



The **BEACON** News from

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PRESIDENT'S MESSAGE

As I'm writing this, the latest threat to science education is being shown in movie theaters across the nation. It's called "Expelled: No Intelligence Allowed," and stars Ben Stein. The movie is a badly-edited hodgepodge of interviews of scientists both for and against "Intelligent Design," interspersed with scenes from Nazi Germany, the fall of the Berlin Wall, and animations of the inner workings of cells. If it was just entertainment, we could write the movie off as just another bomb like "Gigli" or "The Omega Code." However, the film is being heavily marketed to religious groups, and will negatively politicize the national dialogue regarding science education, in addition to energizing the Creationist base.

The basic premise of the movie was briefly published on the film's official web site as a "spoiler": "Many scenes are centered around the Berlin Wall, and Ben Stein being Jewish actually visits many death camps and death showers. In fact, Nazi Germany is the thread that ties everything in the movie together. Evolution leads to atheism leads to eugenics leads to Holocaust and Nazi Germany."

Stein, who is known for his role as the boring economics teacher in "Ferris Bueller's Day Off" and the host of "Win Ben Stein's Money," certainly does not have the science background to discuss evolution intelligently. On the March 17th 2008 edition of Pat Robertson's 700 Club, Stein said "Darwinism explains so little. It doesn't explain how life began. It doesn't explain how gravity works to keep the planets in their orbits. It doesn't explain how thermodynamics works. It doesn't explain how physics or the laws of motion work. No one has ever observed the evolution of a single mammalian species. They've observed evolution within species ... but a new species, no one's ever been able to observe that, or find a fossil record of it.... I think people want to suppress the idea of an Intelligent Designer - I call the Intelligent Designer 'God' - because they think if there's a God, I'm going to be held morally accountable..."

The movie begins with Stein passionately addressing students at Pepperdine University about the evils of "Big Science," and how scientists are denying Intelligent Design advocates their rights to free speech. This scene is the beginning of the film's

blatant deception and propagandizing, but hardly the end. As Michael Shermer wrote in a recent Scientific American report, "*The biology professors at Pepperdine assure me that their mostly Christian students fully accept the theory of evolution. So who were these people embracing Stein's screed against science? Extras. ... Members of the audience had to sign in, and a staff member reports that no more than two to three Pepperdine students were in attendance. ...*" Scientific American editors John Rennie and Steve Mirsky asked "Expelled" producer (and Albuquerque resident) Mark Mathis why biologist Ken Miller, who sees no inherent conflict between his scientific appreciation of evolution and his Catholic faith, was not included in the film. Mathis, after denying any responsibility for making decisions on who was or was not interviewed, answered "Ken Miller would have confused the film unnecessarily." Rennie responded by correctly pointing out that "...it would have considerably undercut the major point that is made ... that belief in evolution obliges you not to believe in God ..."

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Besides equating science with atheism, and blaming Darwin for the Holocaust, “Expelled” argues that pro-ID scientists have been punished and fired for simply “trying to follow the evidence where it leads.” The National Center for Science Education has hosted a new website devoted to systematically showing the truth behind the false claims in “Expelled.” This website, www.expelledexposed.com, notes that the film charges that “Richard Sternberg was ‘terrorized’ and that ‘his life was nearly ruined’ when, in 2004, as editor of *Proceedings of the Biological Society of Washington*, he published a pro-intelligent design article by Stephen C. Meyer. However, there is no evidence of either terrorism or ruination. Before publishing the paper, Sternberg worked for the National Institutes of Health at the National Center for Biotechnology Information (GenBank) and was an unpaid Research Associate – not an employee – at the *Smithsonian*. He was the voluntary, unpaid editor of *PBSW* (small academic journals rarely pay editors), and had given notice of his resignation as editor six months before the Meyer article was published. After the Meyer incident, he remained an employee of NIH and his unpaid position at the *Smithsonian* was extended in 2006, although he has not shown up there in years. At no time was any aspect of his pay or working conditions at NIH affected. It is difficult to see how his life ‘was nearly ruined’ when nothing serious happened to him. He was never even disciplined for legitimate violations of policy of *PBSW* or *Smithsonian* policy. ...”

The film also argues that Carolyn Crocker was fired for daring to mention ID at George Mason University. However, the NCSE site points out that “While there may have been grounds to fire her with cause, Crocker was not fired and continued to teach her course after student complaints; in addition, she did not just ‘mention’ intelligent design, but rather was teaching demonstrably false creationist material. ... The following are just a small sample of her erroneous and clearly creationist claims: * *Archeopteryx* [sic] is a bird (like an Ostrich), not a reptobird; * Only one complete fossil, and has been questioned as a fraud ...” Of course, *Archaeopteryx* was no simple “bird,” having several dinosaurian features such as sharp teeth, and a long bony tail. NCSE adds that “Contrary to what Dr. Crocker’s slide suggests, there are several well-preserved *Archaeopteryx* fossils, and while it is true that two non-paleontologists (astronomers!) claimed in the 1980s that the original fossil was a fraud, the allegation was quickly disproved. ...”

Perhaps the most serious and dangerous of the movie’s propaganda tactics is its laying of blame for the Holocaust on evolution’s door. However, as Anti-Defamation League National Director Abraham H. Foxman said of a similarly-themed production, the 2006 Coral Ridge Ministries film, “*Darwin’s Deadly Legacy*,” “Hitler did not need Darwin to devise his heinous plan to exterminate the Jewish people. Trivializing the Holocaust comes from either ignorance at best or, at worst, a mendacious attempt to score political points in the culture war on the backs of six million Jewish victims and others who died at the hands of the Nazis. ...”

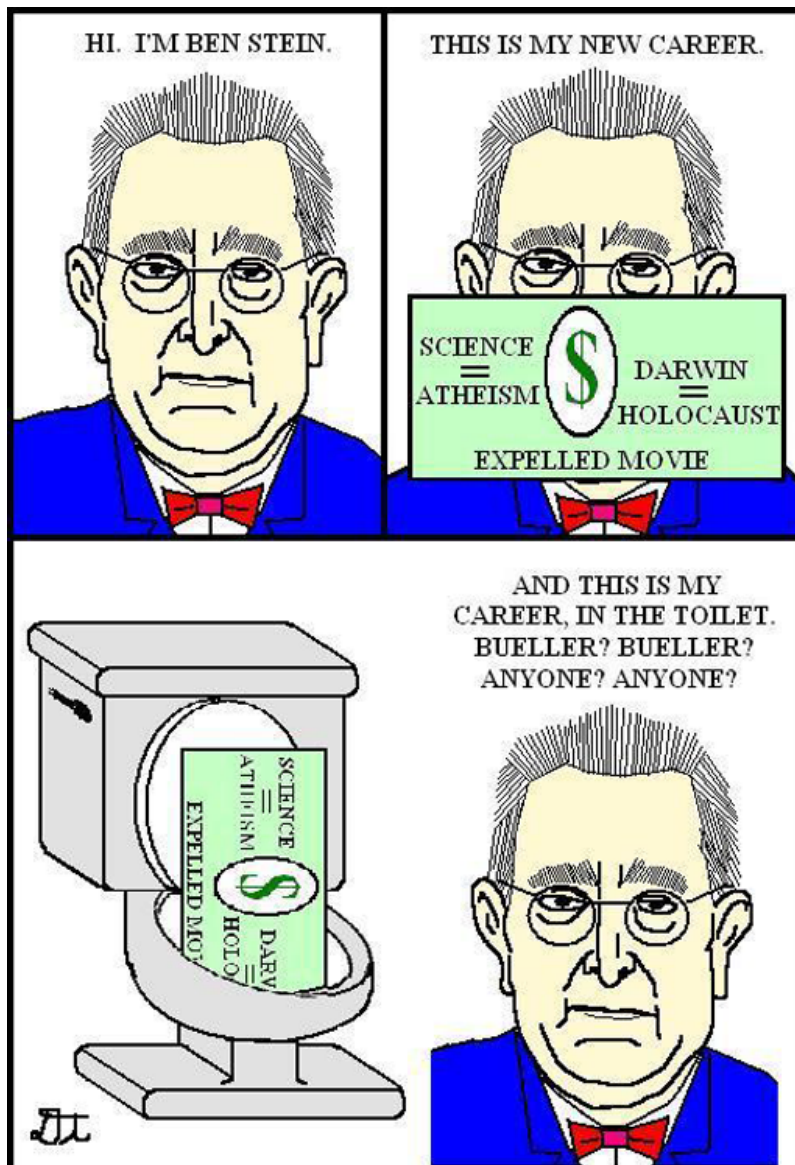
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ACTION ITEM If teachers at your school, or your children's schools, are asked to show "Expelled" in class, please oppose such misguided and unfair tactics. The excellent resources and discussions at NCSE's website, www.expelledexposed.com, are a good place to start. We can joke about "rotten tomatoes" all we like, and poke fun at the film's blatant plagiarism of Harvard/

XVIVO's cell animations and John Lennon's "Imagine," but the fact is that the release of "Expelled" marks a new and ominous downturn in the national discussion on the issue of creationism in public schools. It has already been used for marketing of creationist legislation in Florida and Missouri. Will New Mexico be next?

Dave Thomas
CESE President

Toon by Thomas



BOOK REVIEW**Explore Evolution: The Arguments for and Against Neo-Darwinism**

By Stephen C. Meyer, Scott Minnich, Ralph Seelke, Paul A. Nelson and Jonathan Moneymaker

Review by Dr. Rebecca Reiss, Associate Professor of Biology, New Mexico Tech.

The fourth annual Darwin Day celebration at New Mexico Tech included a panel discussion of *Explore Evolution*. The panel included geneticist Rebecca Reiss (Ph.D., Cornell University), ecologist Kevin Kirk (Ph.D., Dartmouth), and three geologists; David Johnson (Ph.D., University of Iowa), Penelope Boston (Ph.D., University of Colorado), and Donald Wolberg (Ph.D., University of Minnesota). All agreed that *Explore Evolution* is full of so many inaccuracies that it was difficult to decide where to start, but it is what is missing from the book that makes it extremely dangerous.

According to the Discovery Institute's Evolution News and Views Internet site (http://www.evolutionnews.org/2007/06/new_textbook_seeks_to_improve.html) *Explore Evolution* is appropriate for high-school teachers and their classes, home schools, the general public, and college-level courses, including advanced courses in evolution. The Discovery Institute insists the book provides "students with a rigorous college-preparatory curriculum in the life sciences that stresses critical thinking skills." A review of *Explore Evolution* by faculty at New Mexico Tech for Darwin Day 2008 demonstrated otherwise. This book is based on simplistic thinking, faulty logic, and misinterpretations of the scientific literature. Accepting the explanations put forth in *Explore Evolution* without critical analysis insures that students will *not* succeed in college-level science courses. For students who have a basic understanding of the scientific method, this book provides no useful content in their quest for understanding.

Explore Evolution was published by Hill House Publishers, of Melbourne and London and a video about the book that also highlights the authors' credentials is available on the book's web site (<http://www.exploreevolution.com/>) The lead author is Stephen C. Meyer (Ph.D., Philosophy of Science, Cambridge), director of the Discovery Institute's Center for Science and Culture. There are two microbiologists, Scott Minnich (Ph.D., Iowa State University), who is a Discovery Institute fellow, and Ralph Seelke (Ph.D., Clemson). Paul A. Nelson is another philosopher of Science (Ph.D., University of Chicago) and is also a fellow of the Discovery Institute. All these authors have published in peer-reviewed scientific literature, so it is surprising that they provide such gross misinterpretations of scientific principles; it is as if they want to ruin

science education. Jonathan Moneymaker is a technical writer who specializes in "making complex topics easy for the non-expert to understand." His credentials include working for the Walt Disney World Company. Together these five authors create a frightening fantasy world in which true scientific discourse is stifled unless it can be twisted to support their hidden agenda.

The subtitle of the book, *The Arguments for and Against Neo-Darwinism*, implies that it will include a discussion of the contributions to evolutionary science made by Gregor Mendel, the Augustinian Monk whose work with garden peas gave birth to the discipline of genetics. Although a fleeting discussion of basic genetics is included, Mendel is not mentioned by name, despite the fact that his research represents the 'Neo' in Neo-Darwinism. One can speculate as to why Mendel's work isn't the target of critical analysis, but perhaps it is just too ironic that a man of the cloth had the patience and passion to perform the experiments that changed biological science forever. *Explore Evolution's* other major omission is any mention of creationism, intelligent design, or divine intervention, which is surprising considering the direct association of three of the authors with the Discovery Institute. But on the other hand, the mission of the Discovery Institute, as outlined in the wedge-document (<http://www.antievolution.org/features/wedge.html>) is to replace scientific literacy with theistic beliefs, under the guise of intelligent design. *Explore Evolution* even has a biblical look since the figures are designated using a colon (i.e., Figure 1:12), as if they were citing chapter and verse.

Equivocation in the Introduction

In the introduction, Meyer and his colleagues inadvertently expose some of the tactics they use to deceive the reader. They point out that all terms must be properly defined, and they define equivocation as "when someone uses the same word in more than one way" (p.7). They give the following example: "A law can be overturned by the courts or by the legislature. Gravity is a law. Therefore, it can be overturned." (p.8)

Their next example of equivocation (and obfuscation) should have been the often-quoted mantra, "Evolution is *just* a theory." This confuses the scientific definition of theory with the more generic definition meaning

speculation. Instead, they chose as their next example of equivocation the charge that scientists define evolution three different ways: “change over time,” “universal common descent,” and the “creative power of natural selection.” While change over time is a great definition of evolution, universal common descent (more properly, last universal common ancestor) is a concept developed by mathematically modeling past genetic changes based on current diversity. Natural selection refers to a collection of mechanisms that drive evolution. Evolution defined as change over time is accepted as a natural process by the authors, which suggests that there may be some common ground for discussion. However, universal common descent and natural selection are subjected to what is described as critical analysis, but is actually ridicule and misrepresentation.

Despite the earlier admonishment that all terms must be properly defined, the term polyphyletic is distorted in the text. Their definitions are “one view” for monophyletic and “many views” for polyphyletic, which allows them to claim that a polyphyletic view involves an orchard made of multiple trees that are not connected (Figure 1b). An example of equivocation in *Explore Evolution* is that more correct definitions of polyphyletic and monophyletic are presented in the glossary. The true definition of polyphyletic (Greek for *of many races*) is a group of organisms that does not contain the most recent common ancestor of all members, as opposed to a monophyletic (*of one race*) group, where all members *are* descended from a common ancestor. An example of a polyphyletic group is warm-blooded animals, which comprises mammals and birds (Figure 1a), but not groups in-between. Birds and crocodiles are a monophyletic group. Another way to think about this is to consider brothers and sisters as a monophyletic group because they are related to the same parents. Cousins, on the other hand, are polyphyletic since they are related to different parents. These terms are relative and require exact definitions of the groups, since a collection of cousins can be considered monophyletic when compared to a distantly related family.

Both polyphyletic and monophyletic groups must have ancestors for this term to be correctly applied. Their misrepresentation of the polyphyletic concept allows the authors to claim that scientists, such as Carl Woese “differ on how many trees one should expect to find in the ‘orchard’ of life”(p.11). Dr. Woese’s research supports the theory that multiple cell types arose from the non-living world, but the first cells, by definition, do not have ancestors. If they presented the tree proposed by Dr. Woese (http://en.wikipedia.org/wiki/Carl_Woese), their

deception would be far too obvious. These are just a few of the problems in the nine-page introduction.

The misrepresentation of scientific concepts continues throughout the sections on the “arguments for and against universal common descent” and the “creative power of natural selection.” The case “for and against common descent” includes selective and misrepresented evidence for “fossil succession,” “anatomical homology,” “molecular homology,” “embryology,” and “biogeography.” This is followed by chapters on natural selection and mutation. Molecular machines are presented as a new challenge, and special studies include a discussion of survival of the fittest and “what fossils can’t tell you.” The book concludes with a discussion of the nature of dissent in science. There are far too many factual problems to be presented here, and the Darwin Day panel discussion focused on a few points, then turned to a search for common ground.

The fossil record misrepresented

Most of the criticisms leveled by the authors completely miss well-supported principles of evolution; apparently they do not understand the basic concepts. A striking example of this is in the fossil succession chapter, where Fig 1:5 (p. 22) and Fig 1:12 (p. 36) have drawings that are supposed to represent the tree of life. The most obvious problem is that the trees are not labeled, preventing any understanding of the appropriate use of phylogenetics, systematics, or taxonomy. Any pupil knows the importance of properly labeling diagrams. Without labels, these trees appear to be random patterns, so these figures have no scientific or educational value. The authors ignore modern data and refer to scientific literature more than 15 years old as “recent” (p. 20). The irony is that 15 years ago, there were *fewer* gaps, because every time a new transition fossil is confirmed a gap is filled, but new gaps are formed at both ends. This cannot be used to discourage the next generation of paleontologists.

Most of the criticism in the book is aimed at Charles Darwin and at contemporary scientists who point out fatal logical flaws in the rhetoric of the Discovery Institute. We know that Darwin had some aspects of evolution incorrect, partly because he did not have access to modern scientific methods. But he was right about so many other aspects. If you extract Darwin’s work from current knowledge in the field, conclusions will still be the same, and he was one of the first to integrate findings from a wide array of disciplines. The authors constantly brand scientists with whom they disagree as “neo-Darwinists.”

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Bacterial flagella again

The complexity of the bacterial flagellum is fascinating, but the idea that it is an “irreducibly complex” collection of proteins suggests that no new information can be gained by further investigation. But those who continue to study flagella and other molecular motors have found a related collection of proteins that form a needle which pathogenic bacteria use to inject toxins. This evidence against irreducible complexity is described in *Explore Evolution* (p 119-120), but is dismissed as a “vague generalization” made by neo-Darwinists such as Brown University’s Ken Miller, whose testimony in the Dover, Pennsylvania trial was instrumental in the case against the creationist textbook *Of Pandas and People*. In addition the authors use a quote from H. Allen Orr’s essay entitled *Darwin v. Intelligent Design (again)* to support the notion of irreducible complexity (p 121). This is an incredible distortion, since the subtitle of this commentary is “*The latest attack on evolution is cleverly argued, biologically informed—and wrong.*” (Boston Review, December/January 1996-1997: 29).

Turning Sheep into Sheepdogs

Here is yet another outrageous statement from *Explore Evolution*: “For the critic [of natural selection] the question is not whether sheep can become woollier sheep; the question is whether sheep can eventually become sheepdogs” (p. 90).

The problem is, sheep turning into sheepdogs would not be an example of natural selection; it would be an example of divine intervention. Short of this occurring, what would it take for critics of natural selection to accept it as a scientifically significant process that we are still investigating? This question dominated the conclusion of the Darwin Day 2008 panel discussion; “Is it possible to find common ground so that dialogs regarding serious bioethical issues can be discussed by a well-educated society?” One possibility is to invite critics of evolution to the Fifth annual Darwin Day symposium at NMT to tell us what it will take to convince them that evolution is a solid scientific principle that doesn’t require a leap of faith, but can be proved.

Conclusion

There is a clear cycle of misinformation in *Explore Evolution*. First, a well-supported evolutionary concept (such as polyphyletic) is defined incorrectly, allowing

peer-reviewed research to be twisted so it appears to be opposed to evolutionary science. Second, scientists responsible for this research are considered allies in the alternative views, most often through the endnotes in each chapter. Other scientists are branded as neo-Darwinists who are out to squash any dissent. The reader is given no alternatives but is lead to the abyss of intelligent design through misinformation. *Explore Evolution* should be shelved under fiction.

ACTION ITEM

If you find *Explore Evolution* in a school library, insist that the library order the National Academy of Science 2008 publication *Science, Evolution, and Creationism* (www.nap.edu). This publication provides a balanced view of evolutionary science that can inspire the next generation of scientists.

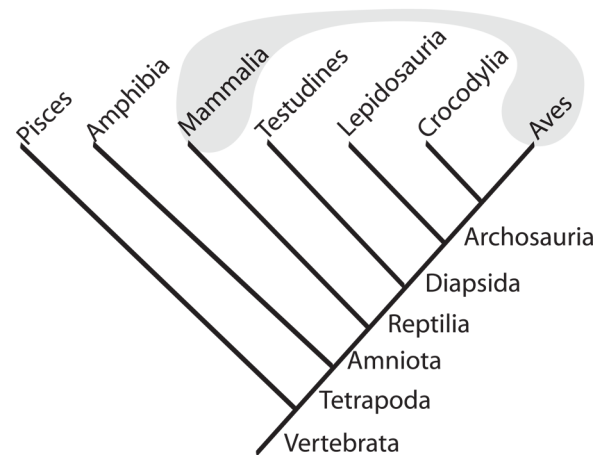


Figure 1a. The accepted definition of polyphyletic are demonstrated in this figure, Mammalia and Aves (birds) are polyphyletic, but Aves and Crocodylia are monophyletic. (<http://en.wikipedia.org/wiki/Polyphyletic>)

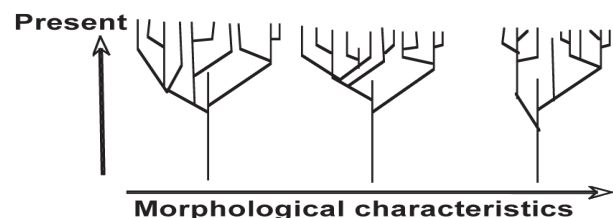


Figure 1b. The Meyer et al definition of polyphyletic, which they also call the “orchard view.” The branches of the trees are never identified. (Modified from Meyer et al., 2007)

ECONOMIC VALUE OF EDUCATION

It is widely recognized that education eventually pays off. Lifetime earnings of college graduates are known to be higher than the earnings of those with only a high school diploma. However, young people are typically less interested in the late rewards than the rewards as young adults. Does a college education pay off in the first ten years after graduation? Families are often most interested in knowing whether they can possibly afford to send a son or daughter for a full four years of college.

The cost does seem prohibitive for the average family. The average cost of admittance for a full-time student at a public four-year college in 2004 was \$15,100 per year. That is a total outlay of \$60,400, at least. If one adds in the student's lost wages for four years (\$26,800 per year for a typical high school graduate) the cost becomes \$131,200. Very few families can manage an outlay like that!

Actually, hardly anyone pays the full amount. Grants and loans help to ease the burden. The average access cost for a low income family is \$6,000 per year, and even the average high income family has some assistance and pays \$11,600. The amount is still more than most families can afford. Usually the solution is to work part time. This could mean stretching school to more than four years, but could be the only solution. Another solution, which is entirely under the control of the student, is to work very hard in high school and get a full scholarship.

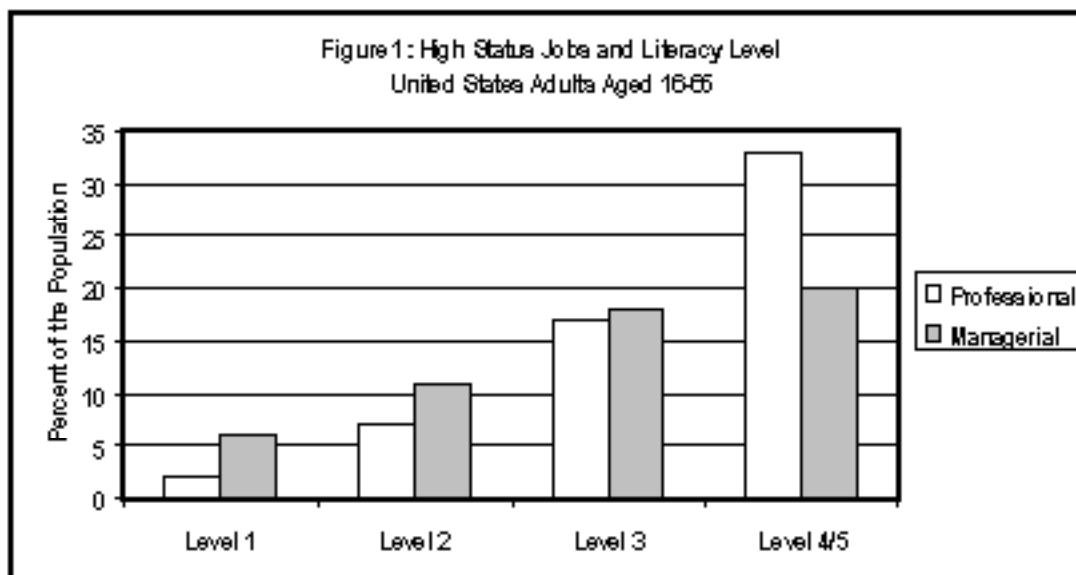
The average annual income with a bachelor's degree in those early years (25 to 34) is \$16,300 greater than for high school graduates of the same age. Over the first ten

years the college graduate has a net profit of \$31,800 for the average low income family, or \$9,400 for even a high income family. Of course, the lifetime payoff is much greater.

If a full four-year degree granting college is completely out of reach, a two-year institution might be a solution. The annual costs are lower, \$9,800 before offsets and an average of \$7,700 after grants and loans. The average family will have to plan ahead, but the cost is certainly more attainable by the average family. Unfortunately, the payoff is less attractive. The average difference above the wages of a high school graduate is only \$4,400 per year for the early years. If lost wages during two years' attendance are included, an early payoff could completely disappear.

Without consideration of degrees, there is a payoff for simply working harder in high school. The International Adult Literacy Study tested literacy of representative samples of adults aged 16 to 65 in 12 nations including the United States. Scores were assigned to five levels. Level 1 is the most basic literacy. Those at Level 1 can find information in simple text, but only if they already know what they are looking for. This would be roughly equivalent to the "below basic" level in NAEP. Levels 4 and 5 can synthesize information from lengthy complex texts and draw correct inferences. Level 5 is roughly similar to the "advanced" level in NAEP.

Students who truly apply themselves in school can achieve higher literacy levels. Figure 1 shows the fraction of the



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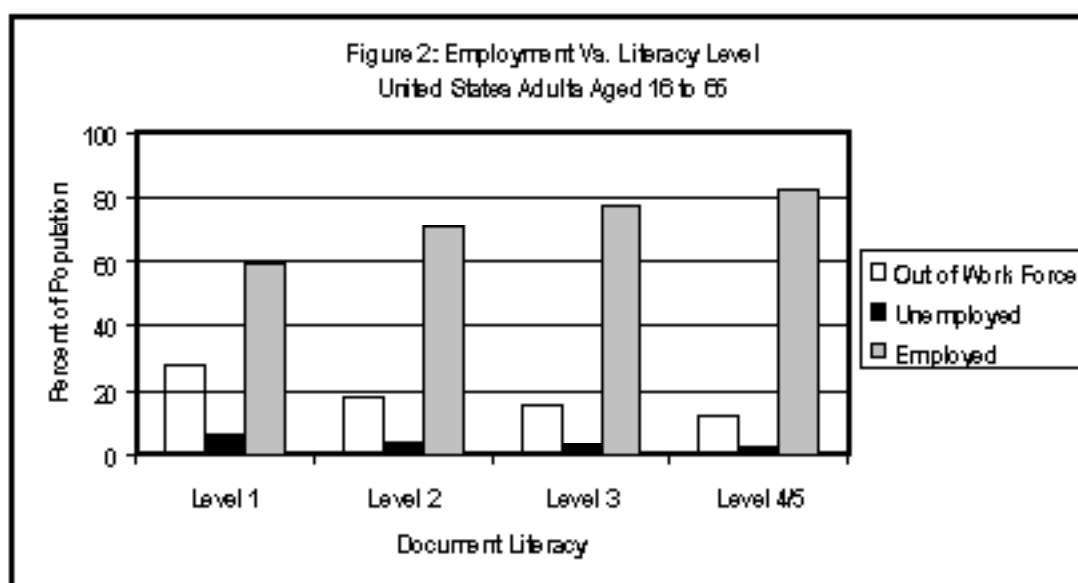
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population at each literacy level who hold high status jobs (professional or managerial.) There is almost no chance for someone with low literacy skills to ever achieve a high status position. At the highest skill levels over half of adults are in high status positions.

Figure 2 shows that the fraction employed in any capacity is closely related to literacy level. At the lowest literacy level more than one-third of the working age population is either out of the work force or unemployed. At the highest literacy level only about 13% are in that group.

The payoff from a college degree begins in the first years after graduation and is even greater in later years. The

cost can be too much for low income families even with the usual grants and loans. Good study habits and hard work in elementary and secondary school can help the cost feasible by getting full scholarships. This will also increase the payoff. Hard work and attention to gaining high literacy skills can make the highest status positions available, but they are almost out of reach for those with low or modest skills. High literacy skills also greatly increase the possibility of full employment. There is a definite early as well as lifetime payoff for good education.



Walt Murfin
CESE Statistician

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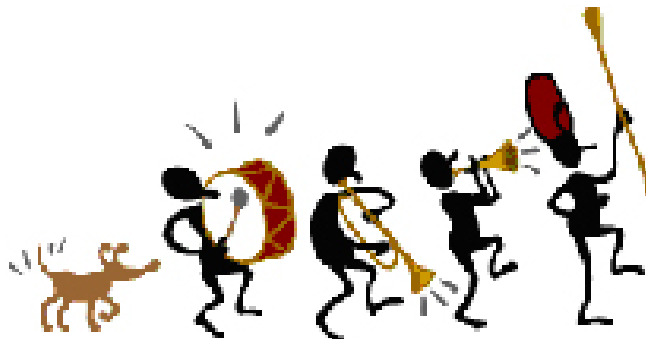
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CESE ANNUAL MEETING Free and open to the public

Saturday, June 21, at 1-4 PM

MAXWELL MUSEUM LECTURE HALL (Room 163).

The meeting will include a presentation by noted Darwin actor Brian "Fox" Ellis of Fox Tales International (www.foxtalesint.com).



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