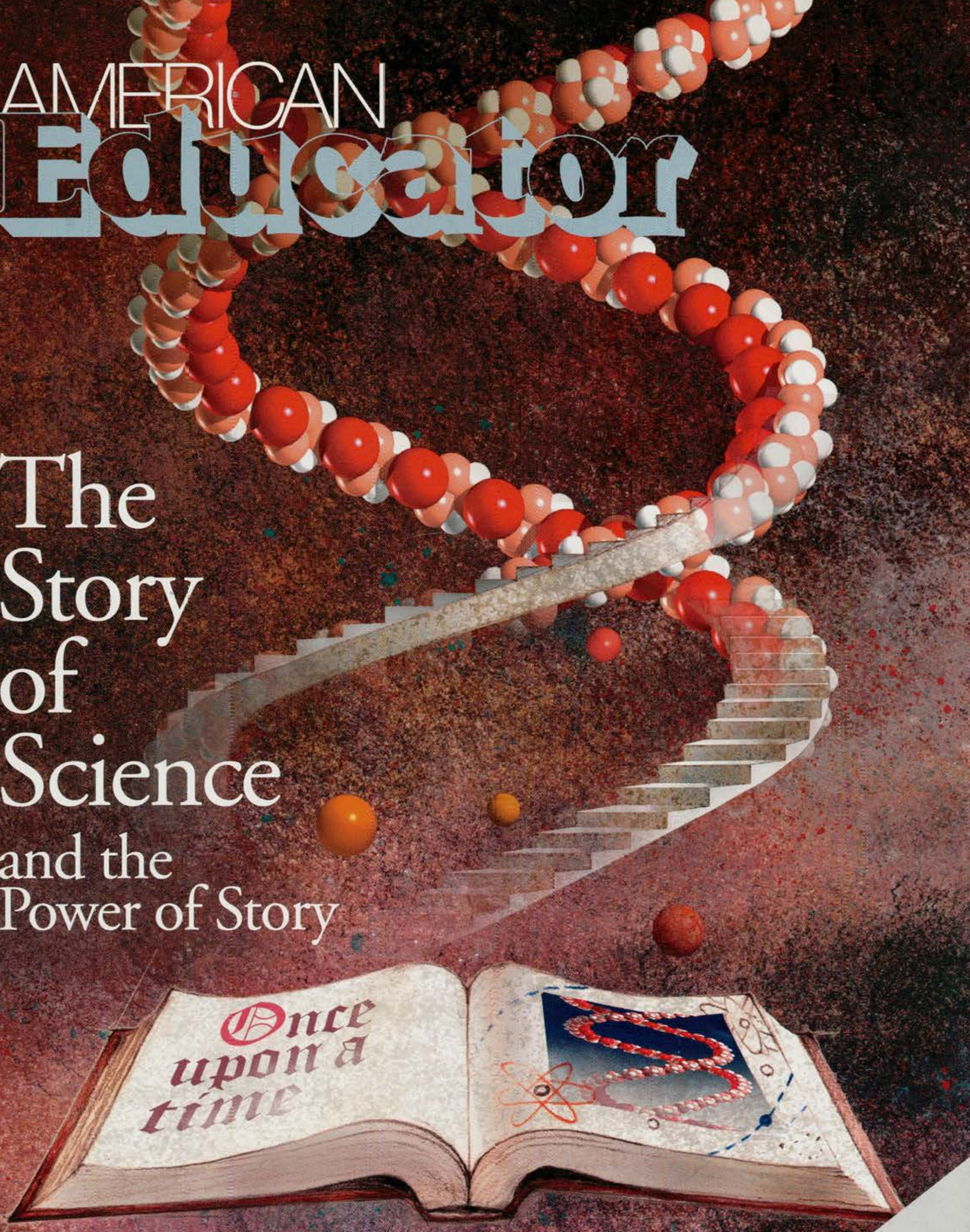
AMERICAN Educator



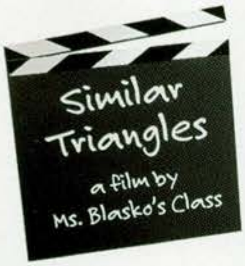
The Story of Science

and the Power of Story

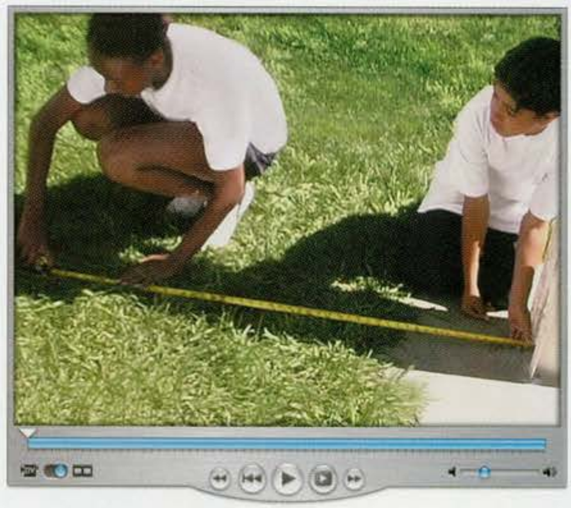
AMERICAN FEDERATION OF TEACHERS
SPRING 2002

INSIDE:
AMERICAN PATRIOTISM

Learning. Cleverly



How do you get a classroom full of restless kids interested in geometry? Pique their interest and their enthusiasm with Apple's revolutionary iMovie.™ Maria Blasko, a math teacher in East Palo Alto,



"Do you know how to tell the height of something if you can't reach the top?" Maria Blasko's students learn a valuable lesson in geometry.

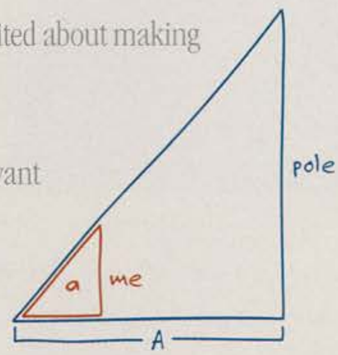
By filming the "Similar Triangles" lesson, Maria Blasko brings new life to an old subject.

California, uses iMovie to take lessons out of the textbook and give them real-world applications. "With the 'Similar Triangles' movie, I took a concept that can be very hard for students to grasp in the classroom environment and took it outside, to get the students involved in the process. Instead of listening to me

disguised as a movie.

iMovie uses simple drag-and-drop technology. So you can focus on teaching, not editing.

tell them about the relationship between similar triangles of differing size, they experienced it. And because we were filming the process they really focused on the assignment and became excited about making the movie. The best part is that once the lesson is done the students want to watch it again and again. So it really reinforces what they've learned." In short, iMovie, combined with inspired teaching, is a formula for student success. To see how Maria and other teachers are using iMovie to energize lessons and connect to their students, call 1-800-800-APPL or visit www.apple.com/teachimovie.



Ms. Blasko built a stronger relationship with her students by combining a passion for teaching with the power of iMovie.

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Carole Moyer
National Board Certified Teacher
Salem Elementary School
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Spring 2002

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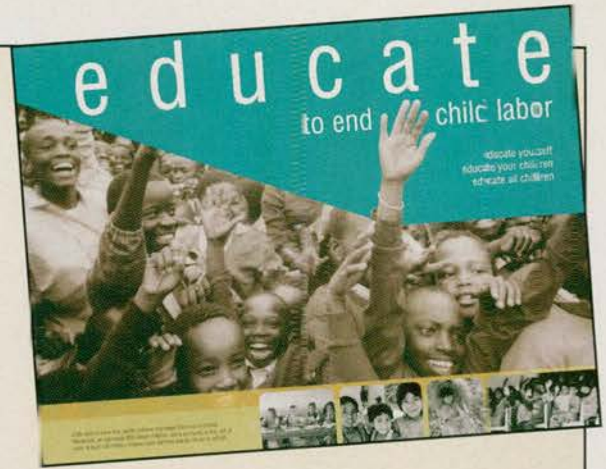
End Child Labor Through Education



The AFT Child Labor project and the Solidarity Center of the AFL-CIO are co-operating to promote awareness of child labor in the U.S. and around the world—and the role of education in eliminating child labor. Our effort includes this **FREE child labor brochure** that folds out into a poster—perfect for your classroom or office! A new interactive Web site on child labor in the commercial agriculture sector is also available at **fieldsofhope.org**. This Web site and its teacher's page section are designed to help teachers incorporate the subject of child labor in agriculture into the classroom. Visit **fieldsofhope.org** today! For more information on AFT's Child Labor Project or to get your free poster, visit our Web site at **www.aft.org/international/child**, or call 800/238-1133, ext. 4448.

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NOTEBOOK

New Funds, New Rules in New Federal Education Law

Funding for the Elementary and Secondary Education Act has been increased to over $22 billion, that's 27 percent more than last year. Along with the increase come new rules that continue a decade-long effort to push districts and states to adopt clear standards for student achievement, tests that can measure progress towards those standards, and accountability measures for using federal dollars in ways that lead to substantially increased student achievement.

Starting in 2005-06, all states will be required to test students in reading and math in grades 3 through 8. (Science tests for several grades come later.) States must also define "adequate yearly progress" for their students. For schools receiving Title I funds, the failure to make adequate yearly progress will bring a mix of assistance (such as technical help and extra funds) and consequences (such as allowing a school's students to attend other public schools or converting the school to a charter). In some cases, these actions could begin this fall.

The law will also require teachers and paraprofessionals to meet new criteria regarding their qualifications. These requirements will phase in, beginning immediately with newly hired paras and, next school year, with newly hired Title I-supported teachers. The law provides funds for paras and teachers to get the necessary training and education.

New ESEA Web Site

Like most such laws, the key to success lies in intelligent implementation—and in just plain understanding the requirements and opportunities (like additional professional development funds, especially for teaching reading). To help, AFT has launched a Web site with basic information on the new law: **www.aft.org/ESEA**. The site includes frequently asked questions and answers and a specially designed online presentation that offers a concise summary of the new law, including, for example, the many ways that Title I funds can be used, such as to support preschool programs, extended-day programs, and reduced class sizes.

New Editor

The AFT has named Ruth Wattenberg editor of *American Educator*, beginning with this issue. Wattenberg was previously the director of Educational Issues for the AFT. Her appointment follows the retirement of the *Educator's* longtime editor, Liz McPike.

TEACHING RESOURCES

A National Treasure Tours the Country

In February 2002, the National Portrait Gallery launched a two-year tour of the country for "its most prized portrait"—*Lansdowne,* the famous painting of George Washington by Gilbert Stuart.

The tour includes an extensive educational campaign, complete with a free 30-page teacher's guide (with lessons for elementary, middle, and high school students) and a poster of the painting, as well as an interactive Web site: **www.georgewashington.si.edu**. These carefully constructed lessons, like "The Right Stuff: What Qualified George Washington To Be President" and "Giving Speeches," support United States History Standards for Era 2, Colonization and Settlement, and Era 3, Revolution and the New Nation.

Changing the Educational Furniture, Not the Educational Substance

For the last 15 years, I have been studying the geological accumulation of education reforms in U.S. schools—the sedimentation of the last two or three geological eras. In a book I wrote with Penelope Peterson and Sarah McCarthy on the structure and restructuring of schools, the main finding we report is that changing structure does not change practice. In fact, the schools that seem to do the best are those that have a clear idea of what kind of instructional practice they want to produce and then design a structure to go with it.

Take block scheduling—the current structural reform *du jour* of secondary education. Sometimes it's used to address serious instructional challenges, like allowing time not just to complete a laboratory experiment, but to discuss it. All too often, the hard work of rescheduling only enables trivial changes. One teacher told me—and an aggregate analysis of block scheduling confirms the general truth of the anecdote—that block scheduling was "the best thing that's ever happened in my teaching career"—because now he "can show the whole movie." We can all agree that watching a whole movie is better than watching a part, but we can also agree that therein does not lie a major solution to our education ills.

That captures my take on structural reform. We put an enormous amount of energy into changing structures and usually leave instructional practice untouched. That message has been confirmed by Fred Newmann's work at the Center on Organization and Restructuring of Schools, and other research. We're just now getting the first generation of aggregate studies on block scheduling, which, shockingly, show no relationship between its adoption and any outcome on student performance that you can measure. Of course, this is exactly what one would have predicted, given the previous research on structural reforms.

The reasons for this are pretty straightforward. Notice that I didn't say structural changes don't matter. They often matter a lot. There are problems in high schools that cannot be solved without making dramatic changes in structure, but in the vast number of cases there is no instrumental relationship between any change in structure, any change in practice, and any change in student performance. That is the big problem with the usual approaches to school improvement. We are viscerally and instinctively inclined to move the boxes around on the organizational chart, to fiddle with the schedule. We are attracted and drawn to these things largely because they're visible and, believe it or not, easier to do than to make the hard changes, which are in instructional practice.

By Richard F. Elmore of Harvard University. Excerpts adapted from the January/February 2002 edition of the Harvard Education Letter, *available online at* ***www.edletter.org.***

High School Culture Here and Abroad

With the cooperation of the AFS (formerly the American Field Service), the Brown Center conducted a survey of foreign exchange students in U.S. high schools during the 2000-01 academic year. Completed surveys were received from 368 students, about 73 percent of the sample. We over-sampled students from high-achieving nations: France, Sweden, Russia, Hong Kong, and Japan.

The response rate makes us confident that the survey findings are an accurate reflection of these students' opinions. Keep in mind, though, that exchange students are almost certainly not representative of their countries' students as a whole. It is safe to assume that they are excellent students, probably from families of above average wealth, attending U.S. schools that are above average in performance, and, while in the U.S., enrolled in classes designed for high achievers.

How do American classes compare?

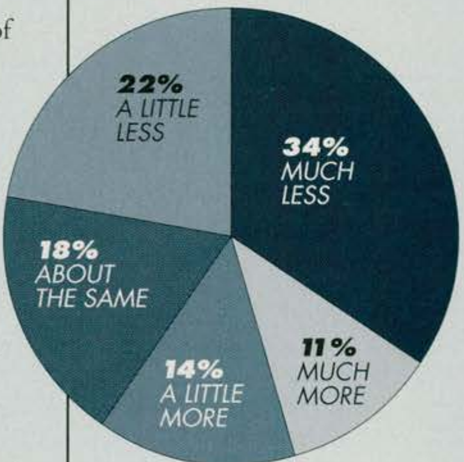
The foreign exchange students found U.S. classes easier than classes in their home countries. More than half, 56 percent, described the U.S. classes they attended as much easier and 29 percent as a little easier. In contrast, only 5 percent found U.S. classes much harder and 6 percent a little harder.

Do American students spend as much time on schoolwork?

We asked exchange students to compare the amount of time U.S. students and students in their home

American students don't spend as much time on schoolwork.

Exchange students were asked: "Compared to students in your home country, do you think U.S. students spend more, less, or about the same amount of time on schoolwork?"



Margin of error: +/– 5%

countries devote to schoolwork. More than a third, 34 percent, said U.S. students spend much less time on schoolwork and 22 percent said a little less time. This compares with 11 percent who felt that Americans spend much more time on schoolwork and 14 percent who believed the U.S. students' time commitment was a little more. The figures reaffirm other surveys of international study habits. American students don't spend as much time studying—either in school or at home—as kids in other countries. The exchange students provide an interesting, counter-intuitive caveat to this finding, however. It isn't simply more homework that makes a difference. Estimates of how often math homework is assigned in the U.S. and abroad are almost identical.

How can American kids spend less time on schoolwork but have homework assigned just as often? Speculation is warranted here. Consistent with courses being easier, U.S. homework may be as frequent but take less time to complete. It could also be that students abroad spend more time preparing for class, studying for tests, and reviewing material previously covered—activities of good students that go beyond completing assigned homework.

It's important to note that such activities are self-initiated. Students are assumed to do them—by teachers and by other students. It's what good students do. That is what is meant by a strong academic culture.

By Tom Loveless of the Brookings Institution. Excerpts adapted from The Brown Center Report on American Education, 2001. *Reprinted with permission by the Brookings Institution Press. Available online at* ***www.brookings.edu/dybdocroot/GS/brown/bc_report/BC_Report_hp.htm.***

Reading, Reading, Everywhere

The American Academy of Pediatricians recommends that parents read to their children every day—starting when the children are just six months old. "Reading aloud with children has been shown to be the single best predictor of a child's future academic success," says the Family Literacy Foundation (**www.read2Kids.org**). The message is getting picked up, thanks to the U.S. military, the Family Literacy Foundation, and the wonders of video. Military personnel stationed far from home can now read their children bedtime stories. In the photograph below, Commander Mark Whitney is in a television studio aboard the USS Theodore Roosevelt, stationed in the Arabian Sea, reading a book about firefighters to his three-year-old twin sons. Whitney's video, which includes four stories, was later sent to his family in Virginia.

ASSOCIATED PRESS/AP

The Power of Story

Based on the science results in the 1996 and 2000 National Assessment of Educational Progress (NAEP), it seems that little has changed in the past several years. While fourth-graders' scores held steady, slightly more eighth-graders reached the proficient level and slightly fewer 12th-graders reached the basic level. If science is indeed a national priority, we must think carefully about how to improve. According to George D. Nelson of the American Association for the Advancement of Science, a critical—yet often overlooked—component of science courses is a conscious effort to tie students' "knowledge into a coherent picture of how the world works and how we have come to know it."

One of today's great scientists, Edward Wilson, agrees. Wilson proposes teaching science through the power of story. As Wilson explains in this first article, the universal love of stories is not a coincidence; our brains function by constructing narratives. Adults and children alike live, learn, and relate to others through stories. Unlike other forms of writing, stories engage our emotions and imagination in the process of learning. "The story," according to educational theory professor Kieran Egan, "not only conveys information and describes events and actions, but it also engages our emotions. 'Story' does not necessarily imply a fictional narrative; rather, it involves the narrative shaping of any content."

In "The Story of the Atom," which follows this article, writer Joy Hakim catches us up in the scientific detective work that eventually convinces the world that the atom exists. Unlike the science texts that we labored over in school, this story drew us in, carried us through difficult concepts, and left us with a whole new understanding of the atom. In other words, we learned a lot!

Paired with experiments and other materials, the stories of science offer an engaging, coherent anchor for our science courses. They also reveal a fascinating aspect of scientific discoveries that is often missed by non-scientists. According to Hakim, "The great scientists always seem to have a sense of story. They are looking for patterns, for connecting links between theories, and those who achieve are those who take the imaginative leaps, combining experimental data with ideas, finding nature's story."

—EDITORS

By Edward O. Wilson

Let me tell you a story. It is about two ants. In the early 1960s, when I was a young professor of zoology at Harvard University, one of the vexing mysteries of evolution was the origin of ants. Ants are the most abundant of insects, the most effective predators of other insects, and the busiest scavengers of small dead animals. They transport the seeds of thousands of plant species, and they turn and enrich more soil than earthworms. In totality (they number roughly in the million billions and weigh about as much as all of humanity), they are among the key players of Earth's terrestrial environment. Of equal general interest, they have attained their dominion by means of the most advanced social organization known among animals. I had chosen these insects for the focus of my research. It was the culmination of a fascination that dated back to childhood. Now, I spent a

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Edward O. Wilson is a Pellegrino University Research Professor and the Honorary Curator in Entomology in the Museum of Comparative Zoology at Harvard University. For his research and writing (which includes hundreds of articles and roughly 20 books), Wilson has earned high honors such as two Pulitzer Prizes, the National Medal of Science, the Audubon Medal, and the Sir George Deacon Medal from the Fulbright Association for Interdisciplinary Studies. This article was adapted from Wilson's introduction to The Best American Science and Nature Writing, © 2001. *Reprinted with permission of Houghton Mifflin Company.*

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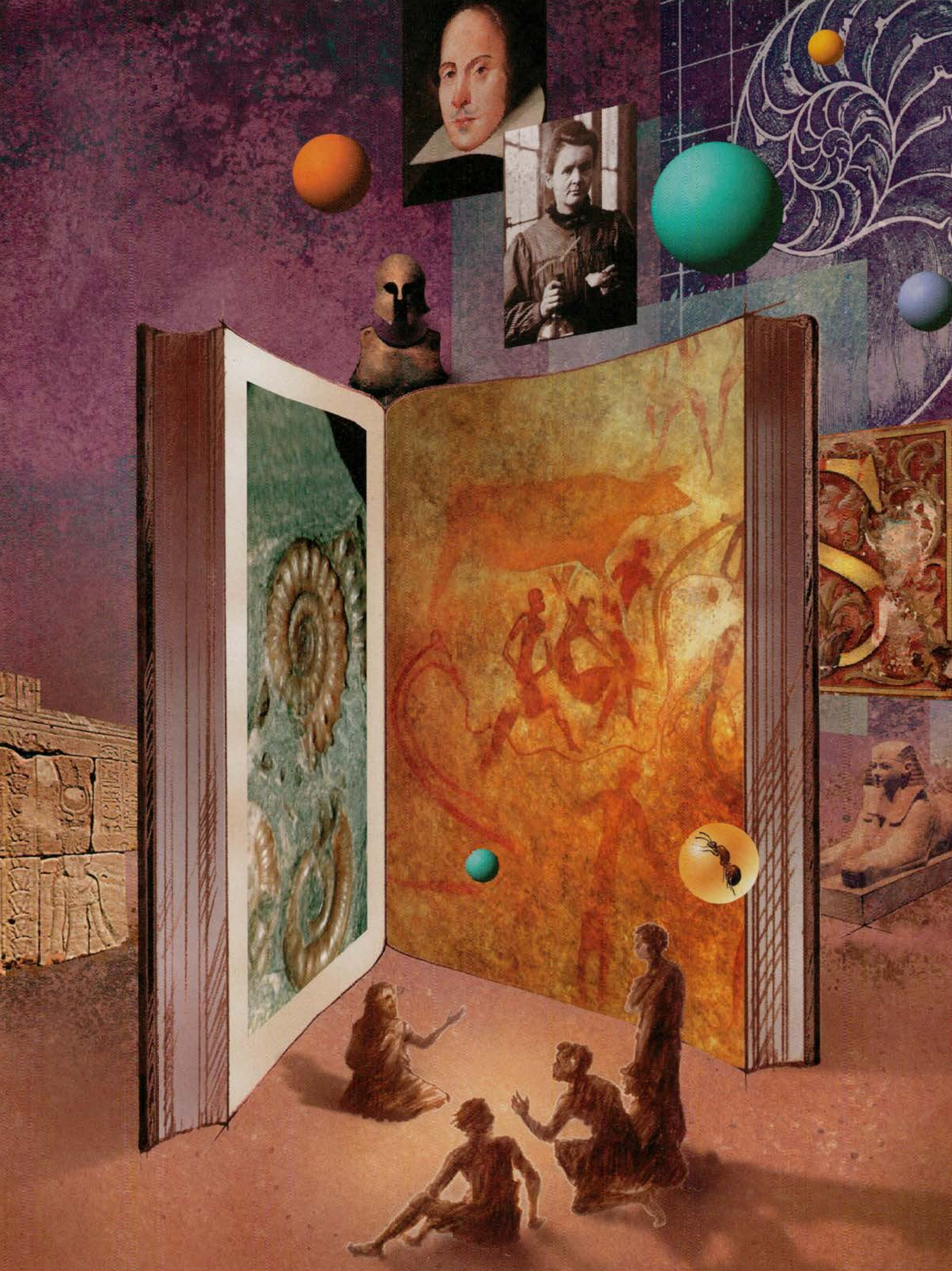


lot of time thinking about how they came to be.

At first, the problem seemed insoluble because the oldest known ants, found in fossil deposits up to 57 million years old, were already advanced anatomically. In fact, they were quite similar to the modern forms all around us. And just as today, these ancient ants were among the most diverse and abundant of insects. It was as though an opaque curtain had been lowered to block our view of everything that occurred before. All we had to work with was the tail end of evolution. I was afraid I would never see a real "Ur-species" (primitive ant) in my lifetime.

Then, as so often happens in science, a chance event changed everything. One Sunday morning in 1967, a middle-aged couple, Mr. and Mrs. Edmund Frey, were strolling along the base of the seaside bluffs at Cliffwood Beach, N.J., collecting bits of amber. In one lump they rescued, clear as yellow glass, were two beautifully preserved ants.

The Freys were willing to share their find, and soon the two specimens found their way to me for examination. There they came close to disaster. As I nervously fumbled the amber piece out of its mailing box, I dropped it to the floor, where it broke into two halves. Luck stayed with me, however. The break was as clean as though made by a jeweler, and each piece contained an undamaged specimen. Within minutes, I determined that the ants were the long-sought Holy Grail of ant paleontology, or at least very close to it. They were more primitive than all other known ants, living and fossil. Moreover, in a dramatic confirmation of evolution as a predictive theory, they possessed most of the intermediate traits that according to our earlier deductions should connect modern ants to the nonsocial wasps.

Science consists of millions of stories like the finding of New Jersey's dawn ants. These accounts—some electrifying, most pedestrian—become science when they can be tested and woven into cause-and-effect explanations to become part of humanity's material worldview. But they also constitute a fascinating narrative, which can be the key to helping the non-scientist understand the great ideas of science.

We all live by narrative, every day and every minute of our lives. Narrative is the human way of working through a chaotic and unforgiving world. The narrative genius of *Homo sapiens* is an accommodation to the inherent inability of the three pounds of our sensory system and brain to process more than a minute fraction of the information the environment pours into them. In order to keep the organism alive, that fraction must be intensely and accurately selective. The stories we tell ourselves and others are our survival manuals.

As two leading researchers in social cognition have said, "Storytelling is not something we just happen to do. It is something we virtually have to do if we want to remember anything at all." Over the past three decades, cognitive psychology has emerged as a promising arena for understanding how we perceive, remember, and feel about the world around us. Researchers have learned that stories—both the ones stored in our memories and those we generate as we interact with the world—are essential to each of these aspects of learning. Facts presented in stories, as opposed to lists, are much easier to remember. Likewise, facts that stir up intense emotions are quickly and easily stored in our brains (think, for example, how easily your students remember what happened in Hiroshima), and well-told stories are a great way to tie emotions to facts. Researchers have also demonstrated that the common marks of good storytelling—metaphors and analogies that draw the audience in—work because they allow the audience to tie the story to previous knowledge and experience.

With new tools and models, neuroscientists have joined cognitive psychologists in drawing closer to an understanding of the conscious mind as a narrative generator. Working on the same questions from different perspectives, neuroscientists, cognitive psychologists, and even evolutionary biologists are converging on a common theory of the brain: It develops stories to filter and make sense of the flood of information that we are exposed to every day. Working at a frantic pace, the brain summons memories—past stories—to help screen and organize the incoming chaos into narrative fragments. Only a tiny fraction of these are then selected for higher-order processing in the prefrontal cortex. That fraction constitutes the theater of running symbolic imagery we call the conscious mind. The brain is also engaged in a continuous cycle of folding new fragments of the story into one's memory while letting others go (forgetting). Across generations, the most important among these fragments are communicated widely and converted into history, literature, and the oral tradition.

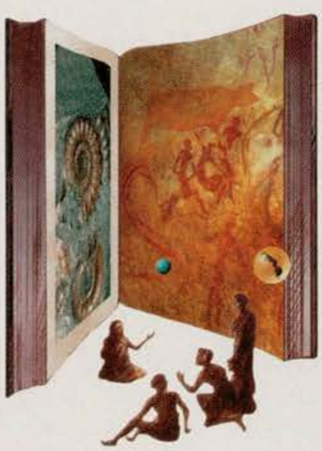
In contrast, the scientific method is not natural to the human mind. The phenomena it explicates are by and large unfamiliar to ordinary experience. New scientific facts and workable theories, the silver and gold of the scientific enterprise, come slow and hard, less like nuggets lying on a streambed than ore dug from mines. To enjoy them while maintaining an effective critical attitude requires mental discipline.

The reason, again, is the innate constraints of the human brain. Gossip and music flow easily through the human mind because the brain is genetically predisposed to receive them. Theirs is a Paleolithic cogency. Calculus and reagent chemistry, in contrast, come hard, like ballet on pointe. They became relevant only in modern, postevolutionary times. Of the hundreds of fellow scientists I have known for more than 50 years, from graduate students to Nobelists, all generally prefer at random moments of their lives to listen to gossip and music rather than to scientific lectures. Trust me: Physics is hard even for physicists.

So, how can we make science human and enjoyable without betraying its nature? The answer lies in humans' innate capacity to understand narrative. Consider the case of science writing. Along with Burkhard Bilger, I edited *The Best American Science and Nature Writing, 2001*. How did the authors succeed in conveying complicated, essential science to a broad audience? By two means: They present the phenomena as a narrative, whether historical, evolutionary, or phenomenological, and they treat the scientists as protagonists in a story that contains, at least in muted form, the mythic elements of challenge and triumph.

To wring honest journalism and literature from honest sci-

Science consists of millions of stories like the finding of New Jersey's dawn ants. These accounts—some electrifying, most pedestrian—constitute a fascinating narrative, which can be the key to helping the non-scientist understand the great ideas of science.



ence, the writer must overcome formidable difficulties. First is the immensity and exponential growth of primary material itself, which, for more than 300 years, has experienced a phenomenally short doubling time of 15 years. Science has spread its reach into every conceivable aspect of material existence, from the origin of the universe to the creative process of the mind itself. Its relentless pursuit of detail and theory long ago outstripped the minds of individual scientists themselves to hold it. So fragmented are the disciplines and specialized the language resulting from the growth that experts in one subject often cannot grasp the technical reports of experts in closely similar specialties. Insect neuroendocrinologists, for example, have a hard time understanding mammalian neuroendocrinologists, and the reverse.

A second obstacle to converting science into literature is the standard format of research reportage in the technical journals. Scientific results are by necessity couched in specialized language, trimmed for brevity and delivered raw. Metaphor is unwelcome except in small doses.

In pure literature, metaphor and personal style are, in polar contrast, everything. The creative writer, unlike the scientist, seeks channels of cognitional and emotional expression already deeply carved by instinct and culture. Imagery, phrasing, and analogy in pure literature are not crafted to report empirical facts. They are instead the vehicles by which the writer transfers his own feelings directly into the minds of his readers in order to evoke the same emotional response. Originality and power of metaphor, not new facts and theory, are coins of the realm in creative writing. Metaphor in the best writing strikes the mind in an idiosyncratic manner: Its effect ripples out in a hypertext of culture-bound meaning, yet it triggers emotions that transcend culture.

To illustrate the difference, I've contrived the following imaginary examples of the two forms of writing applied to the same subject—the search for life in a deep cave:

> SCIENCE: The central shaft of the cavern descends from the vegetated rim to the oblique slope of fallen rock at the bottom, reaching a maximum depth of 86 meters before giving way to a lateral channel. On the floor of this latter passageway we found a small assemblage of troglobitic invertebrates, including two previously undescribed eyeless species of the carabid subfamily *embidini* (see also Harrison, in press).

> LETTERS: After an hour's rappel through the Hadean darkness we at last reached the floor of the shaft almost 300 feet below the fern-lined rim. From there we worked our way downward across a screelike rubble at the very bottom. Our headlamps picked out the lateral cavern exactly where Romer's 1926 map claimed it to be. Rick pushed ahead and within minutes shouted back that he had found blind, white cave inhabitants. When we caught up, he pointed to scurrying insects he said were springtails and, to round out the day, at least two species of ground beetles new to science.

Because science, told as a story, can intrigue and inform the non-scientific minds among us, it has the potential to bridge the two cultures into which civilization is split—the sciences and the humanities. For educators, stories are an exciting way to draw young minds into the scientific culture. One way of teaching science, which I adopted during 40 years of teaching at Harvard, is to begin with the big topics that mean something immediate and important to students. These are the same topics that great works of literature and philosophy attempt to address. For example: What is life? What's the meaning of life? In the case of Joy Hakim's story of the atom that follows, what's our world made of? How do we find out? And so on. Once you've got the attention of the audience, then you break the big questions down into stories, little dramas, that expose the trial and error process of science and the ideas that animate and move it forward.

Most educated people who are not professionals in the field do not understand science and technology, despite the profound effect of these juggernauts of modernity on every aspect of their lives. Symmetrically, most scientists are semiliterate journeymen with respect to the humanities. They are thus correspondingly removed from the heart and spirit of our species. This split is a huge problem. It is, if you will permit a scientist a strong narrative-laden metaphor, the central challenge of education in the 21st century. □

The Story of the Atom

(aimed at middle-schoolers, fascinating for adults)

By Joy Hakim

I. The Ancients

The One Basic Thing

A long, long time ago, actually it was about 2,500 years ago—which was before Socrates, or Plato, or Aristotle, or any of the Greeks you may have heard about—there lived a man named Thales (THAY leez). He is said to be the world's first philosopher-scientist. The first to look for explanations in observed facts, not myths. The first scientist to leave his name on his ideas.

We don't know much about Thales as a person, except what others tell us. And they tell of a many-sided genius who was a lawgiver, a civil engineer (he changed the direction of the Halys river), an astronomer, a mathematician, and a teacher. It is said that he predicted the solar eclipse of May 28, 585 B.C., and that he figured the height of a pyramid by measuring its shadow, using the Sun's position to do it. Perhaps most important to people of his time, he worked out a way to tell distance at sea. For seafaring people, that was an enormous achievement.

Thales tried to discover a basic unit, or element of life. Water—which takes three forms (solid, liquid, gas)—seemed logical. It was a reasonable start for a search that continues today.

The world is full of differences, and yet, Thales had the idea that underneath all the complexity there is a plan—some call it a divine plan—that explains everything. He, and his followers in Greek-speaking Ionia (today, western Turkey), looked for answers in the world about them, not in mythology or wizardry.

Thales asked, "What is the nature of matter?" By that he meant: What are we made of? What is the world made of? Is there one thing that ties everything together?

Those questions are the big ones that scientists from his time until now have tried to answer. Is there something that is basic to all life? Keep reading and see if you can find the answer to that question.

"Earth, Air, Fire, and Water," says Empedocles

Thales said life's basic element is water. Another Ionian, Anaximedes, said it was air. Other Greeks said fire, or earth. Empedocles (em PED uh kleez), who lived in the fifth century B.C., said it was all four of those: earth, air, fire, and water.

That idea of four elements—earth, air, fire and water—was one of the longest lasting and most influential scientific hypotheses in all of world history. For centuries and centuries and centuries (more than 2,000 years) people believed it—although it would turn out to be wrong. Some children were still being taught about earth, air, fire, and water in 19th-century American schools.

Empedocles was wrong in the elements he chose, but right in his idea that, instead of a world where everything is different and unrelated, there are certain basic substances that combine to make up everything else. We now realize that earth, air, fire, and water aren't basic elements. We've found over 100 elements (we discovered some of them in high-technology lab experiments). It was the Ionians who got us searching in the right direction.

What's important to remember about all this is that the

After many years as a teacher, reporter, and editor, Joy Hakim now writes nonfiction stories for children. She is completing a 6-volume history of science for middle-schoolers, from which this article is drawn. Her 10-volume set, A History of US, *which* American Educator *introduced with articles in 1990 and 1993, earned the Michener Prize In Writing and is now being adapted for a PBS series called "Freedom" that will air early next year. The science books should be published by fall 2003; as publication information becomes available, it will be posted on our Web site* ***(www.aft.org/publications/american_educator)****. For other information and how to become a test site, contact* **byron@amerhistpub.com.** *Special thanks to physicists John Hubisz, president of the American Association of Physics Teachers; Hans Christian von Baeyer, professor at the College of William and Mary; and Gerald Wheeler, executive director of the National Science Teachers Association, for their assistance.*

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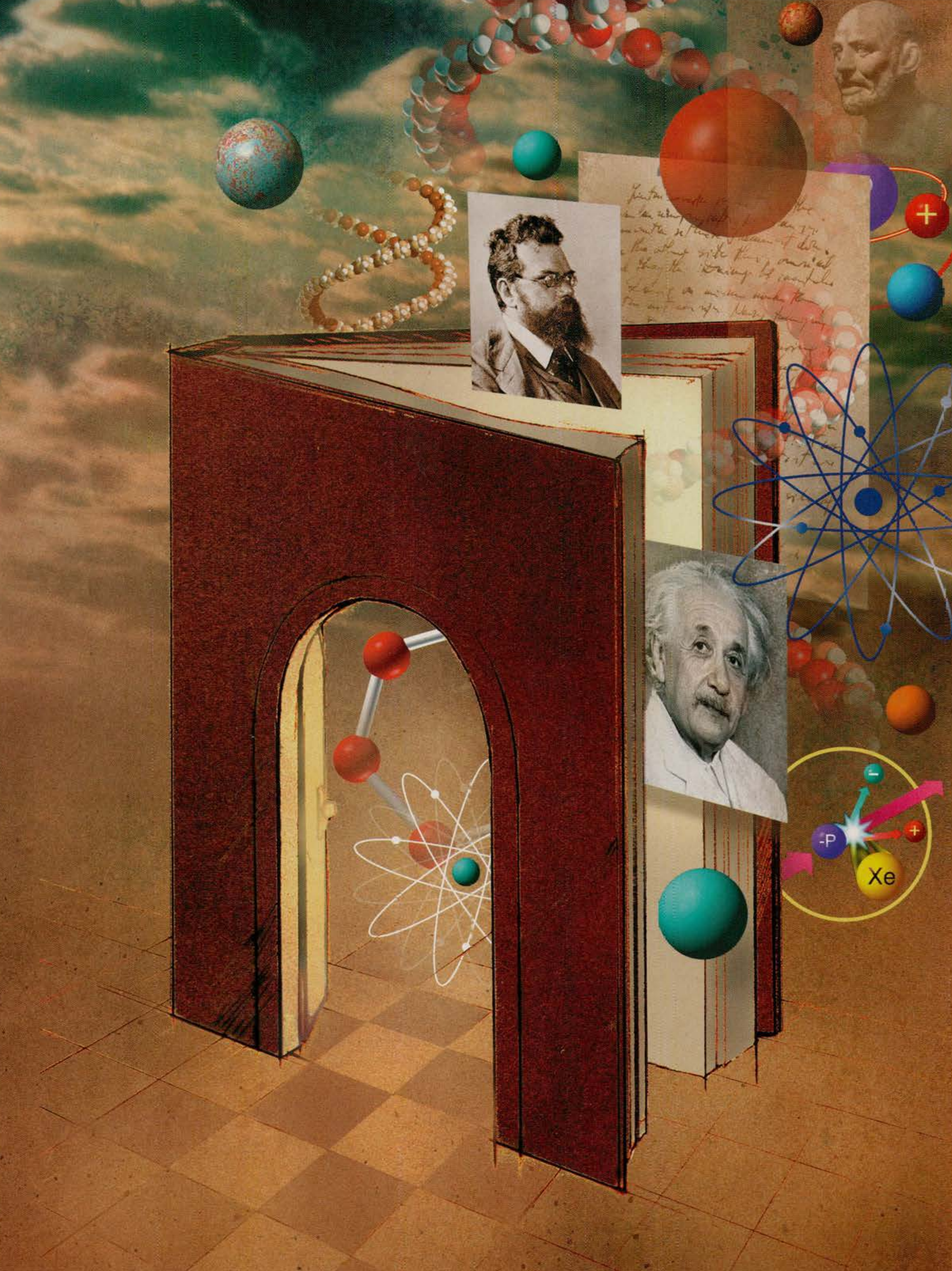
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The Ionians had come up with those four basic elements. Democritus thought there must be something still smaller, something they all had in common.

Greeks trusted their brains, and they understood that to know the large (the universe), they must investigate the small (basic elements). That's exactly what science does today.

"Numbers," says Pythagoras

Pythagoras (puh THA guh russ) was born (in 582 B.C.) on a Greek island, Samos, which had a world-class prosperous port. When Pythagoras was a boy, ships carrying new ideas seemed to blow in on almost every breeze. Samos boasted engineering marvels: a tunnel with water pipes cut through a big hill, a manmade harbor, and the largest of all known Greek temples. But its greatest marvel would turn out to be Pythagoras himself. He tied philosophy to mathematics.

How do you make sense of the universe? Is it a messy place that takes on meaning as we slog through mountains of information—trying this, trying that—adding one block of knowledge to another? (Believe that and you're an Ionian-style scientist.)

Or, is it an orderly, perfect creation that can be understood through mathematical formulas and headwork? (Believe that and you're a Pythagorean.)

Actually, the modern scientific method combines both approaches—pure thinking along with observation and attempts to find proofs (through experimentation)—but it took a long time to get that method working.

For Pythagoras, the way to understand the universe was by searching for things that are absolutely true—and numbers seemed perfect for that quest. "All is number," he said. And he meant it. Everything in the world, he believed, could be explained through mathematics. He went still further; he believed numbers were divine, an expression of God's mind.

By plucking musical strings of different but carefully measured lengths with the same tension, he found that sounds have exact number relationships. That gave order to music that no one had imagined before. If music can be explained mathematically, why not other things?

He focused on the horizon; then he cut through that horizontal plane with a straight up and down vertical line and he had a right angle. Pythagoras must have played with right angles in his mind. He is identified with a theorem that seems simple to us now, but was an astonishing achievement: *The square of the hypotenuse (the longest side) of a right triangle equals the sum of the squares of the other two sides.* It's called the Pythagorean Theorem: $A^2 + B^2 = C^2$.

Some historians say the Babylonians knew that theorem before Pythagoras, but he understood its importance and introduced it to the Greek-speaking world. Whatever the historical truth, he usually gets the credit.

There is an exactness to the world, an orderliness, and it follows rules that can be proved with numbers—that's what Pythagoras told us, and it has been confirmed again and again.

Pythagoras believed that the universe has a mathematical base, and that its structure and relationships can be described with mathematical formulas. He made that a foundation of Western science. No one has done more.

"There's an 'atom,'" says Democritus

I would rather understand one cause than be King of Persia, said Democritus (duh MOK rih tus), who was born about a hundred years after Pythagoras. Now the King of Persia had about as much power as anyone could have—and he was fabulously wealthy, too—so only those who understood the power of ideas would get what Democritus was saying.

Democritus was born in Thrace, which was an unfashionable, out-of-the-way place for a philosopher. "What can you expect from someone born in Thrace?" people may have said. It was a country to the west of the Black Sea and north of the Aegean, and it was not a center of philosophy. But that never stopped powerful thinker Democritus.

Democritus believed that to understand the universe you need to know what it is made of. The Ionians had come up with those four basic elements: earth, air, fire, and water. Democritus thought there must be something still smaller, something that unified these "elements"—something they all had in common.

He said there had to be a smallest substance in the universe that can't be cut up or destroyed and is basic to everything else. He called that smallest substance an "atom" (from *A-tomos,* which means "unable to be cut"). "Nothing exists," said Democritus, but "atoms and the void." (By void, he meant empty space—nothingness.) The atoms that Democritus had in his mind were solid, hard, and compact. Nothing could penetrate them. They were in constant motion, and they were too small to be seen.

Much of what we know of Democritus is hearsay. Except for a few words, his writings have been lost. (In those days before printing, all books had to be hand-copied so there weren't many copies.)

Was he right? Is there a basic building block of life? A smallest of the small out of which comes everything? It's a question we're still considering.

But brains and imagination can only take you so far in science, and then you hit a wall. Without the technology to experiment and test things, you can't confirm your ideas. That was the problem the Greeks faced. There didn't seem to be any place to go with science. It was hopeless to look for atoms; if they existed, they were too small to be seen.

So the next generations headed in a different direction.

Socrates (SOCK ra teez—465? to 399 B.C.), who lived in Athens and was called the wisest man in the world by the

Oracle of Delphi, turned from physical science to a study of the human soul. "Know thyself," he told his followers, echoing the words of that oracle. This is good advice but it doesn't do much for scientific research.

Socrates never got interested in atoms. Neither did his famous student, Plato, or Plato's famous student, Aristotle. Aristotle was an organizer and a classifier and an all-around thinker with a mind few others have matched. But he rejected the idea of atoms. He thought that even those basic substances, called "elements," could be divided endlessly—and that you'd never get anything else. There is no bottom-line particle, said Aristotle. Forget atoms, he said. And, for centuries to come, most scientific thinkers did just what Aristotle told them to do.

II. The 'Atom' Idea Returns

Why Can You Compress Air Without Changing Its Weight?

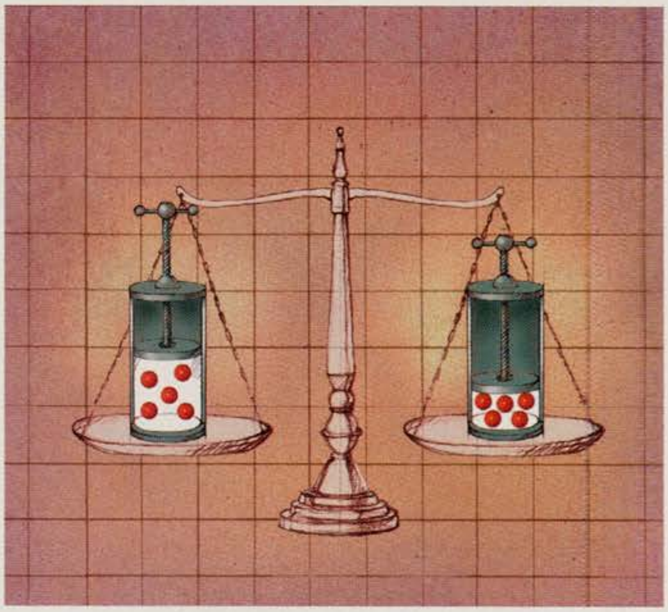
But there was something about those tiny particles—they kept popping up in inquisitive minds. One belonged to Thomas Harriot, an Englishman who went to the New World with Sir Walter Raleigh and wrote a popular book about what he saw there. Later, in a letter to fellow scientist Johann Kepler, Harriot suggested that Kepler "abstract and contract yourself into an atom" and enter "nature's house.... And when you...come out again, tell me what wonders you saw."

Robert Boyle (1627-1691), who was born in a castle a few years after Harriot died, was a prodigy (a young genius). In addition to being very smart, he was rich and lucky and had loving parents who took him on trips through Europe. When he was 14, he got to meet Galileo, the greatest scientist of that time—and one of the greatest scientists ever. (He'd already read all of Galileo's writings.) Galileo told him to study science. He took that advice.

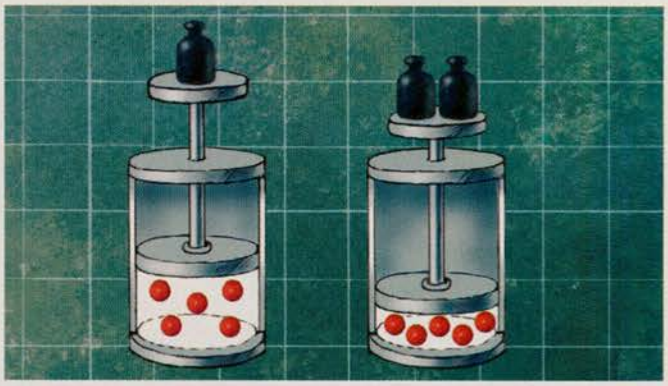
Boyle was fascinated with air; then no one knew it was made of several gases because no one had ever analyzed air—or any gas. In 1657, Boyle got his assistant, Robert Hooke, to design an air pump; with it, they were able to create a vacuum in a tube.

In 1663, Robert Boyle did a famous experiment with the pump, showing that if you take air in a large container and squeeze it into a smaller space, it will be smaller in volume but not in weight.

Later, he came up with what is known as Boyle's Law: *The volume of a gas is inversely proportional to the pressure put on it* (as long as its temperature stays the same). In other words, if you want to squeeze a volume of gas into half its space, you need to double the pressure put on it and vice versa. Boyle's Law, which really is quite simple, is a very important scientific milestone, although few took it seriously at the time. According to Samuel Pepys (PEEPS), who wrote about it in his diary, England's King Charles II "mightily laughed" when he heard the scientists at the Royal Society were "spending time only in weighing of air, and doing nothing else since they sat."



Boyle found that air could be squeezed into a smaller space without changing its weight.



From his experiments with air, Boyle figured out that the volume of a gas depends on the amount of pressure on it—doubling the amount of pressure cuts volume in half. Boyle then realized that air must be made of tiny particles and empty space—future scientists understood that those particles were atoms.

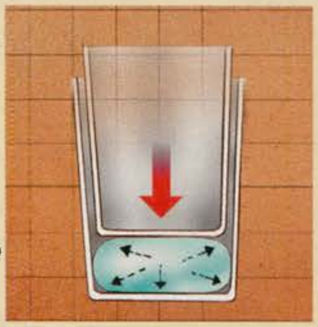
But some earnest scientists understood the importance of Boyle's Law. (It is still the starting point for much scientific research with gases, so it is worth rereading.)

Boyle's Law got scientific thinkers asking, "What can air be made of if you can change its size and shape without changing its weight?" Boyle said gases must be composed of tiny "corpuscles" (KOR puss ulz, little particles) and a lot of empty space, which is the reason a fixed amount of a gas can be squeezed from a big container to a small container. With his corpuscle idea, he was going back to the Greek theory of atoms. Isaac Newton, who was 15 years younger than Boyle (and, like Galileo, one of the greatest of all scientists), also believed in atoms. But he was so busy inventing calculus, finding the laws of motion, tracking down gravity, and studying light that he didn't have much time to work on the atomic idea. (It was Robert Boyle who financed Newton's great book on science, *The Principia.*) Though he didn't closely study atoms, Newton had a picture of those tiny par-

Test Boyle's Ideas

Try to compress a liquid

Fill a balloon with a little water and tie the end. Try to squeeze it between two plastic beakers. You cannot squash the water into a smaller space.



Liquids cannot be squashed, so when you push on one part of a liquid, pressure is carried to all other parts of it.

Try to compress a gas

Blow a little air into a balloon and tie up the end. Try to squeeze it between two beakers. Unlike water, you can squash the air into a slightly smaller space.

Gases can be squashed, or compressed, into a smaller space. A compressed gas, like air in a balloon, pushes out equally in all directions. The more you compress a gas, the higher the pressure inside it.

Based on the 1997 edition of Annabel Craig and Cliff Rosney's The Usborne Science Encyclopedia (*Usborne Publishing Ltd.*).

ticles in his head. He said, "It seems probable to me that God in the beginning formed matter in solid, massy, hard, impenetrable, movable particles." (Keep reading to see if he was right.)

Not many people paid attention to any of this. There didn't seem to be a chance of actually seeing atoms. But, in Switzerland, a young mathematician named Daniel Bernoulli read Boyle and the Greeks and took those tiny corpuscles seriously.

What Creates Pressure in a Gas?

Daniel Bernoulli (burr NEW lee) wanted to be the Newton of the 18th century; he thought he could do it by studying fluids (by that he meant liquids and gases).

Daniel, who was born in 1700, had the background to go for it. His father, Johann, and his uncle, Jacob, were both world-famous mathematicians and they both hated Isaac Newton (who was now dominating the world of science). Daniel was another prodigy: he could deal with numbers at an amazingly early age. But his career wasn't as easy for him as you might think; his father, Johann, was not your normal loving dad—he was jealous, nasty, and miserable.

Johann decided that his son would become a merchant and enter the family pharmacy business. But Daniel wanted to study mathematics. He was good at mathematics, and he was a terrible businessman. He failed as a pharmacist. Johann then insisted that his son Daniel go to medical school, but he did allow him to study mathematics on the side. Johann also answered his son's questions, and, since Johann was one of the best mathematicians in the world, Daniel got very good training.

One of the things that preoccupied the great professor Johann Bernoulli was a little-studied phenomenon called *vis viva* ("living force") in Latin. It was what we call energy, and no one understood it. Daniel was fascinated—*vis viva* was invisible, but clearly powerful.

When Daniel finished medical school—with top grades—he expected to get a professor's job in Basel, and he wanted it to be in mathematics. He got no help from his father and ended up in Russia at the influential Academy of Science. His experiments and writings soon made him widely known. He began winning prestigious scientific prizes. He didn't know it, but his father was fuming.

In 1735, both Daniel and his father wrote papers for the Paris Academy of Sciences, which gave a big prize that was much like today's Nobel Prize. That year, the top prize was split; it was awarded to the two Bernoullis—father and son. Daniel came home to Basel. He thought his father would be pleased, but Johann was furious. He decided his son was trying to take over his position as Europe's top mathematician. Johann threw his son out of the house, and Daniel never returned.

Now, all of that is like gossip, interesting but not really important. What Daniel accomplished though, became a landmark in science. As with so many achievements, it sounds simple, but no one else had figured it out.

Bernoulli considered motion and came up with a very useful principle. Strange as it may seem, when the speed of a fluid increases, its internal pressure decreases proportionately. Or: *As the pressure in a fluid goes down its speed goes up.*

If that simple theorem (idea) doesn't interest you, don't consider a career in engineering. You can't design airplanes or ships or even bridges if you don't understand Bernoulli's principle. If you want to build a carburetor or an atomizer, where air is the moving fluid, you'll use Bernoulli's principle. In an aspirator, water (or another liquid) does what Bernoulli said it should do.

The principle, in simple language, is this: The faster a fluid (liquid or gas) is traveling over a surface, the lower its pressure. Engineers designing airplane wings know (thanks to Bernoulli) that the air flowing over the upper surface of an aircraft wing must move faster than air flowing beneath the wing. When that happens, the pressure will be lower on top of the wing, higher below the wing, and that will help the airplane lift.

That principle of Bernoulli's also led to a "conservation" law that says the total energy in a fluid stays the same no matter what shape the fluid takes. If a liquid or gas goes from a big bottle into a smaller container, the speed of its atoms and the pressure of those atoms against the container will change but its total energy will not.

Daniel Bernoulli went even further than Robert Boyle in anticipating atoms. Bernoulli seems to have pictured them in his mind; he said it is the random, constant motion of atoms hitting the walls of a container that explains pressure in a gas. It was a remarkable deduction, since no one then could be sure atoms even existed.

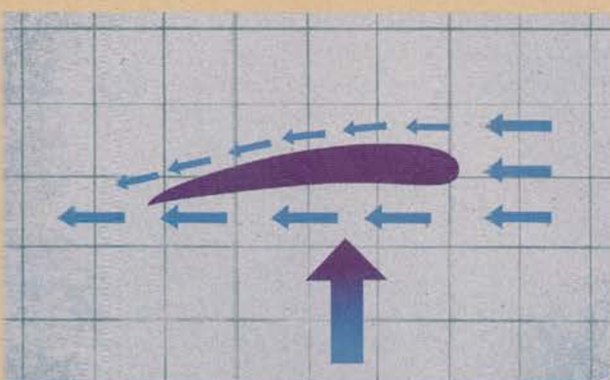
And no one had a clue that atoms are the key to elements, or that each element is made up of atoms that are almost the

See Bernoulli's Idea in Action

How do airplane wings work?

To see how wings work, blow hard over a strip of paper, and watch the paper rise.

The faster air flows, the lower its pressure. So as you blow, the pressure under the paper becomes greater than above it. This pushes the paper up.



The force pushing the wing up is called lift.

The shape of a wing is called an aerofoil. It is designed so air flows faster over the top of it. This lifts the plane up.

Based on the 1997 edition of Annabel Craig and Cliff Rosney's The Usborne Science Encyclopedia (*Usborne Publishing Ltd.*).

same, but different from atoms in other elements. Still, just believing in atoms and figuring out that they are in constant motion—well, that was an astonishing achievement. Getting the atomic idea down on paper as Boyle and Bernoulli did (even if they called them corpuscles), meant others could consider them.

Air Is Not an Element!

Scotsman Joseph Black (1728-1799) was a professor and physician. He was also an experimenter and full of curiosity. As a medical student, he got interested in kidney stones and then realized that minerals in the landscape and minerals in the body are similar. He began experimenting with them. He took some chalk (calcium carbonate, chemically known as $CaCO_3$), heated it with an alkali (a water-soluble base), and found that it gave off a gas. He called the gas "fixed air" because he found he could turn it back into calcium carbonate. We know the gas as "carbon dioxide."

Black's experiment showed that gases can be formed from ordinary solids. Gases, which had always seemed mysterious, were now seen to be chemicals that can be analyzed. Joseph Black, and others, began analyzing. (This was the Enlightenment, and scientific thinkers were helping to make the world understandable.)

Black found that carbon dioxide doesn't act like ordinary air. You can't burn substances in it, and you can't breathe much of it either. He figured out that some calcium carbonate (chalk or limestone in nature) weathers away naturally, becoming part of the air. Black realized that air, which since the time of Empedocles was believed to be basic and elemental, is actually a mixture of gases. That was a totally new idea. Empedocles was wrong—air is not an element!

Gases began to be taken seriously as states of matter, like solids and liquids. In 1766, Englishman Henry Cavendish (1731-1810) found that some metals, acted on by an acid, release a gas that is very flammable. He called it "fire air." We call it hydrogen and it is an element—colorless and odorless, the lightest of all the elements. In 1777, a Swedish apothecary, Carl Scheele, discovered another gas: oxygen. Like Black, Scheele realized that air can't be an element. He found that air contains oxygen and another gas, nitrogen. (He would later learn that it also contains carbon dioxide and still other gases.) Not knowing of Scheele's discovery (the publication of Scheele's results was delayed by his publisher), another scientist, Joseph Priestley, went on to discover oxygen a second time.

Priestley, a big-hearted, nonconformist English clergyman, was a friend of Ben Franklin. (While all this was going on, the British and the Americans were snarling at each other in Boston and Virginia and sometimes fighting.) Priestley, persecuted for his liberal religious ideas in England, headed for America.

Water Is Not an Element!

It was the late 1700s, and on the American continent, a bunch of radicals—George Washington, Thomas Jefferson, and John Adams are some of their names—were getting fed up with British rule. They were imbued with scientific curiosity, as most thinking people were during the Enlightenment (a time rooted in Newton's idea that nature has laws that bring order to the universe).

Politics would take much of the energy of the American revolutionaries. Still, they followed the progress of a young French tax collector who was trying to devote as much time as he could to scientific experimentation. The Frenchman had a head for figures, and also for details. He designed his own superb scientific equipment and spent much of his personal wealth building it. He recorded everything he did. He studied the work of the best of the alchemists (alchemists combined mysticism with experimentation).

The alchemists didn't weigh things with precision. The Frenchman did. He was a real scientist, so he didn't accept ideas he couldn't test and prove. The exact numbers that

Still, just believing in atoms and figuring out that they are in constant motion—well, that was an astonishing achievement.

careful weighing gives make it possible to be mathematical and scientific.

Does water turn into earth as everyone believed? He decided to test for himself. He weighed some distilled water. Then he poured the water into one of two flasks connected by a tube so that the water vapor could go from one to the other. He sealed the flasks and heated them. The sealed system never changed weight. But, after 110 days, bits of residue had appeared in the water. He then weighed the dry flasks, the water, and the residue separately. The flask had lost weight equal to the weight of that residue. The alchemists said that water is "transmuted" (changed) into earth. With his accurate measurements, the Frenchman showed that the residue came from the flask, not the water. Water does *not* turn into earth!

The Frenchman said the new experiments with gases—the work of Boyle, Black, Priestley, and others—were like links in a giant chain that needed to be welded together. He decided he was the person to hold the torch.

When he learned that British experimenters had separated water into hydrogen and oxygen, he did his own experiments and confirmed their work. Now there was no question of it. Water is not an element! He later concluded that fire is not an element either.

The Frenchman realized that certain substances can't be further divided; he said they are the "elements." He understood and explained that idea to others.

The Frenchman's name was Antoine Laurent Lavoisier (ahn TWAHN lor RENT la VWA zee yay) and he has been called the father of chemistry.

III. Atoms and Molecules

Dalton Weighs Atoms

Experiments were proving that Empedocles' four substances—earth, air, fire, and water—were not the uncuttable elements he thought. But what about atoms? Robert Boyle (the Irishman who came up with the famous gas law) said that gases must be made of tiny "corpuscles" with a lot of empty space between them. Newton talked about "impenetrable" particles. Could Boyle's corpuscles and Newton's solid, massy particles be atoms? Lavoisier didn't think so. He didn't believe in atoms. Hardly anyone did, except Daniel Bernoulli (and Bernoulli's work would be ignored for almost 100 years).

Finally, an English Quaker named John Dalton came along and his timing was right.

Dalton was born in 1766 when winds of change had blown fresh air onto the European scene, and science, the arts, and political and religious philosophy were all hives of activity.

Otherwise, he didn't start off with good fortune. His father was a poor weaver who worked on a hand-loom and hardly earned enough to feed his family. Dalton was an awkward, colorblind boy with a weak voice. He was self-conscious and shy, but he was so bright that, at age 12, he was teaching in a small Quaker school. How would you like a 12-year-old teacher? His students didn't think much of the idea; they all dropped out.

Dalton went to a nearby village where he studied and even taught school again. At the same time he was doing experiments. He kept a journal that contained, along with other things, more than 200,000 meteorological notes. (Meteorology has to do with the weather.) His journal was published and that got him a job as a professor at New College in Manchester, England. New College was founded for Presbyterians and Quakers who weren't wanted at Oxford and Cambridge—universities open only to Church of England members. (Read some English history to understand why.)

But he didn't stay a professor long; he wanted to devote his time to research, which he did by living modestly and by tutoring students. He began work in chemistry, starting where Lavoisier (the Frenchman) had stopped.

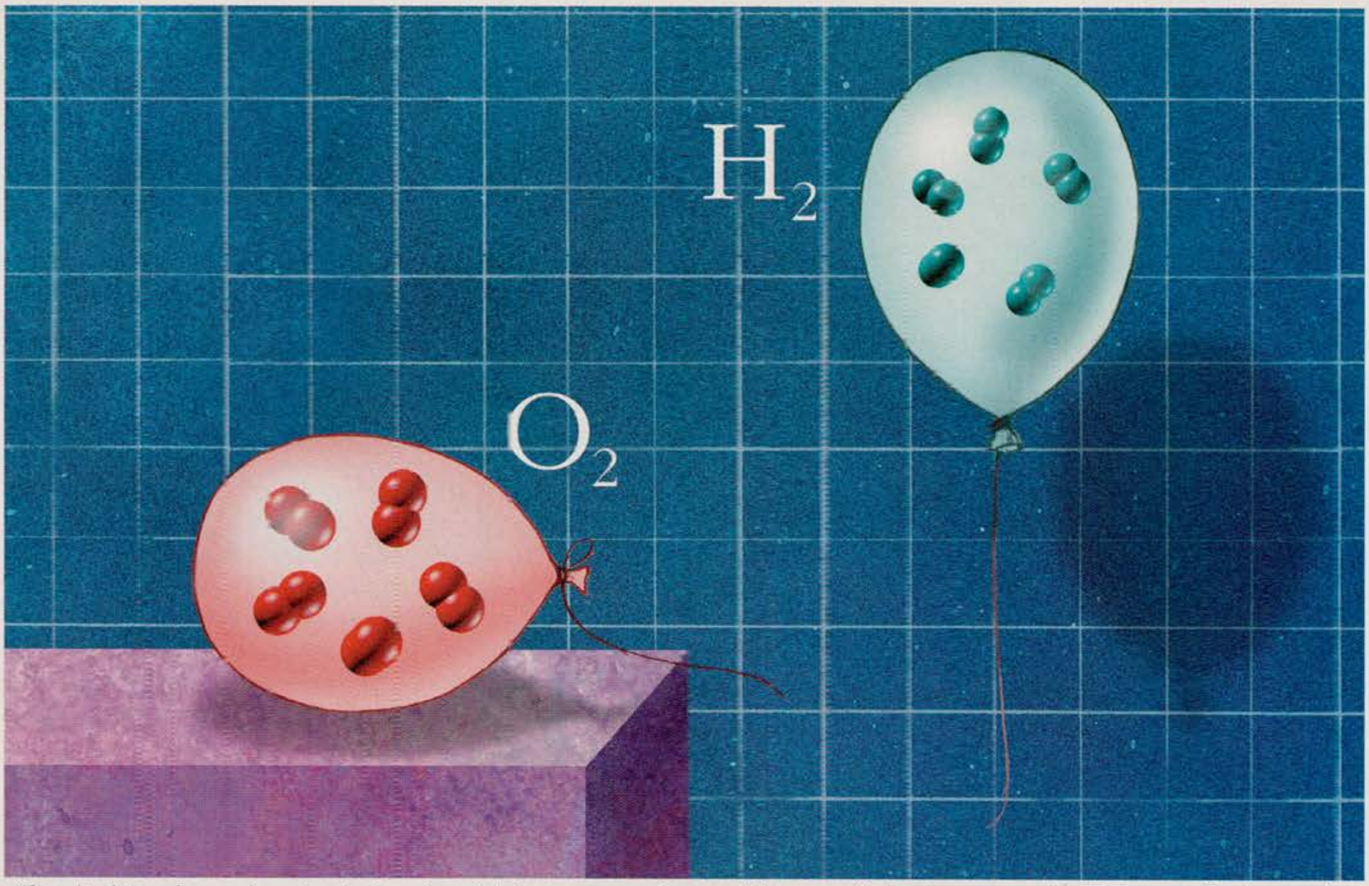
He understood that there are basic substances, known in science as elements—like iron, oxygen, hydrogen, sulfur, and carbon—that cannot be broken down into simpler components by chemical means. But what is it that makes one element different from the other? No one knew.

Dalton thought it might have something to do with atoms. Like Lavoisier, he did his own experimenting and measured with scientific precision. But he went still further. "An enquiry into the relative weights of the ultimate particles of bodies is a subject, as far as I know, entirely new," he wrote, describing the path he had chosen.

But there was no way (then or now) to weigh or measure an individual atom. What could he do? Because of the study of gasses—like hydrogen, oxygen, and nitrogen—Dalton knew that elements always combine in fixed amounts with the same ratio of weight one to another. There is nothing random about it. (It's called "the law of definite proportions.") That give him a breakthrough thought.

Imagine a crate with an equal number of red cups and green saucers. It falls off a forklift: CRASH. You now have a heap of green shards and another of red. You need to know the relative weight of a cup and a saucer but you don't have either. What do you do? You weigh each pile and compare their weights. That ratio between the pile of red and the pile of green is the ratio of the weight of one cup to one saucer.

Dalton knew that if he weighed equal amounts of elements, he could assume equal numbers of atoms and get the ratio of their weights. He still wouldn't know the exact weight of an atom, but he would know how it compared to others. He correctly guessed that hydrogen was the lightest element. He used that as a standard; all the other elements became multiples of that lightest one. It wasn't difficult, but he was the one who got the idea to try it. Once he figured out some relative atomic weights, he could draw conclusions.



After thinking about other scientists' work and doing some experiments of his own, Avogadro was convinced that equal volumes of any two gases contained the same number of molecules (as long as they were at the same temperature and pressure). So, even though H_2 molecules are lighter than O_2 molecules (since hydrogen atoms have less mass than oxygen atoms), a balloon full of H_2 gas would have the same number of molecules as a balloon full of O_2 gas. This insight was another big step in deducing that atoms exist.

Dalton said each element has unique atoms; it is the weight of its atom that identifies an element. (He was basically right, but today we know that atoms are complex. There's a reason for those differing weights. More on this below.)

Dalton's insights led him to ideas that are the basis for modern atomic theory. He said that *every atom in an element is alike and has the same weight;* and *atoms of different elements have different weights.* He prepared a table of atomic weights. He was way off on some of them, but it was a start. (Be sure you understand the difference between mass and weight. We now think in terms of mass, not weight.)

Dalton went on to say that *atoms can neither be created nor destroyed* and that chemical reactions are just rearrangements of atoms.

He understood that atoms that are unlike can bond in a "firm union" to form substances that are not elements—they are *chemical compounds.*

Dalton realized that there is a difference between mixtures (where atoms can exist in almost any proportions—as in air) and compounds (where atoms exist in set proportions and no other—as in water). But he didn't know about molecules, which are groups of two or more atoms bonded together. And he didn't know about some maverick atoms, called isotopes, which are slightly different from their sisters. Most important, he had no idea that atoms have innards and that the number of protons inside each atom determines its characteristics. Dalton talked of "atomic weight"; today, we talk of atomic number, meaning the number of protons. Still, he took a huge step by taking atoms seriously.

When he published his theories in 1808, people paid attention—he became a celebrity. (As I said, his timing was right.) Even the king asked to see Dalton. To be presented to the king meant wearing breeches, buckled shoes, and a sword. Quakers don't wear swords, and Dalton didn't have fancy clothes. What was the shy, awkward scientist to do? He solved the problem by dressing in a university robe. When he died, 40,000 people filed past his coffin. Many didn't understand atoms, but they did understand that this man had helped explain their world.

Atoms turned out not to be solid and impenetrable as Democritus and Newton thought. They were not like hard billiard balls as Dalton described them. In the 20th century, a nucleus and still smaller particles (called neutrons, protons, and electrons) would be found inside atoms. As the 21st century began, the search for yet smaller particles—perhaps pulsating strings really thought to be uncuttable—was under way. But atoms—Dalton's atoms—are still the smallest form of an element having all the characteristics of that element. Knowing that gave science a huge insight into the way the world works.

Molecules

Amedeo Avogadro (ah me DAY oh ah voh GAH dro) took the next step in understanding atoms. He was born in 1776 (an easy date to remember). Avogadro was a count from Italy's Piedmont (northern foothills). His full name was Lorenzo Romano Amedeo Carlo Avogadro conte di Quaregna e di Cerreto and he started out as a lawyer, but was so fascinated with scientific research that he gave up law to be a professor of physics.

Avogadro figured out that most matter—gases, liquids, and solids—is made up of particles containing two or more atoms held in a tight embrace. He named those particles "molecules" (from the Latin word for "small masses"). We believe he was first to distinguish between atoms and molecules.

Water (a compound) is composed of molecules made of unlike atoms—so is carbon dioxide. Hydrogen (an element) is usually found in molecules with two like atoms bonded together (H_2).

Understanding the difference between single atoms and combinations of atoms (molecules) may sound simple, but it was a big step. That idea of atoms and molecules is the foundation of modern chemistry.

Dalton told us that *the smallest form of an element (with all the characteristics of that element) is an atom.* Avogadro told us that *the smallest form of a compound is a molecule.*

Then, Avogadro came up with a law of his own—known naturally as Avogadro's Law. Here it is: *Equal volumes of all gases (at the same temperature and pressure) contain equal numbers of molecules.* Think about that—it gives scientists a very useful measure to work with.

Avogadro used that law to get the correct formula for water. No one had done that before. When a quantity of water is broken apart into hydrogen and oxygen and those gases are collected separately, the hydrogen takes up two times the space of the oxygen. According to Avogadro's Law, if the hydrogen occupies twice the volume, there would have to be twice as many hydrogen molecules. That's how Avogadro figured out that the formula for water is H_2O, not HO as Dalton believed.

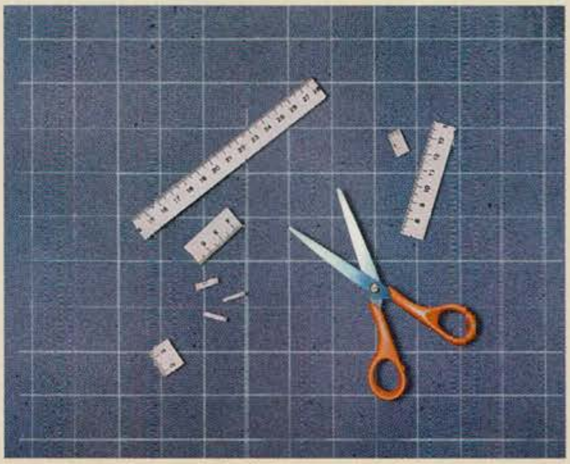
Avogadro's insight would eventually lead to a way to calculate the number of atoms in a given quantity of any element. (Today, it is called Avogadro's number.)

At about the same time Avogadro was doing his work with molecules, a poor boy named Michael Faraday was working in a book bindery. There he bound and read a new section on electricity in the *Encyclopædia Britannica* (to be published in 1810). It helped him find his life's work. Eventually, Faraday's discoveries in electricity would lead to electric generators, electric motors, and much, much more.

But his first fame came as a chemist. Faraday figured out laws of electrolysis; electrolysis is the use of an electric current to break apart compounds, like H_2O. If something couldn't be broken apart, he realized it must be an element. Faraday's laws seemed to confirm that matter is made up of small particles. No one could see those particles, but Faraday assumed they were there—and when he did, his laws worked.

Meanwhile, Avogadro's molecules were ignored. Avogadro was one of those people whose ideas are mostly rejected while they are alive. But if you don't understand molecules you can't do much with atoms. So atomic research didn't get

Just What Size Is an Atom?



Investigate the world of the very small by cutting a 28 centimeter strip of paper in half as many times as you can. If you can cut the strip of paper in half 31 times, you will end up with a piece of paper the size of an atom.

What you'll need

1 strip of paper 28 centimeters (11 inches) long
1 pair of scissors

What to do

Take your strip of paper and cut it into equal halves.
Cut one of the remaining pieces of paper into equal halves.
Continue to cut the strip into equal halves as many times as you can. (And be sure to keep count!)
Make all cuts parallel to the first one. When the width gets longer than the length, you may cut off the excess, but that does not count as a cut.

So, how far did you get?

Here are some comparisons to think about!

Cut 1	14.0 cm	Child's hand, pockets
Cut 2	7.0 cm	Fingers, ears, toes
Cut 3	3.5 cm	Watch, mushroom, eye
Cut 4	1.75 cm	Keyboard keys, rings, insects
Cut 6	0.44 cm	Poppy seeds
Cut 8	1 mm	Thread – Congratulations if you're still in!
Cut 10	0.25 mm	Still cutting? Most have quit by now.
Cut 12	0.06 mm	Microscopic range, human hair
Cut 14	0.015 mm	Width of paper, microchip components
Cut 18	1 micron	Water purification openings, bacteria
Cut 19	0.5 micron	Visible light waves
Cut 24	0.15 micron	Electron microscope range, membranes
Cut 31	0.0001 micron	The size of an atom!

From The Atom's Family Web site: **www.miamisci.org/af/s/n/phantom/papercutting.html.**

anywhere and, as time passed, atoms began to be called "useful fiction." That's not hard to understand—atoms are beyond belief small.

Just what size is an atom?

Imagine magnifying one drop of water until it is 15 miles wide; you would then begin to see the atoms inside the water molecules (not clearly—that would take much greater magnification). Do you understand why no magnifying microscope can see atoms? (Today, scanning tunneling microscopes "see" them electronically.)

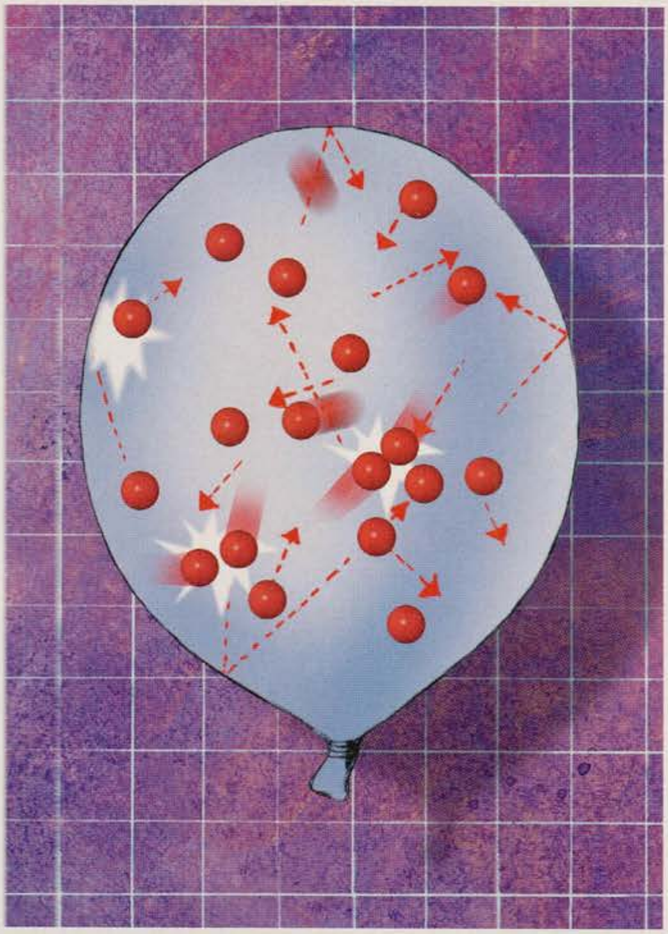
Or, picture an apple. Blow that apple up until it is the size of the Earth. Each of its atoms is now the size of a normal apple.

Here's another image: 250 million hydrogen atoms packed side-by-side will stretch about an inch in length.

As for molecules, chemist Brian L. Silver writes, "Molecules tend to be very small entities... if the whole population of Earth set out to count the molecules in a teaspoon of water, each person counting at the rate of one molecule per second, it would take over a million years."

Scientist Lewis Wolpert says, "There are many more molecules in a glass of water than there are glasses of water in the sea." We know things like that because we have Avogadro's number to help with the calculating.

Imagine figuring out that atoms and molecules exist. What Dalton and Avogadro and Faraday did was astonishing. But you may not be surprised to hear, as time passed, many scientists began to reconsider Dalton's theory. They even made fun of it, just as they had ridiculed Democritus's atoms. No one would ever be able to see an atom, the skeptics said. They were absolutely sure of that. Would you have believed in atoms and molecules?



Boltzmann was sure that gases were made of tiny particles that move around bumping into each other and the walls of their containers. (He was right—that's the pressure that keeps a balloon inflated.)

Bulldog Boltzmann

Ludwig Eduard Boltzmann had a big nose, big ears, a bushy red beard, and a head thick with curly brown hair. Only his glasses were small. They had wire rims, and he peered through them with nearsighted eyes. A student sketched him on a bicycle—a portly professor with coattails in the air. There's charm in the sketch as there must have been in the man.

Boltzmann was a physicist and, in the late 19th century, one of the stars of his profession. He could be intimidating—he was intense and very learned—but he was also kindhearted. He couldn't bear to give his students low grades, and he usually didn't. They adored him. One of them, Lise Meitner (who became a famous atomic scientist herself) wrote, "He was in a way a 'pure soul,' full of goodness of heart, idealism, and reverence for the wonder of the natural order of things." For him, physics was a battle for ultimate truth.

Boltzmann was born in Vienna, Austria, in 1844. His childhood couldn't have been easy: By the time he was 15, his father, brother, and sister had all died. He was schooled at home by tutors. One was the composer Anton Bruckner who got fired by Boltzmann's mother after he threw his wet raincoat on a bed. Nonetheless, Boltzmann became an accomplished pianist.

But it was as a scientist that he made his mark. When he was still a student, a professor handed him some papers by the Scottish scientist James Clerk Maxwell. He also gave him "an English grammar...since at that time I did not understand one word of English." Boltzmann didn't need to translate the mathematical equations—they are a universal language—but he struggled with the English until he understood that, too. Maxwell impressed him above all other scientists of his day. "As with a magic stroke everything that earlier seemed intractable falls into place," he wrote.

Some scientists believed atoms and molecules were just metaphors—convenient fiction that helped explain things mathematically—but Boltzmann was convinced that Maxwell's equations described a real world of atoms and molecules. He studied gases and their behavior. He knew that the amount a gas can be compressed can be explained if the gas is composed of a vast number of tiny entities (atoms and molecules) that bounce around and collide with each other and the walls of their container. (It's that kind of pressure that keeps a balloon inflated.) Bernoulli and Avogadro had understood the movement of atoms and molecules, and Boltzmann paid attention to the ideas of both of them. By the time Boltzmann came along, Avogadro's ideas were finally getting some attention.

Boltzmann couldn't see those atoms, but he could measure their behavior. His approach was based on statistics and measurement, and they led to his "kinetic theory" of gases, Ernst Mach thought atoms were a convenient fiction. "Have you ever seen one?" he would taunt when Boltzmann lectured.

which became an important part of the science of thermodynamics. (THERM-oh-die-NAM-icks—thermo is a prefix meaning heat; dynamics means motion, so does kinetics.)

Boltzmann was fascinated by thermodynamics. The steam engine, which was changing his 19th-century world, had gotten scientists thinking seriously about heat. They knew steam has power—it can move an engine. But they couldn't agree on what heat is. It was a big question that needed solving. Is heat a property of matter, or is it matter itself?

When it came to heat, Boltzmann built on an experiment done by an American, Benjamin Thompson, who was often called a traitor. Thompson, a Loyalist during the American Revolution, fled the United States for England, came back and led British forces, was knighted by the king, and then moved to Munich, where he became Count Rumford. Science remembers him for his experiment with horses and a boring tool demonstrating that heat isn't a substance, but is created by motion. But Rumford didn't take the next step and tie heat to atoms, Ludwig Boltzmann did. He figured out that it is the motion of atoms and molecules that creates heat. He even came up with a formula to measure the speed of molecules in a gas. He had it right, but hardly anyone noticed.

Most scientists of his time, especially many in Germany, just would not believe in atoms. Have you ever had an idea that seems perfectly clear and true and yet no one else seems to get it? Talk about frustration! That's what Boltzmann faced. History is full of cycles and, by the late 19th century the spirit of open inquiry that marked Enlightenment times had receded. It was a hard time to get new ideas accepted.

So Boltzmann became a battler. He kept fighting for that atomic idea. Ernst Mach (pronounced MOCK), another well-known Austrian physicist, was one of those who thought atoms were a convenient fiction. "Have you ever seen one?" he would taunt when Boltzmann lectured. England's Lord Kelvin (William Thomson) also rejected the idea of atoms and molecules, and Kelvin was an important scientist with international clout. (So was Mach.)

Don't worry, change was on the way. Can you feel the tremors in the scientific world? Those tremors—like vibrations before an earthquake erupts—were only noticeable to a few people with keen senses. They could tell that something big was about to happen. It had to do with the atom—proofs were coming. The unbelievers would soon have to admit atoms exist. But even those who believed in atoms weren't prepared for all that was ahead.

At the end of the 19th century, fewer than half of all scientists believed in atoms. And those who did thought atoms were like billiard balls (those solid balls found on a pool table). Isaac Newton said atoms are hard and impenetrable, and so had just about everyone since then—including John Dalton and Ludwig Boltzmann.

But, they would learn, atoms are much more interesting than billiard balls, and much more complex. They are little worlds in themselves, but no one knows that in 1900, as the century turns.

IV. Atoms Come of Age

A Boy with Something on His Mind

Fifteen-year-old Albert Einstein was miserable. He was trying to finish high school in Germany, but he hated the school (a strict, rigid place). To make things worse, his parents had moved to Italy where Albert's father owned a factory that built parts for machines—called *dynamos*—that take energy from coal, oil, or mountain streams and convert it into electricity. His parents thought he should stay behind until his schooling was completed. It wasn't long, though, before he was on his way over the Alps heading south to join them. Why did he leave Germany? Today, no one is quite sure, but a letter from the school offers a powerful clue, "Your presence in the class is disruptive and affects the other students," it reads.

What were the Einsteins to do with their son? How would your parents react if you were a high-school dropout?

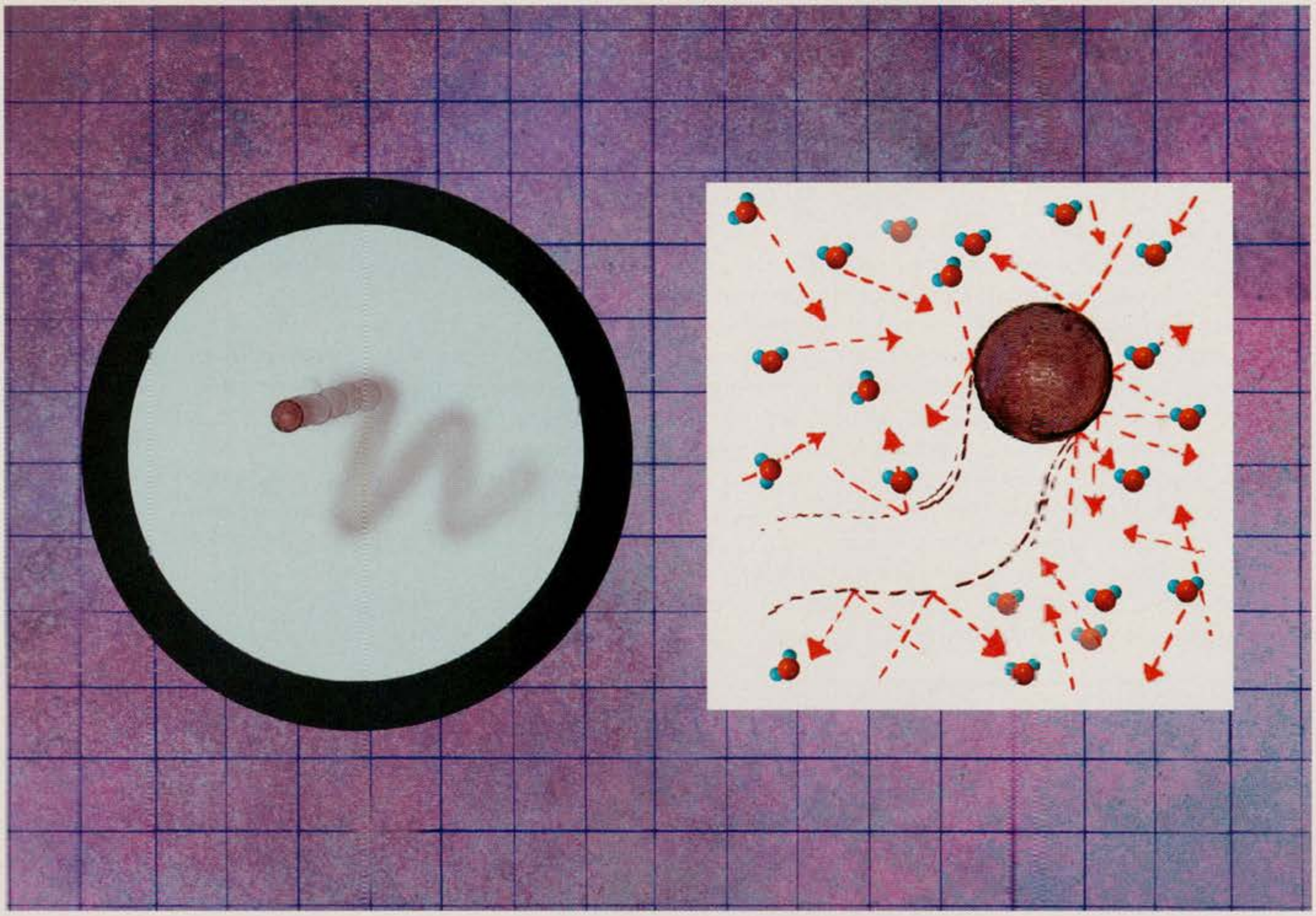
While everyone in the family was worrying about his future, young Einstein's mind was somewhere else. There were questions that wouldn't leave his head: "What would the world look like if I could sit on a beam of light?" he kept asking himself. Are there really atoms—bits of matter too small to be seen by any ordinary microscope? In 1894 (when he was 15), no one had the answers to his questions.

What made Albert Einstein focus on those puzzles? No one knows for sure, but 15 is a good age for questioning. And Einstein, at that age, was already well-grounded in mathematics and the new sciences. He was lucky; he had been born into the right family.

His parents were interested in books and ideas and conversation. Einstein said his father was "very wise." (But he wasn't much of a businessman; his factories kept failing.)

Einstein's Uncle Jacob introduced him to mathematics. His mother read him the best books she could find and introduced him to music. His violin became a friend; he learned to play it well. And then there was a regular dinner guest. His name was Max Talmey, and he was studying to be a doctor. It was a tradition for Jewish families to invite poor students to dinner. Max came every Thursday, bringing the latest ideas in science and mathematics to the dinner table. When Albert was 12 years old, Max gave him a geometry text that Einstein later called his "holy geometry book." Max shared many other books and later wrote that his eager young friend had soon gone far beyond him in mathematical knowledge.

When Albert was 13, Max lent him a book by the German philosopher Immanuel Kant. It was very tough reading,



Brownian motion was a mystery to Brown, but Einstein understood that it was the motion of the water molecules that caused the pollen to dance about. In the drawing above, the left side shows what Brown saw through his microscope—a piece of pollen that inexplicably moved in water. The right side shows what Einstein saw in his mind—water molecules moving about and bumping into the pollen. (In reality, the pollen is millions of times larger than the water molecules.)

but Einstein was always willing to struggle with anything that he thought worth the challenge. Kant tried to connect all the great ideas of philosophy into one embracing system. Later Einstein would try to do the same thing in science.

But his deep reading hadn't helped at the stern German school (called a "gymnasium"), where no one dreamed that what the questioning young Einstein was doing would lead to a new model of the universe.

After he arrived in Italy, his parents suggested he come down to earth. The family factory wasn't doing well. Albert had to find a career. He said he wanted to be a high school teacher, so he was sent off to school in Switzerland to finish high school and prepare for a university. There he boarded with a friendly family, and the Swiss school—in a town named Aarau—turned out to be just right for him. It had outstanding teachers, high standards, and an informal atmosphere. Students were expected to ask questions and search for answers. Fifty years later he still remembered it as a place where everyone joined in "responsible and happy work."

From Aarau, Einstein went to Zurich, Switzerland, to the Federal Institute of Technology (one of Europe's leading technical universities), where he studied physics and mathematics. Zurich, in the heart of Europe, was a lively city with cafés and conversation that attracted artists, writers, and political thinkers from many lands. (Russia's Lenin and Ireland's James Joyce were two of them.) There was only one woman in his class, a Serbian, Mileva Maric. She was a pioneer, one of the first women to study advanced physics anywhere in the world. Einstein must have been impressed.

Meanwhile, he managed to annoy most of his professors. It was clear that Albert Einstein was bright, but he had an attitude problem. He had little patience with schoolwork and often didn't appear in class; he seemed to learn best on his own. When he graduated and needed a job recommendation, he couldn't get one. One of his teachers called him a "lazy dog" because he didn't always do his assignments. But the professor was wrong. Einstein wasn't lazy. His mind was working hard. "In all my life I never labored so hard," he wrote to a friend about one occasion of deep thinking.

He finished his studies at the Swiss Federal Institute of Technology (in 1900). But he didn't have a doctorate and his university record was not very good—he had angered some of his teachers, they didn't recommend him—and he couldn't get a teaching job. He was desperate; he wanted to marry Mileva.

He sent letters off to some scientists he admired looking for work, but none answered. So Einstein put an ad in the Berne newspaper offering to teach physics to private students for three Swiss francs an hour. Still, that wasn't enough to live on, and he often went hungry. Finally, in June 1902, he was hired as a technical expert, third class, at the patent office in Berne. Seven months later, he and Mileva Maric married and, before long, had two sons. (The marriage would fail.)

The patent office turned out to be a good place for him. He had a boss who was strict but fair. "More severe than my father—he taught me to express myself correctly," said Einstein. Day after day, he examined applications for patents on inventions. Each application came with a model. He had to decide, and quickly, if the invention was worthwhile. Should it be given a patent? Then he had to describe the invention and give the reason for his decision—all in a few words. That was good mental training, especially as his boss would only accept precise, careful reports.

The job left him time to think for himself, which was what he was really meant to do. He thought and thought and thought about discoveries that were ricocheting in the world of science. One scientist claimed to have discovered tiny particles called electrons, that were even smaller than atoms. Others seem to have found radioactive energy rays coming from inside atoms. This was at a time when most scientists still didn't believe atoms even existed!

A distinguished German scientist named Max Planck had solved a puzzle about something called radiant energy. He showed that it could be explained mathematically if the energy were assumed to be in "chunks" (or particles or bullets) rather than only in a continuous wave. Planck called those tiny chunks "quanta." Einstein couldn't stop thinking about light; now he had those quanta to consider, too. Could light be made of quanta? Two years later, in1905, the obscure patent clerk published five scientific papers. Four were in a physics journal, *Annalen der Physik*—three in the same issue. (Copies of that issue are now rare and very valuable.)

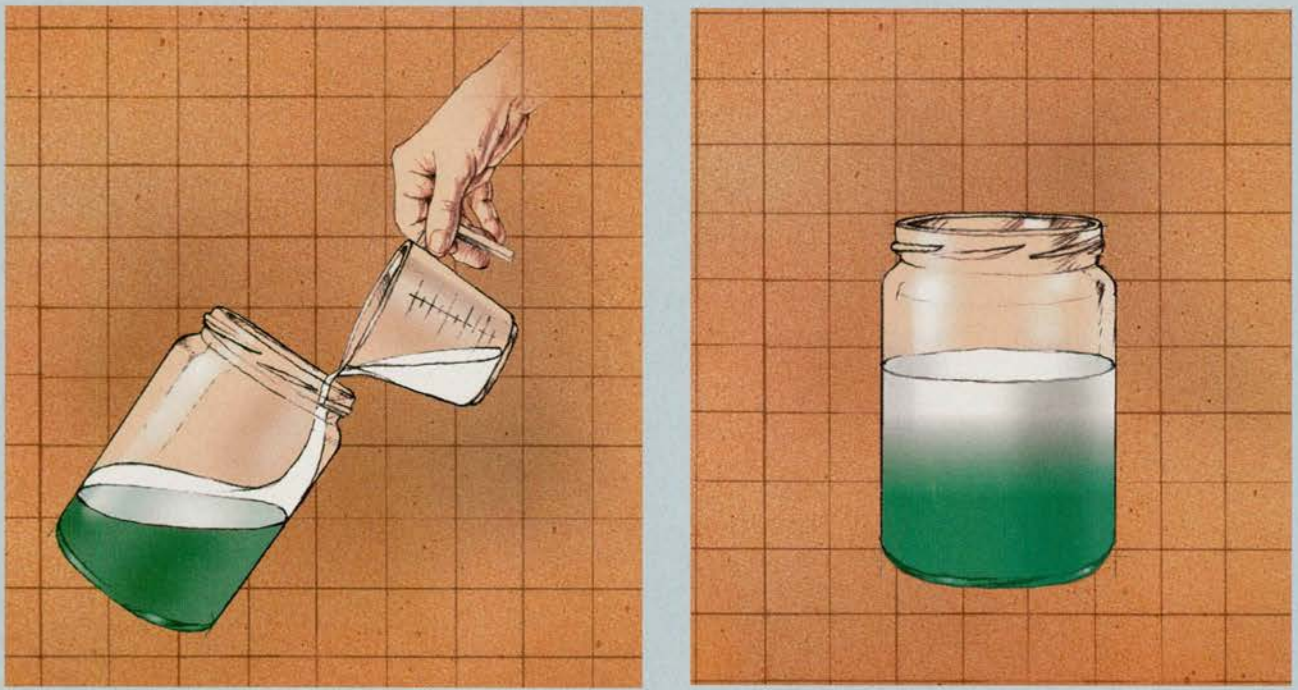
Suppose you'd been a physics professor in 1905, would you have paid attention to articles written by a young patent clerk who didn't even have a doctorate? It was amazing: A few people *did* pay attention. Some knew this was the work of a scientific genius. One of the first to take notice was a distinguished professor—Max Planck.

Test Einstein's Idea of Brownian Motion

Are water molecules really moving around all of the time?

See for yourself. In a 1-quart jar, mix together one teaspoon of sodium chloride (table salt), five drops of green food coloring, and one cup of water. Tilt the jar and slowly pour a second cup of water down the inside of the jar. The result is a layer of green water covered by a layer of clear water.

Place the jar where it can remain undisturbed for three days. Observe the contents of the jar as often as possible. (But don't touch it—you don't want to shake up that water.) The two layers of water will start to mix. The reason? The water molecules are moving just as Einstein reasoned. The end result is a uniformly green-colored liquid.



Based on Janice Van Cleave's A+ Projects in Chemistry: Winning Experiments for Science Fairs and Extra Credit (*John Wiley & Sons, Inc.*).

Thirty-eight years later, a group of scientists floated particles in a liquid, sealed them under glass, and then watched for a whole year. The particles kept moving.
No one could fathom why.

Classical science has a miracle year (in Latin called an *annus mirabilis,* AH nuss mere AH bih liss). It is 1666, the year of Newton's greatest productivity. Modern science also has an *annus mirabilis.* It is 1905, the year of those four articles in the *Annalen der Physik.*

Two of Einstein's articles were about special relativity (which deals with the speed of light and travel at high speeds). One was about Max Planck's quanta and one was about something called Brownian motion, which had to do with atoms.

Brownian Motion...and Atoms

Fifty-two years before Einstein was born—about the same time that John Quincy Adams was president of the United States and the peerless composer Ludwig van Beethoven was on his deathbed in Germany—a Scottish botanist (a plant scientist) named Robert Brown looked through a microscope at tiny bits of pollen floating in water and noticed something puzzling. The pollen was dancing about, even though the water seemed still. What made it move? Could the pollen be alive? Brown didn't think so, but he wasn't sure. Being a careful scientist, he decided to float some other microscopic particles in water. He used old dried pollen, powdered tar, ground-up arsenic dust, and other things he knew had no life. The particles all moved actively. The moves were like a jitterbug or breakdancing, with jumps here and there. Brown called it a "tarantella," which is a Spanish dance. What caused the movement? No one knew.

Scientists spent years debating about that random movement—which came to be called "Brownian Motion." Thirty-eight years later (the year the American Civil War ended), a group of scientists floated particles in a liquid, sealed them under glass, and then watched for a whole year. The particles kept moving. No one could fathom why.

They didn't realize that they could have kept watching and watching, and the dance would have gone on and on. If they had been able to preserve the sample in the glass jar, we could see the same Brownian motion they saw (and so could our grandchildren). It is ceaseless. Why? What makes it happen?

Einstein, in one of his 1905 papers, argued that Brownian motion is caused by the action of atoms in the molecules of water. Those billions of water molecules move very rapidly, he said, bumping and banging the pollen.

No one could see the water molecules, they were much too small for the microscopes of the time. Einstein figured this out in his head, but not all by himself. As you know, the idea went back to Democritus—who lived in Greece long before the birth of Christ. Democritus had conceived of atoms as the basic building blocks of nature and then said that they are in constant motion, even in a substance that seems at rest. Einstein knew of the ancient atomic theories and he knew of John Dalton and Ludwig Boltzmann and those 19th-century scientists who believed in atoms. He also knew that some scientists of his day didn't take them seriously.

How can you believe in something you can't actually nail down? Many scientists still thought molecules and atoms were fictional devices that were helpful in working out formulas, but that it was unscientific to believe in something that you can't actually see. The physicist Ernst Mach was the skeptic who kept asking, "Have you ever seen one?" Einstein admired Mach.

But Einstein ignored his question. Instead, he thought about the problem of Brownian motion and came up with a solution. It was mathematical. He figured out statistically how the water molecules would behave if they were there.

Einstein devised a formula that said that the distance the particles move increases by the square root of the time considered. In other words, in four seconds the particles will move twice as far as they do in one second, not four times as far.

He was convincing and he was right: Billions of unseen but active water molecules were moving the visible particles of pollen. That statistic-based theory could be tested experimentally.

"By 1908, the French experimental physicist J. B. Perrin had tested and confirmed Einstein's formula," said Jeremy Bernstein, a physicist, professor, and author of several books on popular science. "Moreover, by actually observing the distance that the Brownian particles traveled, [Perrin] was able to deduce approximately the number of molecules per cubic centimeter in the liquid through which they were traveling."

Read that again to be sure you understand its importance. Einstein's reasoning didn't just answer the questions of Brownian motion, it helped prove that atoms and molecules exist. It proved that statistics can be taken seriously in the creation of scientific theories. His explanation and the follow-up tests managed to convince the skeptical scientists—those who had been unwilling to believe that atoms are real. It was a sweet victory for the atom.

The End

(Actually, this is not an end at all. It is the beginning of the Atomic Age, to be followed by the Nuclear Age—and that may be the point of this article: Science, like knowledge, keeps going, and growing, and that is why it is so much fun.)

Mystic Chords of Memory

Cultivating America's Unique Form of Patriotism

From the beginning, America's public schools have been charged with instilling in students a love of country. Many believed this emphasis had waned in recent years—partly in response to complaints of "ethnocentrism"; partly because the need for patriotic citizens seemed remote; partly because, in some quarters, in and out of the schools, it just seemed to be out of style—a little crude, a little primitive. As writer George Packer wrote in the New York Times *this past fall, "to be stirred by national identity, carry a flag, and feel grateful toward someone in uniform" had come to be, prior to September 11, "a source of embarrassment."*

In the wake of September 11, the signs of a reinvigorated patriotism are everywhere—including in the schools. Where the anthem had not been sung, it's being sung; where the Pledge had not been said, it's being said; where Veterans Day had not been celebrated, it was celebrated.

In this article, the author takes us through history to define a uniquely American patriotism—one based not on "my country right or wrong," but on the fact that it is a free country and because, as Lincoln once said of Henry Clay's patriotism, in that freedom can be found "the advancement, prosperity, and glory of human liberty, human right, and human nature."

But, says the author, such a patriotism doesn't come naturally or easily. We must be unabashed, thoughtful, and conscious about nurturing it. This patriotism is cultivated when students learn about the value of the democratic idea, the people and events that shaped this country and its principles, the symbols that trigger love for it, and the sacrifices that have been made by Americans of every generation to ensure its survival, spread, and improvement. —EDITOR

Walter Berns is a professor emeritus of government at Georgetown University and resident scholar at the American Enterprise Institute. Berns is the author of numerous articles on American government and politics in professional and popular journals. His books include Taking the Constitution Seriously, In Defense of Liberal Democracy, *and* The First Amendment and the Future of American Democracy. *His most recent book is* Making Patriots, *on which this article is based.*

By Walter Berns

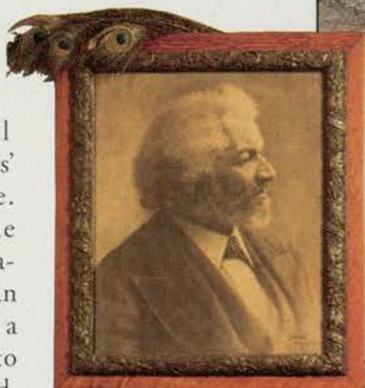
Patriotism. The word itself comes from the Latin *patria,* meaning country. Patriotism implies a love of country, a readiness to sacrifice for it, perhaps even a willingness to give one's life for it. This was well understood in the countries (or cities) of classical antiquity, where citizens were patriots who loved their country simply because it was their country—because it was "their birthplace and the mansion of their fathers," as Alexis de Tocqueville put it in his famous *Democracy in America.* Citizenship was a kind of filial piety, made possible in part because, in general, they were homogeneous peoples descended from the same ancestors, few in number, and inhabiting an area smaller than the District of Columbia.

Our patriotism is not so simply derived. We are many, not few. And we are no longer, if we ever were, a people descended from the same ancestors. In principle, whereas no stranger could become, say, a Spartan, anybody can become an American, and millions of people from around the world have done so; this helps to explain why that patriotic word "fatherland" has no place in our vocabulary.

But our need of citizens who love this country and who are willing to fight for it is the same.

ILLUSTRATED BY MICHAEL GIBBS

No one is born loving his country; such love is not natural. It must be taught or acquired. A person may not even be born loving himself—the authorities differ on this—but soon enough he learns to do so. Unless something is done about it, that self-love can diminish or eliminate his concern for anyone other than himself. The problem is as old as politics, and no country is exempt from having to deal with it. But, for reasons having to do with our unique history and democratic principles, we cannot do so as others have before us—nor would we want to.



(Above) George Washington at Valley Forge. The soldiers assembled at Valley Forge were often bootless, hungry, and freezing. The Marquis de Lafayette wrote, "The unfortunate soldiers were in want of everything ... their feet and their legs froze until they were black, and it was often necessary to amputate." (Below) Henry Clay, speaking to the Senate. (Left) Frederick Douglass, as portrayed in a promotional brochure of the Frederick Douglass House.

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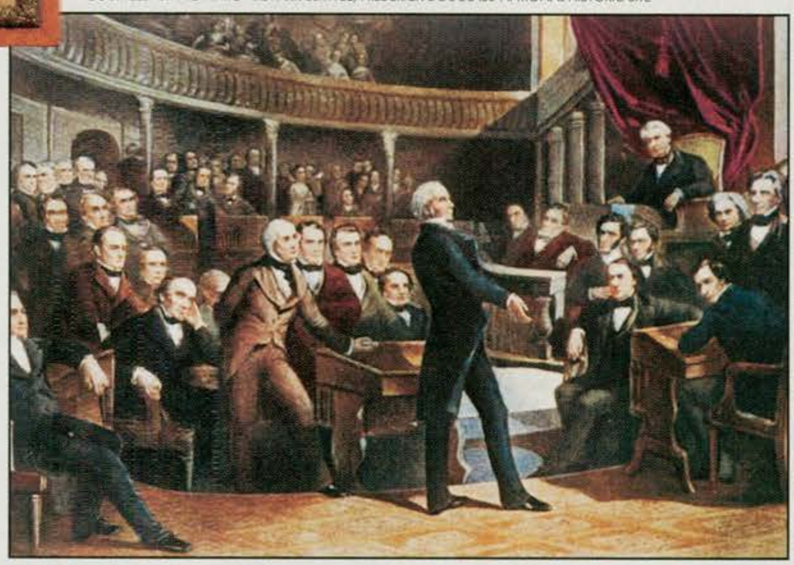

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Instilling patriotic love in American citizens faces at least four unique challenges: First, our founding ideas were focused on individualism and self-interest, not community. Second, unlike the nations that came before us, there was for us no "land of our fathers," no common bloodline or monarch or mystical God that elicited citizens' loyalty and sacrifice. Rather, and this is the third challenge, our nation was founded on an idea. Never before had a citizenry been asked to sacrifice for an idea. And, fourth, it was a *philosophical* idea, which presupposes questioning and debate, not blind fealty. From the beginning—and, as we shall see, right up to the present—this idea has been buffeted by contradictory notions.

How could such a nation elicit from its citizens the love of country that would be necessary for it to survive? To paraphrase a line from Abraham Lincoln's 1862 Message to Congress, our case was new, so we had to think anew. As Lincoln learned, the belief in an abstract idea had to be converted to love, to a passion for the "inestimable jewel" that is our country.

At this moment when patriotic spirit is so high, it's worth examining the special challenges inherent in educating American patriots. And, to consider how those before us have addressed these challenges, especially Abraham Lincoln, American patriotism's greatest poet.

A Self-Interested and Individualistic People

According to the motto inscribed on the Great Seal of the United States (and reproduced on every dollar bill), we are a *novus ordo seclorum,* which is to say, a new order of the ages. We were the first nation to declare our independence by appealing not to the past but to the newly discovered "Laws of Nature and of Nature's God," and this had (and has) consequences for patriotism. Whereas the God of Abraham, Isaac, and Jacob imposed duties on men (see Exodus 20:1-17), "Nature's God" endowed all men with rights, private rights. Whereas the God of the Bible commanded all men to love God and their neighbors as themselves (see, for example, Matthew 22:37-40), nature's God created a state of nature in which everyone was expected to take care of himself. As John Locke, "America's philosopher," said (Treatises II, section 6), man is required to take care of others only "when his own preservation comes not in competition." And so long as he remains in the state of nature, he has the right to do what he is naturally inclined to do, and what he is naturally inclined to do is not to take care of others. Further, as

Tom Paine said in 1776, commerce "diminishes" the spirit of patriotism. To say the least, the American steeped in such ideas is *not* naturally inclined to be a patriotic citizen.

Of course, when properly understood, the Declaration is not merely a catechism of individual rights. In fact, it claims to be the act, not of isolated individuals, but of "one people," an entity in which individuals are bound to each other, contractually if not naturally. Accordingly, it was signed by men who pledged to each other their lives, their fortunes, and their sacred honor.

Nevertheless, it remains true with us that rights are primary and duties are secondary and derivative. This is a first challenge to American patriotism.

Alexis de Tocqueville named another: individualism. "Individualism," he wrote, "disposes each member of the community to sever himself from the mass of his fellows and to draw apart with his family and his friends, so that after he has thus formed a little circle of his own, he willingly leaves society at large to itself." Leaves it to itself and leaves it to take care of itself; an individualist could be the opposite of a patriot.

Designing a public spirit curriculum for such a people would be no easy task—but the challenges are yet more complicated—and historically unique.

A Patriotism of Ideas

In his eulogy for Henry Clay, Lincoln said in 1852, he "loved his country partly because it was his own country but mostly because it was a free country; and he burned with a zeal for its advancement...because he saw in such, the advancement, prosperity, and glory, of human liberty, human right, and human nature."

Lincoln called the American founders the "patriots of seventy-six." He could not have meant that they were patriots in the traditional sense; they had not fought for "their birthplace and the mansion of their fathers." Like their fathers, they had been born British subjects. He meant that—like Clay—Washington, Jefferson, Hamilton, Marshall, and the others were "the patriots of seventy-six" because they were devoted to the cause of human liberty, human right, and human nature—to America's cause.

In speaking thus of Henry Clay, Lincoln identified what is, in fact, the unique character of American patriotism: the devotion not only to country (because thanks to the Founders, there was now a country), but also to its principles, which in our case, means the principles set down in 1776. As Thomas Pangle has rightly said, "The declaration by which Americans made themselves independent marked the birth of the first nation in history grounded explicitly not on tradition, or loyalty to tradition, but on an appeal to abstract and universal and philosophical principles of political right." Thus while that famous American sailor Stephen Decatur thought he was being patriotic when, in 1816, he offered his toast, "Our country, may she always be in the right; but our country, right or wrong," he could be accused of being un-American, a term for which there is no counterpart in any other land or language.

Frederick Douglass, the former slave and abolitionist, understood that American patriotism means devotion to a set of principles. In 1847, he said he "had no love for America, as such," but he had a great love of America as those principles intended it to be. To make it so required not only the abolition of slavery and a new constitutional definition respecting citizenship, but, as Abraham Lincoln said at Gettysburg, "a new birth of freedom."

This element of American patriotism—its basis in an idea—deserves to be remarked upon: Devotion to a principle requires an understanding of its terms, and that understanding cannot be taken for granted.

In 1863, based on this idea of America, Douglass called for the enlistment of "colored" troops:

> I hold that the Federal Government was never, in its essence, anything but an anti-slavery government. Abolish slavery tomorrow, and not a sentence or syllable of the Constitution need be altered. It was purposely so framed as to give no claim, no sanction to the claim, of property in a man. If in its origin slavery had any relation to the government, it was only as the scaffolding to the magnificent structure, to be removed as soon as the building was completed.

By "scaffolding," Douglass meant the three constitutional provisions addressed to the slavery question: the provision in Article I, section 2(3), whereby the Southern states were allowed to count three of their five slaves for purposes of representation in the House of Representatives; the one in Article I, section 9, allowing them, for 20 years, to import more slaves from abroad; and finally, the one in Article 4, section 2(3), providing for the return of fugitive slaves. These concessions to slavery, demanded by the Southern states, were the original price of union, and the Framers did indeed pay that price. To this day, they have been criticized for doing so—but they paid it grudgingly, out of what they thought was necessity. Anyone who says the price was too high is obliged to demonstrate that the lot of the slaves would have been better if the Southern states had been allowed to form (as they did in 1860-61) their own confederation.

Ideas Provoke Debate

This element of American patriotism—its basis in an idea—deserves to be remarked upon: Devotion to a principle requires an understanding of its terms, and, especially in the case of an abstract philosophical principle, that understanding cannot be taken for granted. Most people can enjoy liberty, but not everyone understands its foundation in principle. Further, people can disagree as to its meaning. For example, not everyone agreed with Lincoln that the Kansas-Nebraska Act violated the principles of the Declaration of Independence by allowing the people of the territories to decide whether to come into the Union as free or slave states. Such disagreements led to civil war, with not one but both sides claiming to fight for liberty and self-government.

Furthermore, the effort to understand a principle necessarily requires one to consider, indeed to question, its validity. Did nature's God really endow everyone with the rights to life, liberty, and the pursuit of happiness? And does it follow that the purpose of government is "to secure these rights"? The patriots of seventy-six held these to be "self-evident" truths, but King George III held them to be arrogant nonsense; the vice president of the Confederate States of America held them to be self-evident lies.

But, Can an Idea Inspire Patriots?

James Madison was one of the first to note that securing the people's allegiance to an abstract idea could be problematic. He wished that reason alone would secure citizens' attachment to the new government. But that, he said, "is as little to be expected as the philosophical race of kings wished for by Plato." In reality, the government would need people's emotional attachment, as well.

Lincoln reached the same conclusion. As civil war loomed, he said there was a question as to whether our political institutions could survive or, to use his term, "be perpetuated." The principles on which they rested had the support of "the patriots of seventy-six," men capable of understanding the "Laws of Nature and of Nature's God." But for the people generally, Lincoln thought, their attachment to our institutions would have to be passionate, not rational. As we shall see, he felt that passion would best flow from an understanding and appreciation of America's ideas.

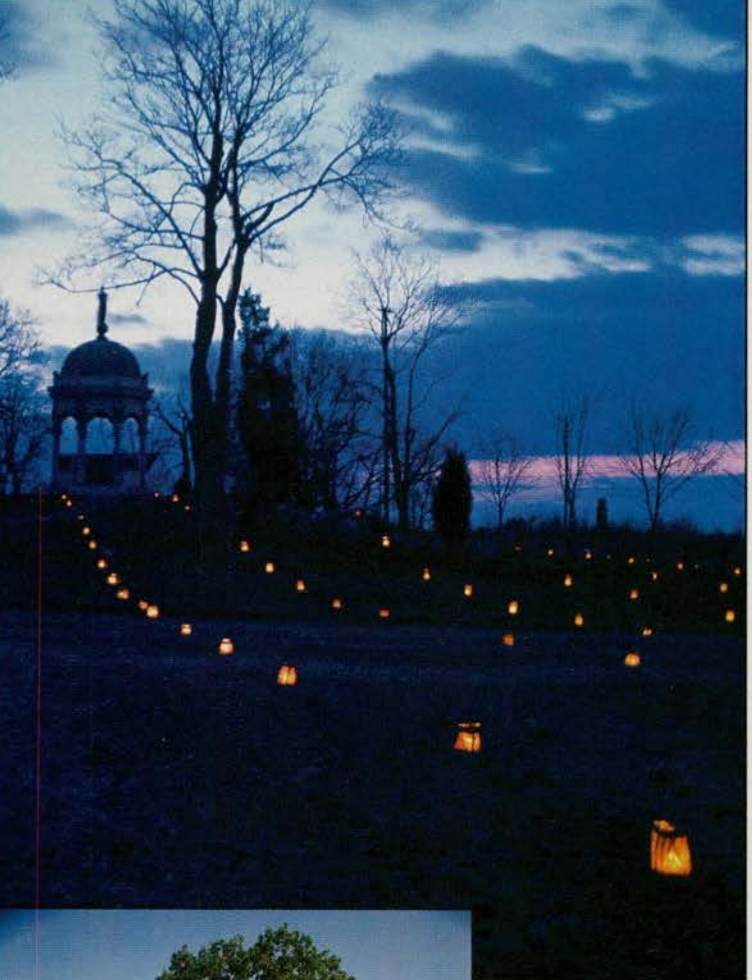
For more than 50 years, Lincoln said, the American people's love of country and its institutions was inseparable from their hatred of Britain. So long as the memory of the Revolutionary War was fresh in their minds, "the deep-rooted principles of hate and the powerful motive of revenge, instead of being turned against each other, were directed exclusively against the British nation." And thus, Lincoln concludes, "from the force of circumstances, the basest principles of our nature were either made to lie dormant, or to become the active agents in the advancement of the noblest of causes—that of establishing and maintaining civil and religious liberty."

But that would change, Lincoln said, as the memory of the Revolution faded. For a while—for a generation—that memory was kept alive because in every family there was to be found "in the form of a father, husband, son, or a brother, a living history of the revolution, a history bearing the indubitable testimonies of its own authenticity, in the limbs mangled, in the scars of wounds received, in the midst of the scenes related." But those histories are gone, he said, and can no longer be read. "They were a fortress of strength, but what invading foemen could never do, the silent artillery of time has done: the leveling of its walls."

Thus, he believed that his task, or, as he put it, the task of "our WASHINGTON," was to make freedom an object of the

RICHARD T. NOWITZ/FOLIO, INC.

(Clockwise from top) The annual December Illumination commemorating fallen soldiers, held at Antietam Battlefield, which saw the bloodiest single day in American history, with some 22,000 troops dead or wounded; the battlefield at Gettysburg, now a national military park; Gettysburg National Cemetery's gravestones for unknown soldiers; painting of Lincoln at the scene of the Gettysburg Address, by Jean Leon Gerome Ferris.



What Lincoln did at Gettysburg was to create new mystic chords, stretching from a new battlefield and new graves, to our hearts and hearthstones. He used the occasion of the war to cause us to love the Union, because of what it stood for.

DAVID MUENCH/CORBIS

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DAVE BARTRUFF/CORBIS

American people's passions or, more precisely, an object of our love. For love is a passion, not a judgment arrived at by a process of ratiocination. Thus, in August 1864, speaking to an Ohio regiment being disbanded and returning home, he used the ideas of the past to stoke that passion:

> I almost always feel inclined, when I happen to say anything to soldiers, to impress upon them in a few brief remarks the importance of success in this contest. It is not merely for today, but for all time to come that we should perpetuate for our children's children this great and free government, which we have enjoyed all our lives.... It is in order that each of you may have through this free government which we have enjoyed, an open field and a fair chance for your industry, enterprise, and intelligence, that you may all have equal privileges in the race of life, with all its desirable human aspirations. It is for this [that] the struggle should be maintained, that we may not lose our birthright—not only for one, but for two or three years. The nation is worth fighting for, to secure such an inestimable jewel.

He further inspired that passion by recalling the Founders and their commitment. He closed his First Inaugural (which was mostly given over to an appeal to the Southern states not to secede from the Union), with this statement:

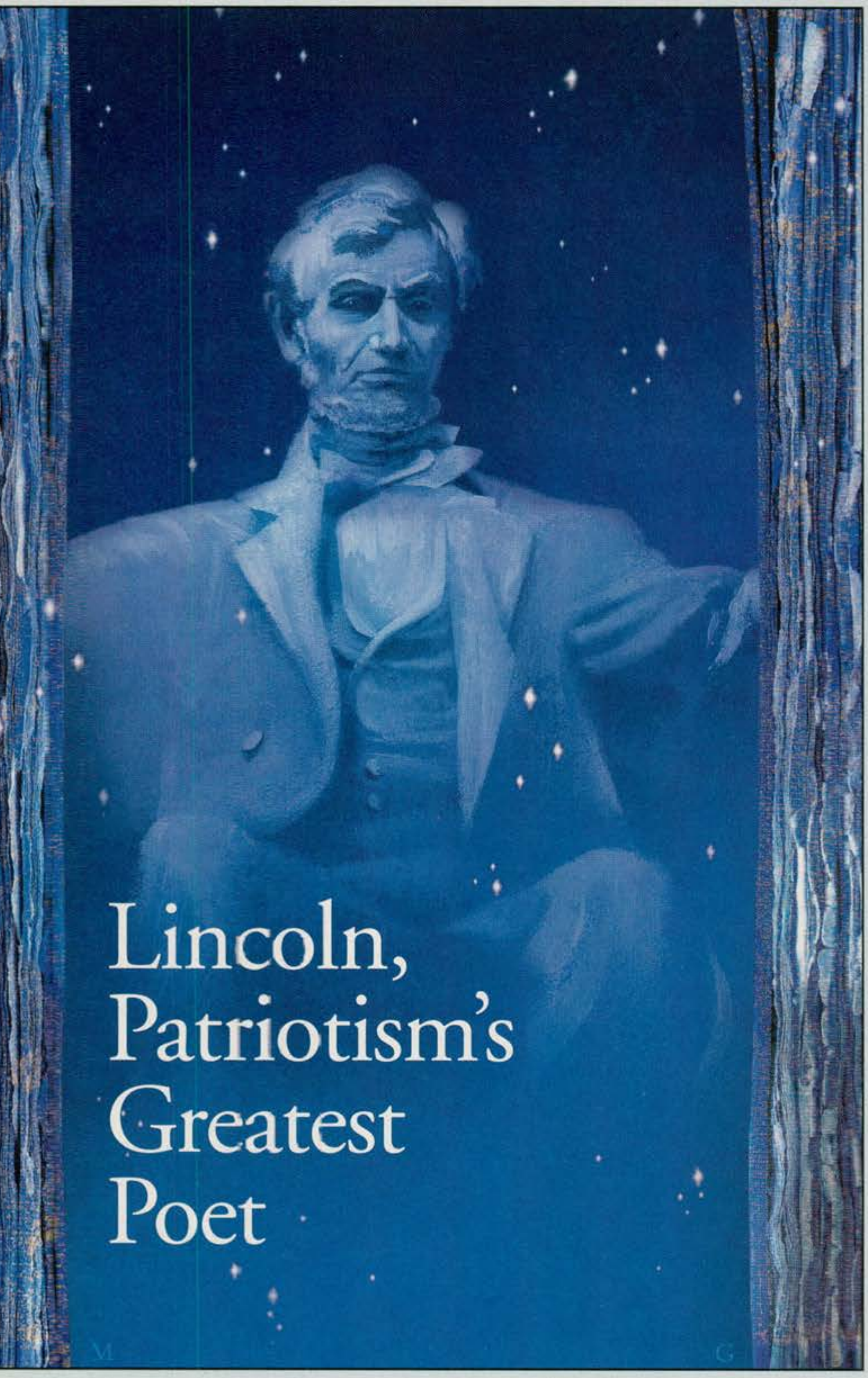
> We are not enemies, but friends. We must not be enemies. Though passion [note again this word] may have strained, it must not break our bonds of affection. The mystic chords of memory, stretching from every battlefield, and patriot grave, to every living heart and hearthstone, all over this broad land, will yet swell the chorus of the Union, when again touched, as they surely will be, by the better angels of our nature.

But Lincoln had told us in an earlier speech to the Young Men's Lyceum that memories, even those stretching from the graves of patriots, grow cold as they grow old, and will in time fade altogether—unless by means of words so compelling and memorable, they could be made an imperishable part of the nation. The Civil War, with its fresh patriots' graves, provided an occasion for such rhetoric.

At Gettysbug, Lincoln delivered the most beautiful speech in the English language—generations of schoolchildren used to commit it to memory—a speech of 272 words, delivered on a battlefield. "We are met on a great battlefield," he said, to dedicate a cemetery filled with the graves of patriots:

> It is for us the living, rather to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion—that we here highly resolve that these dead shall not have died in vain—that this nation, under

(Continued on page 34)



ILLUSTRATED BY MICHAEL GIBBS

Lincoln, Patriotism's Greatest Poet

The Constitution and Slavery

[Slavery] is hid away, in the constitution, just as an afflicted man hides away a wen or a cancer, which he dares not cut out at once, lest he bleed to death; with the promise, nevertheless, that the cutting may begin at the end of a given time. Less than this our fathers COULD not do; and MORE they WOULD not do. Necessity drove them so far, and further, they would not go. But this is not all. The earlier Congress, under the constitution, took the same view of slavery. They hedged and hemmed it in to the narrowest limits of necessity.

In 1794, they prohibited an outgoing slave trade—that is, the taking of slaves FROM the United States to sell.

In 1798, they prohibited the bringing of slaves from Africa INTO the Mississippi Territory—this territory then comprising what are now the States of Mississippi and Alabama. This was TEN YEARS before they had the authority to do the same thing as to the States existing at the adoption of the constitution.

In 1800, they prohibited AMERICAN CITIZENS from trading in slaves between foreign countries—as, for instance, from Africa to Brazil.

In 1803, they passed a law in aid of one or two States laws, in restraint of the internal slave trade.

In 1807, in apparent hot haste, they passed the law, nearly a year in advance, to take effect the first day of 1808—the very first day the constitution would permit—prohibiting the African slave trade by heavy pecuniary and corporal penalties.

In 1820, finding these provisions ineffectual, they declared the trade piracy, and annexed to it the extreme penalty of death. While all this was passing in the general government, five or six of the original slave States had adopted systems of gradual emancipation; by which the institution was rapidly becoming extinct within these limits.

Thus we see, the plain unmistakable spirit of that age, towards slavery, was hostility to the PRINCIPLE, and toleration, ONLY BY NECESSITY.

October 16, 1854, Peoria, Ill.
Lincoln responds to Sen. Stephen Douglas on the repeal of the Missouri Compromise.

Democracy as a Universal Ideal

[The Founders] meant to set up a standard maxim for free society, which could be familiar to all, and revered by all; constantly looked to, constantly labored for, and even though never perfectly attained, constantly approximated, and thereby constantly spreading and deepening its influence, and augmenting the happiness and value of life to all people of all colors everywhere.

June 26, 1857, Springfield, Ill.
Speech on the Dred Scott Decision in which the Supreme Court held that Dred and Harriet Scott would remain slaves.

The 'Electric Cord' that Binds All Americans, Regardless of Ancestry

We have besides these men—descended by blood from our ancestors—among us perhaps half our people who are not descendants at all of these men, they are men who have come from Europe—German, Irish, French and Scandinavian—men that have come from Europe themselves, or whose ancestors have come hither and settled here, finding themselves our equals in all things. If they look back through this history to trace their connection with those days by blood, they find they have none, they cannot carry themselves back into that glorious epoch and make themselves feel that they are part of us, but when they look through that old Declaration of Independence, they find that those old men say that "We hold these truths to be self-evident, that all men are created equal," and then they feel that that moral sentiment taught in that day evidences their relation to those men, that it is the father of all moral principle in them, and that they have a right to claim it as though they were blood of the blood, and flesh of the flesh, of the men who wrote that Declaration, and so they are. That is the electric cord in that Declaration that links the hearts of patriotic and liberty-loving men together, that will link those patriotic hearts as long as the love of freedom exists in the minds of men throughout the world.

July 10, 1858, Chicago, Ill.
Speech given as a reply to remarks made by Sen. Douglas regarding events in Kansas.

The Gettysburg Address

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we cannot dedicate—we cannot consecrate—we cannot hallow—this ground. The brave men, living and dead, who struggled here, have consecrated it, far above our poor power to add or detract. The world will little note, nor long remember what we say here, but it can never forget what they did here. It is for us the living, rather, to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us—that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion—that we here highly resolve that these dead shall not have died in vain—that this nation, under God, shall have a new birth of freedom—and that government of the people, by the people, for the people, shall not perish from the earth.

November 19, 1863, Gettysburg, Pa.
Lincoln's Gettysburg Address.
With this Address, Lincoln put the central proposition of the Declaration, equality, "in a newly favored position as a principle of the Constitution..." says Garry Wills, author of Lincoln at Gettysburg: The Words that Remade America. "*By accepting the Gettysburg Address, its concept of a single people dedicated to a proposition, we have been changed. Because of it, we live in a different America.*"

The Sin of Slavery

It may seem strange that any men should dare to ask a just God's assistance in wringing their bread from the sweat of other men's faces; but let us judge not that we be not judged. The prayers of both could not be answered; that of neither has been answered fully. The Almighty has his own purposes. "Woe unto the world because of offences! For it must needs be that offences come; but woe to that man by whom the offence cometh!" If we shall suppose that American slavery is one of those offences which, in the providence of God, must needs come, but which, having continued through His appointed time, He now wills to remove, and that He gives to both North and South, this terrible war, as the woe due to those by whom the offence came, shall we discern therein any departure from those divine attributes which the believers in a Living God always ascribe to Him?

Fondly do we hope—fervently do we pray—that this mighty scourge of war may speedily pass away. Yet, if God wills that it continue, until all the wealth piled by the bond-man's two hundred and fifty years of unrequited toil shall be sunk, and until every drop of the sword, as was said three thousand years ago, so still it must be said "the judgments of the Lord, are true and righteous altogether."

With malice toward none, with charity for all, with firmness in the right—as God gives us to see the right—let us strive on to finish the work we are in, to bind up the nation's wounds, to care for him who shall have borne the battle, and for his widow, and his orphan—to do all which may achieve and cherish a just and lasting peace, among ourselves, and with all nations.

March 4, 1865, Washington, D.C.
Lincoln's Second Inaugural Address.
It would not have been appropriate at Gettysburg, says Garry Wills, "to talk about the sins of the men to whom he was paying tribute." But, in this subsequent speech, Wills explains, "war is made to pay history's dues in a prophet's ledger, where scales balance precisely, the blood drawn by the lash and by the bayonet."

This selection of excerpts is based on those used by Garry Wills in Lincoln at Gettysburg: The Words that Remade America. *The text of the excerpts is reprinted from* Lincoln at Gettysburg *and* Abraham Lincoln: His Speeches and Writings, *edited by Roy Basler.*

MYSTIC CHORDS

(Continued from page 31)

> God, shall have a new birth of freedom—and that government of the people, by the people, for the people, shall not perish from the earth.

What Lincoln did at Gettysburg was to create new mystic chords, stretching from a new battlefield and new graves, to our hearts and hearthstones, *all* over this broad land, South as well as North, reminding us of the cause written in our book, the Declaration of Independence. His words touch or sound those chords in a way that no American, at least no American of my generation, can forget. He used the occasion of the war to cause us to love the Union as he and Henry Clay loved it, because of what it stood for. Love and rational judgment are not incompatible or irreconcilable, but they are different.

Thus is American patriotism complicated. It must push against the self-interest and individualism upon which the country was founded. It must convert an idea to a conviction, to a passion, while respecting it as an idea. But it's more complicated still.

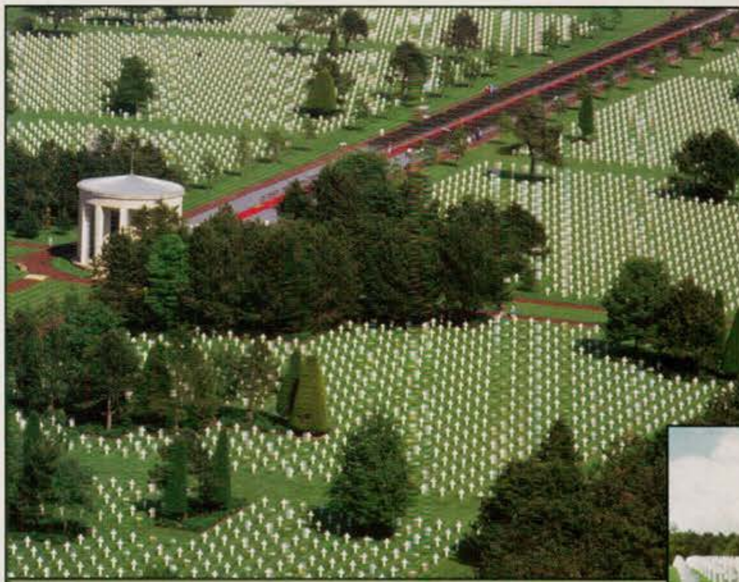
Ideas Get Buffeted

Like all ideas, the idea that fundamentally underlies American patriotism—"that all men are created equal and endowed with certain unalienable rights"—is subject, today as always, to argument. Today, American educators—who were placed on the frontline of educating patriots by Thomas Jefferson—face arguments never imagined by the Founders.

Thomas Jefferson believed that war brings out the best in a people, but, it is not "the best engine for us to resort to." Other "engines" had to be found for fostering those habits and actions that he held to be the foundation of republican government. He offered a host of proposals, including those related to education: the schools, at every level, were to play an important role in instilling those virtuous habits and transmitting them from one generation to the next.

Not only did he expect schools to provide instruction in Greek, Latin, geography, the higher branches of numerical arithmetic, and Grecian, Roman, and American history, but, without employing religion for the purpose, he expected them to instill "the first elements of morality" into children's minds. He believed it essential that children be taught to love their country, and he further believed this country especially deserved to be loved, because it was good or just. This assumes—and in 1776 we held it to be a fact—that there are standards by which countries are to be judged.

But that idea has been challenged in recent years, as the open preference for liberal democratic principles has been



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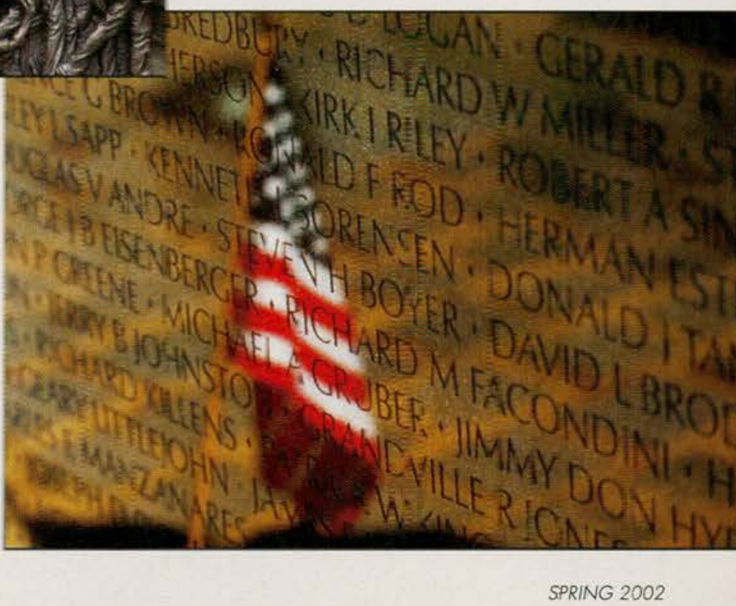
(Above, Monument commemorating the battle of Iwo Jima, where 6,000 Marines died. Survivors raised the flag on Mt. Suribachi using the only available pole—a pipe from the battlefield.

LEE SNIDER/CORBIS



TODD GIPSTEIN/CORBIS

derided as "ethnocentric." An egregious example of this was a teaching guide that went so far as to ensure that all regimes would be seen in the same light, that it accorded equal significance to the democratic rights of freedom of speech, the right to vote, and the guarantee of due process on the one hand and to what was called the "right" to take vacations on the other—despite the fact that under the regimes that espoused such economic rights as "vacations," there were no "rights" at all, only privileges that the government could give and take away at will.

If taken seriously, such extreme cultural or political relativism makes it difficult, if not impossible, for the schools to do what they have traditionally been expected to do, namely, to play a major role in the making of public-spirited citizens. How can the schools teach American students to

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TODD STRESHINSKY/CORBIS

(Clockwise from top left) The World War II American Cemetery overlooking Omaha Beach and the English Channel on the coast of Normandy, the location of the D-Day invasion of German-held Europe during World War II, where nearly 10,000 Americans are buried; the Lincoln Memorial, Washington D.C., the site of many civic gatherings, including here the most famous, the March on Washington for Jobs and Freedom, where Martin Luther King Jr. gave his "I have a Dream" speech; the Vietnam memorial on the National Mall in Washington D.C.; bronze plaque from The Boston Common commemorating the 54th Massachusetts Infantry, the black regiment that stormed South Carolina's Battery Wagner and was immortalized in the movie "Glory."

NATIONAL ARCHIVES

All of these stories, commemorated in monuments and memorials, are the nation's stories, and telling them should be part of the civics curriculum.

love their country and be prepared to make sacrifices for it, when telling them that its form of government—based on the principles of the Declaration of Independence—is no better than one that denies basic rights to its citizens? The founders could speak of "civilized nations," as opposed to "savage tribes" and "barbarians," and did so because they thought the distinction important (see *Federalist* 10, 24, 41). But if that distinction is denied, teachers could speak only of cultural differences, not of distinctions implying a judgment. In this new moral order, tolerance—blind tolerance—is the virtue taught, and "judgmentalism" is the vice.

We can see how this extreme reticence to offer judgments has filtered even into the well-meaning teaching guides published to help teachers address the events of September 11. In guide after guide, explicit judgment about the aims and character of the terrorists is avoided and teachers are beseeched to help students "understand all opposing perspectives"; to recognize that "One person's terrorist is another person's freedom fighter"; and to help students who are involved in "gun play" and "bad guy play" shift from "one-dimensional understanding to an expanded sense of bad guys as fully human people."

Of course we want students to be familiar with the perspective that drives our adversaries. And we want students who can raise questions. But we also want students—and citizens—who are prepared to make judgments about the worthiness of various regimes and the ideas that animate them, who can make distinctions between freedom-fighters and terrorists based on the methods used and the ends that are being fought for, who are happy to stand tall in defense of the ideas enshrined in the Declaration of Independence and for which we have all fought on many fronts ever since.

There is another idea at work against American patriotism. In her essay "Patriotism and Cosmopolitanism," Martha Nussbaum, a professor of law and ethics at the University of Chicago, criticized "patriotic pride" as "both morally dangerous and, ultimately, subversive of some of the worthy goals patriotism sets out to serve." "Justice and equality," she says, would be better served

> Patriotism is the opposite of selfish; it is love of community. Told it was in short supply, Americans rushed to give their blood and to the scene of devastation in New York with food, blankets, masks, whatever they thought was needed.

JOE RAEDLE/GETTY IMAGES

by persons "whose allegiance is to the worldwide community of human beings." Peoples differ, she admits, but they share "common aims, aspirations, and values." National boundaries are not only artificial, she says, but arbitrary barriers that blind us to our common humanity. Thus, instead of being taught that "they are, above all, citizens of the United States," students should be taught that "they are above all, citizens of a world of human beings."

If there was, in fact, a worldwide community animated and governed by liberal notions of justice and equality, this might be a point worth arguing. If American patriotism did, in fact, blind Americans to the humanity of non-Americans, it might be a point worth arguing. But neither is the case. The world community consists of too many countries that torture, jail, enslave, and murder their citizens, particularly those who don't share the race, ethnicity, class, or faith of their rulers. Insofar as "community" implies shared values, we want no part of such a community.

More importantly, citizens of the United States have no trouble whatsoever in regarding the victims of these regimes as members of "our common humanity" and worthy of our compassion. When, for example, Chinese students took to Tiananmen Square, we could see immediately that they shared our "aims, aspirations, and values." Just as immediately, we could see the Chinese government did not. We could see these things precisely because, as Americans, we believe that all men, whether or not they are our fellow citizens, are endowed with certain unalienable rights.

In 1776, we declared our right to form a new nation by appealing to the principle of unalienable rights. Because we were the first to do so, it fell to us to be its champion, first by setting an example—Lincoln was ever mindful of this—and subsequently by defending it against their latter-day enemies, the Nazis and fascists in World War II and the communists in the Cold War. Like it or not (and it is something of a burden), our lot is to be the one country essential to the survival and spread of democratic ideas and government—the one country with the power to defend liberal democracy against its enemies, the model as well as the arsenal of democracy. This ought to be acknowledged, beginning in our schools and universities, for it is only then that we can come to accept the responsibilities attending it. We owe it to our friends, as well as our ourselves, to be patriotic.

BETTMANN/CORBIS

The terrorists understand this, which is why they hate us (especially us) and want to destroy us. Our existence is a threat to them precisely because it gives hope to the oppressed people of the wretched and undemocratic lands from which they come. They hate us because we are a free country, a country that guarantees freedom of speech, freedom of association, freedom of enterprise, and the freedom that best distinguishes us from the countries harboring the terrorists—freedom of conscience. This country is, as Lincoln said it was, "the last, best hope of earth."

Since then, some eyes have opened, as Jefferson once predicted, to the universal rights of man, but by no means all of them. A part of the world today is what it was in 1945, when American soldiers came upon the concentration and death camps of Nazi Germany. Looking with horror at one of these camps, General Eisenhower was moved to say,

> I want every American unit not actually in the front lines to see this place. We are told that the American soldier does not know

ASSOCIATED PRESS POOL

what he is fighting for. Now, at least, he will know what he is fighting against.

The Chords Gain a New Note

On September 11, a new note was added to the mystic chords of America's memory, and patriotism burst out. Millions of Americans are flying their flags from their front porches and balconies, on their automobiles and the antennas of battered pickup trucks (even wearing it on their lapels). Flying the flag—the people seemed to know this intuitively—is the readiest way to demonstrate their love of country and their pride in being Americans.

As noted in the beginning, patriotism is the opposite of selfish; it is love of community. Told it was in short supply, Americans rushed to give their blood and to the scene of devastation in New York with food, blankets, masks of some sort, whatever they thought was needed. They grieved for those who had lost their lives, and some of them prayed for the bereaved left behind: the heroic police and firefighters, and especially, because it was not their job to do so, those passengers on United Airlines Flight 93 who gave their lives to prevent the plane from going on to Washington, D.C., to destroy the White House or, worse, the citadel of our representative democracy, the Capitol on the Hill. And for the relief of those left behind, Americans donated the prodigious sum of more that $1.3 billion. It was as if they remembered what the Apostle Paul said in his Epistle to the Romans, "we are members one of another."

They had reason to believe this. The terrorists did not discriminate; they killed us all: black, white, and every shade between; rich and poor, investment bankers and blue-collar police and firefighters; old and young; liberals and conservatives; and Christian, Jew, Muslim, and "infidel." Some were foreigners, as we soon learned, but all the others were Americans—unhyphenated Americans—fellow citizens, if not personal friends or immediate neighbors.

There was no more talk of us and them, as in our usual political discourse; the only "them" were the terrorists. They surely did not intend it—and, I trust, will come to regret it—but, by attacking us intending to destroy us, they launched an unprecedented swell of patriotic sentiment among us.

Especially after the events of September 11, it is appropriate that schoolchildren be taught the history of this country—and not that all cultures are equal, not that the greatest sin is to be judgmental, and not that previous flaws and failures of American democracy in practice render the ideas themselves as anything less than, as Lincoln said, setting up a "standard maxim for free society...revered by all; constantly looked to...and thereby...augmenting the happiness and value of life to all people of all colors everywhere."

Educating Patriots

I've been asked if I believe that war is necessary to make us patriots. The answer I give is a qualified "no," so long as we remember past wars. Our wars have often been fought because big ideas were at stake. And so, they remind us of our "birthright," of the ideas that constitute it and of the price that has been paid for them.

To help us remember, we have a Memorial Day (Decoration Day, when I was young), a Flag Day, and the Lincoln, Vietnam, Korean, and (eventually) World War II memorials. To the same end, we have national cemeteries filled with the graves of patriots, and a national anthem composed during, and reminding us of, a long-past war. This nation was born in an earlier war, and Abraham Lincoln referred to the men who fought it as "the patriots of seventy-six." Born British subjects, and living in 13 separate British colonies, we became "one people" in 1776; we said so in our Declaration of Independence. The Civil War was the deadliest of our wars, but it was also the most necessary: at stake was the meaning of the Declaration of Independence. In World War II, we learned that the survival of democracy depended on the might and leadership of our nation. All of these stories, commemorated in monuments and memorials, are the nation's stories, and telling them should be the nation's business; it should be an important part of the civics curriculum in our schools.

Students should also—this is surely the time for it—be encouraged to read political biographies, of Washington, Jefferson, Adams, Madison, Hamilton, Douglass, and especially of Lincoln; then having acquired a taste for biographies, go on as adults to read those of Webster, Clay, and Calhoun; of Roosevelt and Wilson; of Truman and the second Roosevelt.

As General Eisenhower understood, it's also important for students to understand what this country is against, which is just another way of saying students should well understand what's at stake in the survival and spread of free societies.

Such an education will permit the next generation to hear the mystic chords of memory that Lincoln knew could bind our country.

There is no denying that patriotism can be a problem; it can be misguided or a blind nationalism. Timothy McVeigh certainly demonstrated that. This is why Aristotle refused to number it among the virtues along with justice, friendship, and courage, for example. But our patriotism is neither misguided or blind, nor is it a Spartan "my country right or wrong" patriotism. Ours is the kind best described by Lincoln in his eulogy for Henry Clay. The American patriot is devoted to his country, of course, but he is also devoted to universal principles respecting the rights of man.

The twofold character of American patriotism is evident in our Pledge of Allegiance. We pledge allegiance to "the flag of the United States of America, and to the Republic for which it stands." The flag, and the Republic.

The flag carried by the Contintental Army in January 1776 had 13 stripes and the British ensign in the upper left-hand corner; but, after we declared our independence in July of that year, the Continental Congress resolved that "the flag of the thirteen United States be thirteen stripes, alternate red and white: that the union be thirteen stars, white in a blue field, representing a new constellation," which is to say, a new and different kind of country. Congress later declared the "Star-Spangled Banner" to be the national anthem and June 14 to be Flag Day, and, later still, John Philip Sousa's "Stars and Stripes Forever" was designated the national march. As Madison indicated, republican government especially requires public-spiritedness, and Congress obviously intended the celebration of the flag—on Flag Day, for example—to be one means of promoting it.

It is our emotions, more than our rational faculties, that are triggered by the sight of the flag, not when it is used (or abused) for commercial purposes, but when it is waved and flown on Flag Day and the Fourth of July and displayed at the various war memorials or on the Mall in Washington, D.C. Or, for that matter, displayed in towns and cities around the country and on the battlefields at Bull Run, Antietam, and Gettysburg, and at the cemeteries where those who fought and died are buried—not only at Arlington and Gettysburg, but in the faraway places we sometimes visit, among them Manila in the Philippines, Cambridge in England, Chateau-Thierry in the north of France, and perhaps, most famously, above Omaha Beach in Normandy. The sight of it, especially in these places, evokes memories of past battles and of those who fought them, and to whom we are indebted.

They willingly put their lives at risk for the country and its principles. We know little about them, save for the fact that they must have wanted the country to endure. (Why else would they have fought for it?) But to know that they wanted the country to endure is to know something else about them; in fact, it is to know something of importance about them: that they felt themselves obligated to their forefathers and their posterity, the forebearers because, from them, they had inherited a country worth fighting and dying for, and their posterity because, being related to them—by nationality if not by blood—they were anxious that they, too, might enjoy its many benefits. They served our country and were the better for it; by honoring them, as we do, we pay a service of our own and are the better for it. I can make this point with an analogy: Not every American can be a Lincoln, but all Americans are made better by reading his words and coming to love him and the cause for which he gave his life.

The Republic, in turn, stands not only for our country but for those principles, the principles expressed by Henry Clay, and before him by "the patriots of seventy-six"—namely, that all men, not just Americans, are endowed by their Creator with certain "unalienable rights" and that government is instituted "to secure these rights." Those who feel awkward about flag-waving should keep in mind that a symbol is only as noble, or evil, as the object or idea it symbolizes. The fact that Nazis and others have used their symbols to promote heinous acts shouldn't make us reticent about our own symbols.

And so, as Jefferson said, it falls to teachers—though not only to teachers—to cultivate students' patriotic feeling. And that means passion and love. It means enabling them to hear the mystic chords of memory that trigger an emotional response to the flag. But in the American context, that love grows from understanding the ideas, including knowing—as Henry Clay, Douglass, and Lincoln did—that American patriotism includes working to realize in practice the ideas of our founding. American patriotism is both head and heart. Teachers must help cultivate both. Perhaps then, all our citizens—young and old—can learn to appreciate the birthright Lincoln spoke of, and to understand better what he meant by this "inestimable jewel." □

The Road to Interest and Curiosity

It Begins with a Deliberate Choice

By Ron Rude

"But I'm not interested," cried the child.
"Oh, dear! Oh, dear! The child is bored," lamented the reformer, waving his hands and running about in circles.
"Hurry! Hurry! We've got to rebuild the universe to suit her."
"No," muttered the cynic. "She must rebuild it herself."

In "Seeking Edutopia," an essay that appeared in the May 16, 2001, edition of *Education Week*, filmmaker George Lucas is quoted as follows: "My own experience in public school was quite frustrating. I was often bored. Occasionally, I had a teacher who engaged me, who made me curious and motivated to learn. I wondered, 'Why can't school be interesting all of the time?'"

The essay's writer uses Lucas' question as a springboard for launching his version of what public schools need. Like other idealistic critics, he assumes that schools are "deeply rooted in the past." He also assumes that the unhappy public school experience of the few makes a valid condemnation of the entire system. And he hints that the failure so far of technology to revolutionize education is due to the fact that educators haven't properly embraced it. When all is said and done, however, the writer doesn't answer the question: *Why can't school be interesting all of the time?*

This is a key question, because it drives so much of what we do, both successfully and unsuccessfully, in education. And there is an answer to it. But the answer doesn't lie in continuously overhauling the entire system, though the system certainly cannot afford complacency. Neither does it lie in somehow eliminating the weaknesses of teachers, although we cannot pretend that poor teaching doesn't hurt students. Nor is it found in the worship of computing and the Internet or in tailoring schools to meet every child's interests or "learning style."

The answer comes in two parts and it manifests itself if we are willing to agree that idealism is something one works *from,* not *in.* I tell rookie teachers that no matter how idealistic they are, reality will pound them into despair within two or three years. That's about the time many young teachers leave the profession. The trick for survival and for success, I tell them, is to keep idealism as a motivation but also develop a clinical realism for the day-to-day action.

The same should be true for reformers.

Speaking realistically then, the first part of the answer to Lucas' question is this: On the megascale, *school simply cannot be "interesting" all of the time, nor should "interest" be the primary factor in deciding the forms and functions of a school system.*

It's true that the public may be enchanted momentarily with new technology or glitzier curriculum, but kids, especially, will soon forget the "new" and "different" and revert to the same attitudes American kids have always had simply because those are the attitudes much of America has: School is boring, studying is boring, intellectual depth is subversive, and only what applies to job training and self-esteem is valuable.

It's also true that schools will likely "lose" some of the most- and least-advanced students. That's a sad fact, and it is certainly no excuse for cold-heartedness. It is where educators, as idealists, must continue to tilt at the windmills. But no reforms based purely in idealism will eliminate the inherent injustices of the system.

Like it or not, the public education system, on the large scale, is charged with the prosaic but critical task of giving people tools that help them become thoughtful and intelligent citizens, productive workers, and well-adjusted individuals.

For the safety and welfare of all of us, the citizenship purpose of education should be more important than the other two. When we allow the "worker" purpose to drive the other two purposes, we get it wrong. But we also get it wrong when we allow the "individual" purpose to become paramount.

Thus, personal interest, while certainly a valuable motivating force for any of us, is nevertheless too capricious, too easily warped into selfishness, to be a foundational plank of something with the scope and breadth of a public education system or its individual schools.

Some progressive educators reading this are, I'm sure, already lining up to expose my ignorance. They've long ago bet on the idea that, if we could just make things interesting

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Ron Rude is a former English teacher and the current superintendent of the Plains Public Schools in Plains, Mont. The original article was published in Education Week, *Vol. 20, No. 43, Aug. 8, 2001.*

enough, all the other problems of education would drift away. They may even suggest that I'm asking for a "cookie-cutter system," but if they do, they'll be wrong.

"Interesting" is good. Nobody should have to be bored blind in school, either by the subjects and materials or by the teaching methods. But we are too easily seduced by the flimsiest charms of "interest." And that's one of the reasons we've built a certain flimsiness into the system. We've become a nation addicted to personal interest (along with convenience and infinite choices, the other two legs of this wobbly ethic), and school isn't the only place that weakness appears.

PacMan was interesting, for example, when it first appeared. But if interest alone could keep that product going, why the constant barrage of new, wilder, more violent, more bizarre video games? The simple answer is this: Interest doesn't last. What alleviates boredom can, in turn, beget boredom.

Whether public education can survive in the 21st century will depend not so much on making the system personally interesting or occupationally relevant, as it will on helping kids, and the adults who nurture them, understand that perseverance and self-discipline will get them furthest in life. I'm not optimistic that we will ever recognize this, much less accomplish it. Too often we fail to see the distinction between the pursuit of a current interest and the work that will be rewarded with lifelong interests.

The second part of the question's answer is this: School can't be interesting all of the time *because we consistently refuse to do our part in making it interesting.* The "we" here includes not only educators and reformers, but also parents, kids, and Americans in general.

Interest is not a genetic trait, it is something that we *develop*—sometimes coincidentally, but often through deliberate actions—by knowing something about the subject in the first place, for example, or by tying the information in front of us to something we already understand. Interest is something over which the individual has considerable control and so cannot blame its absence on the system alone. A case in point: "senioritis." It just is not logical to say that high school seniors lose interest in academics because no school in the country has anything interesting to offer them in their final year. At least one major cause of senioritis is deliberate choice.

When I was a high schooler, my 11th-grade world history course was taught by a tall, tense young man who immersed us daily in long lists of facts and names from the past. He was so nervous about classroom control that he allowed no questions, no activities, and no discussions. I hated the teacher and the class, but complied begrudgingly, pulled my B's, learned a bit of history in a rote way, and moved on, thereafter using that teacher as a model of how not to teach.

But a few years after I graduated, when Uncle Sam plunked me down in the middle of what was then West Germany, I spent time wandering through medieval castles, Romanesque and Gothic cathedrals, 17th-century bishops' residences, and villages still rebuilding from the ravages of the World Wars. I stood in the ruined Nuremberg amphitheater where Adolf Hitler once inflamed his followers, and I felt the weight of history that place represented. My wife and I lived in an apartment across the alley from what had been Napoleon's headquarters on a campaign through Germany.

And history became fascinating. I developed such a passion for it that the indifference of most of my GI pals began to anger me. I discovered then that despite his indefensible methods, my high-school teacher had taught me a smattering of European history that enabled me to understand what I was seeing and to learn more. I had a knowledge base, minuscule though it was, and I had finally grown up enough to do my part. Once I let knowledge and experience broaden me—surprise! Interest became, and still is, the reward, not the motivation. The challenge for teachers is not to discover their students' interests; it is to awaken in them the ability and desire to take interest in what they are learning.

One more anecdote: For most of my 25 years in the English classroom, I assigned seniors a big, formal term paper to end the school year. This produced weeping, gnashing of teeth, and cries of "boring" and "stupid" from my students, as well as occasional hard questions from parents or principals. Yet, every year I watched as various students became proud experts in a tiny niche of knowledge they had chosen—sometimes out of interest, but more often out of necessity—to pursue deeply, methodically, boringly. As they did their part, their boredom turned to interest.

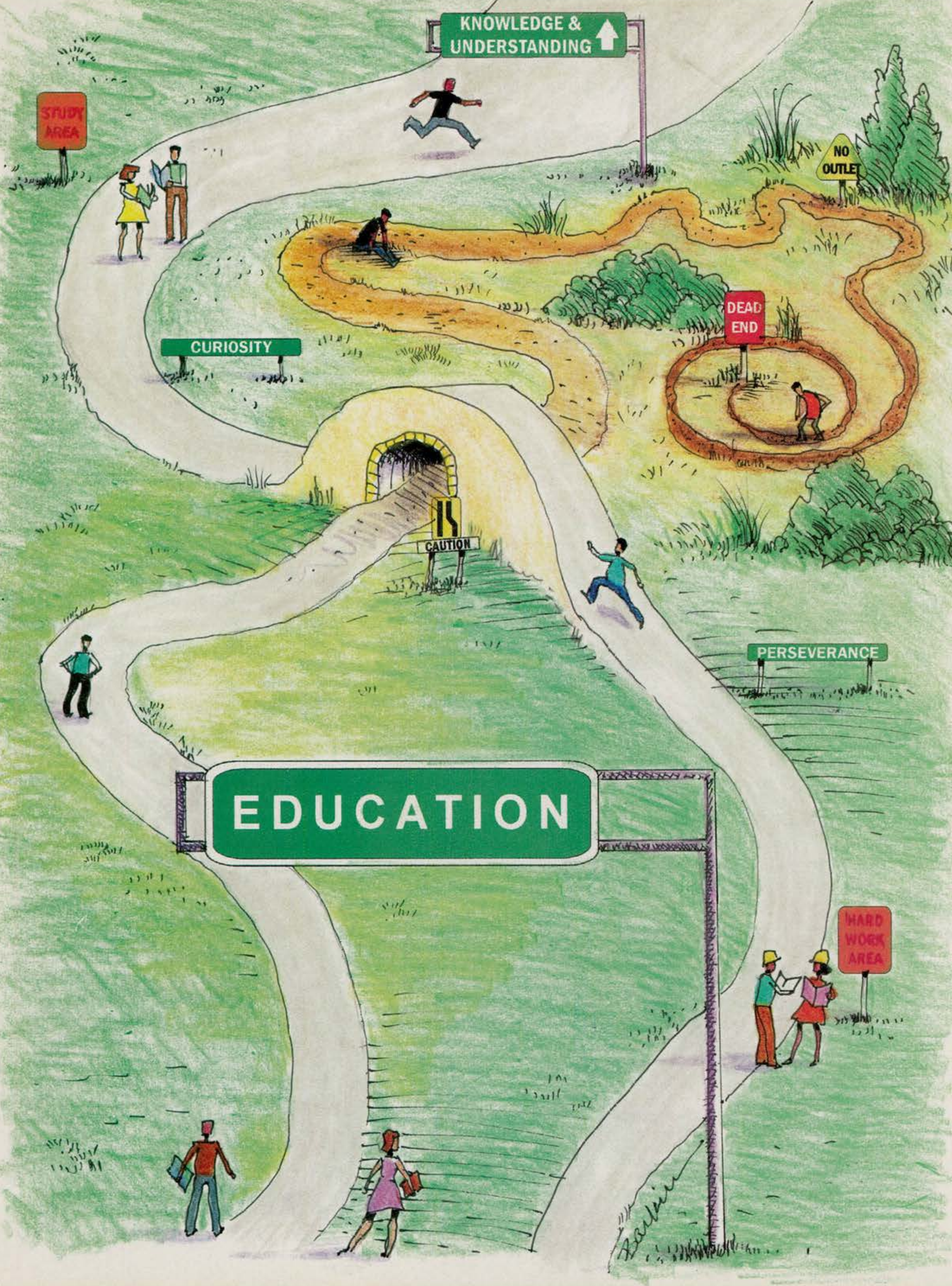
In other words, there's a chicken-and-egg paradox here, one we need to unravel in answering the question of what education should be and where it should go. The paradox is this: If you refuse to begin except where you're interested, you will most likely travel toward boredom. And the longer you go in that direction, the narrower you will be, the fewer things you will find interesting, and the more bored you will become. Thus, idealists who insist that schooling must be rooted in individual interests may be doing us all—especially the students—a disservice.

If, on the other hand, a student complies with the demands of the initial boredom, he may learn something. And if he does, he may very likely *become* interested. Once a student starts in this direction, he will be continuously surprised at how many things hold real interest. Only by *motivating our own selves* do we truly become educated.

In art, I think they say it another way: If you sit and wait, the Muse will never come; but if you work, you can force the Muse to appear.

No matter how much we wish it to be otherwise, the interesting will remain defined only by the individual at the moment, and will be subject to change on a whim. The longer we pander to the notion of providing only "interesting" schoolwork, the longer it will be until we build a national seriousness about scholarliness and the less likely it will be that we'll ever have in great quantity students who realize their highest creative and intellectual capacities. □

ILLUSTRATED BY ROBERT BARKIN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CURIOSITY
CAUTION
PERSEVERANCE
EDUCATION
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A Different Kind of Book Club

By Gerard Lesperance

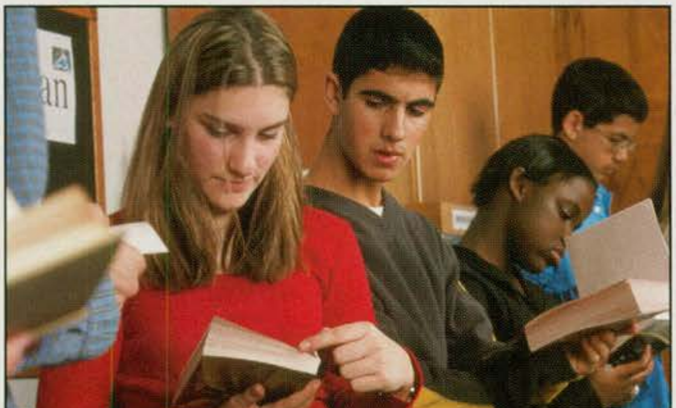
Becoming acquainted with the pleasures of reading while attending parochial school in Brooklyn during the 1950s was a simple matter. Once the good sisters "suggested" that a trip to the local library would be beneficial, my arrival there was ensured. Since my world at that time consisted of a five-block radius around the school, the thought of leaving this safe zone for a half-mile walk along unknown streets was daunting for a fourth-grader. Little did I know that walking this path would change my life intellectually as well as geographically.

The library, located on Bushwick Avenue, appeared imposing in a neighborhood of frame houses. I was proud to have successfully negotiated the solo journey as I climbed the stone steps and entered the building. Approaching the desk, I attempted to make eye contact with the librarian. This, however, proved difficult, as she appeared to be deeply involved in a weighty novel. Finally, she lifted her eyes, "Can I help you young man?" in a voice seasoned with just a tinge of annoyance. "Yes, I would like to take some books from the library." "The word is borrow," she shot back.

In spite of her annoyance, she quickly generated a temporary library card and provided a brief tour of the building, amazingly, without ever leaving her seat. I listened, wide-eyed, my head moving in tandem with her arm as she animatedly pointed around the room, "You will find fiction here, nonfiction there, children's section over there, select two books and return to this counter." This completed, her head immediately dropped into the reading position as if some internal battery had suddenly gone dead.

With a combination of luck and persistence, I located the two assigned books but was oddly drawn to continue my exploration of this new realm. As I moved through the aisles, I chanced upon a book entitled, *The Adventures of Tom*

Gerard Lesperance is the assistant principal for curriculum and instruction at Walt Whitman High School in South Huntington, N.Y. He has taught science in middle and high schools in New York City and Long Island.



PHOTOGRAPHS BY BRUCE GILBERT


The Metamorphosis
by Franz Kafka
Barrio
Boy

Sawyer. The drawings and the description on the inside cover interested me more than the two I had been assigned. I wondered, should I ask the librarian if I could take out a third book or eliminate one assigned by my teacher—both unpalatable thoughts. I decided to defer the decision and squeezed *Tom Sawyer* into my back pocket.

After exploring the stacks for several more minutes my stomach reminded me that getting home was a priority. I warily returned to the desk and once again engaged the librarian, who stamped the date on each book with a THUMP-THUMP. Relieved, I turned and slowly began my exit when suddenly the words, "Young man!" shattered the silence, striking me with high-voltage intensity. As I turned, the librarian spoke slowly, pronouncing every syllable distinctly, "What-is-that-in-your-back-pocket?" I slowly contorted my body to verify and to my horror saw the book. As I was attempting to explain in a nervously incoherent babble, the librarian slowly closed her book, left her seat, removed her glasses, and stared down at me. Inexplicably, her face softened and, with the slightest hint of a smile, she accepted the book from my outstretched hand. "I am pleased to see that you are eager to read, but only two books on a temporary card."

In spite of this harrowing experience, I returned to the library within two weeks and borrowed *Tom Sawyer.* Each time I returned for a required assignment I picked up other books that piqued my interest and quickly became an avid reader—Greek mythology, Edgar Allan Poe, Jules Verne, Ernest Hemingway, Washington Irving, Herman Melville, and James Michener.

Becoming immersed was strangely pleasing. I could open a book and transcend my cramped apartment, arriving at locations I could never hope to visit and participating in events exciting beyond my imagination. At times I stayed up until 3 A.M., fighting sleep for just one more chapter or a few more pages. Many mornings I awoke with the lamp still lit and my book lying where it had fallen. If the book was particularly interesting, the pages turned too rapidly. I reacted by consciously slowing the pace in an attempt to delay the inevitable.

This behavior did not go unnoticed by my parents, who were somewhat perplexed at the sudden surge of literary in-

Resources to Inspire Young Readers

Ready to encourage more reading in your classroom, school, or neighborhood? The following diverse set of resources will give you plenty of ideas.

National Geographic

As part of its nonfiction literacy campaign, National Geographic launched the Book Club for Kids with a wide range of fun activities and free materials online. Books are categorized for the history buff, world traveler, adventurous explorer, and super survivor. Children can write and post book reviews, read book reviews from other kids all over the world, make their own bookmark, and look over study guides. In the special Reading Expeditions section, teachers have access to teaching notes, materials for student activities, assessment handbooks, and guides relating the materials to national standards. Visit National Geographic's Book Club for Kids at **www.nationalgeographic.com/bookclub**.

Spaghetti Book Club

The Spaghetti Book Club offers K-12 teachers a venue for publishing their students' book reviews, as well as related artwork, on the Internet. For \$75 to \$150 per year (depending on the number of reviews published and amount of assistance needed with posting artwork), teachers are provided with lesson plans on developing book reviews, publishing criteria, and consent forms. Instead of just posting students' reviews online, Spaghetti Book Club staff members read the reviews to make sure they meet the publishing criteria. If not, students are given an opportunity to rewrite their reviews. Similar to many state literacy standards, these publishing criteria challenge students to think critically about the books they are reviewing. Learn more about the Spaghetti Book Club at **www.spaghettibookclub.org**.

Braille Children's Books

To make sure your bookshelves have plenty of resources for everyone, review the American Foundation for the Blind's resources for children's braille books. The list is available at **www.afb.org/info_document_view.asp?documentid=1249**. Another great source is the Children's Braille Book Club, which offers a new print-braille children's book every month for preschool through third-grade students. Affiliated with the National Braille Press, this club can be found at **www.nbp.org/bookclub.html**.

Scholastic

For economically priced children's books and information on earning points for free materials, visit the preschool through eighth-grade book-buying clubs offered by Scholastic at **http://teacher.scholastic.com/clubs/custsvc/tguide/index.htm**.

Book Club Deals

If you are ready to dive deep into the world of book clubs, spend some time looking through **www.bookclub-deals.com**. Not only will you find great deals—like clubs offering five books for \$2 when you join—you'll find book clubs in dozens of categories from children's to mystery to politics. There are even book clubs for early, primary, and middle school teachers.

terest. Over time they also noticed that a strange phenomenon was occurring. My grades began to improve. A direct correlation? Most likely. But at the very least they were witnessing the creation of a lifelong habit that was to affect me positively in many ways.

Run the clock fast forward to the late nineties. I had recently begun working at Walt Whitman High School in South Huntington, N.Y. Whitman, a suburban school located on the North Shore of Long Island, provided an environment that was open to new ideas. My arrival here coincided with the publication of an issue of *American Educator,* entitled "The Unique Power of Reading and How To Unleash It" (Spring/Summer 1998), which contained a series of articles devoted to the benefits of reading. Although the idea of a book club had been rattling around in my head for several years, it was this confluence of factors that coaxed my thought into action. With no model to emulate, I hoped that common sense and experience might carry me through.

I still remained hesitant because the concept might be perceived as too anachronistic in the electronic age of the 21st century. Also, times had changed: The Internet, TV, sports, clubs, jobs, and new learning standards now competed with reading for the minds and hearts of young adults. Recreating my experience for the students at Whitman seemed risky. But, after consulting with the high school principal who told me to "go for it" and hearing the encouraging words of the math and science chairs, "even if you inspire one student to read you will have succeeded," the Walt Whitman Book Club was launched.

The club was to have no meetings (students were already busy with countless other tasks and this would allow a wider range of participation), no required book lists, or club officers. Just reading for enjoyment. Eligibility was simple—students would read a book on any topic and submit a book review, which was then placed on the book club bulletin board alongside the names of all the members. The rewards for this effort would be the full benefits of membership—a free book for each one completed and eligibility to attend book club sponsored trips.

This was, however, easier said than done because books are expensive, and with no budget the club would lose its major incentive. Fortunately, I soon received a call from a community member whose aunt, an avid reader, had just passed away. When the caller told me she was searching for a home for her aunt's library, I immediately enlisted the help of a staff member who owned a Bronco and raced to collect what turned out to be a treasure trove of several hundred titles. A short time later, I was delighted to receive generous funding from the Teacher/Parent Resource Center (twice) to further enrich our collection. Our school technology teacher collaborated with a student to construct a bookcase and made this collection of new and used titles more attractive. Apparently, the book club was ready to go. But the question remained, what kind of response could I expect from the students?

I began to promote the club by the usual means—letters and public address announcements—but the best advertise-

ments were the books themselves. Many students who passed by the bookshelves each day were curious about the titles that were on display. It was heartwarming to observe them pick up a book that caught their attention, skim through it, and inquire about the club. In this manner, membership began to build slowly as the book club became a part of the landscape of the school. But oddly enough, it was the secondary benefit of membership—eligibility to attend trips—that provided the greatest stimulus. It proved not only to be an effective incentive for students to read, but also generated a force for teacher involvement that was to transform the book club into a more broadly based student organization.

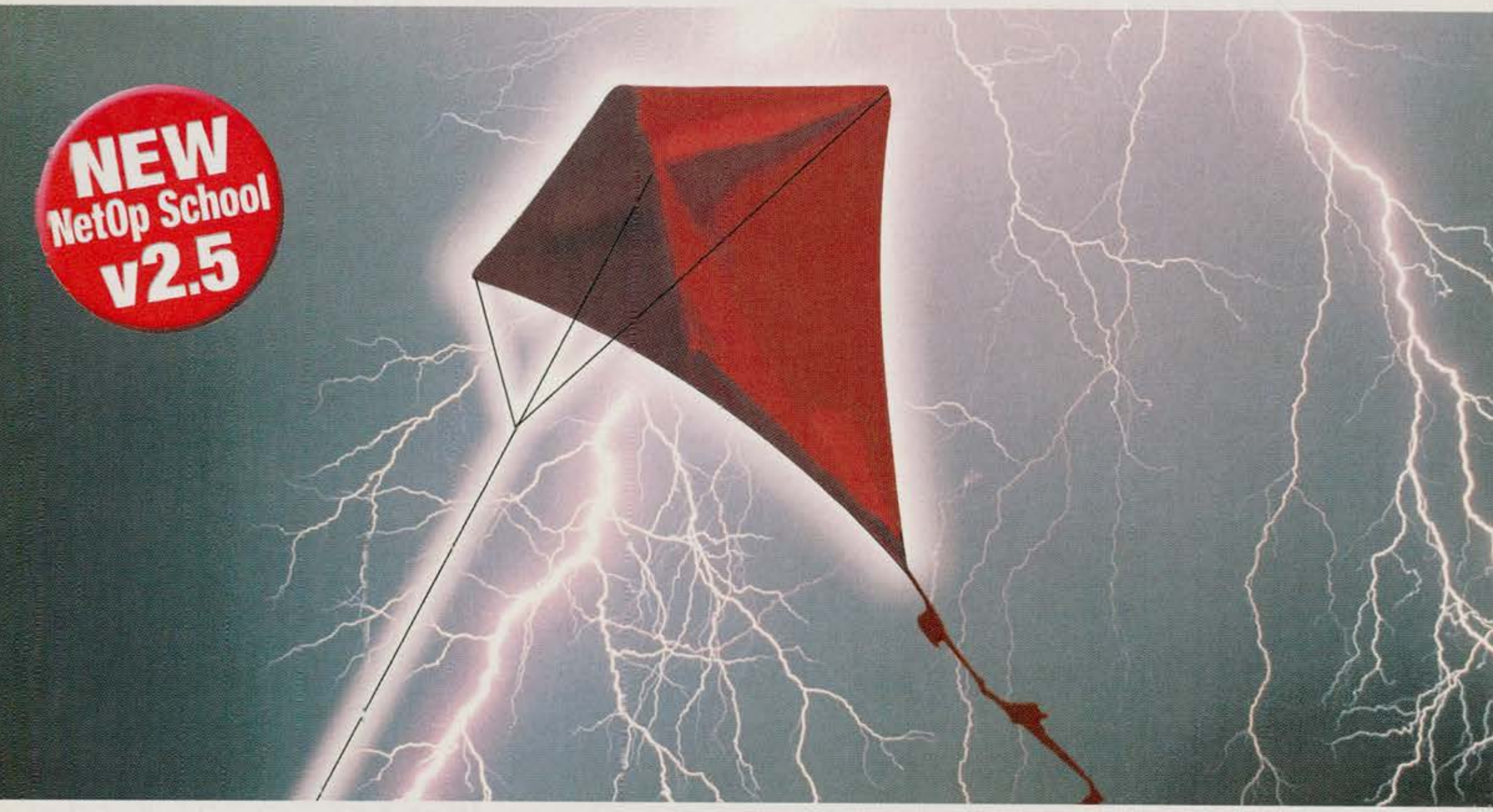
This all came about quite serendipitously while planning our first trip to the home of Teddy Roosevelt at Sagamore Hill. I received a tip that a member of the social studies department was not only an avid reader and a frequent visitor to Sagamore Hill, but was also a TR enthusiast. What better way to organize a trip and simultaneously promote the book club than to use the expertise of a member of the teaching staff? Within the next few weeks, he compiled a list of recommended titles for the students, provided them with book review forms, and acted as promoter for our club. The trip was an overwhelming success, introducing many new students to the book club and prompting subsequent trips to the United Nations with the English as a Second Language department and to the Brooklyn Museum of Art with the art department. Since I was a relatively new member of the staff, these trips became a collaborative experience and, as such, accelerated building relationships with teachers as well as interest in the club. This success caused its rapid evolution from an organization with a small focal point to one with universal appeal and potential as a curriculum support mechanism.

I soon learned that trips and free books were not the only motivators to club membership. Since many of the students at Whitman were already involved in recreational reading, they were attracted because they found validation in their love of the written word. The book club inspired them to increase their reading volume and to experiment with a broader range of literature. They proudly submitted their book reviews and delighted in spending an entire period selecting their free title. Some appreciated the weathered look of the donated classics while others were attracted to the newer hard- and soft-cover editions. Some students joined because it offered an extracurricular activity that they easily found the time to enjoy; since neither great athletic prowess nor above average grades were necessary for membership, its appeal was universal.

In fact, the club draws a disproportionate number of members from special education and English as a Second Language students who are welcomed through class visits and the acquisition of appealing book titles. As a result, club membership, which is now above 100, developed into an eclectic mix of students from throughout the social and ethnic fabric of Whitman. It was quite interesting to observe students from all the diverse segments of the school population "see" each other for the first time and have some limited interaction through the book club and its trips. It was not uncommon to observe students in my office dressed totally in black alongside others in baggy pants standing next to students in full Muslim dress.

(continued)

Another great discovery



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As we begin our fourth full year, we have managed to attract a steady flow of new members to replace those who have graduated. We are enhancing our appeal by creating a page for the school's Web site so students and parents may log on to read about the latest books of interest. The club has received further funding from the South Huntington District and a most generous donation from a prominent family in the community.

Enthusiasm continues to build as the club affects different groups within the school. The librarian has noticed an increase in usage; in fact, she has supported the club by producing colorful displays that promote book club activities. The president of the PTA has become an ardent supporter and managed to secure a free slice of pizza and a soda from a local restaurant for the first 50 students to read a book. Although this was a limited offer, it came at a critical moment in the history of the club. This was not only another incentive, but also proof that the community values reading as an educational tool. As for me personally, I discovered that the desire to grow through reading is a trait that has not yet disappeared from the human genome. This point was driven home when selecting titles for the free book library. I hesitated before buying books of poetry and essays believing that there would be few takers; but to my surprise, these books were among the first volumes to be selected.

The little adventure I undertook those many years ago transported me beyond my known world and stimulated a lifelong habit of reading. The creation of the book club has been an equally important journey. Not only has it promoted interactions that have benefited me emotionally and professionally, but the book club has opened an avenue through which I was able to provide enrichment for our school. It has been a gratifying experience—working with administrators, teachers, parents, and most of all, students who clearly recognize the centrality of recreational reading in the educational process. □

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