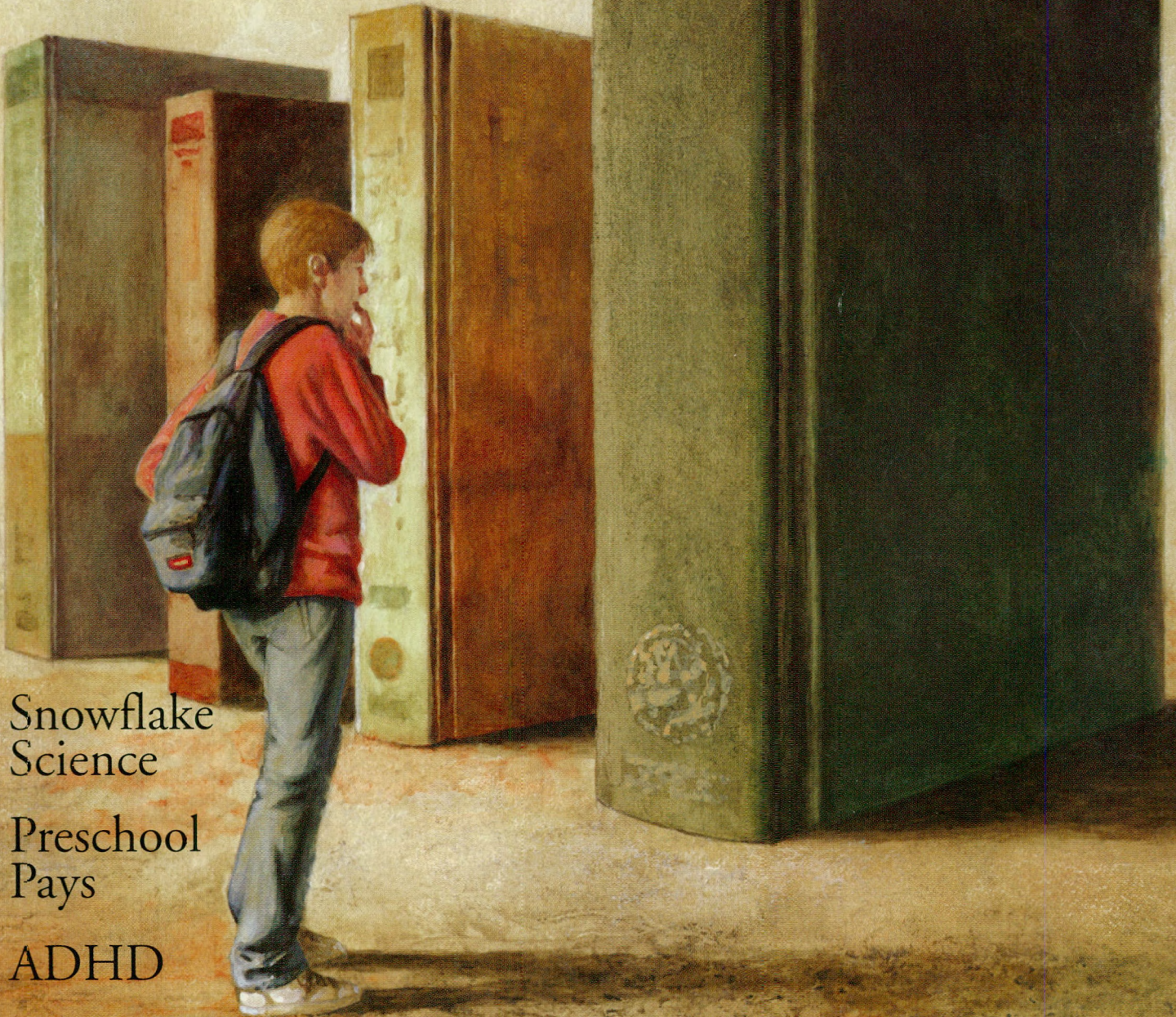


AMERICAN **Educator**

AMERICAN FEDERATION
OF TEACHERS
WINTER 2004/2005

Literary Choice and the “Problem Novel”

What do our kids need
most from books?



Snowflake
Science

Preschool
Pays

ADHD

Agamemnon

Ad
Council.org

A
AfterSchool Alliance

M
CHARLES STEWART
MOTT FOUNDATION



AFTERSCHOOLSCENE.COM
AFTERSCHOOL PROGRAMS ARE A WAY BETTER PLACE

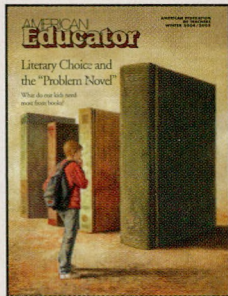
2 **Letters**

4 **Notebook**

8 **Reflections on the
"Problem Novel"**

By Barbara Feinberg

Once upon a time, the books we gave our young may have been too sweet, too removed from reality. Has the pendulum swung too far in the other direction? A writer and mother reflects on the pros and cons of the "problem novel"—that ubiquitous subgenre of adolescent literature in which tragedy piles on tragedy.



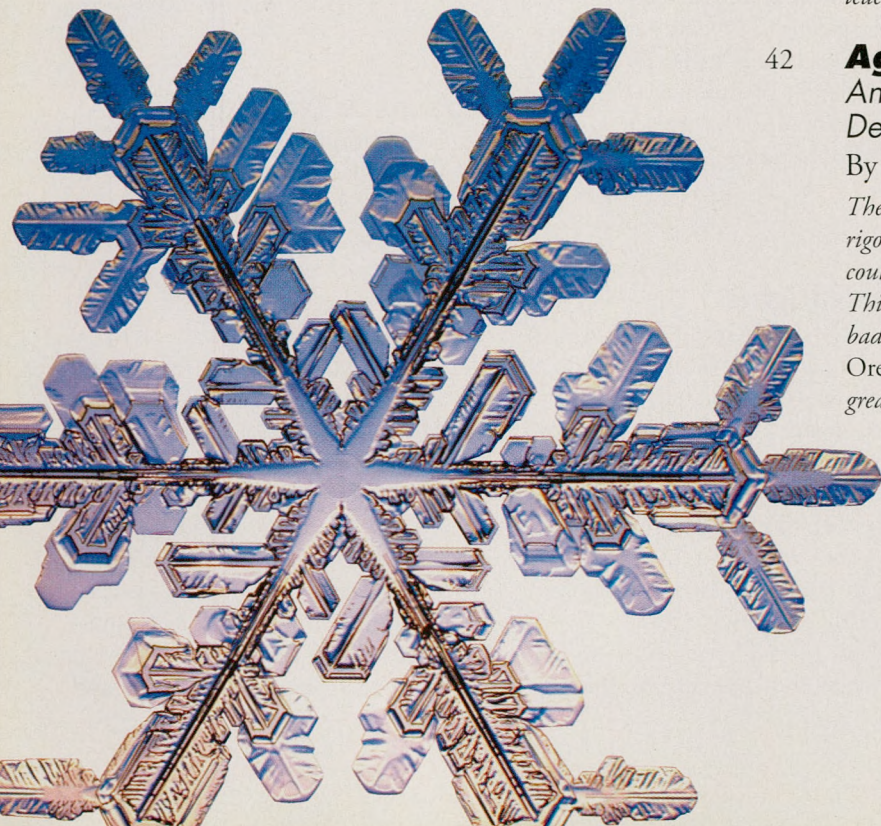
Cover illustrated by Sonja Lamut

20 **Snowflake Science**

A Rich Mix of Physics, Math, Chemistry, and Mystery

By Kenneth Libbrecht

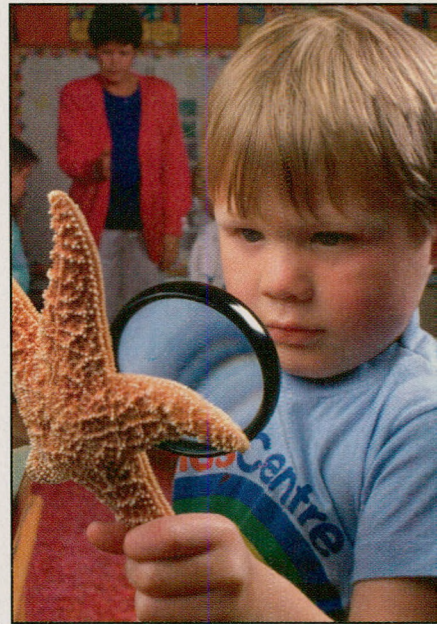
We all marvel at the beauty and intricacy of snowflakes, but few of us can explain how they come to be. You'll be surprised to learn that they are not frozen raindrops and, despite the pattern on your sweater, they never have eight sides. You'll also be surprised to learn that scientists haven't yet fully figured out the causes of snowflakes' complex patterns.



26 **Preschool Pays**
High-Quality Early Education Would Save Billions

By Robert G. Lynch

Would you spend a dollar today if it could save you three dollars tomorrow? Of course. Wouldn't you want your government to do the same? It can. By spending \$19 billion now to provide high-quality preschool to all poor three- and four-year-olds, this economist calculates that by 2050, America would save \$61 billion per year.



36 **Ask the Cognitive Scientist**
Understanding ADHD

By Daniel T. Willingham

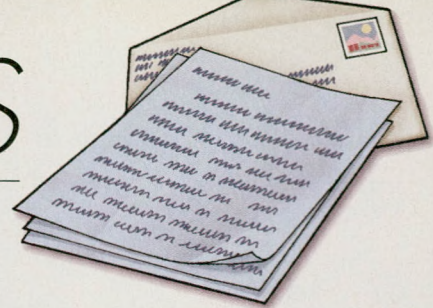
Attention Deficit Hyperactivity Disorder seems to be in the news (and our classrooms) constantly: What is it, how is it diagnosed, and how should it be treated? Our cognitive scientist provides the facts with an eye toward helping teachers deal with ADHD in the classroom.

42 **Agamemnon for At-Risk Teens**
An Ancient Classic Delivers Relevance and Rigor

By Rick Ayers

The further behind students are, the more they need rigorous content—how else could they ever catch up? This teacher leads a class with a bad reputation through The Oresteia and is reminded that great literature can resonate across the divide of centuries.





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mjk/mk



Preventing Early Reading Failure

I have been an instructional aide for eight years. I firmly believe that having an aide in all K-3 classrooms would improve our children's education—these youngsters need a great deal of individual support in order to succeed. The articles in the Fall 2004 issue verify this and also stress how important early success is and that children do not “catch up.”

In addition to offering more intensive interventions to prevent reading problems, we should also do more comprehensive vision tests. Thirty years ago my son was having difficulty reading. The teacher assured me that he had passed the vision screening and that vision was not the problem. Unfortunately, I let a year go by before I took him for a comprehensive vision examination. My son suffered needlessly. Working in school today, I find that nothing has changed. A more effective approach would be to educate parents and teachers about children's vision and the limits of the standard vision screening. Personally, I advocate requiring a comprehensive vision exam by a qualified optometrist or ophthalmologist so children start school with their most needed school supply—good vision.

—NORA C. WALICZEK
Hollywood School
Brookfield, Ill.

Women's Rights

Azar Nafisi's article, “Women's Rights—Not Just for Westerners,” does well to challenge a tendency of well-intentioned multiculturalists to inadvertently avoid the tough questions about injustices that may be inherent in cultural practices. She is also right to point out that some extremists have hijacked religion, in particular, Islam, to deprive women of their rights.

However, I would have liked to see some discussion of Iranians' disillusion-

ment with aspects of “Western culture,” and how that gave rise to the “fundamentalism” that Nafisi rightly criticizes. In addition, at least a handful of Muslim women scholars all over the world, including Dr. Azizah Al Hibri here in the U.S., are highlighting that not all interpretations of Sharia laws need be anti-woman, and there are at least some interpretations that protect Muslim women's dignity.

—SARAH SAYEED, PH.D.
Baruch College
New York, N.Y.

Fantastic Journey

I am enjoying Joy Hakim's splendid article, “Fantastic Journey,” in the Fall 2004 issue. I am a poet, translator, editor, professor (62 years old), and I have an Irish-Sicilian daughter, Elisabeth, who is in fourth grade. She, too, is enjoying the article: written for youngsters, yet having the sweetness (never mean) to reach all ages. This is good, and it is the sort of thing that *American Educator* should be publishing.

—EMANUEL DI PASQUALE
Middlesex County College
Edison, N.J.

Separate Is Not Equal

I welcomed the Summer 2004 issue of *American Educator*, “The Beginning of the End of Caste in America.” There was, however, a curious omission of an important piece of our history, namely the position taken by the AFT leadership in 1954 that banned segregated locals. The message was forthright and principled—integrate or leave. In those days before dues check off or agency shop, that farsighted, principled position came with a price tag. As a result of this stand, the AFT lost thousands of members who would not break with injustice. Nevertheless, within a decade, the AFT emerged as a leading progressive voice within the labor movement and went on to organize teachers and

win union recognition in New York City, the nation's largest school system. Other large cities soon followed. The important lesson for AFT members today is that what was lost was regained tenfold.

—SEAN AHERN
*Marta Valle Secondary School
New York, N.Y.*

I am very impressed by your article on the legal strategy that toppled segregation. I intend to use it in my classes of American Government and U.S. History. It is concise, readable, and yet thorough. But, when the authors quoted a portion of Chief Justice Warren's opinion, I believe they omitted the key portion of the argument—that education is unequal “even though the physical facilities and other 'tangible' factors may be equal.” As the article stresses, separate but equal is not sufficient. Segregation per se is demoralizing and must be eliminated. Again, congratulations; educators need the history and arguments that the article explains.

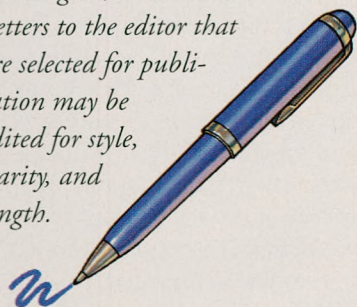
Color, gender, and other matters count, but the root problem is that well-off kids of any color, gender, etc. are likely to get excellent education and poor kids of any color, gender, etc. get the leavings. Most teachers (and their children) are middle class; if they don't lead the struggle for fairness for poor kids, nothing will change.

—DON TAYLOR
*Community College of Allegheny County
Pittsburgh, Penn.*

Let us know what you think!

Please send letters to the editor via e-mail to amered@aft.org or by mail to American Educator, 555 New Jersey Ave. N.W., Washington, DC 20001.

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THE GILDER LEHRMAN INSTITUTE of AMERICAN HISTORY

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led by Carol Berkin and Catherine Clinton

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FRENCH TEACHERS

(11-19 students' age) from Metropolitan France, West French Indies, French Guyana, Reunion Island and French Polynesia wish to get into contact with teachers for correspondence, exchange of flats or holidays.

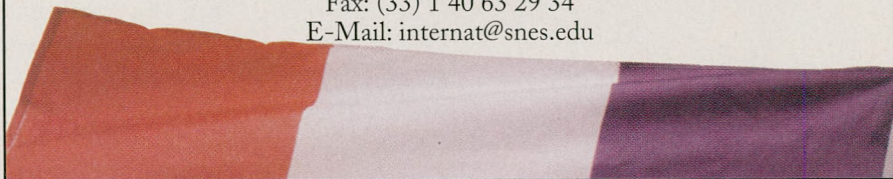
If you feel interested, write to

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E-Mail: internat@snes.edu



NOTEBOOK



Report Roundup

Three New Reports Answer Three Important Questions

How Does Teacher Pay Compare?

A new report by the Economic Policy Institute (EPI) finds that in terms of compensation, elementary and secondary teachers are being left behind other professionals. Reports on teachers' salaries come out rather frequently and tend to have mixed findings—some say teachers are underpaid, others say they are fairly paid (almost none say they are overpaid). What's going on here? It's more than just politics. EPI's report, *How Does Teacher Pay Compare? Methodological Challenges and Answers*, found that such studies depend heavily on the definition of compensation (e.g., whether or not benefits are included), the chosen comparison group (e.g., all workers or college graduates with similar skills), and how teachers' summer vacation is accounted for. EPI tackled each of these to create accurate wage comparisons.

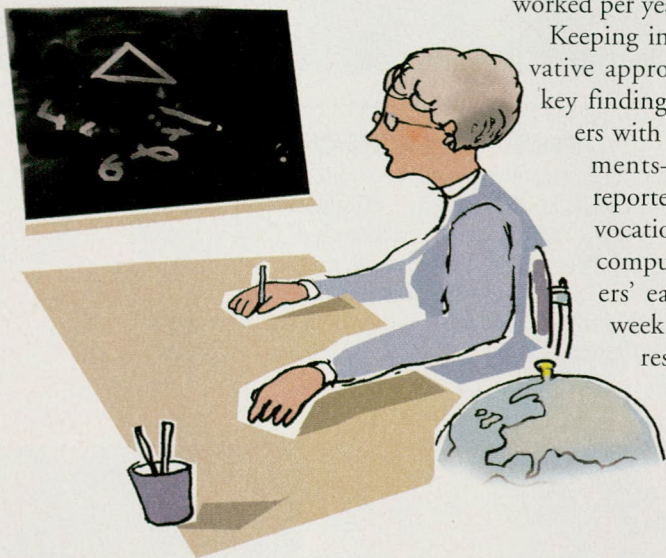
One of the trickiest issues in comparing teachers' pay to that of other professionals is dealing with teachers' summer vacation. EPI researchers dealt with this problem by purposefully doing conservative calculations that rely on weekly wages. The researchers reason that comparing teachers' *annual* wages to those of professionals who work year-round probably *overstates* teachers' wage disadvantages because it does not take into account the value of the additional leisure time or the extra income that they could earn during the summer. In contrast, comparing *weekly* wages probably *understates* teachers' wage disadvantage because teachers who take summer jobs may have to accept lower rates of pay and teachers who engage in professional development and prepare classroom materials in the summer may think of themselves as full-year workers. (To examine these weekly wages, researchers have surveys that ask about wages earned in the most recent week of work, as well as surveys that ask about annual wages and weeks worked per year.)

Keeping in mind EPI's conservative approach, consider these key findings: Relative to workers with similar skill requirements—like accountants, reporters, registered nurses, vocational counselors, and computer analysts—teachers' earned \$116 less per week in 2002. When the researchers accounted for the fact that teachers, on average, work more hours per week than these other profes-

sionals, they found that teachers have a wage disadvantage of 14.1 percent. Furthermore, while it is true that teachers tend to have better benefits than these comparable professionals, those benefits do not offset the wage disadvantage much at all: When benefits are considered, teachers have a total compensation disadvantage of 12.5 percent. The problem isn't that teachers' salaries are actually going down—it's that they aren't keeping up with the salary increases that professionals in other fields have been enjoying. Between 1979 and 2003, female teachers' weekly wages actually dropped 18.5 percent *relative to those of similarly experienced and educated professionals*. (Male teachers suffered a 9.3 percent relative drop over this time period, resulting in a relative drop for all teachers of 13.1 percent.)

The report also painstakingly refutes some recent research that claimed that teachers' hourly wages were actually higher than those of lawyers, computer programmers, and some other highly-paid professionals. In brief, these reports are based on flawed data sets that make it impossible to compare the wages of professionals who are on regular schedules to those who are not (such as teachers, college professors, and airline pilots).

Ultimately, the report predicts problems with maintaining teacher quality in the future if the erosion of teacher pay is not stopped. According to one of the authors, Sylvia Allegretto, "This gap puts teachers in an untenable position, where they have to choose between their students and their own families' well-being." To read a brief excerpt from the report, or to purchase it, go to www.epinet.org/content.cfm/books_teacher_pay.



ILLUSTRATED BY BRU ASSOCIATES

How Tough Are Exit Exams?

The decade-long push to increase standards and accountability has produced high school exit exams in nearly half of U.S. states. Developing such exams is a delicate enterprise: To be worth administering, the exam needs to cover important content in a serious way such that passing is an accomplishment—that is, the exam must address material that is worth knowing because it is necessary for well-paying work or college. At the same time, an exam that is unrealistically difficult or disconnected from real-world requirements for success will not sustain public support.

States have a long way to go to find just the right balance, but a new report by Achieve indicates that they are making progress. The current batch of tests is more rigorous than the minimum competency tests designed in the 1980s, but however difficult they may be for students, this new batch does not represent a level of rigor that exceeds what students actually need to succeed in college or in most well-paying jobs. Further, in comparison to other industrialized countries, America's exams are still less demanding. Achieve does not claim, however, that getting all students to pass will be easy; states must offer students extra support and multiple opportunities to retake exit exams.

The report, *Do Graduation Tests Measure Up? A Closer Look at State High School Exit Exams*, presents careful analyses of mathematics and English

language arts exit exams in Florida, Maryland, Massachusetts, New Jersey, Ohio, and Texas. Drawing on panels of mathematics and English language arts experts, as well as some independent rating scales, Achieve answered several key questions about these state exit exams:

■ **The exams mainly measure basic, not advanced, content.**

Achieve divided the exams into the disciplines' major domains (e.g., number, algebra, geometry/measurement, and data analysis for mathematics; basic comprehension, literary topics, informational topics, and critical reading for English language arts). They found that the math exams emphasize basic topics in algebra and geometry, and the English language arts exams emphasize basic comprehension.

■ **Exam questions mainly draw on lower-level cognitive skills.** Analyzing the content of the exams is important, but it's only part of the picture: Questions on basic topics in geometry, for example, can be quite simple or they can require real analysis. Therefore, Achieve analyzed the content of the test questions to find out their level of cognitive demand. In mathematics, they rated the cognitive demand of each test item as follows: recall, using routine procedures, using non-routine procedures, formulating problems and strategizing solutions, or advanced reasoning. They found that the tests placed a heavy emphasis on using routine procedures and expected very little advanced reasoning. Similarly, the English language arts exam items were rated as: literal recall, infer, explain, or analyze. Once again, they found a heavy emphasis on knowledge and skills at the lower end of the scale (particularly inferring).

■ **U.S. math exams expect less than foreign exams.** Achieve compared the content on the

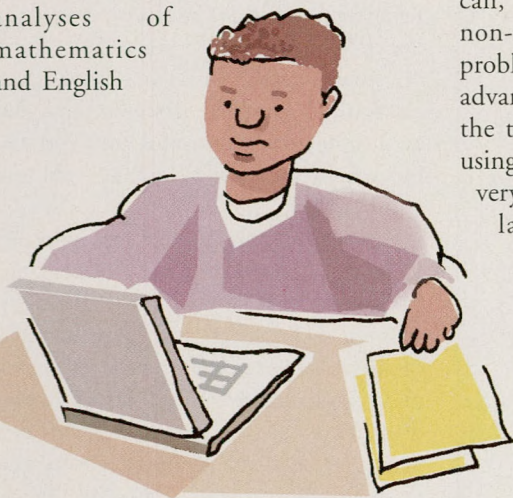
mathematics exams to the International Grade Placement (IGP) index tells when certain topics are taught in 41 nations. According to the IGP, the content of the selected states' mathematics exams is taught in about eighth grade, on average, in other countries.

■ **States' English exams expect less than national exams.** Lacking an international measure of when language arts topics are typically taught, Achieve

compared these states' exams to assessments used nationally, including the National Assessment of Educational Progress, the SAT, and the ACT. Achieve found that the *reading passages* were mostly at a late middle-school to early high-school level, with some passages at a late high-school level. As for the *overall content* of the English Language Arts exams, Achieve found that the vast majority of the content was at the 8th and 9th grade level.

Achieve concluded that the exams represented reasonable expectations for high school students, but cautioned that today's high school students will only pass these exams if they are given the extra support they need. For example, Achieve points out that in Massachusetts, 95 percent of the class of 2003 passed the state's exam after having multiple opportunities to retake the test. Importantly, Achieve notes that, "Those who initially failed the test and took advantage of the extra help available to them were significantly more likely to pass the test the next time, underscoring the importance of student effort and responsibility."

Achieve's report can be found online by going to www.achieve.org, clicking on "News/Reports," and then clicking on "Publications."



What Works to Raise Student Achievement?

Increased accountability in both state and federal laws has spurred a new thirst for information on programs and strategies with evidence of effectiveness. Trouble is, there are few areas in which educational research can offer adequate, meaningful, and reliable guidance. Educators typically don't have the time to sort through the thousands of studies published each year nor do they have the training necessary to identify which studies are flawed. After many attempts to remedy the situation—including efforts like *An Educators' Guide to School-wide Reform*, which the AFT published in 1999 in conjunction with four other organizations—there's finally a sustained effort underway to let educators know what practices and programs really are effective.

The What Works Clearinghouse

(WWC) is a much-needed, new organization devoted to making education research useable. Many of its key staff members (including some formerly with the AFT) worked on the *Educators' Guide*—they know what schools need and are working hard to provide it. The WWC's main objective is to critically review evaluations of curricula, programs, and interventions so as to clearly state which ones are trustworthy and what the findings were. To accomplish this objective, the WWC has set standards that define what credible and reliable evidence is. In brief, the standards ideally call for studies with experimental designs, similar to those conducted in medicine, in which students are randomly assigned to either a treatment or control group. (The standards also allow for quasi-experimental designs in which students are not randomly assigned, but are carefully matched so as to make the treatment

and control groups as similar as possible. However, the WWC advises caution with such studies because there is no guarantee that the two groups are equivalent.) Over time, the WWC hopes researchers will strive to meet these standards—and thus greatly increase the overall quality of education research. The new Institute for Education Sciences at the U.S. Department of Education has promised to support this form of research.

To kick off its research, the WWC identified several high-priority topics such as beginning reading instruction, character education, mathematics curricula, and dropout prevention. In November 2004, the WWC completed its first topic review and released a set of reports on middle school mathematics curricula. Unfortunately, the findings say more about the need for better research than they do about math: Of the 800-plus studies that were initially identified, only 11 met the research standards set by the WWC. Those 800 studies reviewed 44 mathematics curricula, but the credible 11 studies only covered five curricula—and just two of those curricula had evidence of having increased student achievement (but their results were not uniformly positive). Of course, this doesn't mean that other curricula are not effective—it just means that we don't have enough evidence to know whether they are effective or not.

Thankfully, this won't be the final word from the WWC on middle school mathematics curricula; their findings will be updated on the Web as new studies become available. For now, teachers may find it useful to check the list of 44 curricula to see if it includes any that are used in their school. Each curriculum is briefly described and has an annotated list of evaluations indicating which are credible, which are not, and why.

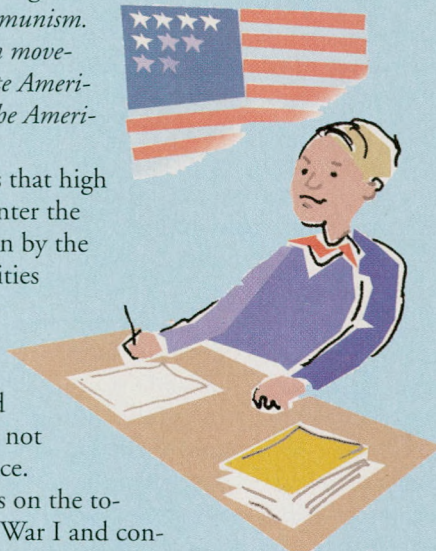
There is great hope that with so much new attention being paid to student achievement, more states, districts, schools, and teachers will demand high-quality evidence of programs' effectiveness—and that researchers and program developers will start providing that evidence. To read the WWC's reports and learn about upcoming projects, go to www.w-w-c.org.

Idea of America Essay Contest

Describe totalitarianism by comparing the goals, methods, and results of fascism and communism. How were the tenets of these totalitarian movements different from the ideals that unite Americans? How did the ideals embodied in the American founding prevail?

These are the challenging questions that high school juniors will tackle when they enter the 2005 Idea of America essay contest run by the National Endowment for the Humanities (NEH). As part of NEH's *We the People* initiative, this annual contest focuses on America's unique foundation: We are a people united by shared principles of democracy and freedom, not by a common ethnicity, religion, or race.

In 2005, students are asked to focus on the totalitarian states that arose after World War I and consider the costs of absolute state power not only to the people who lost their freedom, but to those who remained free as well. Successful essays will draw heavily from primary sources, present multiple perspectives, and explain the historical context of the issues addressed. Essays must be in English and no more than 7,500 characters (approximately 1,200 words). All entries must be received by April 15, 2005. The first place winner will receive \$5,000 and have his or her essay published in a national forum. Five runners-up will each receive \$1,000. Winners will be notified in September 2005. All six winners, accompanied by a parent or guardian, will attend an awards ceremony in Washington, D.C. in October 2005. Please visit NEH's Web site at www.wethepeople.gov/essay/guidelines.html for more information.



THERE'S NOT ENOUGH ART IN OUR SCHOOLS.

NO WONDER PEOPLE THINK
LOUIS ARMSTRONG
WAS THE FIRST MAN TO
WALK ON THE MOON.

It's a long way from the Apollo Theatre to the Apollo program. And while his playing may have been "as lofty as a moon flight," as Time magazine once suggested, that would be as close as Louis Daniel Armstrong would ever get to taking "one small step for man."



Armstrong left his footprints all over the jazz world. And he usually did it in lace-up oxfords.

But as the premier jazz musician of the 20th century, giant leaps were a matter of course for Satchmo. No person before or since has ever embodied — and revolutionized — jazz the way Louis Armstrong did.

Take solos, for instance. It's impossible to imagine jazz without them. But they actually didn't become an established part of the jazz vocabulary until Armstrong helped popularize them. Seventy years later, his solos are still revered for their audacity and virtuosity.

In the 1950s, when his popularity became too big to be contained within our borders, he accepted an invitation from the State Department to act as an American goodwill ambassador around the world. And when he



Instead of a giant leap, Louis Armstrong delivered one giant free-form crazy jazz groove for mankind.

became the last jazz musician to hit #1 on the Billboard pop chart, he beat the Beatles to do it.

Not bad for a kid whose first experience with a trumpet was as a guest in a New Orleans correction home for wayward boys. If only today's schools were as enlightened as that reformatory was.

LOUIS THE FIRST.

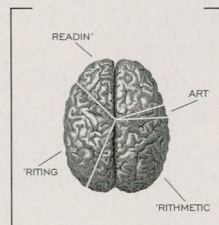
Ask almost any parent, and they'll say arts education is very important to their child's

well-being. Virtually every study shows that moms and dads like the effects the arts have on their children. They like that dance and music and painting and drama teach kids to be more tolerant and open. They like that they allow boys and girls to express themselves creatively. And they appreciate that the arts help promote individuality, bolster self-confidence while also improving overall academic performance.

Which makes it so surprising that the arts have been allowed to virtually disappear from our schools. And our children's lives.

THIS IS WHAT HORNS ARE FOR.

A little art is not enough. If you think the hour or so of art your kids are getting each week isn't nearly their fair share, it's time to make some noise. To find out just how to get involved or for more information on the ways your child can benefit from arts education, please visit us on the web at AmericansForTheArts.org. Just like the great Satchmo, all you need is a little brass.



There's plenty of brain to go around. Give more to art.

ART. ASK FOR MORE.

Reflections on the “Problem Novel”

*Do These Calamity-Filled Books
Serve Up Too Much, Too Often, Too Early?*

By Barbara Feinberg

The day started out all right. I woke early and, still in my nightgown, walked out to the porch and began to paint the walls. I had never planned on doing this. The porch didn't need to be painted, and because of all its windows and high ceiling—not to mention the bicycles and muddy shoes and old couches that needed to be shoved aside—to paint it was a huge undertaking, one I never would have wanted to do.

My children ambled in. Alex is 12, very tall, and has bright blue eyes. Clair is 7, round and dark, and her hair was tangled from sleep. They were quiet and sleepy. They lay down on an old couch.

After a while, Alex announced to Clair in a serious voice, “We have to do that thing,” and she, delighted to be needed by her older brother, nodded, and they trooped off into the house.

I climbed up on the arm of the couch and, having found a can called “Summer Blue,” began painting the trim of the large window that looks from the porch into the living room. When my children came back into the living room, they walked into the blue frame. They had changed out of their pajamas, and looked as if they were getting ready to go to work, which it turned out was sort of the case. My daughter was wearing a little vest over her T-shirt.

I couldn't hear them, but could see that they were clearly discussing an audiotape Alex was holding, a novel on tape he'd gotten from the library the day before. The book, I knew, was *Chasing Redbird* by Sharon Creech; this was the book he was supposed to read over the summer, in preparation for seventh grade. And he dreaded this. He had read an-

other book by Sharon Creech for the previous summer's assigned reading and hated that—said it was too “dark.” So this summer, he'd settled on the idea of listening to *Chasing Redbird* instead of reading it. This way, he'd reasoned, he could have the company of his sister, and this would make the experience more “bearable.”

I watched as they put the tape in the cassette slot. They were sitting side by side on the couch. I tapped on the glass, but they were engrossed now, waiting for it to begin. A woman's voice came on. I could not make out her words, but the volume was high, and the feeling and quality of her voice permeated the glass. It was a low voice, with no lift or variation.

“Ah, a sad story,” I thought happily. Alex and Clair had spent the summer roaming around, reading *Harry Potter*, playing, swimming, and lounging. Alex had read a gamut of scripts and biographies of comedians. This foray into a sad tale sounded intriguing now, on this dark morning; it seemed important, more akin to “serious literature.” But Alex and Clair looked tense, and the phrase “bracing themselves” came to mind.

What exactly was this book? Aside from the title, I knew nothing about it. In fact, all the books Alex was assigned in school were foreign to me. I recalled his last year's language arts teacher, on Back to School Night. I had been excited to meet her, because Alex adored her and her class.

But now I remembered that I had also felt a slight wariness with regard to the school's choice of books. I remembered her gesturing to the paperbacks the class would be reading. “Most of these books are recommended by the American Library Association, and many are Newbery Medal winners.” The books were propped around the room. They all had teens on the covers. I didn't recognize a single title. I had picked up one and read that it promised “profound struggle.” I put it back carefully.

The good warm feeling in the room had persisted. When

Barbara Feinberg founded and now teaches at Story Shop, a creative writing afterschool program for children. This article is adapted from Welcome to Lizard Motel: Children, Stories, and the Mystery of Making Things Up, A Memoir by Barbara Feinberg, 2004, by permission of Beacon Press.



the teacher cited an experience she'd had the previous year, during which a mother "came up to me and said, 'Gee, thanks a lot, my daughter was up all night crying because of the death of a whale in a book'" (it wasn't *Moby-Dick*), we all laughed a bit at the sarcasm, and from a certain happiness we felt at the idea of a child being so swept up in a story. But now I remembered something else that had been said: "You see," the teacher had gone on to explain, "A good book should make you cry."

These words came back to me now as I watched my children. They were sitting so stiffly, their spines arched. Their posture was the opposite of how they sat when they were absorbed.

I had seen Alex like this many times during the year, when I'd passed his room in the evening; he always left his door open. There he'd be, reading one or another book assigned from school, under the cone of his desk lamp. He never looked at ease while he read. I had tried adjusting his light and suggested he close his door. No, he always wanted the door open when he read, didn't like to be alone with these books. "Everyone dies in them," he told me wearily. He'd recited the litany: a story about a town besieged by radioactive poisoning; one in which a girl searches for her mother, only to find her mother has committed suicide; children being abused in foster care, never told why their mothers weren't coming back. The list went on.

It can't be that bad, I always thought; reading, after all, is good. His teacher was a fine captain; I trusted her sense of direction. (But the choice of books?) I had never offered too much sympathy. Once or twice I'd picked up a book and studied the cover, where a photograph of a teen stared back at me, challengingly, such that I always lowered my eyes. Once in a while I had put my hand on Alex's shoulder and, wondering what to say, found only these words: "Just do it."

What had I meant? I meant it in the same way someone might have once said, "Just drink your milk," or "Just take your cod liver oil," or, I realized suddenly, the way someone might believe that a child ought to endure a beating, because even though it hurt, it was a "good beating," would make him better, build character.

Was this kind of reading akin to a "good beating"?

Would the monotony of the voice on the tape break? I was listening for a shift in tone, a ravine of mystery, but no shift came. I realized no change would come. I had been listening for a certain music of sadness; instead, these were the brittle and fatty sounds of heavy depression. The voice was aggressive too, the way depression can make someone hostile.

"You know nothing about how bad life really is," it seemed to be droning. "You need this big dose of reality I am giving you. It's killing me, this talking, but I'm doing it for you."

It is easy to spot Alex's assigned reading books among his real books. His real books are worn, and cling to a driving force, namely Comedy. These books are stacked and bulging in his shelves, all the novels by Louis Sachar, Daniel Pinkwater, Barbara Park. And then thicker books—the biographies of Milton Berle, Sid Caesar, Larry Gelbart; all the

scripts from *Our Show of Shows*; the script of *A Funny Thing Happened on the Way to the Forum*; a book called *170 Years of Show Business*. But mostly his library serves to illuminate and honor Mel Brooks, his hero.

Among these worn texts, the school-issued books seem sleek and untouched in comparison. They are paperbacks moderate in length, and on their covers are drawings of slim, attractive teenagers. They look cool, defiant; they manage to look at me but not seem exposed. I never read any of these books in my own childhood (nothing in this pile was published before 1972). Who are these bold teenage protagonists? Do these books constitute a new kind of book, represent a new sensibility with regard to children? What is the nature of their grimness?

* * *

I decide to read *Walk Two Moons*, by Sharon Creech, a book I know Alex had to read last summer, before entering sixth grade. It has a girl on the cover, although we can see only her long flowing hair. She is turned toward an intriguing landscape of purple mountains and clear water, with a vibrant sunset beyond the mountains. Stamped in the middle of the cover, as if it were a moon floating in that clear water, is the golden seal of a Newbery Medal.

I sit in a slatted chair, out on my front lawn, alone for a few hours since my children are at the town pool and my husband won't be home until dinnertime. I begin to read. The book is about Salamanca, a girl whose mother has strangely and abruptly left home; Sal travels across the country with her grandparents looking for her mother. The plan is to show up where she thinks her mother has gone, on her mother's birthday, and coax her to return. The story is told by Sal, and takes place mostly in the car, in dialogue between Sal and her two interesting and unusual grandparents. She spends much time telling fascinating stories about things that have been happening to her since her mother has gone. I set about reading *Walk Two Moons* with the notion of keeping an analytic distance, but the story draws me in, and I begin to read slowly to savor the language. The writing is lyrical, the insights of the narrator sensitively revealed. I put the book down midway for a break with a feeling of pleasant surprise. I feel excited for my son: Here is an ambitious book, ambitious not only in terms of the writer's reach, but also in the way that it calls upon the young reader to stretch his way of hearing a story and seeing a world.

Walk Two Moons is engrossing, although increasingly upsetting things begin to pile up. We learn about the bloody miscarriage and hysterectomy Sal's mother endured before she deserted her family. Sal's grandmother has a stroke and must go to the hospital. The grandfather must remain to watch over her, so Sal drives on to find her mother by herself. She arrives in the town her mother has fled to, and yes, she has made it right on her mother's birthday. I am excited, the long journey has come to an end (the reader is told that Sal's grandmother has died in the meantime, but for the moment the girl does not know this), and I cannot wait for the mother and daughter to hold each other in their arms. Only it turns out the mother is not there, since she's been dead all

He always wanted the door open when he read, didn't like to be alone with these books. "Everyone dies in them," he told me wearily.



along. She was killed in a bus accident. We find this out in the last pages. There are some hasty resolutions afterwards, but these feel tacked on and don't do much to dispel the book's great bad wallop of an ending.

I am stunned by this death and all this sudden cramming in of dismal facts. I feel as if I've been had, the way you might feel if, all along, you thought someone was your friend, only to find he is a paid actor. The ending and, suddenly, the whole book feel immeasurably contrived, weighted with a huge message—something about growing up and having to leave one's mother behind. About having to rely on yourself. Something like that. What had begun as a real book, sad yes, but complex and original, has ended as a tearjerker.

I drop the book on the grass and close my eyes. Evening is coming on. The wind is near, and then very far, more like an

echo, and the dusk takes on a deeper dimension, beyond the small planet of my yard. Autumn is approaching. Soon Alex will disappear down the path on the side of the house each morning to school.

Every night before school, he will do his homework, diligently, pack his own things up, manage projects: He is masterful in his realm. When he leaves down the steps, his blue knapsack will look heavy and lumpy, but he's not dwarfed by it. His stride is purposeful. He looks like "a youth just starting out."

What does someone just starting out in the world need to take? If I were to stand in the street in my slippers and call after him now that he is 12, as he descends the steps, what would I call?

"Be brave."?

"Seek adventure!"?

("Come home at three."?)

What book in his knapsack might help him along his way? (Not the one I've read today; it seems too nerve-racking, freighted with anxiety. It would weigh him down.)

What Builds Courage? Lightens Despair?

A sudden cold snap extinguishes the bright roses along the fence. Summer is over just like that, and the yard looks littered and strange. My children return to school, and I stand in the doorway.

My job—I run a creative arts program for children, called Story Shop—doesn't begin until late October. Story Shop is an afterschool program I run for children, which, as I explain to parents, "helps children find forms for their original stories." Children write stories, and tell them, and enact them, and build scenes and characters out of paper and boxes and odds and ends. Stories are often presented to the group as a whole, so that kids get a chance to share what they've made, and also to draw inspiration from the work of others.

I began Story Shop when Alex was little, and I needed a part-time job that would allow me to work close to home. For the previous 10 years I had been teaching writing as an adjunct professor in colleges, and while I liked this, what I loved most was working with children, especially in the arts, and especially as it gave me a chance to be in the realm of childhood imagination. I had been a teacher of writing for children in many different venues: in a residential treatment center for emotionally disturbed children, in a fantastically wealthy private school, and as part of an arts program in a low-income neighborhood. When Story Shop reopens for fall, I will be buckled into an exacting routine, but for now, for this brief period, I am free.

At midmorning I drive to the library in the next town, as I have been doing lately. I like to go there, because, unlike in my own library, I rarely see anyone I know, and I like the anonymity. The children's librarian, who is stamping books at the front desk, is a sturdy woman, with a serene face and tidy, pale hair.

"Excuse me," I said pleasantly, "but when we were kids, didn't we used to read books that were less ... catastrophic?"

"Oh, these realistic sad books are very popular," she said

mildly. “Teachers love them. They win all the awards.” In fact, in the past 10 years, 40 percent of the Newbery Medal winners have been of this sort.

Later, after I made my way over to a table, having begun tentatively to pluck books with glaring teens on their covers, she walked over to me and handed me a hefty book. “This might help you,” she said.

It was a reference book called *Children’s Literature in the Elementary School*, into which she had stuck a yellow sticky note where, presumably, she thought I should read:

“Realistic fiction helps children enlarge their frames of reference while seeing the world from another perspective,” the highlighted passage read. “Stories ... help young people develop compassion for an understanding of human actions.... For many years, death was a taboo subject in children’s literature. Yet, as children face the honest realities of life in books, they are developing a kind of courage for facing problems in their own lives.”

Sound enough, as far as it went. I read further. But after a while, I began to wonder different things. First, what did they mean that death had been taboo? What did it take for a young reader to draw courage from a book? I knew it was possible, of course. Even though I was very unsettled by reading *The Hundred Dresses*, by Eleanor Estes, when I was 9—a story about schoolgirls’ insensitivity to a poor classmate, and the failure of any of them to stand up for the girl—I recognize that it helped me to begin to formulate some ideas about how I wanted to act, and not act. In particular, I think the book offered me the first outline of the idea that it was possible to resist the velocity of group pressure.

But more often in my reading experience, it seems, I had drawn inspiration not so much from a character’s actions, or the plot, as from some moment in the language of the story, when it was revealed to me that the author was seeing the world in the same way I did. At such times, I felt pulled out from some shadow I hadn’t known I’d been hiding in. I remember feeling startled, embarrassed, but strangely heartened, for example, when I came across Alfred Kazin’s book *A Walker in the City* when I was 12; it was as if Alfred Kazin were writing specifically about me, and the secret feeling I had that my neighborhood in the upper tip of Manhattan was odd, too far from the rest of the world. “When I was a child,” he wrote, “I thought we lived at the end of the world. It was the eternity of the subway ride into the city that first gave me this idea. Even the I.R.T. got tired by the time it came to us, and ran up into the open for a breath of air.” The subway had always been a being to me also, in need of that fresh gulp of air, but I never guessed that another person thought this way too.

My table at the library is by the window, a round table with a quiet luster, on which all the books I’ve been reading for two weeks make a precarious stack. These are the books whose titles I came across on school reading lists, some that were prize winners, some recommended to me by friends and kids I know. But some books I found just by generally poking around the shelves—the children’s shelves and the adjacent Young Adult section. I

Literary critics refer to some of the books I’ve assembled as “problem novels”—and *boy do problems abound*.

selected books that strove to be realistic, rather than books of fantasy, or humor, or historical fiction, because the realistic books seemed distinct from books I grew up with, whereas the other types were more familiar. I tried to choose books that promised “profound struggle.”

And I have come to regard my books in the words of a 10-year-old girl I know: “They give me a headache in my stomach.” Literary critics refer to some of the books I’ve assembled as “problem novels”—and *boy do problems abound*.

While making my way through them, I have encountered: kids whose parents are drunk and cruelly neglectful (*The Pigman*), a child’s uncle so demented by grief that he hallucinates his dead wife throughout the whole book (*Chasing Redbird*), atrocities of foster care and abandonment by one’s mother (*They Cage the Animals at Night*; *Monkey Island*), more abandonment (*Dacey’s Song*; *Belle Prater’s Boy*), alcoholism (*The Late, Great Me*), kidnapping (*Ransom*; *The Face on the Milk Carton*), child abuse (*Bruises*; *Don’t Hurt Laurie*), family violence (*Breathing Lessons*), sexual abuse (*Speak*), incest (*Abby, My Love*), teen suicide (*Tunnel Vision*), death of a friend (*Bridge to Terabithia*), running away and child prostitution (*A House for Jonnie O.*), and self-mutilation (*Cut*; *Crosses*)—to name but a very few. Some of the books are well written and affecting. Some—many—are downright depressing, so that even if the writing is vibrant, the story told is unpleasant, weighty. Others are so sensationalistic as to read like dopey soap operas, pure and simple. *The Face on the Milk Carton*—about a teenage girl who suddenly realizes one day at breakfast that the face she sees of a missing child on the milk carton is actually her own when she was a toddler, and that, in fact, the adults she lives with, whom she has believed are her mother and father, must really be people who kidnapped her from her real parents years before—well—fits the last category.

While plowing through these stacks, I read around in some other texts as well, in an effort to get a handle on the nature of these novels.

“Stated broadly, and ignoring variations that inevitably exist in so large a literature,” writes historian Anne Scott Macleod, “the path of American adolescent novels has been from outward to inward; from concern with the young

adult's relationship to the larger community to a nearly exclusive emphasis on the adolescent's inner feelings."

Problem novels and the like sprang into existence during and after the 1960s (I probably stopped dipping into children's literature just at the moment they began). The general speculation seems to be that *The Catcher in the Rye*, by J.D. Salinger, while not intended for teenagers, was perhaps a

prototype for the first problem novels, in that the story is told in the voice of a disaffected adolescent at odds with a disappointing adult world.

Sheila Egoff, a Canadian specialist in children's literature, writes that the realistic adolescent novel, "[takes] the approach that maturity can be attained only through a severe testing of soul and self, [featuring] some kind of shocking

A Tree Grows in Brooklyn: A Novel that Offers Pain, but Also Solace

One Saturday when I was 11 or 12, I asked my father to recommend a book for me, and he came back some time later, after having given it obvious careful thought. It turned out to be just the right book for me: a battered copy of *A Tree Grows in Brooklyn* by Betty Smith.

I picture myself on my bed, curled around the book, or sitting up, my mouth dry from nerves. I was in the world of Brooklyn, which was so remarkably like my own street in New York City, and Francie was 11 just like me, and she walked through her neighborhood and noticed the secret things I noticed. Up until these pages, I never imagined that anyone else thought about such things: the faces and hands of the shopkeepers, the personality of candy, the interesting way coins felt in your hand. Francie was alone like me, but in some way she wasn't lonely; nor was I, really: We shared a kind of pioneer quality, drinking in life beyond our own small apartments. She loved her father most of all, her father who was an alcoholic, although no such word was used in the book. We only knew how he acted when he drank, and when he was sleeping it off, and how kind and grand he was toward his daughter, and how drawn-in and bitter his wife was. Through these descriptions we came to know the presence of alcohol. I was guided along the landscape of this family life by the narrator, who was alert and wise, and never skipped over what we (Francie and I) felt. Through this widening, clear lens, I glimpsed my own life, and the presence of alcohol in my family too, even though in my house the bottles were kept hidden. And the

immensity of love, the tragedy intertwined with the love a daughter has toward a doomed father, and the love—but scary, unacknowledged dread, too—toward a mother.

Sometimes I would close the book and stare at the name of the author, Betty Smith. I did not like that her name was on the cover of the book, because its presence was a reminder that the book wasn't real, and had been made by one, mere person. I preferred to think only of the narrator, who was keen and generous, somehow, and all of the characters, whom I felt I knew. When I closed the book for the night, I trained myself to avert my eyes from the author's name.

How was this book, with all its reality and sadness, different from *Walk Two Moons* and the other problem novels I've read?

When Francie's father died, something in me collapsed. It set off dreams of my own father in a coffin; the dreams persisted for years. It must have given form to feelings that had been floating in me previously, but up until the moment of reading, the feelings had been underground, lurking. Suddenly the prospect of a father dying—my father—came clearly to mind. It became an obsessive worry. I remember lying curled on my bed, crying so hard I felt my face turn inside out. What if I were left, like Francie, with only a bitter mother? For the first time, I thought consciously about the "future" and the prospect of a life that would inevitably include loss. I bit the fleshy part of my arm for comfort. But whom could I turn to? I spoke to no one about this experience. If I had tried to explain why

I couldn't stop crying, what could anyone have said? How can anyone offer comfort about the death of a character in a book?

And yet there was something full about it all, brimming, exciting, alluring. The book was bigger than the tragedy; it was close and protective in that world, as well as tragic. Aunt Sissy, for example, who gave Francie shiny pennies as a gift; the kindness and ingenuity of this episode has stayed with me all these years. She and some other adults were portrayed as stable and clear-thinking—different than any of the adults in *Walk Two Moons*; there, the adults, while zany, interesting, even loving, were also portrayed as very unpredictable, and never satisfyingly protective.

The book portrayed a whole life, not just one driven by a "problem." The death occurred in the middle of the book, not at the end like the deaths in *Walk Two Moons*. Francie's father's death was followed by the chronicling of her ongoing experiences, as she picked up the pieces and found some peace, so that her life widened again.

The book created a dome around itself, and I felt enclosed within it. The truth was that I liked the privacy of the enclosed story. The book invited me in. Each word felt just for me, to me. In fact, I didn't feel the need or desire to talk about it. The book was a house; we lived in it together. Betty Smith was with me. We all knew how we felt. Maybe this is what made *A Tree Grows in Brooklyn* such an intimate, deepening experience.

—B.F.

'right of passage' such as the uprooting of a child's life by war, the death of a close friend...." She defines the problem novel as a subgenre of the realistic adolescent novel: It tends to be narrower in focus, less rich in narrative scope, and at times feels "as if the writers had begun with the problem rather than the plot or characters." The problem novel is most often about a "child defined by the terminology of pain." Egoff further delineates some of its characteristics:

- The protagonist is alienated and hostile toward adults.
- Some relief from unhappiness comes from a relationship with an adult outside the family.
- The story is often told in the first person, and is often confessional and self-centered.
- The narrative is told from the point of view of an ordinary child, often in the vernacular; vocabulary is limited; tone is often flat, and emotionally detached.
- Dialogue predominates.
- The settings are urban, usually in New York or California.
- Sexuality is openly and frequently discussed.
- Parents are absent, either physically or emotionally.

I have found these observations applicable to many of the books I've read, although in the more recently published books, death, rather than sex, seems the primary theme, and locations are not limited to the coastal cities. And while many are written primarily in dialogue, often in the vernacular, there appears to be a growing body of realistic, problem-driven books written in a densely elegiac language, borrowing, perhaps, from the mood of the adult memoir.

A desolate feeling in many of the novels prevails. In virtually all the books I've read, the character's mother is dead, missing, or nonfunctional.

The ethos of many of these books, if there is one, seems not to be "Love Makes the World Go Round," or "Only Connect," or "There's No Place Like Home," or even primarily "Be Brave." Instead, "Only Survive" or "At Least You Have Yourself (since you can't rely on anyone else)" is more to the point. Also: "What You See Is All There Is." Also: "Lower Your Expectations (the most you can expect from life is small kindnesses from strangers and the fact that you can get up in the morning and go on)."

The narrative voices in these novels, whether the story is told in first person or third, seem to share a particular quality. Lack of humor, the tackling of traumatic themes, and a relentless earnestness all come to mind, as well as their often confessional tone. But another aspect also links this group.

It's Not an Authentic Child's Voice

While the books are most often told in the voice of a child narrator, or narrator identified with a child, and, in some, the child's language might sound more or less believable, many of the books rarely deliver what I consider an authentic child's perspective. Something feels false. Something essential feels missing.

What is it? The answer is this: No child I have known (who is approximately 12 or under) experiences "reality" only in terms of what happens—"the facts." For all children, except in cases of extreme pathology, there is to a greater or

There's something else about these child narrator voices that feels so inauthentic: These little narrators see too much, they know too much. Real kids' minds filter the world's events.



lesser degree a corresponding magical, imaginative counterpart to experience. This dimension does not have to be fully conscious, but exists nevertheless. By "magic" I do not mean (only) manifest magic, as the child's belief or wish that he could turn invisible or fly. In fact, as children get older, such manifest magic is understood increasingly to be the exclusive province of dramatic play and art, distinct from reality. But latent magic continues to abound in the everyday. There is chatter among trees. The world vibrates with connections, and within these connections the world is more dangerous (than for adults), since shadows can be alive, and menacing, but the world is more providential also, since allies can be

found in rocks, in the hopeful sunlight, and the like. Within this universe, the child is the nexus, but while he might be hindered or aided by the natural world, he is never alone. The point is that in childhood, and well into early adolescence (and in all poetic worlds), the universe is animate, or at least potentially animate, with an unseen presence.

And it is precisely this dimension to childhood experience that is absent from many realistic novels and virtually all problem novels. No magic, manifest or latent, vibrates within them. Instead, in all of these self-proclaimed realistic stories, “reality” is understood as the opposite of imagination and fantasy, as if childhood were a dream from which children must be awakened—when, in fact, reality is not divisible from imagining, for children. But in these books children’s imagination is regarded as something that must be tamed, monitored, barred. The child protagonist, while presented with the darkest and most upsetting situations imaginable, is denied what in real childhood would exist in abundance: recourse to fantasy.

There’s something else about these child narrator voices that feels so inauthentic: These little narrators see too much, they know too much. Real kids’ minds filter the world’s events. And when a child narrates a realistic story with a genuine voice, that filter is in place, allowing children of different ages (and even adults) to grasp the novel at different levels in varying ways, helping the child reach for a fuller understanding of the world, but without a heavy hand.

Judy Blume and Beverly Cleary are brilliant at capturing an authentic child’s perspective. Christopher Paul Curtis is another author who writes convincingly from a child’s point of view. In particular, I am thinking here of *The Watsons Go to Birmingham—1963*, a book dealing with harrowing, realistic themes indeed. The 9-year-old narrator, Kenny, tells the story of his family traveling to Alabama to visit relatives, and the horrible church bombing that occurs during their visit. Kenny believes his little sister, who had chosen to attend the church that morning, was killed, and even when he finds out she wasn’t, his terror and depression continue; he can’t shake the feelings.

While some problem novels might have handled these themes in a heavy-handed way, this book manages to be graceful, sometimes quite lighthearted. This is true because Kenny’s narrative voice never feels like an adult talking through a child, and instead reads exactly, to my ear, the way a genuine 9-year-old (who has a great sense of humor) would be experiencing his life. The language is believable—word choice, rhythm, etc.—but even more significant is the way events are relayed through his voice: much is filtered out; not *everything* is noted by the child narrator. Curtis’s genius is that while he manages to convey to the keen reader the facts of poverty and racism in the child’s community, mostly through details Kenny notes almost in passing, he does not choose to have Kenny fully grasp and describe with full scope the meaning of these observations. Kenny doesn’t reflect on “big issues”—although because information is noted, we can expect that as he grows, he will become more reflective. But what is within the child narrator’s grasp now is what is immediately important to him: family relationships, the intricacies of friendships, playing, etc. In other

words, his life is described at his eye level.

Particularly compelling is the way Kenny describes his efforts to make sense of the traumatic events he witnessed. When solace comes, it is not because an adult in the book has delivered a meta-narrative about the meaning of racism, or stress, or why he should move on with his life and stop feeling bad. (Adults try in the book but their attempts don’t do the trick.) Instead, Kenny pursues his own imaginative and idiosyncratic ways of healing himself, just as a real child might, and is finally delivered by the loving attention of his brother.

The author’s faithfulness to the child’s perspective allows the child reader to take in as much as he is able about the story. He can identify with the narrator, who, as I’ve said, sees things through his particular filtering lens. Or, as the child reader is ready, he can ponder larger aspects of the story. The author doesn’t shout out “the problem” and/or “the meaning” but leaves room for the reader to connect with the story—the beautifully told story—on the level that is meaningful to him.

Children also do not play in problem novels. Or if they do, the play sequences are never woven seamlessly into life, the way, for example, Huck in *Huckleberry Finn* describes his playing life. (Huck, even though he has a whole array of family troubles, like children in problem novels, is the very antithesis of the problem novel character.) Huck’s narrative moves in and out of descriptions of play and fantasy episodes. When he pretends to plot crimes with Tom Sawyer and a gang of other boys, deep in damp caves in the middle of the night, pages are devoted to descriptions of the oath pledged among the boys, involving exchanges of blood and promises of murder if the secret of their gang is revealed by any. The story told through Huck’s eyes portrays play the way it really feels to children: deliciously real, but at the same time, *not exactly the same* as reality. Play and fantasy are facets of the prism through which life is experienced.

Many of the novels I’ve read seem not to regard play in this way. Any play sequences are described in a highly self-conscious, guarded way, and are put in the story to teach a lesson. The “secret world” in *Bridge to Terabithia* is a perfect example of how fantasy is regarded in these books. The very bridge in question causes the death of a child. (Fantasy is dangerous.) And Jess’s realization at the end of the book—indeed the book’s epiphany, as it were—is that to grow up he must give up imaginative wanderings in favor of “reality.”

But while the children in problem novels don’t have rich imaginations, they are given mood states: They are depressed, nervous, worried. And they often feel very guilty. One child I know remarked, “In those books the kids always hate themselves.” Many characters are portrayed as feeling that they are the cause of the terrible things that occur.

This feeling of being the center of the universe—the cause of everything—is authentic enough to childhood, but where this omnipotence reigns in child thinking, doesn’t a whole world of other fantasies—comforting, deep ones—exist along side it? Why deprive the child narrators of the rest of their experience?

From the (Overly?) Benign to the (Overly?) Malign

I open another book in my stack—*American Children's Literature and the Construction of Childhood* by Gail Schmunk Murray. It is a nice size book, small, not too thick, with a peaceful golden cover. It is part of a series called *Twayne's History of American Childhood*. It was published in 1998. I turn it over in my hands before I open it. It promises to contextualize, as the historians say, the advent of the problem novel. Why and when did the problem novel come into being?

In her introduction, Murray argues that “the meaning of childhood is socially constructed and ... its meaning has changed over time.”

Of course, society has never spoken with one voice, but in every era, except perhaps the present one, a dominant culture has prevailed. Books written for children reveal this dominant culture, reflect its behavioral standards.... On the whole, children's literature is a conservative medium. Clergy, teachers, parents, and writers have all used it to shape morals, control information, model proper behavior, delineate gender roles, and reinforce class, race, and ethnic separation. Historically, children's fiction has not encouraged creativity, exploration of behaviors, or self-expression.

“Children's books,” Murray observes, “often tell us much more about the image of the ideal child that society would like to produce than they do about real children.”

And what was the ideal child like when I was young, nearly 40 years ago? The ideal girl—at least the ideal that spoke loudest to me—was pure and good, charitable, almost selfless. I am thinking of *Pollyanna* and *Anne of Green Gables*, books written early in the 20th century, but which did not feel outdated when I was young. An ideal boy was more like Tom Sawyer or Huck Finn: fundamentally kind and just, but adventurous, even wayward. A risk-taker.

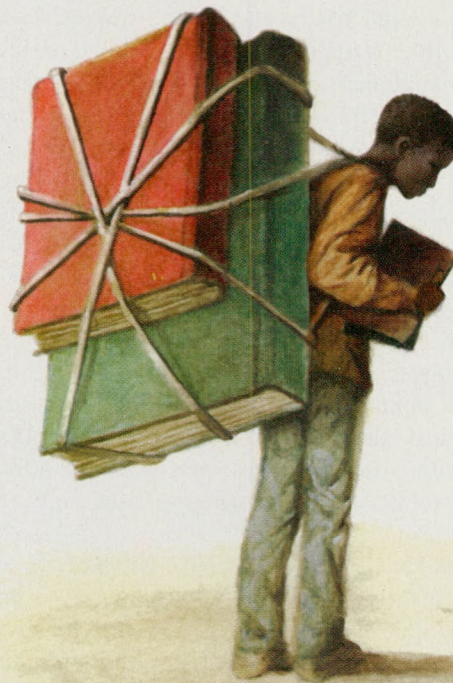
I flip to the chapter called “Idealized Realism, 1920-1950,” which, even though I was born in 1956, seems to sum up in its title something about the books I grew up on. “It is hard to find a more turbulent era in American history,” Murray writes, “than the three decades bracketed in this chapter.” But children's literature of this period, she notes, did not reflect any of the country's upheaval; instead, books offered an optimistic world-view.

I am reminded here of a succinct sentence written by Anne Macleod, summing up the same period: “On the whole, the outer world as pictured in children's fiction was benign, an extension of home kindness toward children.”

All this rings true. Weren't all our books then safe, with the presence of someone, some kind adult, however crusty or obscure, watching over us? Wasn't there someone who, when we felt most alone, turned out to have been there all along?

I don't remember feeling anxiety upon opening a book. *Somebody* was in charge of those books. And if it wasn't a character, an adult or a wise animal, maybe I'm just remembering my feeling about the narrative voice itself back then: omniscient, disembodied (never a first-person child narrator). Maybe because it spoke over and above, this narrative voice had a kind of sweeping grandeur for me, echoing my

Would I have liked this book years ago? Would it have been the same experience to read it at 12 as, say, at 15? Would it be the same to read it on one's own, in “secret and private,” as to have to read it as part of a school curriculum?



feelings about an overseeing God, or nature, or a protective, all-knowing adult.

And those narrators would never tell us stories that left us desolate. Even the youngest readers knew this. We knew from the outset who would never die: main characters, children, parents. Or if someone central was killed off, if tragedy struck, death would be cocooned in a kind of enviable angelic aura (e.g., Little Eva in *Uncle Tom's Cabin*). Or death was otherwise neatly subsumed into the story, and over before you knew it, making it seem remarkably manageable.

I remember reading a novel about the Holocaust when I was 12, called *The Silver Sword*, by Ian Serraillier, about

children whose parents are taken away by Nazis, and who then had to fend for themselves in the woods and abandoned basements. But even though the story was tense and felt profoundly real, and I knew about the Holocaust from my parents and grandparents, I loved that book. I don't recall feeling overwhelmed or bleak, the way, say, Alex seems to feel about some of the books he is asked to read. It didn't give me nightmares. In fact, didn't I used to play that I was somehow also an orphan, hiding from the Nazis, just like in the book? How had that story been handled such that it left me feeling exhilarated, rather than hopeless?

I remember that the children had verve. They formed a kind of ragtag gang of orphans; they had a certain jaunty cheer. They were inventive. And even though the world they moved through was terribly dangerous, the mere fact that they were children gave them a special status, an aura of protection.

Later I find the book on the library shelves, one old tattered copy, published in 1959. I come upon a section that I seem to have remembered all these years: the children, who have been hiding in a barn, and who are exhausted and scared, are discovered by a farmer who might or might not turn them over to the authorities. He orders the children to his farmhouse. But a certain fairy tale atmosphere prevails:

There were gay window-boxes on the sills of the farmhouse, gay with flowers. On the scrubbed table in the kitchen a breakfast of coffee and rolls had been laid.

"Emma," called the farmer. "Four visitors for breakfast—four tattered bundles of mischief from Poland."

A plump and comfortable-looking lady shook hands with each of them in turn, and, welcoming them to the table, went to fetch more breakfast.

The children are refreshed. The scene is radiant. It is as if the story dips itself periodically into a clear lake that washes away the grime of life, leaving the children's spirits renewed. While the tone here is like a fairy tale's, it also captures something realistic about childhood for me: Alex and Clair, and most children I know, seem to have access to this clear lake, this radiance and capacity for renewal.

I rest my head on my folded arms, and angle my face to the weak sunlight. I am remembering Dick and Jane readers, the very first schoolbooks. The drawings of chubby little Jane from so long ago, with her blonde curls and her gossamer pinafore, and Dick, in shorts, the very picture of a "lad."

The parents were called Mother and Father, which I found shocking—that children might refer to their parents so formally. And Mother and Father came out onto the green yard once in a while, on special occasions. They were young, laughing, trim. Mother had such a small waist, and wore a little belt around her dress.

But even when Mother and Father weren't in the pictures, their shadows seemed to fall across the lawn, as if they were standing just out of the frame, always present. If there wasn't this proximity, how else could Dick and Jane be so carefree? Which was how they seemed: wagons and balls scattered casually on the lawn (in my New York City life, I had never seen a real wagon); the dog yipping around without a leash.

The parents oversaw everything. The white picket fence encircled the children. The continual joy of the parents impressed me: It seemed incited by nothing in particular, except by the same joy the children felt about their ball, their dog, life in general. This was the feeling in all our books then, wasn't it?

I continue to lie on my arms. Against the darkening sky, I can see my own eyes looking back at me in the glass, watching myself, remembering the pictures, and myself as a girl reader.

What if Dick and Jane had looked up, beyond the page, and seen me—the huge face of a dark girl?

How did Jewish enter into this? What made me know—although I never then could have formed it into words—that Dick and Jane and Mother and Father weren't Jews? That they had never heard of Jews, that they might not like Jews? What mood would cross their faces if they realized who had been watching them all this time?

No Jew lived in that book.

I sit up. This is what I remember from those first books. The children in them were safe, and enclosed. It was sunny there. But sometimes I felt left out. I imagine many other children must have felt this way too.

"[A] new construction of childhood emerged during the 1960s," Gail Murray argues in her chapter "Child Liberation 1950-1990":

It recognized that children could not always be protected from the dangers and sorrows of real life; they might be better prepared to cope with pain if adults did not try to protect them from it.... The boundaries that had protected children and adolescents from adult responsibilities throughout the 19th century and the first half of the 20th century became much more permeable.... Such previously defined adult issues as sexuality and suffering entered the realm of childhood.

Or, as Anne Macleod sums up: "By the middle of the 1960s, political and social changes leaned hard on the crystal cage that had surrounded children's literature for decades. It cracked, and the world flowed in."

I view the stacks of books on my table. *The Pigman*, by Paul Zindel, written in 1968, is a book I find especially haunting, one that most seems to sum up this new "construction of childhood." It never fell into my hands when I was young, but a neighbor's daughter read it in sixth grade. She hated it, said it was "weird" and "depressing."

It is weird and depressing. But it's intriguing too. It stands out from the rest of the problem novels, maybe because—unlike in *Bridge to Terabithia*, say—no adult viewpoint comes in to wrap the story up, bring it down to earth, pay lip service to its "meaning." *The Pigman*, in a sense, is unchaperoned by any sobering adult sensibility, is told straight in the alternating voices of two teenagers, and ends disastrously. It does not serve as a moral tale; the reader does not sense any hidden agenda, or at least not a familiar one, on the part of the writer.

A friend tells me she read *The Pigman* when she was a teenager, years ago, when it first came out. She said the book meant a lot to her, that she cherished it, that it told her something about boys and girls together that she hadn't read anywhere before. This remark reminds me of a critic's obser-

vation: "Individual readers come to each story at a slightly different point in their life's journey. If nobody comes between them and the book, they may discover within it some insight they require, a rest they long for, a point of view that challenges their own, a friend they may cherish for life." My friend felt that the book was "secret and private."

Would I have liked this book years ago? Would it have been the same experience to read it at 12—as my neighbor's daughter did—as, say, at 15? Would it be the same to read it on one's own, in "secret and private," as to have to read it as part of a school curriculum?

To read about the anarchic world of *The Pigman*, at 12 (unthinkable at 8) would have been more than I could handle. Like a direct assault. It would have been like ripping down one structure, the only structure I had, before anything else was in its place. (*A Tree Grows in Brooklyn*, on the other hand, ripped down nothing; it constructed something.)

How about at 15?

By then a lot had changed.

What Does a Young Person Need?

Alex has left his room ablaze with light, and I go in to turn off the lamps. *They Cage the Animals at Night* lies on the bed. I flip through the pages, the soft tuft fanning me. The sadness of the book returns. How does such a searing story about abandonment—this child's mother drops him off one day at an orphanage, with no explanation, and never is really able to retrieve him—hit a 12-year-old reader? A friend of mine who is a psychiatrist in a city clinic told me that a 12-year-old patient of hers, with a "trainwreck life"—foster care, abuse, horrible things—loved reading excessively traumatic books. "The girl eats them up," my friend said, "can't get enough. Finishes one, picks up another." This makes sense to me; I can imagine how reading about others in trouble could feel like a lifeline.

But how do the books hit a 12-year-old or 10-year-old who still has a mother, whose life has all its parts more or less functioning, but who is just beginning the process of becoming more independent? What is the effect of hitting a kid with stories about abandonment and loss just at the moment that *he* is repositioning himself to separate?

The books evoke compassion, sure. They offer a glimpse into other lives, broaden understanding of the inequities of society. Obviously this is good. But unless there is the assumption that children always remain slightly detached readers—sociological perspective foremost—don't stories with such potent, universal themes as abandonment and loss reverberate as personal stories?

Some of them must have been written as a kind of offering: to the child, to all children, who may at some point be in trouble. The book is a protector; the book reaches out. The child needs help.

I sit down on Alex's bed.

The troubling books are all squished together in his bookshelf. They have taken up residence. Seen as a group, they have a pushy, aggressive edge.

Just who is their intended reader? What assumptions have been made about that intended (10- to 12-year-old) reader?

Self-centered, unfeeling? Needs to be hit on the head repeatedly about how people suffer? Can't this approach inspire the opposite reaction—invite such a detached person to become even more detached? Does a blitz of misery sensitize a person, or numb him? Rather than making issues of human suffering more available for reflection, might such a barrage invite a person to trivialize such issues? "A book must be an ice axe to break the sea frozen inside us," Kafka wrote. The child is frozen, the book's job is to hack away?

I pick up the book on Alex's bed again, and flip through it. This time a paper falls out of the tuft. It is a paragraph Alex must have typed, copied from *Newsweek*. It is from an article on foster care:

The autopsy photo shows a little boy who looks relieved to be dead. His eyes are closed. A hospital tube protrudes through his broken nose. He has deep cuts above his right ear and dark linear scars on his forehead. The bruises on his back are a succession of yellows, greens, and blues. On the bottom of his tiny feet are third-degree burns. He had been battered and tortured.

On the bottom of the page, in clear print, Alex's teacher has written: "Excellent Choice Alex! A!"

This? A child relieved to be dead? In the whole wide world of literature, why is it imperative for 12-year-olds to stare into the abyss of the abusive foster care system? Why? Why this of all things?

I stomp downstairs. Alex is eating a cookie in the kitchen. He looks cheerful. "I saw this article about foster care," I say casually, offering it. "It's an intense article. Why exactly did he have you read this?"

His face darkens. "It's for language arts. To go with *They Cage the Animals at Night*. We have to research the foster care system. Forget it. It's not important."

I don't know what to say. "But, it's so—Did you find it, I mean, what did you think of this article?"

"Please," he says. "Please. I don't want to talk about it!"

"But I just want to understand—"

"Leave me alone!"

I leave.

The days are grey. The branches are bare; there is mud, a battering of icy rain. My friend calls and invites me to go for a walk.

The woods are dreary. My friend is a cheerful sort, although she is a thoughtful, rather scholarly person who lives books, and in fact does volunteer reading once a week in an orphanage. We like to talk about books, and wonder together at the strange books assigned to our sons. Her son is 12, like Alex, and also in the seventh grade.

"They've finished *Ransom*, about the kids being kidnapped," she tells me. She's heard that in a nearby town the seventh-graders are reading *A Child Called It*, by David Pelzer, an adult memoir about a man's recollection of his childhood abuse. "I called a friend of mine who lives over there," she says, "and asked her how she feels about this. You know what she said? She said she looked at what the kids have been reading, and that she thought the books were good because they were like a 'modern day *Oliver Twist*.'"

I ponder what my friend has said. The hugeness of the difference between *Oliver Twist* and any of these books is too

What does a young person need from his family and culture when he is about to set out on his own?

much to articulate. The whole of the 19th century is in that book, the complexity, the subtlety, the vision of childhood. “For one thing,” I hear myself say, “Isn’t *Oliver Twist* a great book?” And then I add, “What do real orphans like to read? Orphans who are 11 and 12 years old? Would you read them *They Cage the Animals at Night*, for example?”

She turns to look at me as we walk. “Oh my god no. They would hate it. It’s too real. They would find it unbearable.”

“They wouldn’t take comfort in it? What do they like instead?”

“You’re not going to believe this,” she says, and stops again. “And, no, they wouldn’t take comfort in it. They like picture books. They like Dr. Seuss; they like *The Three Little Pigs*.”

You read 12-year-olds *The Three Little Pigs*?” I try to picture this. “How did you hit on that idea? Aren’t they seriously into being teenagers? Weren’t you worried the first time you pulled the book out that they would feel insulted? And hate it?”

“Yes,” she said. “The first time I was going to read, a girl who looked about 18 (she was really maybe 12), with long fingernails, kept tapping them on the table. It made me really nervous. But I had taken some of them to the library the week before, and what they gravitated toward was picture books, nursery rhymes in fact. These tough-looking kids were absolutely riveted by Mother Goose. It was really surprising. But I still worried the first time I decided to read that that girl would hate it. But as soon as I started reading *Corduroy*—you know, about the stuffed bear who gets lost in a store—she stopped tapping her nails. She absolutely loved it. They all want me to read all the books over and over. That’s what I do each week now.”

So who are those sad books for? I wonder as we resume walking. Apparently, at any rate, not for real orphans. But I continue to wonder. They did, after all, seem to fill a deep need for my psychiatrist friend’s patient.

The librarians are talking so loudly I feel indignant. I think about shouting, “Uh, do you mind? This is a library! I’m trying to get some sleep!” Luckily I realize the folly of this, and I stop myself.

I sit up. I am surprised to see that the librarian is walking softly along the periphery of the room, as if waiting for her shadow to lead the way. She is drawing the shades, pulling delicate cords.

I sink back down between the table and the window. I must have dozed again, because this time when I open my eyes she is standing over me, and so is the other one—the goodly one, whose velvet headband sweeps her hair back; in my mind I call her Alice.

“Hi,” I say weakly.

I sit up properly and make to slap dust off my legs, as if this lying position had been foisted on me, and is infinitely irritating. In one swoop I am a citizen, sitting upright. I say, loudly, “I have realized what is missing in those books.”

They wait expectantly.

“Open destiny.”

They continue to stand expectantly, and I struggle to remember what it is I am referring to, and then I do.

“It’s from a line in a Grace Paley story. She describes how she hates stories that move from point *a* to point *b*, toward an ending that’s fixed before starting out. You know, contrived. She says she hates that absolute line between two points”—and then I lower my voice, and recite—“... not for literary reasons,” she says, “but because it takes all hope away. Everyone, real or invented, deserves the open destiny of life.”

They are nodding.

“I’ve always preferred open destiny myself,” Alice says.

Before we can continue, the bank of lights overhead has been turned out, and then another bank. I realize there has been a third librarian all along, a frail Indian woman, in a sari. The room is blue now, and through the blinds, lightning crackles in the sky, although as far as I can tell, it is not yet raining. I sit quietly and wonder, as I often do: What does a young person need from his family and culture when he is about to set out on his own? □

This article is adapted from *Welcome to Lizard Motel: Children, Stories, and the Mystery of Making Things Up* by Barbara Feinberg. In this unique and interesting memoir, a mother and creative writing teacher reflects on the role of imagination in children’s lives. By special arrangement with Beacon Press, members of the American Federation of Teachers are eligible for a 20 percent discount. To order, visit www.beacon.com and enter the promotional code FEINBERG.



Snowflake Science

*A Rich Mix of Physics,
Mathematics, Chemistry, and Mystery*

By Kenneth Libbrecht

Growing up on a farm in North Dakota, I developed an early and intimate familiarity with snow. The cold north winds blowing down from the Canadian prairie brought us everything from quiet snow flurries to great howling blizzards. My winters were filled with snowballs, snow forts, and snowmen, with sliding, sledding, and skiing. Snow wasn't just part of the landscape where I lived; it was part of our heritage.

On snowy afternoons at school, our class sometimes trekked outdoors with magnifying glasses in hand to examine falling snowflakes. The crystals were especially well-formed on colder days, when the starlets would sparkle brightly and linger long enough for a careful inspection of their shape and symmetry. Then the activity became a frenzied treasure hunt as we vied to see who could find the largest or most spectacular specimen.

Although I've admired many a snowflake in my day, only recently have I begun to appreciate their more subtle features. In my youth, the phenomenon of snow was so familiar that I usually ignored how extraordinary it is, that nature somehow manages to craft these miniature ice masterpieces right out of thin air. Perhaps we just had too much of a good thing—it can be difficult to appreciate the inner beauty of snowflakes when the driveway is piled high with them and you have a shovel in your hand.

It was only later in life, after moving to southern California and enjoying a long hiatus from shoveling, that I began to look carefully at snowflakes. I had been examining the physics of how crystals grow and form patterns, and I suppose my heritage returned to guide my thoughts. Snowflakes are growing ice crystals, after all. Before long I was studying just how these frozen structures are created in the clouds, and even how to engineer synthetic snowflakes in my laboratory.

Investigating the physics of snowflakes is an unusual occupation, to say the least. When visitors stop by my lab,

Kenneth Libbrecht is professor of physics and chairman of the Physics Department of the California Institute of Technology. The purpose of his research on snow crystals is to better understand pattern formation in nonlinear nonequilibrium systems. This article is excerpted with permission from The Snowflake: Winter's Secret Beauty, by Kenneth Libbrecht, 2003, Voyageur Press. Photographs © Kenneth Libbrecht.

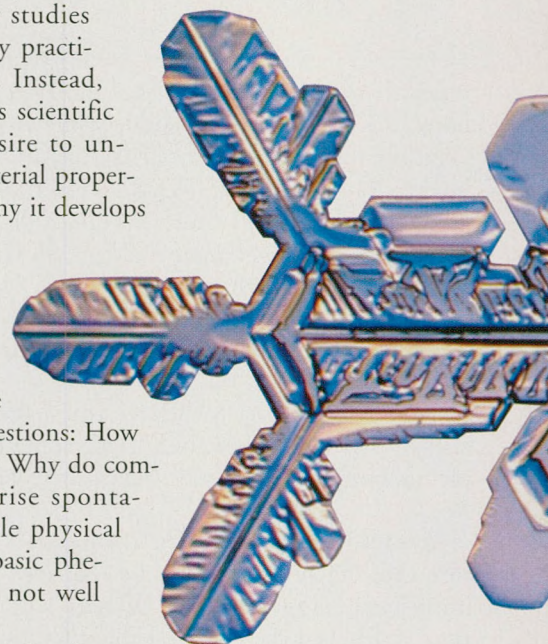
they're sometimes puzzled why anyone would spend time trying to understand snowflakes. Was I trying to work out schemes for weather modification? Could this research improve the quality of artificial snow for skiing?

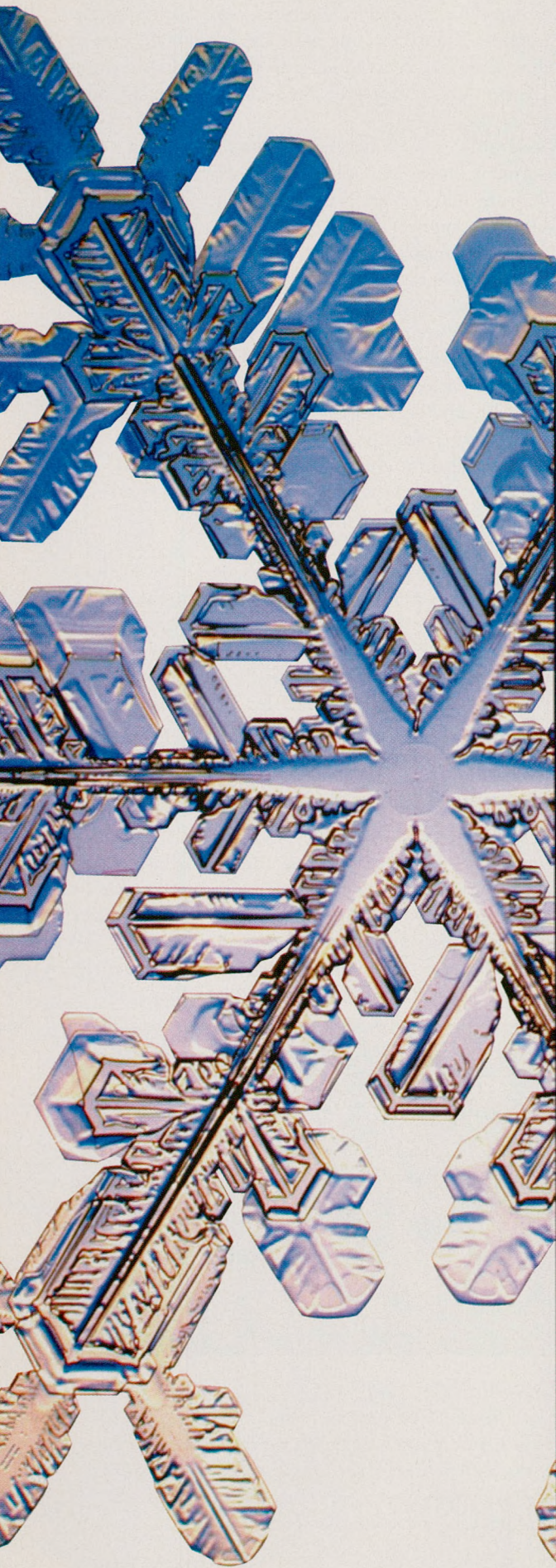
No, my flaky studies are not driven by practical applications. Instead, my motivation is scientific curiosity—a desire to understand the material properties of ice and why it develops such elaborate patterns as it grows. The formation of snowflakes touches on some fundamental questions: How do crystals grow? Why do complex patterns arise spontaneously in simple physical systems? These basic phenomena are still not well understood.

Many materials form complex structures as they grow, and in the case of snowflakes, we see the results falling from the sky by the billions. I sought to understand how this works.

When most people think of snowflakes, they think of elaborate, multi-branched snow stars. These are the ever-popular icons of ski sweaters and winter-holiday decorations. Nature produces a great many variations of this type of snow crystal, each exhibiting its own style of branching and sidebranching. Some stellar crystals contain scores of sidebranches, giving them a leafy, almost fern-like appearance. Others contain fewer sidebranches, perhaps decorated with thin, patterned ice plates.

Not just any snow-crystal shape or pattern can be seen falling from the sky, however. Whatever their appearance, stellar snow crystals usually grow six primary branches, each supporting additional sidebranches. Sometimes





the side-branching appears to be symmetrical, but often it does not. One thing you will not find in nature is an eight-sided snow crystal. The same is true of four-, five-, and seven-sided snow crystals. The symmetry of the ice crystal does not allow such forms. Eight-sided snowflakes may be easier to cut out of paper, but real snow crystals never have eight-fold symmetry, regardless of what you see in holiday decorations. (You'll find out why shortly.) Just as the colors of the stars reveal their composition, the shapes of snow crystals tell a tale of how they were created.

The Making of a Snowflake

Snowflakes are made of ice, yet ice alone does not a snowflake make. You could produce a million ice cubes in your freezer and not one would look even remotely like a beautiful stellar snow crystal. You cannot simply freeze water to make a snowflake; you have to freeze water in just the right way.

The mystery of snowflakes is how they are fashioned into such complex and symmetrical shapes. Snowflakes are not made by machines, nor are they alive. There is no blueprint or genetic code that guides their construction. Snowflakes are simple bits of frozen water, flecks of ice that tumble down from the clouds. So how do they develop into such intricate six-branched structures? Where is the creative genius that designs the never-ending variety of snow-crystal patterns?

Many people think snowflakes are made from frozen raindrops, but this is simply not true. Raindrops do sometimes freeze in midair as they fall, and this type of precipitation is called *sleet*. Sleet particles look like what they are—little drops of frozen water without any of the ornate patterning or symmetry seen in snowflakes.

You do not make a snowflake by freezing liquid water at all. A snowflake forms when water *vapor* in the air condenses directly into solid ice. As more vapor condenses onto a nascent snow crystal, the crystal grows and develops, and this is when its elaborate patterning emerges. To explain the mystery of snowflakes, we must look at how they grow.

In a snowflake, just an ordinary snowflake, we can find a fascinating story of the spontaneous creation of pattern and form. From nothing more than the simple act of water vapor condensing into ice, these amazing crystal structures appear—complex, symmetric, and in endlessly varying designs. Snow crystals are the product of a rich synthesis of physics, mathematics, and chemistry. They're even fun to catch on your tongue.

The scientific definition of a crystal is any material in which the atoms or molecules are lined up in a regular array. Ice is a crystal made of water molecules, and the normal form of ice is called *ice Ih*, made of sheets of water molecules arranged into “puckered” hexagons. Hexagons, of course, have a six-fold symmetry, and this symmetry ultimately carries over into snow crystals.

Besides ice, all sorts of crystals can be found in our everyday lives. Copper is crystalline, as are rubies and diamonds. Computer chips are made from silicon crystals. Most rocks are made from jumbled bits of crystalline minerals like quartz. Salt, sugar, and aluminum foil are a few crystalline materials you can pick up at your grocery store.

All crystals demonstrate an amazing organizational ability—they assemble themselves. A crystal's order and symmetry arise spontaneously, starting with a random collection of molecules. This organizational feat should not be overlooked. If you want a brick wall somewhere, it certainly does not assemble itself.

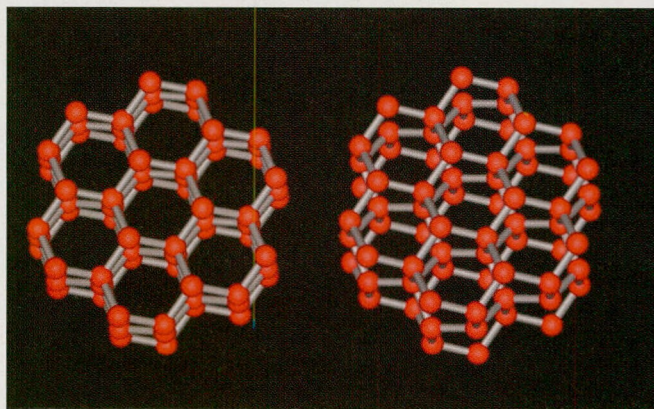
Self-assembly is how things are made in the natural world—crystals, snowflakes, plants, animals. Even you and I are made from self-assembled parts, guided by biochemical rules. Yet self-assembly is hard to fathom because it usually involves either nanoscale objects, like the molecules in a crystal, or tremendously complex objects, like living things.

To assemble ice crystals, water molecules form chemical bonds between themselves, and these bonds make the molecules line up and stick together. The bonds have certain preferred orientations, and this dictates how the water molecules stack up. Thermal agitation (the constant motion of atoms and molecules that becomes faster as the temperature rises) jostles them into position, and soon you're left with an ordered arrangement of water molecules—an ice crystal.

Snow Crystal Symmetry

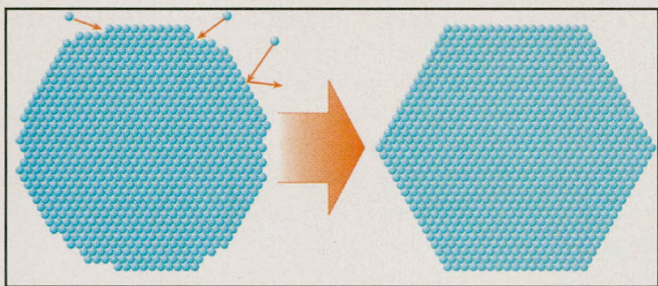
Snow crystals, like all naturally faceted crystals, always show characteristic symmetry in the angles between the facets. This symmetry comes from the chemical forces that determine the angles of the molecular bonds inside the crystals. The natural facets we see in crystals, however, including snowflakes, are far larger than the molecules inside the crystal. So the question arises: How can molecular forces, operating only at the nanoscale, determine the shapes of large crystals? How does one end of a crystal facet manage to grow the same as the other end? Does one end know what the other end is doing?

The molecules on opposite corners of a growing faceted crystal do not communicate with one another to determine the crystal shape. Nor do they have to. The reason facets form is simply because some surfaces acquire material and advance more slowly than others. As a crystal grows, the slow-moving facet surfaces eventually define its shape.



HEXAGONAL STRUCTURE

These two different views show the crystal structure of the normal form of ice, known as ice Ih. The red balls represent oxygen atoms in the H₂O molecules; each gray bar is a hydrogen atom. The hexagonal lattice structure of the ice crystal is what ultimately gives snow crystals their six-fold symmetry.

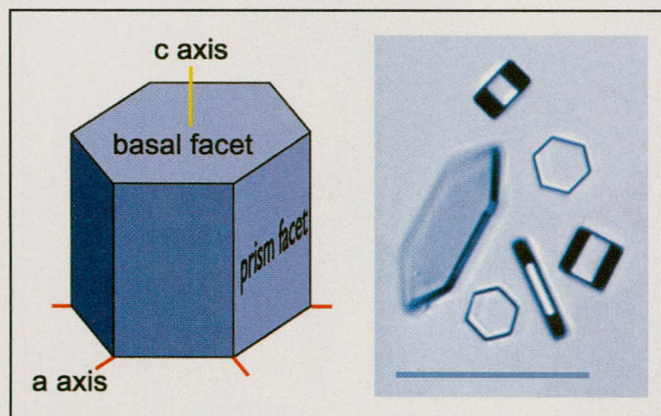


WHERE DO FACETS COME FROM?

Facets form as molecules are added to a crystal. If we start with a small, round crystal, molecules quickly attach themselves to the molecular steps on the surface, because that's where they will be most tightly bound. The smooth, flat, facet surfaces only accumulate molecules slowly, because molecules don't stick so readily there. After the fast-growing regions fill in, all that remains are the slow-growing facet surfaces, which then define the shape of the crystal.

How fast a given surface collects material and advances depends on the molecular structure of the crystal. If you could cut a crystal at a random angle and look at the individual molecules on the cut surface, you would find lots of dangling chemical bonds. Those surface molecules miss their former neighbors and are anxious to find new ones. Therefore, molecules that hit the surface are rapidly incorporated into it. Put another way, a randomly cut crystal surface is rough on the molecular scale, and rough surfaces accrue material quickly.

If you carefully cut your crystal along a facet plane, however, the surface would be relatively smooth on the molecular scale. The crystal structure is such that the facet surfaces have fewer dangling chemical bonds. In a sense, the molecules are arranged in straight rows, and if you cut along a row, the cut will be cleaner. With fewer dangling bonds, free molecules are incorporated into the crystal at a slower pace.



HEXAGONAL PRISMS

The most basic snow-crystal shape is the hexagonal prism, left, which includes two basal facets and six prism facets. The small, laboratory-grown snow crystals, right, are all shaped like hexagonal prisms. Depending on which facets grow faster, a hexagonal prism can become a thin plate or long column. The crystals shown are tiny, smaller than the width of a human hair.

If you start out with a small lump of a growing crystalline material, the molecular rough spots on the surface will incorporate new molecules quickly, so these surfaces will advance outward quickly. Meanwhile, the adjacent smooth surfaces will not advance so rapidly, and these slowly moving surfaces will broaden to form facets. Before long, only the slow-moving faceted surfaces are left, defining the shape of the growing crystal. The molecular forces act locally and on a small scale, but long-range order and structure result. This is how the geometry of a molecule governs the geometry of a large crystal.

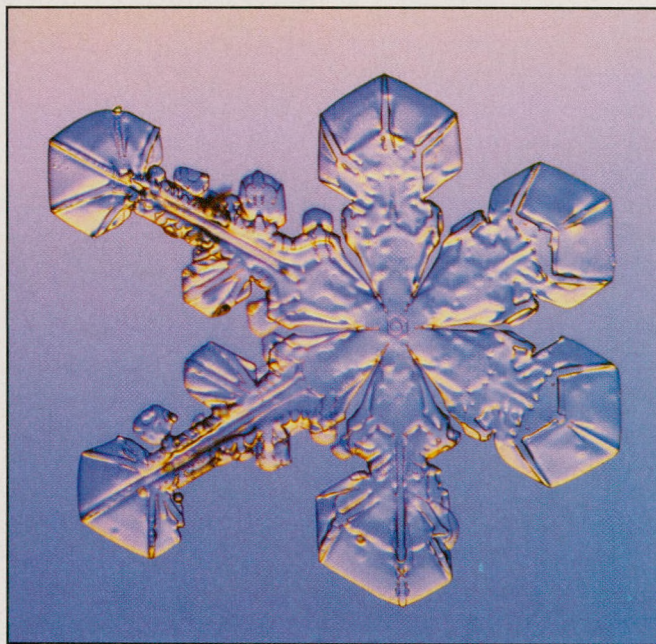
The symmetry you see in a snowflake descends directly from the most fundamental mathematical symmetries of nature. The snowflake's hexagonal patterning derives from the structure of the ice-crystal lattice. The lattice structure in turn derives from the geometry of water molecules and how they connect. This is determined by the quantum mechanics of how atoms interact to form chemical bonds. The chain of reasoning quickly brings us to the most elementary laws of physics.

Symmetry and Complexity

The real puzzle of snowflakes is not their symmetry alone. The real puzzle is their combination of symmetry and complexity—the fact that snow crystals grow into such complex shapes that are *also* symmetrical. Just look at an elaborate snow star and it begs the questions: How do the six arms each develop the same ornate shape? How do the branches coordinate the intricacies of their growth?

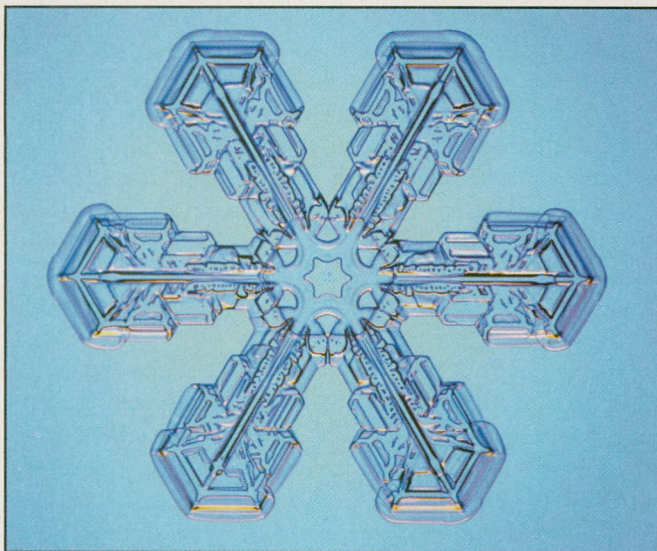
The key to unlocking this mystery was the observation that snow-crystal growth is exceedingly sensitive to temperature and humidity.

Consider the life story of an individual snowflake—a large symmetrical snow star that you might catch on your



ASYMMETRICAL SNOWFLAKES

Most snow crystals are not beautifully symmetric, but are more irregular in shape. Some, like this one, are downright odd.



COMPLEX SYMMETRY

Many snow crystals show remarkably complex symmetry, which comes from nothing but the simple interactions among water molecules. This sliver of ice contains a great many small markings—and most are faithfully reproduced on each of the six arms. In addition to its six-fold symmetry, each arm of the crystal is also symmetric about its central axis.

mitten during a quiet snowfall. In the beginning, your crystal was born as a tiny nucleus of ice, and by its good fortune, this nascent snowflake quickly grew into a well-formed single crystal of ice, a minute hexagonal prism.

While in its youth, fortune again smiled by placing the crystal in a region of the cloud where the humidity was just right and the temperature was a perfect -15°C (5°F). There, the tiny crystal grew into a thin, flat hexagonal plate. In this early phase in its growth, the crystal shape was being determined mainly by faceting.

As it reached snow crystal adolescence, the crystal blew suddenly into a region of the cloud with high humidity. The increased water supply made the crystal grow faster, which in turn caused the corners of the plate to sprout small arms. Because the humidity increased suddenly, each of the six corners sprouted an arm at the same time. The arms sprouted independently of one another, yet their growth was coordinated because of the motion of the crystal through the cloud.

The crystal subsequently blew to and fro in the cloud while it grew, following the will of the wind. As it traveled, the crystal was exposed to different conditions. Since a snow crystal's growth depends strongly on its local environment, each change of the wind caused a change in the way the crystal grew. Again, each change was felt by all six arms at the same time, so the arms grew synchronously while the crystal danced through the clouds.

As the crystal grew larger and ever more ornate, it eventually became so heavy that it floated gently downward, out of the clouds, to land on your mitten. The exact shape of each of the six arms reflects the history of the crystal's growth. The arms are nearly identical because they share the same history.

The precise morphology of each falling crystal is determined by its random and erratic motions through the atmosphere. A complex path yields a complex snowflake. And since no two crystals follow exactly the same path to the ground, no two crystals will be identical in appearance.

So where is the creative genius capable of designing snow crystals in an endless variety of beautiful patterns? It lives in the ever-changing wind.

Faceting explains how the structure of the ice lattice is imparted onto a snow crystal's growth and form, so faceting explains a snow crystal's six-fold symmetry. But if the slow-growing facets were the whole story, then all snowflakes would look like simple hexagonal prisms. We need something more to explain why snow crystals fall to earth in such complex, lacy structures. There are endless variations of snow-crystal shapes, but each and every one is produced by the same simple process—water vapor condensing into ice. How does the simple act of freezing produce such elaborate structures?

Growth is the key ingredient for the generation of snow-crystal patterns. Left in isolation for a long time, an ice crystal will eventually turn into a plain hexagonal prism. Ornate patterns appear only when a snow crystal is out of equilibrium, while it is growing.

A snow crystal grows by grabbing water molecules out of the air and incorporating them into itself. Water vapor molecules are assimilated into the existing ice lattice, which then increases in size. As long as the humidity is sufficiently high, the crystal will grow; there will be a flow of water from air to ice.

As a crystal grows, however, it consumes the excess water vapor around it, depleting the nearby air and reducing its humidity. To keep growing, water molecules from farther



HOLLOW COLUMNS

Columnar snow crystals may be less beautiful than their stellar cousins but are more common. This form can be found in abundance during warmer snowfalls. Many columns, like this one, include two conical-shaped hollow regions inside the crystal.

away must diffuse through the air into the depleted region near the crystal. This process takes time, so diffusion impedes the crystal's growth. Under such circumstances we say the growth is *diffusion limited*. The crystal development is governed by how quickly molecules can make their way to the crystal. Diffusion-limited growth often leads to branching.

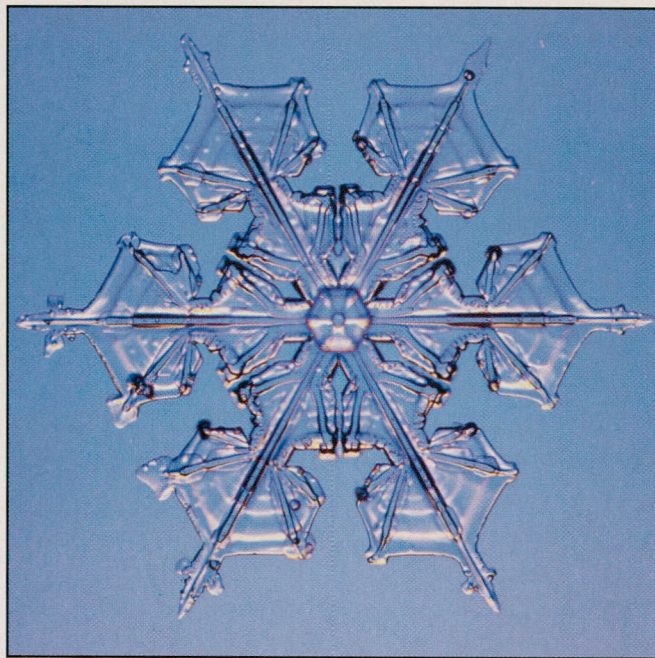
Consider a simple hexagonal plate crystal as it floats through a cloud. Because the hexagon's six points stick out a tiny bit, water molecules are a bit more likely to diffuse to the points than to anywhere else on the crystal. The points then tend to grow a bit faster, and before long they stick out farther than they did before. Thus the points grow faster still. The growth becomes an unstable cycle: The points stick out a bit, they grow faster, they stick out more, they grow faster still.

This kind of positive feedback produces what is called a *branching instability*—even the tiniest protruding points will grow faster than their surroundings and thus protrude even more. Small corners grow into branches; random bumps on the branches grow into sidebranches. Complexity is born.

Instabilities like this are the heart of pattern formation, and nature is one unstable system heaped on top of another. The sun heats the air near the ground and the warm air rises—a convective instability that drives the wind, clouds, and all of our weather. The resulting wind blows on the surface of the ocean, making the ocean surface unstable, and waves are generated. The waves travel across the ocean, and when they run into a shallow beach, the waves become unstable and break. Instabilities are responsible for many of the patterns you see in nature, including snowflakes.

If you look at enough snowflakes, you can see that their growth is governed by a delicate balance between faceting and branching. In most cases, neither faceting nor branching is completely dominant. It's the combination of both that gives a snow crystal its character. In a large stellar crystal, for example, the slow-growing basal facets give the crystal its overall flatness. The branching instability produces the crystal's complex fern-like structure, but the 60-degree angles between the branches are set by faceting. Both faceting and branching play important roles in these crystals.

You can get a feeling for how the balancing act between



COMPLEX PATTERNS

Snow crystals form complex structures through a combination of faceting and branching. Faceting produces thin plates and flat edges while branching promotes the growth of more elaborate patterns.

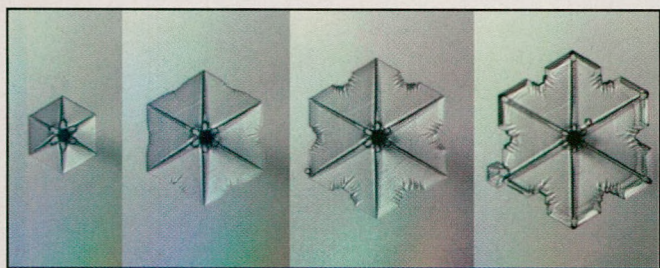
branching and faceting works by again considering the growth of a simple hexagonal prism crystal. When the crystal is small, diffusion is not an important factor. Water molecules readily diffuse the short distance from one end of a tiny crystal to the other, so the supply of water is essentially the same over the entire surface. In this case, the growth is not diffusion-limited at all, so faceting determines the crystal shape. Extremely small crystals often look like simple hexagonal prisms for this reason.

As the prism becomes larger, diffusion starts to limit the growth, so the corners start to grow a bit faster than the centers of the crystal faces. But as soon as that happens, the facets will no longer remain exactly flat. When the face centers start to lag behind, their surfaces become lightly curved, exposing some extra molecular bonds. Since surfaces with exposed bonds accrue material more quickly than flat faceted surfaces, the faces are able to keep up with the corners, even though their water supply is lower.

For a while, the forces of branching and faceting are held in balance, and the ice surface maintains just the right curvature. If it gets a bit too flat, then branching begins to kick in, causing the corners to grow faster, increasing the curvature. If the curvature is too great, the faces grow faster and catch up. A dynamic equilibrium is maintained automatically, and for a while, the crystal keeps its simple faceted appearance. The facets are not precisely flat on the molecular scale, but they look flat because the curvature is so slight.

As the crystal grows still larger, however, the branching instability becomes an even greater force. The faces become even more curved and thus rougher on the molecular scale.

(Continued on page 48)



THE BIRTH OF BRANCHES

This series of photographs shows the growth of a simple plate-like snow crystal, demonstrating the transition from faceting to branching. Faceting dominates when the plate is small, yielding a hexagonal plate. When it grows larger, the corners of the hexagon stick out so far that branches form.

Preschool Pays

High-Quality Early Education Would Save Billions

By Robert G. Lynch

The youngest children suffer the highest poverty rates of any age group in the United States. Nearly one in five children under age 6 lives in poverty, and the number is rising.

Poor children often have inadequate food, safety, shelter, and healthcare. In school, poor children too often fall far short of achieving their academic potential, making them more likely to enter adulthood lacking the skills to compete in the global labor market. As adults, they are more likely to suffer from poor health and participate in crime and other antisocial behavior; they are also less likely to be gainfully employed and contributing to economic growth and community well-being.

There is a strong consensus among the experts who have studied high-quality early childhood development (ECD) programs that these programs have substantial payoffs. Although the programs vary in whom they serve and in the services they provide, most high-quality ECD programs have the following characteristics in common: well-educated and trained staff; a low child-to-teacher ratio and small classes; a rich curriculum that emphasizes language, pre-literacy, and pre-numeracy activities, as well as motor, emotional, and social development; health and nutritional services; and lots of structured and unstructured play. Good programs also typically include parental involvement and education.

What benefits have such programs produced? We can answer this question thanks largely to carefully conducted, long-term studies that have compared the school and life outcomes of participants in four high-quality ECD programs—the Perry Preschool Project, the Prenatal Early Infancy Project, the Abecedarian Early Childhood Intervention

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tion, and the Chicago Child-Parent Center Program—with a control group of children who attended no such program.¹ (Two of these, the Perry Preschool Project and the Chicago Child-Parent Center Program, are described in more detail in the sidebar on pages 31-33.)

These studies have established that participating children are more successful in school and in life than children who were not enrolled in high-quality programs. In particular, children who have participated in high-quality ECD programs tend to have higher scores on math and reading achievement tests, have greater language abilities, are better prepared to enter elementary school, are more likely to pursue secondary education, have less grade retention, have less need for special education and other remedial coursework, have lower dropout rates, have higher high school graduation rates, higher levels of schooling attainment, improved nutrition, better access to healthcare services, higher rates of immunization, better health, and experience less child abuse and neglect. These children are also less likely to be teenage parents and more likely to have higher employment rates as adults, lower welfare dependency, lower rates of drug use, show less-frequent and less-severe delinquent behavior, engage in fewer criminal acts both as juveniles and as adults, have fewer interactions with the criminal justice system, and lower incarceration rates. The benefits of ECD programs to participating children enable them to enter school “ready to learn,” helping them achieve better outcomes in school and throughout their lives (Barnett, 1993; Karoly et al., 1998; Masse and Barnett, 2002; Schweinhart, 1993).

Parents and families of children who participate in high-quality ECD programs also benefit. For example, mothers have fewer additional births, have better nutrition and smoke less during pregnancy, are less likely to abuse or neglect their children, complete more years of schooling, have higher high-school graduation rates, are more likely to be employed, have higher earnings, engage in fewer criminal acts, have lower drug and alcohol abuse, and are less likely to use welfare (Karoly et al., 1998).

Because of these positive results, there is now a consensus among experts of all political persuasions that investments in high-quality ECD programs have huge potential long-term payoffs. Investments in high-quality ECD programs consistently generate benefit-cost ratios exceeding 3-to-1—or more than a \$3 return for every \$1 invested. While participants and their families get part of the total benefits, the benefits to the rest of the public and government are even larger and, on their own, tend to far outweigh the costs of these programs. Several prominent economists and business leaders (many of whom are skeptical about government programs generally) have recently issued well-documented reviews of the literature that find very high economic payoffs from ECD programs. For example, Nobel Prize winning economist James Heckman of the University of Chicago has concluded:

Recent studies of early childhood investments have shown remarkable success and indicate that the early years are important for early learning and can be enriched through external channels. Early childhood investments of high quality have lasting effects.... In the long run, significant improvements in the skill

levels of American workers, especially workers not attending college, are unlikely without substantial improvements in the arrangements that foster early learning. We cannot afford to postpone investing in children until they become adults, nor can we wait until they reach school age—a time when it may be too late to intervene. Learning is a dynamic process and is most effective when it begins at a young age and continues through adulthood. The role of the family is crucial to the formation of learning skills, and government interventions at an early age that mend the harm done by dysfunctional families have proven to be highly effective.²

The director of research and a regional economic analyst at the Federal Reserve Bank of Minneapolis, Arthur Rolnick and Rob Grunewald, have come to similar conclusions:

... recent studies suggest that one critical form of education, early childhood development, or ECD, is grossly under-funded. However, if properly funded and managed, investment in ECD yields an extraordinary return, far exceeding the return on most investments, private or public.... In the future, any proposed economic development list should have early childhood development at the top.³

This Federal Reserve Bank of Minneapolis study (Rolnick and Grunewald, 2003) further determined that annual real rates of return on public investments in the Perry Preschool project were 12 percent for the non-participating public and government and 4 percent for participants, so that total returns exceeded 16 percent. Thus, again it is advantageous even for non-participating taxpayers to pay for these programs. To comprehend how extraordinarily high these rates of return on ECD investments are, consider that the highly touted real rate of return on the stock market that prevailed between 1871 and 1998 was just 6.3 percent.⁴

Likewise, after reviewing the evidence, The Committee for Economic Development (CED), a nonpartisan research and policy organization of some 250 business leaders and educators, concluded that:

Society pays in many ways for failing to take full advantage of the learning potential of all of its children, from lost economic productivity and tax revenues to higher crime rates to diminished participation in the civic and cultural life of the nation.... Over a decade ago, CED urged the nation to view education as an investment, not an expense, and to develop a comprehensive and coordinated strategy of human investment. Such a strategy should redefine education as a process that begins at birth and encompasses all aspects of children's early development, including their physical, social, emotional, and cognitive growth. In the intervening years, the evidence has grown even stronger that investments in early education can have long-term benefits for both children and society.⁵

What if we provided high-quality early childhood development to all poor children?

How much would it really cost the government to provide such an experience to all poor children? And how much would it actually save the government in terms of crimes not committed, welfare payments no longer needed, reduced remedial education costs, more taxes collected, and so forth?

In a new study published by the Economic Policy Institute and summarized here, I calculate how much taxpayers would save, how much the economy would grow, and how much crime would be reduced over the next 45 years if



high-quality programs were provided for all poor children. To create these estimates, I've extrapolated from research on the Perry Preschool Project.⁶ Perry was *not* chosen because it is an ideal program (or even better than the three other programs named above). It is simply the only program with data suitable for these extrapolations. (For a fuller explanation of the merits of such extrapolations, see the sidebar on page 34.) These estimates assume the launch of an ECD program for all of the nation's three- and four-year-olds who live in poverty in 2005, with full phase-in by 2006. (For practical purposes, such as finding appropriate staff and locations, a large-scale ECD program would have to be phased-in over a longer period.) The costs set forth in these estimates may understate the start-up costs of such an ambitious program, especially the costs of recruiting and training teachers and staff and of establishing appropriate sites. On the other hand, the total benefits of ECD investment are also understated in these estimates (see the sidebar on page 31 for a discussion of some of the benefits of the Perry Preschool Project that are unaccounted for). Thus, although the benefit-cost ratio of a national ECD program could be somewhat higher or lower than that which is found in the pilot programs, it is implausible that the ratio would be less than the 1-to-1 ratio necessary to justify launching the program.

In the next two sections we'll look at the results of these extrapolations and specifically the effects of ECD investments on 1) government budgets, and 2) on the economy and crime.

What is the effect on government budgets?

We can expect, based on long-term research on children who participated in high-quality ECD programs and similar non-participating children, that these ECD investments would benefit taxpayers and generate government budget benefits in at least four ways.⁷ First, subsequent public education expenses would be lower because participants spend less time in school (as they fail fewer grades) and require expensive special education less often. Second, criminal justice costs would come down because participants—and their families—would have markedly lower crime and delinquency rates. Third, both participants and their parents would have higher incomes and pay more taxes than non-participants. Fourth, the ECD investment would reduce public welfare expenditures because participants and their families would have lower rates of welfare usage. Against these four types of budget benefits, we must consider two types of budget costs: the expenses of the ECD program itself and the increased expenditure due to greater use of higher education by ECD participants.

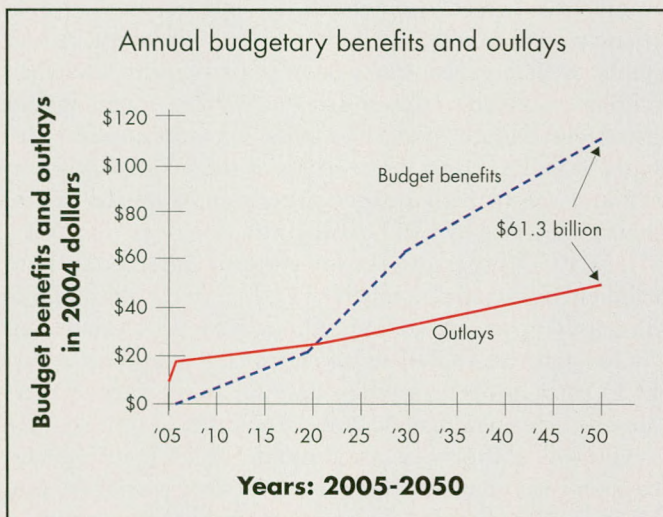
The ECD programs do not perform miracles on poor children. Substantial numbers of ECD participants go on to do poorly in school, commit crimes, have poor health outcomes, and receive welfare payments. The key point is that ECD participants as a group have far lower rates of these negative outcomes than do non-participants.

Given all of this, what effect would such ECD investments have on government budgets?⁸ In the second year of the program, 2006, when the program would be fully phased-in,

government outlays would exceed offsetting budget benefits by \$19.4 billion (in 2004 dollars). The annual deficit due to the ECD program would shrink for the next 14 years. By the 17th year of the program, in 2021, the deficit would turn into a surplus that would grow every year thereafter. Within 25 years, by 2030 if a nationwide program were started in 2005, the annual budget benefits would exceed costs by \$31 billion (in 2004 dollars). By 2050, the net annual budget savings would total \$61 billion (in 2004 dollars). In short, for the first 16 years, additional costs exceed offsetting budget benefits, but by a declining margin. Thereafter, offsetting budget benefits exceed costs by a growing margin each year. This pattern is illustrated in the figure below, which shows annual revenue impacts and costs in constant 2004 dollars.

The reason for this fiscal pattern is fairly obvious. The costs of the program will grow fairly steadily for the first decade and a half, in tandem with modest growth in the population of three- and four-year-old participants. Thereafter, costs will grow at a somewhat faster pace for a few years as, in addition to the costs of educating three- and four-year-olds, the first and subsequent cohorts of participant children begin to use public higher education services. After the first two years, when the first cohort of children starts entering the public school system, public education expenditures will begin to diminish due to less grade retention and remedial education. After a decade and a half, the first cohort of children will be entering the workforce, resulting in increased earnings and thus higher tax revenues and lower welfare expenditures. In addition, governments will experience lower judicial system costs.

The timing of these fiscal benefits resulting from a nationwide ECD program should appeal to those concerned about the fiscal difficulties posed by the impending surge of retiring baby boomers. The substantial fiscal payoffs from investing in young children would become available to governments just as the wave of new retirements puts the greatest pressure on government resources. For example, the government-wide budget savings in 2030 and in 2050 from ECD investments begun next year would be enough to offset about one-fifth of the deficits in the Social Security trust fund projected for those years. This potential contribution to the solvency of the



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The Benefits of High-Quality Early Education

Perry Preschool Project

Description: The Perry Preschool Project (Ypsilanti, Mich., 1962-1967) was created in the early 1960s by David Weikart, the then-special education director of the Ypsilanti Public Schools, to see if grade retention and widespread school failure could be prevented. Between 1962 and 1965, 123 African-American children with low IQs (in the 70 to 85 range) and from families with low socioeconomic status were randomly assigned to one of two groups: one enrolled in the new preschool program and one not.

Those enrolled in preschool attended for two school years at ages 3 and 4. For seven months of the year, the Project's four teachers had a total of 20 to 25 children in class for 2.5 hours per day and made weekly 1.5-hour home visits to each child and his or her mother. The curriculum and rich environment were well-conceived to provide children with experiences that build their language and foster pre-literacy, mathematics, logic, music, art, and social interaction skills. The daily routine that teachers established encouraged children to make choices and solve problems, thereby contributing to their cognitive and social development. The teachers were knowledgeable about early childhood development and education, received ongoing curriculum training and supervision, and communicated frequently with parents.

Results: Evaluations of the children were performed annually until the children reached 11, and then again at ages 14, 15, 19, 27, and 40. Table 1 summarizes some of the statistically significant outcomes of the preschool program.

Each time the children were evaluated, important benefits of the preschool program emerged. For example, by age 10 only 17 percent of the preschool children had been held back

a grade or placed in special education compared to 38 percent of children who had not been placed in preschool. By age 14 the preschoolers had significantly higher achievement scores, and by age 19 they had higher literacy scores and grade-point averages.

The differences in achievement appear to have grown over time. By age 27, seventy-one percent of the preschoolers had graduated from high school versus 54 percent of those not placed in preschool. Seven percent of the preschoolers had been arrested five or more times as compared to 35 percent of those who had not participated in preschool. Seven percent of the preschoolers had been arrested for drug-related offenses compared with 25 percent of the non-preschoolers. By age 27, significantly fewer preschoolers had ever been arrested (57 percent versus 69 percent of the control group), and the average number of arrests was about half (2.3 life-time arrests versus 4.6 for the control group).

In addition, the children in the program had significantly better life-time earnings. About 29 percent of preschoolers earned \$2,000 or more per month compared to 7 percent of

the non-preschoolers. The employment rate was 71 percent for the preschoolers compared to just 59 percent for the non-preschoolers. At age 27, average monthly earnings were 59 percent higher for the program participants (\$1,219 versus \$766 in 1993 dollars); 27 percent of preschoolers owned their own home, and 30 percent owned a second car. Only five percent of non-preschoolers owned their own home, and 13 percent owned a second car. Just 59 percent of preschoolers had received welfare or other social services in the past 10 years versus 80 percent of the non-preschoolers. More dramatically, only 15 percent of preschoolers were receiving public assistance at age 27 compared to 32 percent of the non-preschoolers. Finally, 57 percent of the female Perry Preschool participants were single mothers compared to 83 percent of the non-preschoolers. Preliminary evidence for the children at age 40 indicates that benefits continue to accrue: Preschool participants continue to have higher earnings, fewer arrests, greater home ownership, and less drug use.¹

A benefit-cost analysis by Barnett
(Continued on next page)

**TABLE 1:
PERRY PRESCHOOL PROJECT RESULTS**

	Preschoolers	Non-preschoolers
Grade retention or special education, age 10	17%	38%
High school graduation, age 27	71%	54%
Arrested five or more times	7%	35%
Arrested for drug-related offenses	7%	25%
Arrested, age 27	57%	69%
Average number of arrests, age 27	2.3	4.6
Earn \$2,000 or more per month, age 27	29%	7%
Employment rate	71%	59%
Average monthly earning, age 27	\$1,219	\$766
Homeownership, age 27	27%	5%
Own second car	30%	13%
Receive welfare or social services	59%	80%
Receiving public assistance, age 27	15%	32%
Single mothers	57%	83%

Sources: Barnett (1993), Schweinbart (1993, 2004), and Karoly (1998, 2001).

Social Security system would be achieved without raising social security taxes or cutting benefits.

What is the effect of ECD on crime reduction, earnings, and the economy?

It is important to keep in mind that savings to government is not the only benefit of ECD investments. These other benefits come in many forms. Investments in high-quality ECD programs are likely to substantially reduce crime rates and the extraordinary costs to society of criminality. Some of

these reduced costs are savings to government in the form of lower criminal justice system costs. These savings to government would total nearly \$28 billion (in 2004 dollars) in 2050, and were included in the earlier discussion of the fiscal effects of ECD investments. But there are other savings to society from reduced crime. These include the value of material losses and the pain and suffering that would otherwise be experienced by the victims of crime. By 2050, these savings to individuals from less crime would amount to \$127 billion (in 2004 dollars).

(1993) found \$108,002 in benefits and \$12,356 in costs per preschool participant (in 1992 dollars), a benefit-cost ratio of 8.74-to-1 based on data collected up until the participants were 27 years old. Of the total benefits, the public received \$88,433, and \$19,570 accrued to the program participants. The benefits to the public included \$70,381 saved by potential victims of crimes never committed (based on typical settlements for such crimes) and in reduced justice system costs; \$8,846 in higher taxes paid because of participants' higher earnings; \$7,155 saved in education costs due primarily to lower grade retention and use of special education; and \$2,918 in lower welfare costs. These benefits were partly offset by \$868 in increased costs for the public funding of higher education. The benefits to the program participants included \$21,485 in higher earnings and fringe benefits and \$738 in childcare offset by a loss of \$2,653 in welfare payments.

Another benefit-cost analysis of the Perry Preschool Project also found substantial net benefits. Karoly et al. (1998) found \$49,972 in benefits and \$12,148 in program costs in 1996 dollars—a benefit-cost ratio of 4.1-to-1 based on data collected up until the participants were 27 years old. Estimates of benefits by Karoly et al., differ from those by Barnett mostly because they exclude the benefits that derive from reductions in the intangible losses due to crime: the pain and suffering that crime victims experience. Thus, Barnett calculates \$70,381 in benefits from less crime, while Karoly et al. estimate the benefits from less criminal activity at just \$20,885. The benefits from reductions in the intangible losses due to crime do not, for the most part,

go to government. Thus, while there is a large difference in the overall benefit-cost ratios calculated by Barnett (1993) and Karoly et al. (1998), the benefit-cost ratios they calculate for government savings are very similar: 2.5-to-1 by Barnett and 2.1-to-1 by Karoly et al.

The economic benefits of the Perry Preschool Project were probably underestimated by both Barnett (1993) and Karoly et al. (1998). For example, neither of these benefit-cost analyses calculate the likely positive effects on the children born to participants who have higher earnings and employment and lower incarceration rates.² Other savings to taxpayers and boons to government budgets, such as reductions in public healthcare expenditures, likely resulted from the program, but these benefits were not calculated either.

The Chicago Child-Parent Center Program

Description: The Chicago Child-Parent Centers (Chicago, Ill., 1967 to present) serve children from low socioeconomic status families. Twenty-three centers, all of which operate next to or within a wing of a Chicago public elementary school, provide half-day (three hour) preschool services for children aged 3 or 4. Nineteen of these centers also provide half-day or full-day kindergartens. Both the preschool and the kindergarten operate throughout the school year and for eight weeks in the summer. Thirteen of the centers provide additional educational services through the third grade when children typically reach 9 years of age. Annually,

over 5,000 children are now attending the centers.

Each center is run by a head teacher who oversees the child education, parent involvement, community outreach, health, and nutritional programs; that head teacher reports directly to the principal of the partner elementary school. Other staff include classroom teachers and aides, a parent resource teacher, and a school-community representative. Nurses, speech therapists, and other specialists are shared with the partner elementary school. Preschool and kindergarten classes have a teacher certified in early childhood education and a full-time aide; preschool classes typically have 17 children and kindergarten classes typically have 25. The child-to-adult ratio is often much lower because of the presence of parent volunteers. (Parents are required to volunteer at the center for one-half day per week, but not all centers have attained this level of involvement.) Each center selects its own curriculum, but all emphasize basic language and reading skills, as well as social and psychological development. Teachers and aides receive regular in-service training through the Chicago Public Schools' Department of Early Childhood Programs. The centers do home visits and strongly encourage parental involvement in classroom activities, field trips (e.g., to the Museum of Science and Industry and the zoo), and adult education classes. The centers also provide free breakfasts, lunches, and health services, including vision and hearing tests.

Results: Several different studies have followed large samples—typically 1,000 or more students—and com-

Another major benefit of ECD investments is their impact on the future earnings of participants.⁹ The initial increase in earnings occurs in 2020 when the first cohort of participating children turns 18 and enters the labor market. By 2050, the increase in earnings due to ECD investments is estimated to amount to 0.43 percent of GDP, or some \$107 billion (in 2004 dollars).

The increased earnings of children who participate in a high-quality ECD program not only allow the U.S. to compete more effectively in a global economy, but also aid both

earlier and future generations of children. These increased earnings will benefit earlier generations when they reach retirement age because these earnings will contribute to the solvency of Social Security and other public retirement benefit programs. Future generations will benefit because they will be less likely to grow up in families living in poverty.

A nationwide commitment to high-quality early childhood development would cost a significant amount of money up front, but it would have a substantial payoff in the future. The United States' political system, with its two-

pared outcomes for center students to non-center students. Data in these various studies have been collected periodically, with one ongoing study having analyzed data for as long as 19 years, or until the students were 22 years old. Table 2 summarizes some of the statistically significant outcomes of the preschool program.

Fuerst and Fuerst (1993) reported that center preschool students had higher scores on achievement tests at grade two as well as significantly higher graduation rates (62 percent versus 49 percent) than non-center students. Reynolds (1994) found that center preschool children scored higher on achievement tests than other comparable groups of children every year from kindergarten to 7th grade. In addition, that study found center preschool children had less need for special education (12 percent versus 22 percent) and significantly lower rates of grade retention (24 percent versus 34 percent).

The Chicago Longitudinal Study (CLS) has been following nearly all of the 1,150 students who attended center preschools in 1983-85 and center kindergartens in 1985-86 and compar-

ing them to a control group of 389 children of the same age who met the eligibility criteria for participation in the intervention program and came from families of low socioeconomic status. The CLS has demonstrated that numerous benefits have been generated by the centers; presented here are just the benefits produced by the center's preschool program. For example, the study found that the center preschool children had significantly higher achievement test scores at ages 5, 6, 9, and 14. These children also spent less time in special education through age 18 (0.7 years versus 1.4 years), and had lower grade retention at ages 9 and 15 (19 percent and 23 percent versus 26 percent and 38 percent). Between the ages of 4 and 17, five percent of the preschool children had been victims of abuse or neglect compared to 10 percent of the nonparticipating group. Delinquency rates were significantly lower for the center preschool children through ages 13 and 14. By age 18, only 17 percent of center preschool children had been charged with serious crimes compared to 25 percent for non-center children—and charges for violent offenses were brought against

nine percent of center preschool children but 15 percent of non-center children. Parental involvement with the schools was much higher among the parents of center preschool children than it was for the parents of non-center children. By ages 20 and 22, the high school graduation rates for center preschool children were 50 percent and 65 percent compared to just 39 percent and 54 percent for non-center children.

Reynolds et al. (2002) carried out a benefit-cost analysis of the Chicago Child-Parent Center Program. For the preschool program alone, they identified \$47,759 in benefits and \$6,692 in total costs in 1998 dollars—a benefit-cost ratio of 7.1-to-1 based on data collected up until the participants were 22 years old. The benefits derived mainly from reduced public education expenditures due to lower grade retention and use of special education, reduced costs to the criminal justice system and victims of crime due to lower crime rates, increased income tax revenue due to projected higher lifetime earnings of center participants, and higher projected earnings of center preschool participants.

Once again, the benefits of the program were underestimated. For example, the benefits from less pain and suffering as a result of fewer crime victims were not included, nor were the likely gains from improved health, fewer pregnancies, and other positive life changes. Moreover, the likely benefits to offspring of center participants were not calculated.

—R.L.

¹ Schweinhart (2004).

² See Rolnick and Grunewald (2003).

**TABLE 2:
CHICAGO CHILD-PARENT CENTERS PRESCHOOL RESULTS**

	Center students	Non-center students
Special education	12%	22%
Grade retention, age 15	24%	34%
Years in special education, age 18	0.7	1.4
Serious criminal charges	17%	25%
Violent offenses charges	9%	15%
High school graduation, age 20	50%	39%
High school graduation, age 22	65%	54%
Victim of abuse or neglect, age 4-17	5%	10%

Source: Karoly (1998, 2001), Reynolds et. al. (2001, 2002).

Extrapolating from one program...

Making extrapolations from the Perry Preschool Project to a nationwide ECD program raises several questions. Do results from a program that operated in a small-town setting carry over to large urban, often inner-city environments where many poor children live today? Have the problems faced by poor children changed so much since the Perry Preschool Project operated in the 1960s that it is unlikely that the success of that program can be replicated? Have the dramatic changes in the U.S. welfare system that have taken place over the past decade reduced the welfare savings that could be generated by an ECD program like the Perry Preschool Project? Does the fact that the Perry Preschool Project had the highest benefit-cost ratio of all the ECD programs analyzed imply that the results for that project may overstate the net benefits of a nationwide ECD program? Finally, how confident can one be that the benefits found for the Perry Preschool Project, which was a relatively small pilot program, would apply when replicating the program, or a similar high-quality program, on a large, nationwide scale?

I believe that the results for the Perry Preschool Project would apply to a large-scale, nationwide ECD program today. The results for the Perry Preschool Project—the life outcomes of its young students—are similar to those of the Chicago Child-Parent Center program. The Chicago Child-Parent Center program is not a small-scale pilot program: It serves about 5,000 children annually and has served over 100,000 children to date (Reynolds et al., 2001). The Chicago program operates in a large urban, inner-city environment. The program started in 1967 but *continues* to serve thousands of children annually, with all their modern-day problems. If we could measure all of the benefits of each program, there is a good chance that we would find that the Chicago

programs' net benefits actually exceed those of the Perry Preschool Project.

In fact, if we look strictly at the effect on government budgets (and not the broader positive effects on the economy and crime), the net benefits of the Chicago Child-Parent Centers (and of the Prenatal/Early Infancy program) are even higher than they are for the Perry Preschool Project.¹ Likewise, in terms of economic impacts alone, the net benefits of the Chicago Child-Parent Centers exceed those for the Perry Preschool Project. The total benefits of the Chicago program are underestimated relative to the Perry Preschool Project because none of the Chicago program researchers has ever measured the substantial savings that derive from reductions in the intangible losses due to crime.

It is not clear whether the dramatic changes in the welfare system would likely result in lower savings to government today than would have been generated decades ago by ECD investments. But even if the changes in the welfare system did mean that there would be relatively less government savings from reduced welfare usage, the results of this extrapolation would not change substantially; for the Perry Preschool Project the savings to government from reductions in welfare usage amounted to only about 9 percent of the total savings to government and less than 3 percent of the total benefits of the program.

The ultimate benefit-cost ratio for a large-scale, nationwide ECD program enrolling roughly 1.6 million children a year could turn out to be higher or lower than in smaller pilot programs. A large program would have the potential not possible in small programs to improve the school atmosphere for everyone, not just ECD participants. Raising academic performance while reducing disruptive classroom behaviors and drug or

criminal activity of 20 percent of children and teenagers should benefit the other 80 percent of students who attend school with them. In addition, there may be some multiplier effects on the economy from the higher-skilled, more productive, and higher-earning ECD participants.² On the other hand, a larger scale ECD program might draw in more kids who are less at risk than those in the pilot programs. Such kids might (or might not) have lower benefit-cost ratios than those in the pilot programs—experts are divided on this issue. Likewise, the quality of teachers and other staff may not be as good, or the teachers and staff may not be as highly motivated, as those in the pilot programs. But all told, the research on high-quality ECD clearly indicates that even on a national scale the benefits will greatly outweigh the costs.

—R.L.

¹ It should be noted that the government savings from the Chicago Child-Parent Centers program are understated relative to those of the Perry Preschool program because they do not include the government savings from reduced adult welfare usage on the part of the Chicago program participants.

² It is important to note that this study's estimates of the benefits of the nationwide ECD program do not take into consideration the positive feedback effects on future generations of children and therefore the possible savings in the future costs of the ECD investment. The program invests in the parents of the future who, as a consequence of the ECD investment, will be able to provide better educational opportunities to their children than they would without the ECD program. As a result, it may not be necessary to spend as much on ECD in the future to achieve the same educational, crime, and income effects on the children of the next generation as is estimated here. Alternatively, not scaling back the future level of ECD investment may result in greater benefits than estimated in this study once the generational effects are taken into account.



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and four-year cycles, tends to under-invest in programs with such long lags between when investment costs are incurred and when the benefits are enjoyed. The fact that lower levels of government cannot capture all the benefits of ECD investment may also discourage them from assuming all the costs of ECD programs. Yet, the economic case for ECD investment is compelling.

To recapitulate, I estimate that providing poor three- and four-year-old children—20 percent of all children in this age range—with a high-quality program would initially cost about \$19 billion a year. Such a program would ultimately reduce costs for remedial and special education, criminal justice, and welfare benefits, and it would increase income earned and taxes paid. Within about 17 years, the net effect on the budget would turn positive (for all levels of government combined). Within 30 years, the offsetting budget benefits would be more than double the costs of the ECD program (and the cost of the additional youth going to college).

In addition, investing in our poor young children is likely to have an enormous positive effect on the U.S. economy by raising GDP, improving the skills of the workforce, reducing poverty, and strengthening U.S. global competitiveness. Crime rates and the heavy costs of criminality to society are likely to be substantially reduced as well. □

Endnotes

¹ All but the Chicago Child-Parent Center Program had random assignment of potentially eligible children into the intervention program or the control group. The Chicago Child-Parent Center Program did not use randomized assignment but the control group did match the intervention group on age, eligibility for intervention, and family socioeconomic status.

² Heckman (1999), pp. 22 and 41.

³ Rolnick and Grunewald (2003), pp. 3 and 16.

⁴ Burtless (1999).

⁵ Committee for Economic Development (2002).

⁶ The annual average impact for various types of costs and benefits per Perry Preschool Project participant, estimated by Rolnick and Grunewald (2003) of the Federal Reserve Bank of Minneapolis, was used as the baseline for the analysis. (Rolnick and Grunewald used the costs and benefits as described by Schweinhart [1993] and Barnett [1993].) The annual costs and benefits per program participant of the preschool program were adjusted for inflation and/or wage increases every year through 2050 in line with projections made by the Congressional Budget Office (June 2004).

The numbers of three- and four-year-olds entered in the estimating model were taken from recent population projections made by the U.S. Census Bu-

reau (2004). The total costs and benefits of the preschool program were determined by multiplying the number of participants of a particular age by the average value of the cost or benefit for each year that the cost or benefit was produced by participants of that age as determined by Rolnick and Grunewald (2003). Thus, for example, the reductions in the cost of providing public education per participant were assumed to kick in when that participant entered the public school system at age 5 and were assumed to cease when that participant turned 18 and left the school system.

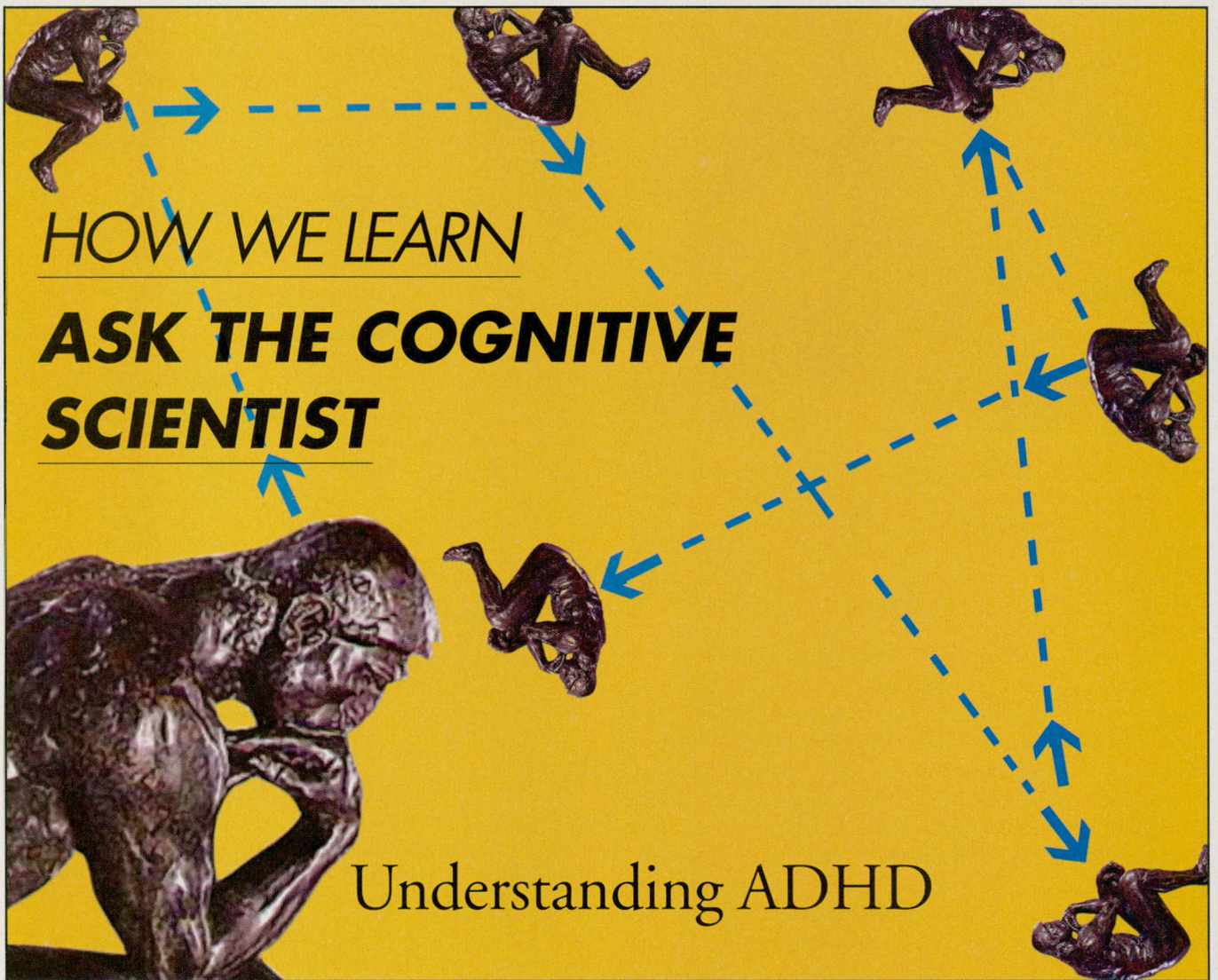
⁷ Other savings to taxpayers and boons to government budgets, such as reductions in public healthcare expenditures, are likely to exist. But, we lack the data to quantify all these other potential savings.

⁸ This analysis considers budget effects on all levels of government—federal, state, and local—as a unified whole. As a practical matter, the source estimates have not made such a distinction, nor should they. All levels of government share in the costs of education, criminal justice, and income support. Responsibilities have shifted in the last half-century and will continue to do so over the nearly half-century timeframe used in this analysis. Although a case can be made that ECD investments should be the responsibility of the federal government to address educational inequalities before children enter the school system, these investments could be made at any or all levels of government. This analysis focuses on capturing national effects of ECD investments.

⁹ The guardians of participants are also likely to experience increases in earnings since they will have more time for employment as a consequence of the day-care provided to their children by the ECD program. These earnings benefits have not been calculated for our nationwide ECD program.

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ILLUSTRATED BY GUY SCHUM

HOW WE LEARN

ASK THE COGNITIVE SCIENTIST

Understanding ADHD

How does the mind work—and especially how does it learn? Teachers’ instructional decisions are based on a mix of theories learned in teacher education, trial and error, craft knowledge, and gut instinct. Such gut knowledge often serves us well, but is there anything sturdier to rely on?

Cognitive science is an interdisciplinary field of researchers from psychology, neuroscience, linguistics, philosophy, computer science, and anthropology who seek to understand the mind. In this regular American Educator column, we consider findings from this field that are strong and clear enough to merit classroom application.

By Daniel T. Willingham

Question: What can you tell me about ADHD? Is it even real—or is it just a faddish diagnosis? How can I recognize it in a student—and how can I help a student who has it?

Answer: ADHD, short for Attention Deficit Hyperactivity Disorder,¹ is indeed real. It is a complex condition with variable symptoms. The American Psychiatric Association (2000) estimates that 3-5 percent of kids have it. The biological basis is becoming better understood, but is still not completely clear. Fortunately, it is treatable, and the treat-

ments that you have no doubt heard about—stimulant medications—are effective for most children. Unfortunately, there is not much evidence that purely behavioral or talk therapies are as effective as medications. In this column, I’ll tell you some of the basics about ADHD, and I’ll describe what role you as a teacher have in helping a child with ADHD get the most out of school.

* * *

ADHD is a real disorder, despite seemingly widespread beliefs to the contrary. I have met more than one person who snorts with disgust when ADHD is mentioned, saying something like, “In my day, if a kid had too much energy, you told him to run around on the playground for a while. Now they give him drugs!” Other doubters suggest that there are probably more kids with attention problems these days, but it’s because this generation is easily bored due to excess television viewing and permissive parents who buy them too many toys. To make matters worse, ADHD’s high incidence now (compared to its apparent absence a generation ago) gives the diagnosis a faddish feeling.

But all of these impressions are based on inaccuracies. ADHD is not new—it has been identified since the early

20th century. Until 1980, ADHD went by other names such as “restlessness syndrome” or “hyperkinetic impulse disorder.” Sophisticated studies tell us that it is not caused by bad parenting, too much television, or playing video games. A large number of studies have examined the relationship of these sorts of social practices and found that they do not cause ADHD (e.g. Anderson, 1996). And further, there does not appear to be anything about American culture in particular that breeds the disorder; research demonstrates that ADHD exists in about the same percentage of children in other cultures (Szatmari, 1992).

What Is ADHD?

ADHD is a medical disorder for which there is very strong scientific evidence. It has three recognized subtypes, predominantly Hyperactive, predominantly Inattentive, and Combined, each of which looks a little different. Kids whose ADHD is predominantly Hyperactive-Impulsive,² show mostly hyperactive and impulsive symptoms, i.e., they seem to fidget nonstop, they have a hard time playing quietly, and they don't seem to think before they act. Those with predominantly Inattentive ADHD show more inattentive symptoms, i.e., they don't seem to listen, they often seem to be daydreaming, and they have trouble organizing tasks. The third group, with Combined ADHD, shows both types of symptoms.

Interestingly, children with ADHD (regardless of subtype) can sustain attention when they find something in the environment of interest, for example a video game or movie, or a building project. The problem comes in *controlling* their attention; that is, directing and maintaining it when the object itself does not have properties that maintain the child's interest.³

Researchers have a fair idea about at least some of what goes wrong in the brain of a child suffering from ADHD. A brain circuit is affected that involves structures near the center of the brain called the basal ganglia, and part of the prefrontal cortex—the front part of the outer covering of the brain. Brain imaging studies show that these structures are smaller and less active in ADHD sufferers than in non-ADHD control participants (i.e., Giedd et al., 1996; Zametkin et al., 1990). We also know that there are particular problems in the way these brain structures use dopamine, one of the chemicals that nerve cells in the brain use to communicate with one another and that play a crucial role in the basal ganglia and prefrontal cortex.

That's the biology behind ADHD. But what causes these biological differences? Geneticists have shown that ADHD is one of the most heritable psychiatric diseases known. *Heritability* refers to the extent to which one's genetic inheritance influences an outcome (i.e., the likelihood of developing ADHD). Some important studies of heritability have examined twins. Of course, twins can be identical (and so share 100 percent of their genes) or fraternal (and so share 50 percent of their genes). Studies show that if one twin has ADHD, then the other is much more likely to have it if the twins are identical than if they are fraternal. Note that the home lives of either identical or fraternal twins are likely to be quite similar (Levy et al., 1997). Thus it is the greater

shared genetic component that drives the effect. Further, geneticists have identified several candidate genes that may be the culprit, most of which are implicated in the regulation of dopamine (e.g., Faraone et al., 1997).

How large is the genetic contribution? One way to think about it is to compare the effect of genetics on height and on ADHD: The heritability of ADHD is about 80 percent; the heritability of adult height is about 90 percent. In short, whether or not a child develops ADHD depends largely on his or her genetic inheritance, not the amount of television watched or a particular parenting style.⁴

This description of the brain basis of ADHD makes it sound as though kids won't just “grow out of it,” and indeed, they don't. Kids with ADHD for the most part, but not uniformly, grow up to be adults with ADHD. And as they grow, these kids, if untreated, are at significantly increased risk for a host of problems (Barkley, 1998). They are much more likely than other kids to drop out of school and to have few or no friends. They are also at increased risk for teen pregnancy, drug abuse, clinical depression, and personality disorders.

Diagnosis

It is not currently possible to diagnose ADHD via genetic testing (as we can, for example, for Huntington's disease) or by an analysis of the brain's chemicals. Rather, it is diagnosed via a careful analysis of behavior. A child must show six of nine symptoms in one of the two lists shown on page 36 to be diagnosed as either predominantly Inattentive or predominantly Hyperactive-Impulsive. If the child has six or more characteristics from both lists, he or she is diagnosed as Combined. These characteristics are evaluated relative to the child's peer group. Further, the symptoms must be present for at least a year, they must occur in at least two different settings, they must appear before age 7 (a rule that acknowledges ADHD's biological basis in the brain, which means the disorder would likely appear by age 7), and they must be severe enough that the child is impaired in major life activities, such as school work or getting along with friends (i.e., the symptoms actually cause problems). Together, these con-

¹ The term Attention Deficit Disorder (ADD) is no longer used.

² Although adults do suffer from ADHD, I will refer throughout this article to people with ADHD as though they are children, since we are focused on K-12 students.

³ Of course, we expect that younger children will be more distractible than older children and will have a harder time knowing when it's appropriate to play quietly and when they can burn off energy. That is why a diagnosis of ADHD requires that symptoms be evaluated relative to same-age children.

⁴ A recent report that kids who watch a lot of television at ages 1 to 3 tend to develop ADHD by age 7 (Christakis et al., 2004) got a lot of press attention, but that study was rife with problems. Two of the more important problems were that no one in the study was clinically evaluated for ADHD (parents reported on a few categories as to whether their children had attentional problems) and the study showed a *correlation* of these reported attention problems and watching television, from which one cannot conclude that watching television *causes* attention problems. It is perfectly plausible that kids with nascent attentional problems like to watch TV more than kids who will not later develop attention problems.

straints work to protect against unmerited diagnoses. In addition, other possible causes of the symptoms must also be ruled out, e.g., other neurological or psychiatric disorders, a reaction to a stressor such as a chaotic home life, and so on. It may seem suspicious to you that there is not a 100 percent accurate marker for the disorder. But other diseases—for example, Alzheimer’s disease—are likewise diagnosed via a set of symptoms coupled with exclusion criteria.

ADHD Symptom List

Inattentive symptoms	Hyperactive/Impulsive symptoms
Failure to give close attention to details; prone to careless mistakes	Tendency to fidget and squirm when seated
Difficulty sustaining attention and in persisting with tasks until they are complete	Tendency not to remain seated when it is expected to do so
Often appears as if his or her mind is elsewhere	Engages in excessive running or climbing where it is inappropriate
Frequent shifts from one uncompleted activity to another	Difficulty playing quietly
Difficulty organizing tasks and activities	Appears to be often “on the go” or “driven by a motor”
Dislike and avoidance of activities that require sustained mental effort	Talks excessively
Disorganized work habits; materials necessary for tasks are scattered, lost, or carelessly handled	Difficulty delaying responses; tendency to blurt out answers before a question is completely stated
Easily distracted by irrelevant stimuli; frequently interrupts tasks to attend to trivial events easily ignored by others	Difficulty waiting one’s turn
Forgetful in daily activities, e.g., misses appointments	Frequently interrupting or intruding on others

Brief description of the symptoms of ADHD. A more complete description is available in the Diagnostic and Statistical Manual of the American Psychiatric Association.

Ever since ADHD became a hot topic in the media, there has been much public discussion of overdiagnosis. It would seem that if you define “inattentive” relative to an age group, you are guaranteeing that the least attentive kids have a “disorder.” But the criteria for diagnosis—for example, that the inattention must be causing a real problem for the child—are supposed to protect against that danger. Still, when a disorder gets a lot of press, it is possible that it is so much in the forefront of physicians’ minds that it will be overdiagnosed. Researchers have investigated this possibility, and the data are mixed (e.g., Jensen et al., 1999; LeFever et al., 1999). Thus, an appropriately cautious attitude would indicate that ADHD *may* be overdiagnosed. But, we should also bear in mind that it may well be *underdiagnosed* in communities with poor access to healthcare.

An appropriately cautious attitude would indicate that ADHD *may* be overdiagnosed. But, we should also bear in mind that it may well be *underdiagnosed* in communities with poor access to healthcare.

Treatment

The best known and most comprehensive study on treating children with ADHD was sponsored by the National Institute of Mental Health (NIMH). Eighteen well-known researchers at six medical research centers participated, and nearly 600 children, aged 7-9, were assigned randomly to be treated with (1) medication alone; (2) psychological/behavioral treatment alone; (3) both therapies combined; or (4) routine community care alone. The first results were published in 1999, and the study is ongoing. Results thus far indicate that either medication alone or combined treatment are more effective than behavioral therapy or community care alone in reducing ADHD symptoms. Other analyses indicated that these conclusions hold across race, ethnicity, and gender (Arnold et al., 2003). A recent follow-up study (MTA Cooperative Group, 2004) tracked the original participants and found that subjects who stopped taking medication had a return of ADHD symptoms, but those who had continued their medication did not. Further, those who had not taken medication as part of the study, but then began taking it when the study ended, showed a reduction of ADHD symptoms.

This research concerned the reduction of symptoms, which doesn’t guarantee improvement in more complex behaviors like performing well in school or getting along with peers. When these more complex behaviors were measured, the NIMH study indicated that the combined treatment of medication and psychological/behavioral treatment held a slight edge over either treatment on its own. But other recently published work came to the conclusion that training in social and academic skills combined with medication provided no advantage to children over and above medication alone (Abikoff et al., 2004; Hechtman et al., 2004).

Still other behaviors of concern are the risk factors men-

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tioned earlier, such as increased risk of substance abuse, anti-social behavior, and so on. These risks are meliorated by medication. (e.g., Abikoff et al., 2004; Klein et al., 1997; Wilens, 2004). This protective effect is not an inoculation, however. The meliorating effect lasts only as long as the child is taking the medication. Obviously, different risks are associated with different ages, depending on the time of life. A 6-year old will not be at risk for dropping out of school, whereas a 16-year old might be. One might, in particular, think that medicating children with stimulants would put them at greater risk for abuse of stimulants (or other drugs) later in life. That appears not to be the case (Mannuzza, Klein, and Moulton, 2003).

It is fair to ask whether these children really *need* medication. Most children (and adults) don't like to pay attention to things that are not inherently interesting. Many overcome this dislike, and we attribute their ability to stick with a task as a sign of good character; their behavior shows perseverance and diligence. Couldn't kids with ADHD overcome their problem with some gumption? Are we perhaps depriv-

ing children with ADHD of the opportunity to develop strong character if we provide medication? Character is doubtless important, but children with ADHD are not just fighting a disinclination to do uninteresting work the way others do—they are fighting their physiology. It's rather like asking a child with limbs weakened by polio to do ten pushups, just as everyone else does. Greater perseverance will help that polio-impaired child, but even great perseverance won't bring him or her to the athletic level that a normal child could reach with far less effort. Likewise, strong character is not unimportant for the ADHD child, but without medication, his strong character simply won't be able to produce as much concentration and focus as could the non-ADHD child with less strength of character and less effort.

What are we to conclude from these data? Obviously, there is solid evidence that medication is effective, and there is less evidence that behavioral or psychological treatments work as well. But we should *not* conclude that these latter treatments should be abandoned. There is variability among children. Some don't respond to medication or cannot toler-

The Conners' Teacher Rating Scale – Revised (CTRS-R) is a widely-used tool to assess a host of problematic behaviors, including ADHD, in children and adolescents ages 3 to 17. It comes in both long (59-item) and short (28-item) forms and can be used in conjunction with the Conners' Parent Rating and the Adolescent Self-Report Scales to create a full description of a child's troubling behavior. The Conners' Ratings Scales – Revised are considered the standard for assessing ADHD; they also measure problems such as oppositional behavior, inattention, perfectionism, anxious/shy behavior, and hyperactivity. These carefully developed tools rely on normative data from more than 2,000 teachers, 2,000 parents, and 3,000 adolescents. In addition to contributing to a diagnosis, these scales can be used to measure changes in behavior once treatment has started.

Displayed here are portions of the long form of the CTRS-R. All of the items shown are part of the ADHD subscale, though some, like

Conners' Teacher Rating Scale - Revised (L)

by C. Keith Conners, Ph.D.

Student's Name: _____ Gender: M F
(Circle One)

Birthdate: ____/____/____ Age: ____ School Grade: ____
Month Day Year

Teacher's Name: _____ Today's Date: ____/____/____
Month Day Year

Instructions: Below are a number of common problems that children have in school. Please rate each item according to how much of a problem it has been in the last month. For each item, ask yourself "How much of a problem has this been in the last month?", and circle the best answer for each one. If none, not at all, seldom, or very infrequently, you would circle 0. If very much true, or it occurs very often or frequently, you would circle 3. You would circle 1 or 2 for ratings in between. Please respond to all the items.

NOT TRUE AT ALL (Never, Seldom) JUST A LITTLE TRUE (Occasionally) PRETTY MUCH TRUE (Often, Quite a Bit) VERY MUCH TRUE (Very Often, Very Frequent)

	0	1	2	3
3. Forgets things he/she has already learned				
4. Appears to be challenged by work				
5. Recalls easily past				
6. Is perfectionist				
7. Temper tantrums, explosive, unpredictable behavior				
8. Excitable, impulsive				
9. Fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities				
10. Sassy				
11. Is always "on the go" or acts as if driven by a motor				
12. Avoids, expresses reluctance about, or has difficulties engaging in tasks that require sustained mental effort (such as schoolwork or homework)				
13. Loses track of the ball in ball games or games				
14. Has emotional outbursts				
15. Excitement may be painful				
16. Restless or overactive				
17. Fails to finish things he/she starts				
18. Does not seem to listen to what is being said to him/her				
19. Actively defies or refuses to comply with adults' requests				
20. Leaves seat in classroom or in other situations in which remaining seated is expected				
21. Poor in spelling				

"Poor in spelling," are also part of other subscales. As you can see, for each item,

teachers are instructed to ask themselves, "How much of a problem has it been in the last month?"

Many of these suggestions are rooted in the idea of putting more regulation for the child in the environment since the child is not able to regulate himself or herself very well.

ate it due to side effects. Some show better response to behavioral interventions than others. It should also be borne in mind that across different studies, the behavioral treatments will vary in their design and in how effectively they were implemented. There are also differences among kids in what their home and school environments are like without these interventions—some parents and teachers already provide a fairly structured, predictable world, whereas others do not. The behavioral intervention would make a much bigger difference to a child in the latter situation.

Another feature of these studies is noteworthy. Medication was effective, but the children were very closely monitored in terms of their responses to different doses, presence of side effects, and so on. Everyone who advocates medication for kids with ADHD must also advocate very close monitoring of its effects.

What if you suspect a student in your class has ADHD?

Suppose there is a child in your class who seems to have many of the symptoms listed on page 38. What should you do? Obviously, as a teacher you are not trained to make a diagnosis, and even if you were, you only see the child at school and a positive diagnosis requires observation in at least two settings. Nevertheless, as a teacher you are in a position to observe the child for extended periods, and you have a good idea of appropriate behavior for the age group. Your knowledge and opinion is critically important. Each school should have a clear, known process through which your concerns can be addressed. Typically, the school principal would have a designee, usually a guidance counselor or psychologist, who is authorized to convene a meeting of various school personnel to consider the evidence and, if merited, recommend a formal ADHD evaluation. If you suspect a child may have ADHD—meaning you see multiple symptoms for several months—don't keep it to yourself. Bring the issue to your principal or the designated staff person in your school. Bear in mind that if this child does have ADHD, he or she is at significant risk to develop further problems—and that risk can be attenuated with treatment.

What if a child in your class has diagnosed ADHD?

Suppose instead that you have a child who has been diagnosed with ADHD in your classroom. What can you do to help him or her get the most out of school? Again, the first thing to keep in mind is that you must coordinate with others. Your school counselor or psychologist should be helpful in coordinating your efforts with those of the child's parents and physician. Obviously, it is vital that any changes you make in your classroom are supported by changes made in the child's home and vice versa. Here is a list of the sort of changes that might be suggested to you (for further reading, see Barkley, 1998):

Make it easier for the child to pay attention

Subtle changes to the environment may help the child with ADHD focus attention. Sitting close to you may help him or her maintain attention on class work. If your desks are arranged in circles or clusters, make sure that the child is oriented so that he or she can see you most of the time. ADHD kids may also frequently seem not to listen, even when directly addressed. Try using the child's name any time you directly address him or her.

Immediate and frequent consequences

Kids with predominantly impulsive ADHD don't think about the consequences of what they are doing before they do it. Making the consequences immediate may help them to make that connection. For example, a child may be told to play alone for a few minutes if he grabs a ball from another child during recess. Positive consequences should follow positive behaviors, as well. The child should be rewarded or praised when he politely asks to share the ball instead of grabbing it.

Break tasks into smaller chunks

Because kids with ADHD have trouble focusing attention and trouble staying organized, you may be asked to make tasks shorter and more manageable for them. For example, rather than telling a high school sophomore to write an essay on the causes of the American Revolution, the teacher may provide a series of steps for the student: find relevant research materials; read and summarize the materials; write a brief outline; expand the outline with more details; write a rough draft; edit the rough draft. The teacher would evaluate the work at each stage and provide immediate feedback. The teacher thus takes over from the child some of the requirements for organization and self-regulation.

Use prompts, especially for rules and time intervals

Students with ADHD have a special problem with regulating their own activities and so will benefit from prompts or reminders. For example, other children may readily learn the rule that students must take a hall pass to go to the bathroom and that it must be replaced on the hook when they return. The child with ADHD will likely need to be reminded of this rule many more times than other kids. Another aspect of regulating one's own behavior is anticipating

As much as ADHD is disruptive to a child's academic performance, the possible long-range consequences of the disorder are still more dire ... early intervention is the child's best hope.

how long it will take to complete an ongoing task and allocating effort on the different stages of the task accordingly. Again, the child with ADHD will benefit from prompts about time, e.g., "Everyone has five more minutes to complete their graph, so you should be about halfway done by now."

Artificial rewards

Sometimes a child responds very well to a reward system, such as a token economy. The child might earn points or plastic coins for each instance of appropriate behavior (e.g., a class period in which he doesn't get out of his seat). These artificial rewards can later be exchanged for a desirable toy or other tangible reward. The goal in such programs is not to "buy" appropriate behavior, but rather to shape behavior toward the target so that the rewards can be reduced in frequency and eventually discontinued, with the desirable behavior remaining.

Contact with parents

You will likely be asked to be in frequent touch with the child's parents in order to update them on his or her progress, alert them to any problems that arise, and so on. Sometimes a daily "report card" is used, which briefly summarizes the child's progress on targeted behaviors.

You'll note that many of these suggestions are rooted in the idea of putting more regulation for the child in the environment since the child is not able to regulate himself or herself very well. Another goal is to make the environment more predictable; if the child knows what's coming, he or she may more easily learn to self regulate.

As much as ADHD is disruptive to a child's academic performance, the possible long-range consequences of the disorder are still more dire: academic failure, social isolation, and increased risk of drug abuse and other self-destructive behaviors. Early intervention is the child's best hope, and teachers have an important role to play in triggering and providing this intervention. □

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Agamemnon for At-Risk Teens

*An Ancient Classic
Delivers Relevance
and Rigor*

By Rick Ayers

“Dear Gods, set me free from all the pain,” declares the watchman at the beginning of *Agamemnon*, setting the stage for a most dreadful story, one that confronts us brutally with the horrors of death and a life filled with wrong choices.

I began to wonder if this was the right way to start my 11th-grade World Literature class. Yes, *Agamemnon*, the first play in the trilogy *The Oresteia*, is a classic and would set a great benchmark for the year. And the local theater, the Berkeley Repertory Theatre, was planning to present the whole trilogy in the spring.

But this was going to be a hard ride. The junior class of Communication Arts and Sciences (CAS) was coming to me with a bad reputation. They were the “problem” class, the ones who drove their freshman teacher crazy, who inspired others to try to get out of teaching them. In our diverse high school, it was also the class with the highest number of working-class kids and “at-risk” kids and the lowest level of literacy and academic preparation. The majority of the kids were African American, which made this class more like the “urban” side of Berkeley as opposed to the “suburban” population.

Could we really jump off with a story about a warrior king returning from Troy and being slaughtered by his wife and her lover, with the subsequent revenge killings by the cursed couple’s son with the aid of his sister? I have always been an advocate of more texts by authors of color, always coming down against the “dead white men” curriculum in the canonical debate. Still, it turned out that many of the classics were not a “bitter medicine” that had to be swal-

lowed; for one thing, they’re filled with appealing topics like sex and violence. People who talk about the corrupting influence of rap lyrics and violent movies ought to take a gander at the Greeks. And the classics were not exercises in bowing to authority. The Greeks were above all doubtful, suspicious, and critical of authority. I did not believe this class needed to be confined to tales of ghetto heroism and tragedy. We could travel back 2,500 years and 4,500 miles to some of the foundational works of Western civilization and find relevant and powerful tales.

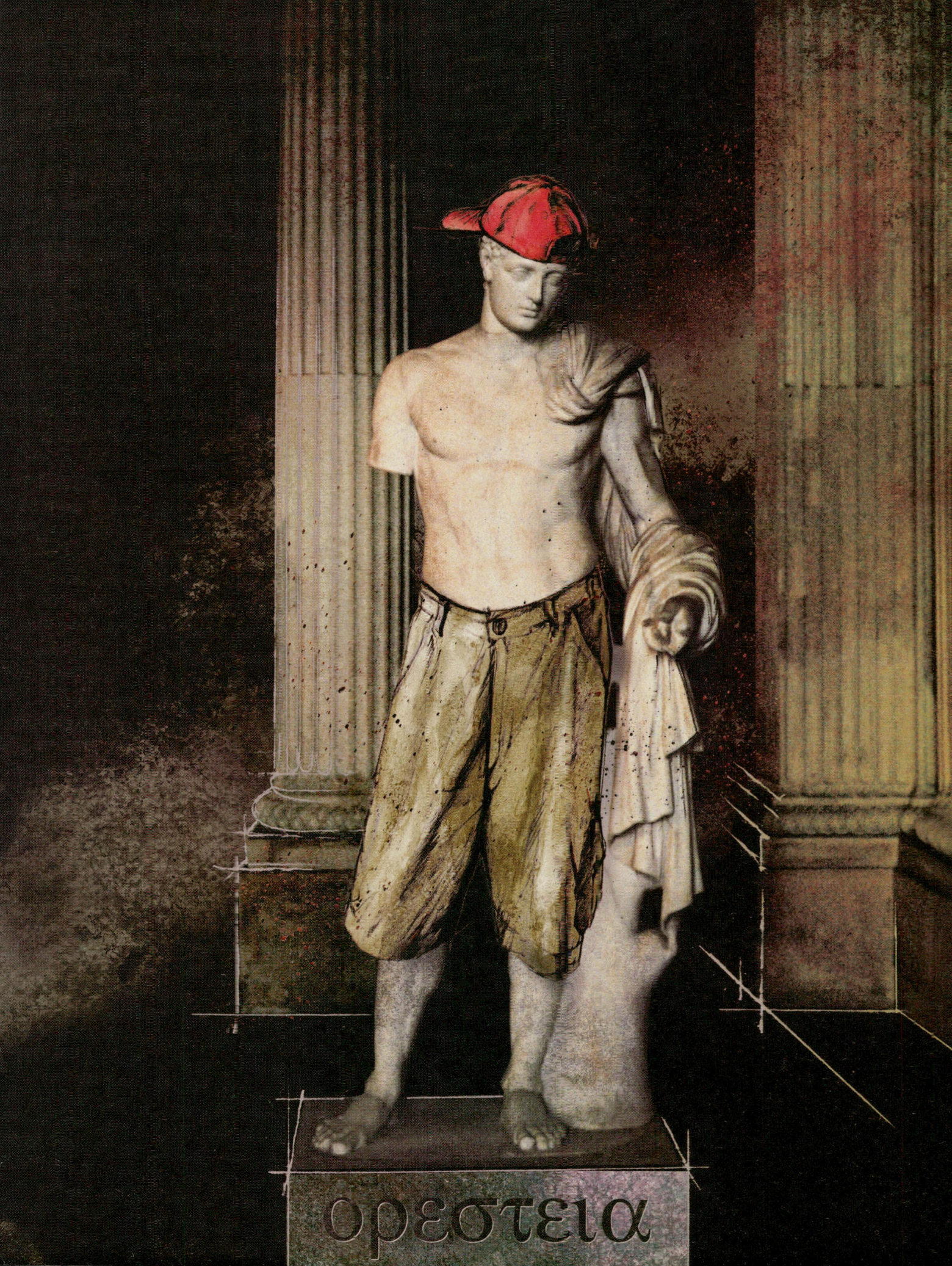
Robert Fagles, in the introduction to his 1975 translation, declares that “*The Oresteia* is our rite of passage from savagery to civilization.” Yes, in fact, it is the story of the first democratic court system. In this trilogy, a seemingly endless cycle of violence is plaguing the House of Atreus, with one revenge killing following after another. Finally, wise Athena, patron goddess of Athens, comes down and declares it is time for brute force to step aside. Both sides of the blood feud will argue their cases. But here’s the real twist. It is neither she nor Zeus who will decide. A jury from the audience will be impaneled (an early case of audience participation) and judge the case. Suddenly in *The Eumenides*, the third installment of the trilogy, the play changes from a gore fest to a courtroom drama. What a revelation. We don’t have to slaughter each other. There is a way out.

This was the secular urge of the Greeks in its full glory. They would rely neither on the gods nor on brute force to settle things. No, reason and persuasion would decide the case. And we would be freed of the need for more killing, more revenge, and more horror. This was a way in, and I saw the way we would work in relevance to the students’ lives. I read the play, making marks and noting themes. But I still did not grasp the play in all its resonance. That would wait until the class began reading it aloud together.

The Cycle of Revenge

By the second day of class, we had begun reading *Agamemnon*. I’m always anxious to start reading aloud together and encounter whatever difficulties and confusions come up.

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Ορεσταια

So we plunged in, beginning to work our way along the Eagles translation—just noble enough but also accessible. The animal imagery jumped out at the students. The chorus describes the two commanders of the Greek forces, the brothers Agamemnon and Menelaus, as twin eagles, fierce and merciless. In fact, the chorus describes the vision of a seer, who spied two eagles swooping down and tearing open a pregnant hare, scattering her unborn babes on the ground in a bloody mess. “Eew,” exclaimed Angela, throwing back her tie-dyed scarf, “how gross.” Gross, yes indeed, but all I could think of with a certain amount of glee was, *it’s going to get much worse*.

They had yet to encounter the flashback, the story of how Atreus, the twin kings’ father, brought a curse on his house by engaging in a quarrel with his brother Thyestes and one day serving him a dinner in which he had cooked up Thyestes’ own children in a stew. They were captivated by the tale—this was no longer obscure Greek literature but an over-the-top horror story.

Now that they were involved with the play, the problem statement—the overriding issue—made its appearance. It seemed that all the horror was tied to an endless cycle of revenge. And teenagers know this paradigm only too well. How many times have the adults broken up futile fights and confrontations only to have the participants complain, “Well, he did this to me first,” or “But she did that to my sister.” Somehow payback was reason enough to do something stupid. Maybe Aeschylus could help us think about this pattern and how to break it. After all, the doomed people in the House of Atreus had plenty to be angry about, far more than a playground slight.

The main action of *Agamemnon* is that queen Clytemnestra kills her husband on his arrival back, victorious, from the Trojan War. Agamemnon was a leader of the Greek coalition fighting against the Trojans and has fought for 10 long years, only to be cut down the day he arrives home. Why the murder? Well, Clytemnestra was upset, to say the least, that her husband had sacrificed their beautiful teenage daughter, Iphigenia, to secure a safe ocean passage on the eve of the war. Then again, she also has a motive for killing Agamemnon’s new concubine, Cassandra, and installing her own paramour as the king. In the next play, *The Libation Bearers*, Agamemnon’s daughter and son, Electra and Orestes, avenge their father’s murder by killing Clytemnestra. In *The Eumenides*, Clytemnestra’s ghost and the avenging earth goddesses (the Furies) come after Orestes to kill him in vengeance for the matricide. Here, wise Athena intervenes and sets up a tribunal to stop the cycle of violence and determine a final and just resolution.

As we were reading the first pages, I gave the students the assignment to write a personal reflection. They were to tell a story, a narrative, about an example of a cycle of revenge—how people behave in loyalty to their own group by getting back at, and revenge on, the “outsider” or “other” group.

One of my students, Francisco, was always quiet and seldom responded to writing assignments. He came to class regularly but stayed out of discussions—sitting in the back

with his Dickies work pants, clean pressed white T-shirt, and short hair slicked straight back. This time he handed in something right away, and he was clearly in touch with the danger in the theme. He wrote,

The cycle of revenge is an extremely dangerous thing to be part of, and it has a lot of consequences for you and even your family. The Norteños and Sureños live the cycle of violence and revenge every day. The cycle never ends. It keeps going back and forth. Both sides are living the life of [*The Oresteia*].

The Norteños and Sureños can be extremely powerful when it comes to violence and revenge. There is this saying by the Norteños, “You take out one of ours, we take out 10 of yours.”

“And I say rush in now, catch them red-handed, butchery running on their blades.” I chose this quote [from *Agamemnon*] because many Sureños and Norteños get caught red-handed in their rivals’ turf. Some get caught red-handed by going to, and tagging on, their rivals’ turf. They can also get caught (slippin’) just being on your rivals’ turf. This happened to a lot of my friends. I heard stories of them getting jumped, stabbed, and shot by rivals. They also went back for payback, but they never think of the consequences. While getting paid back, sometimes the rivals come back and sometimes they don’t. But they come back some day, the cycle just never ends.

The stuff we were dealing with was real. Francisco dug right into the sense of futility and frustration engendered by the cycle of violence in his life and found pieces of Aeschylus’s writing that spoke directly to him. I only hoped that he could stay with it through all three plays, with the resolution, the breaking of the cycle, and the achievement of peace and a just society. Was it possible that he would be able to apply the Greek solution in West Berkeley?

Aysha, the slam poet and African-American radical of the class, took Francisco’s point, written in the privacy of his paper, and brought it into the discussion in the classroom. How do we understand revenge, even with kids on the playground? Is this something called human nature, or are we taught to do it? And isn’t revenge sometimes justified—either to teach the wrongdoer or to gain some satisfaction? But who is the wronged one? There always seem to be eight sides to every story.

Big thoughts, and, yes, Francisco and Aysha were right into them. The class was engaged, and I was holding my breath, hoping we could continue to surf this wave of interest.

Something about reading together, aloud, made all these new and fascinating connections jump out. Whereas academics read with a cool eye, high school students are fiercely present, always looking for the powerful connection to their lives. Aeschylus, the playwright, made them question their choices and their pride, made them wonder about impulsive actions and moderation, and made them consider the wisdom of their elders less dismissively.

We talked about theater, then and now. The earliest Greek theater festivals took place at the feast of Dionysus, the annual celebration of the harvest and wine, licentiousness, debauchery, wildness, and the unbridled id. The students were fascinated to hear about the tragedy competitions. Who says poetry is sullied by competition for money in slams? Such competition was good enough to create Aeschylus and Sophocles—not bad company. And of course each set of three tragedies was coupled with a comedy and a Satyr play.



The latter, a wild physical comedy filled with sexual parading (how about those six-foot-long phalluses for a theater?), are always fascinating to high school students. We never, of course, stage such plays as part of our appreciation of Greek culture.

We were drawn into a long discussion about gender, especially as we read *Agamemnon*, the story of the murderous wife. The chorus tells a flashback tale in which the goddess Artemis requires the sacrifice of Iphigenia, Agamemnon and Clytemnestra's beautiful 13 year-old daughter, for the storms to abate, and for the Greek ships to have smooth sailing to Troy. Aeschylus does not spare us the disgusting details. It's all there, the girl screaming, a gag stuffed in her mouth, her clothes torn off, her arms and legs bound, then the carving and the blood. And with his commitment to the requirement of war—a task of state, “men's work”—Agamemnon has violated the laws of home, hearth, the center of life, and “women's rights.”

The chorus, recounting the house gossip, laments, “A father's hands are stained, blood of a young girl streaks the altar. Pain both ways and what is worse? Desert the fleets, fail the alliance? No, but stop the winds with a virgin's blood? Feed their lust, their fury? Feed their fury! Law is law! Let all go well!” (I. 210).

So as we were reading, a new theme emerged—the men versus the women, the question of patriarchy. According to

one reading, *The Oresteia* explains that women's power (represented by Clytemnestra, as well as her earth goddesses, the Furies) must be overthrown—even if it is painful—for civilization to be established. In this play we see the struggle between the old, the communal, and the tribal society and the new imperial civilization of the polis. Just as the old earth goddesses, Gaia and the Furies, were overthrown by the Olympians Zeus and Apollo, so the mother-right must be overthrown for the men to carry out their imperial tasks.

But that neat story doesn't quite do justice to the unruly forces at work here. Clytemnestra's adultery, her maternal attachment to Iphigenia, and her murderous fury point to different directions, at least to modern ears.

There is something frightening in the women of *The Oresteia*. It is as if the men are afraid of the very passion, the very sexuality, of the women, and these must be controlled and repressed. Angela and Aysha pick up on this. Aeschylus even leveled the accusation that a strong woman, one who resists the sacrifice of her daughter, is not feminine enough. After Clytemnestra's first speech, the chorus leader remarks, “spoken like a man, my lady.” Maybe she's not so bad, the students argued; maybe she has a grievance that no one will listen to. How would the play look if a woman had written it?

And most strikingly to me, we grappled with death.

When Agamemnon returns victorious, Clytemnestra urges him to enter the palace by walking on the red tapestry, a long, embroidered royal rug she has prepared for him. In words rife with double meaning (foreshadowing the blood of Agamemnon that is about to flow), she says, as she rolls out the tapestry, “Let the red stream flow and bear him home to the home he never hoped to see—Justice lead him in” (I. 904). Agamemnon is anxious, not sure he should step on such a beautiful tapestry, afraid such an act would be too proud, too risky. He says, “What am I, some barbarian peacocking out of Asia? Never cross my paths with robes and draw the lightning [never deck me out like a god and attract the wrath, and lightning, of Zeus]. Never, only the gods deserve the pomps of honor” (I. 915). The comment on the “barbarian peacocking” refers to Mongol and Persian warriors who dressed in all their finery, with full makeup, when going to war.

Here, Clytemnestra has her way. With a combination of bullying and flattery, she persuades Agamemnon to go against his better judgment and act like a god. Ah, then his downfall is sealed. He steps out of his chariot onto the red tapestry, walks into his house, and is slaughtered in the bathtub by his wife.

At this point, the dramatic irony, as well as personal recognition became real for the class. Anthony remarked, “Yes, you can always try to avoid this error or that error. But we are human. We never know the future or what effect will be created by this or that action. So we are doomed to making the tragic error. Only the powerful ones, the arrogant ones, make the error in a big, loud, public way.”

The class seemed to resist the play. “Why is there so much death, so much slaughter in these things?” intoned Aysha. “Why is Western literature always about killing, suicide, and despair?”

"I'm not sure," I backpedaled. "Maybe it's because it would be boring to have a simply happy story, two people falling in love, walking off into the sunset, and living happily ever after. Where's the fun in that?" But there was more.

Jesse challenged me: "These guys are obsessed with death. Why?"

I wondered too. Maybe they knew death more intimately. Maybe we should too. Perhaps our sanitized lives, I suggested, where the infirm are sent away to die in isolation, allow us to live in denial. People gather in the theater and weep over the most extreme situations as a way of facing the terror of inevitable death together.

From a modern sensibility, the terror at our mortality, at our being lost to the world, is an existential crisis. It is the story of death, of how we face it or turn away from it. The Greek tragedies make us take a good long look at our mortality. Maybe on other days, engrossed in workaday trivialities, we don't think about death. But when we are most in touch with it, most aware, we look into the yawning abyss, and we quake. The class agreed to read on, this time with a bit less bravado.

Clytemnestra crows about her power and her husband's household, declaring her pride and hubris without hesitation. "Our lives are based on wealth, my king, the gods have seen to that ... and you are Zeus when Zeus tramples the bitter virgin grapes" (II. 96off). But the chorus is still frightened, still worried. "Stark terror whirls the brain and the end is coming, Justice comes to birth" (I. 998). The old men fear the specific horror about to happen but also bemoan the fate of all mortals, what Unamuno called the tragic sense of life, the fact that we must die: "But a man's life-blood is dark and mortal. Once it wets the earth, what song can sing it back?" (I. 1018).

Then Clytemnestra tries to entice Cassandra (Agamemnon's mistress and war captive, the daughter of Troy's Priam) to follow Agamemnon into the house. Cassandra is silent, and Clytemnestra quickly tires of trying to engage her and leaves. The chorus leader then speaks to Cassandra, trying to show pity and concern. Cassandra, however, was given the power of prophecy by Apollo and dreads going inside. Her first words are a half-mad scream, "Aieeeee! Earth—Mother—Curse of the Earth—Apollo, Apollo!" (I. 1071). She speaks with the leader, always emitting sharp cries and visions of the future as well as the past of the House of Atreus. This dramatic scene has Cassandra pitching herself around onstage, seeing the horrors of the future. "She is the snare," she cries, referring to Clytemnestra, "the bedmate, death mate, murder's strong right arm!" (I. 1117).

The chorus is confused by all of this and doubts the veracity of her words. Cassandra raises another concern of the Greeks that is familiar in our postmodern consciousness: What is true, what can we really know? The gods name things, and their words are true, but what words are we mortals to believe? "What good are the oracles to men? Words, more words, and the hurt comes on us, endless words and a seer's techniques have brought us terror and the truth" (I. 1135). Cassandra's vision becomes even more opaque, more surreal. She screams, "Flare up once more, my oracle!" and then she conjures a vision from hell, of dancing

Furies, legions of men killed in battle, blood for blood. She then describes, in horrendous detail, the feast at which Atreus (Agamemnon's father) served his unsuspecting brother Aegisthus his own children in a stew.

Cassandra predicts her own death but also knows that Orestes will return and kill Clytemnestra and her lover. "There will come another to avenge us, born to kill his mother, born his father's champion" (I. 1302). The leader asks the same question the students asked: "If you see it coming clearly, how can you go to your own death, like a beast to the altar driven on by god, and hold your head so high?" (I. 1320). Cassandra explains that her time has come, and it is best to go out with honor. She enters the house, where she smells death. She ends her time on-stage with an evocation of the existential dilemma: "Oh men, your destiny. When all is well the shadow can overturn it. When trouble comes, a stroke of the wet sponge, and the picture's blotted out. And that, I think, that breaks the heart" (I. 1350).

I asked students to do a freewrite on what they felt they had learned about Greek culture and values. Angela wrote:

Greek culture. Intense. If I lived there then, well, I guess I wouldn't live for very long unless I set up a mafia or something....

Greeks, if they saw so much death, why didn't they just stop? Clytemnestra killed because her daughter was murdered, but then to save her own neck she would have killed another one of her children (Orestes). Make any sense? No. Neither do the Greeks.

A culture based on love and hate, revenge, ruled by Zeus, whose servants are women. The men rule over everything, like dogs gone wild, killing whatever gets in their way. People have others as property, and the more property you have the better the people fight over property and power. And love and hate and lust. Life is a death sentence if you are in the family of Agamemnon.

It's a tradition, a traditional curse that falls upon houses struggling with one another for the power to be in control.

Death reaches people so extremely that that is all they can see. Death for death, life for life.

Well, gosh, I thought, maybe I have been having a different experience with these plays than the students. The Greek tragedies are painful, ghastly really. And many students commented that the Greeks seem to be reveling in death and destruction. Have I been teaching this stuff wrong? What about the soaring insights of the Greek concept of love? What about the noble ideas of humanism and science? Does it look to the class like a deadly world of mafia terror?

But when I looked further at Angela's wonderful reflection, written in a few minutes, I wondered. The tragedian has succeeded in weaving a picture of desperation, of despair, of the terrible downfall that mortals suffer. It is a world in which "men rule over everything, like dogs," and they fight over property and power. Well, this wasn't so unfamiliar. The dog reference fit, too, because some of these plays demonstrate the dangers of an unchecked id, the violence and selfishness of desire.

I am older and, at least by degree, closer to death. So I contemplate these things, the existential black hole we peer into, wondering if it does end in dust. Teenagers are famous

for living in an eternal present, seemingly immortal. But in reality they think about death all the time; they are just reaching the age where they can wonder deeply about it. Sometimes, perhaps, they want to look death in the eye and challenge it. Even though we adults shake our fingers at them and remind them of the dangers of fast cars, AIDS, violence, and cigarettes, sometimes they take these risks precisely to face down death, to dance with it, to challenge it, and sometimes to embrace it.

So Aeschylus has ground Angela's face in some pretty terrible thoughts. Great literature takes these thoughts out of the secret recesses of the mind and makes us take a good, hard look at them.

But on second thought, I could see that the Greeks had taken Angela somewhere else. They had made her cry out (as Athena does), "When does it all stop, the killing, the tragedy, the cycle of revenge? Who is the one with the strength to stop it?" Yes, that's the question. And she couldn't have done a better job of setting up *The Eumenides*, the denouement of the trilogy, the resolution of the cycle of revenge. For Athena calls a tribunal composed of a jury of mortal citizens to review the various crimes (complete with a prosecutor and a defense attorney, like an Olympian version of the TV show *The Practice*). And we put an end to the violence. We establish order and civilization and human rights.

No, we do not escape the horrors of death. Part of the story is the encounter with mortality and a search for order and peace and love.

By the end of October, we had finished with the plays and had moved on to other works, other texts, other discussions. But the story of Agamemnon, Clytemnestra, and the whole cursed House of Atreus remained as a reference point for the rest of the year. When we were studying Latin America, we dove into the magical realism of Pablo Neruda's poetry as well as the small Mexican novel *Esperanza's Box of Saints*, by María Amparo Escandón. This was far from the Greeks, to be sure, but again we encountered cycles of revenge, the women's critique of patriarchal power, and the grand mystery of death.

Seeing *The Oresteia* Onstage

The Berkeley Repertory Theatre presented Aeschylus's masterpiece a few months later. When *Agamemnon* finally opened, we were thrilled to be in the first student audience to attend the play. This play was performed at the new stage that the Rep had built, which they were inaugurating with the oldest surviving play. They performed the first tragedy on its own, and a week later they presented the other two, *The Libation Bearers* and *The Eumenides*.

When the day of the performance finally came, the whole class was excited. For students at a big school like Berkeley High, just getting off the campus is a treat. Yes, it was going to be a big old Greek tragedy, but they were ready, they knew what to expect. Except that they didn't, since the actors and directors impart so much to the performance.

We had gone over some of the main discussions, reread a few final papers, and discussed what to expect before heading to the theater.

The students filed into the new theater, a large venue with soaring seats that made everyone feel close to the front. The whole front of the stage was covered by a massive stone wall, representing the city of Argos. The students bent together and whispered, "Look, there's the watchman. Remember the beginning?"

As the play progressed, I became delighted with the production. I also kept looking back at the students to see what they were taking in. It was all there: "We must suffer, suffer unto truth"; "Our lives are pain, what part not come from god?"; "Words, endless words I've said to serve the moment—now it makes me proud to tell the truth"; "Call no man blest until he ends his life in peace, fulfilled."

The only thing the students could not abide was the depiction of Cassandra. She was the seer, a visionary who was cursed with the fact that no one would believe her. She was also a bit mad, a wild and crazy spectacle. And I had been told she would be completely naked onstage. When she emerged, the students were shocked and angry, but not by the nudity, which became secondary. No, what bothered them was how horrid, filthy, disheveled, and "torn up" Cassandra looked. They were expecting to see a brilliant seer, a beautiful concubine of Agamemnon, the sister of Helen. Instead, Cassandra looked like a refugee from the schizophrenic ward in the movie *One Flew over the Cuckoo's Nest*. The students looked scandalized.

Of course, the nudity was the director's choice. Cassandra staggered, bellowed, and screamed. The students, in turn, squirmed and mumbled ("Oh, no, that ain't right," one of them said). Well, they were learning; that is part of the theatergoing experience. You interact with what's onstage. You like one thing but don't like something else. Personally, I loved it and fought back tears through the whole ending—tears at the horror and beauty of it and at being there with a group of 16- and 17-year-olds taking in the whole spectacle.

When the final curtain came down, we heard thundering applause. Students clapped, stood up, laughed. Many had never been at a performance like this and were delighted to see the actors come back onstage, in their own identities now, smiling at the audience, applauding back, and taking bows in pairs, individually, and as an ensemble. *A good curtain call always makes a good play greater*, I thought.

But the real experience of those CAS juniors and *The Oresteia* was not that we could bring the classics to a group of diverse students. It was that a diversity of students could come to *The Oresteia* and bring everything—their concerns, their anger, their brilliance—and make it real and important, the way theater is supposed to be. The classics are not ossified, but our notion of how to teach them often is.

My experience with this group of students and *The Oresteia* convinced me that great literature is timeless not because it is inaccessible, but precisely because each audience, each generation, makes compelling meaning of the piece. And I'm certain that any students, from any background, can derive rich and important experiences from such works if he or she can get with the right group—a classroom, a family, or friends—to voyage out and discover the power of literature. □

Snowflakes

(Continued from page 25)

Eventually, the face centers become completely rough, and their growth is then limited only by diffusion. Soon after all this happens, the faces will no longer be able to keep up the pace and the hexagonal prism will sprout arms. Branching has won; instability kicks in.

The bottom line is that both faceting and branching are simultaneously important for determining snow-crystal structure. Furthermore, the interplay between these two growth mechanisms is complicated. It depends on temperature, humidity, and even the size and shape of the growing crystal. The delicate balance between these two forces gives snow crystals their tremendous diversity.

Thinking about Snowflakes

As a child watching the falling snow in North Dakota, I never imagined I would someday be thinking about the science of snowflakes. Now, having worked on the subject for many years, I still find it extremely rich and endlessly fascinating.

The physics governing snowflake growth touches on many topics, from the structure of crystals and their surfaces to the mathematical subtleties of self-assembly. A careful examination of the inner workings of a snowflake reveals much more than just a sliver of ice. The symmetric patterns demonstrate the spontaneous generation of complex struc-

tures in the physical world.

I whiled away the cold winters of my youth throwing snowballs and building frozen fortresses out of packed snow. Now I construct designer snow crystals in my laboratory, trying to gain insights into the molecular dynamics of crystal growth. There are many mysteries left. We currently don't understand the surface structure of ice in detail, or how it affects crystal growth.

So here we sit at the beginning of the 21st century and we cannot yet explain exactly why snowflakes are what they are. Snowflakes are full of surprises, and there are still some fundamental aspects of snowflakes we do not understand. A bit of mystery remains in these delicate ice structures.

One thing I've learned from my research is that snowflakes are fascinating little structures that are full of surprises. It is my desire that this article inspires you to look at snowflakes differently, to see them with new eyes. Perhaps the next time you find yourself surrounded by a gentle snowfall, you'll pick up a magnifying glass and discover firsthand the intriguing beauty of snowflakes. And should you find yourself examining one of these diminutive ice sculptures, I hope you pause to think about what snowflakes really are, where they come from, and how they are created.

There is a great beauty in a large, symmetrical stellar snow crystal. The beauty is enhanced by the magnifying lens that brings out the fine structures in the ice. The beauty is enhanced still further by an understanding of the process that created it. □

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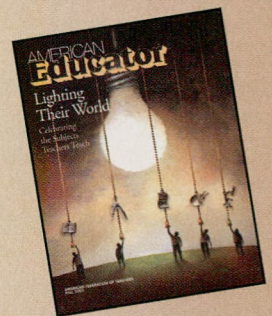
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