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Editorial

C. Garland Dulan

Future Directions in Higher Education

The staff of the General Conference Department of Education (GCDOE) serves the Seventh-day Adventist Church by providing consulting services to the church’s schools, colleges, and universities worldwide. In collaboration with the education directors of each division, the GCDOE has concentrated on strengthening educational programs at the tertiary level.

Currently, the Adventist Church’s education system includes more than 5,000 primary schools, some 1,200 secondary schools, 103 colleges and universities, 37 worker-training schools, and more than 58,000 teachers instructing almost 1.2 million students. The unprecedented growth during the past decade from about 50 tertiary institutions to more than 100 has raised several challenges—maintaining focus on the mission, goals, and objectives of the church, securing qualified and committed teachers, and ensuring that students learn the essential concepts and skills to function successfully in today’s world. Most important is the need to ensure that students have an opportunity to become better acquainted with God and to make a decision regarding their future destiny. Without this focus, there would be no point in the Adventist Church operating such an expensive educational system.

The growth of our schools brings with it new opportunities for mission, since the largest area of growth comes from the enrolling of non-Adventists. In 2001, of the 120,000 new students entering the system, more than 60 percent were non-Adventists. We must ensure that the environment maintained by our schools is overtly Christian and Seventh-day Adventist. For this reason, over the past several years, the GCDOE has placed greater emphasis on the development of spiritual master plans and on the integration of faith and learning.

In the future, the GCDOE will emphasize (1) strengthening the faith and learning components of our system; (2) assessing how well the mission, goals, and objectives of our institutions are accomplished; and (3) ensuring that the mission of the Seventh-day Adventist Church is being fostered through our schools’ educational programs.

Through collaboration, we will seek to involve a larger audience in the consultative framework in which the GCDOE operates. We plan to become better informed and thus more capable of processing information and providing service. Though our major emphasis will continue to be higher education (unions and conferences focus on secondary and elementary education), we are, after all, one Adventist educational system, not two or three.

The GCDOE plans to continue its two current publications: the Journal of Adventist Education and Dialogue, and to expand the Adventist Professionals Network (APN) whose database already contains information on more than 3,500 Adventists with academic degrees and specialties of interest to Adventist employers. We will continue our international conferences for tertiary administrators. Undoubtedly, some new initiatives will grow out of recommendations and actions by the Commission on Higher Education, whose report is due in October 2003.

In the near future, a number of changes will be taking place: Some internal processes of the GCDOE will need revision, along with accreditation guidelines; new linkages will need to be developed with other church entities; and we will need to devise more effective methods of information sharing. These adjustments will enable the GCDOE to be more useful and user friendly to the church in strengthening our education system and furthering God’s kingdom. We enlist your support in accomplishing these goals and welcome your suggestions.

On January 1, 2003, C. Garland Dulan became the World Director of Education for the Seventh-day Adventist Church. He previously served as an Associate Director of Education at the church’s world headquarters and as Provost at La Sierra University in Riverside, California.
The expressions “act naturally,” “found missing,” “plastic glasses,” and “giant shrimp” are known as oxymorons—expressions that in their superficial or literal meaning are self-contradictory or absurd. Does the term “institutional grace” also fit that definition?

The nature of grace is accepting and forgiving, while the nature of an institution is to establish by using rules, policies, and regulations.

Grace is a product of the unconditional love and acceptance of God. To give grace to others means to live toward them as God lives toward us—that is, being forgiving, loving, and accepting. Grace accepts you as you are, shortcomings and all, while an institution is more likely to accept you when you measure up.

The word institution comes from the root word “to stand” or to establish. The institution is organized by people who “stand” for something and who wish to perpetuate their convictions. Therefore, they establish policies and standards. In order to ensure that their convictions persist into the future, they “institutionalize” their ideas. The result? Institutions develop church manuals, policy manuals, student handbooks, and education codes.

This brings us to the question, “Is it possible to communicate a loving, warm, accepting God in an institutional setting? Is ‘institutional grace’ an oxymoron?”

It’s the age-old challenge of balancing law and grace. When do you apply the law, and when do you extend grace? I heard a story about a woman who had a child out of wedlock, and the church extended grace by welcoming her into its fellowship. They gave her a shower and helped her extensively as she cared for her new baby. The result? She had another child out of wedlock. When are we enablers, and when are we truly extending grace?

Imagine Moses, the institutional leader, saying: “Lord, these children of yours have built a golden calf. I think that this is really a problem of environmental depravity caused by their poor home condi-

**Grace accepts you as you are, shortcomings and all, while an institution is more likely to accept you when you measure up.**

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**Institutional Grace – An Oxymoron?**

By Gordon Bietz
tions in Egypt. Please don’t hold them responsible for these actions."

Law and Grace in the Early Christian Church
The early church leaders sought to find that balance between the application of law and grace: “Some men came down from Judea to Antioch and were teaching the brothers: ‘Unless you are circumcised, according to the custom taught by Moses, you cannot be saved’” (Acts 15:1, NIV).1

They were saying that salvation required the performance of certain Jewish rites; it mandated certain rules. “You can’t abandon the standards given to us by Abraham!” they exclaimed. They had a major disagreement about which rules and regulations were prerequisites for salvation.

“This brought Paul and Barnabas into sharp dispute and debate with them. So Paul and Barnabas were appointed . . . to go up to Jerusalem to see the apostles and elders about this question” (Acts 15:2).

We live in an age of independent individualism that generally thumbs its nose at institutional rules. Its response to church and school is: “I don’t care what you say. I am my own person, and you shouldn’t presume to restrict my liberty.”

We can learn something from Paul’s response to this dispute in the early church. Why did Paul go to Jerusalem? It is because he cared about the community. The institution was important to him. What “the brethren” had to say mattered to Paul.

“When they came to Jerusalem, they were welcomed by the church and the apostles and elders, to whom they reported everything God had done through them. Then some of the believers who belonged to the party of the Pharisees stood up and said, ‘The Gentiles must be circumcised and required to obey the law of Moses’” (Acts 15:4, 5).

If you translated this into a contemporary setting, it might read, “Then some of the believers who belonged to the conservative party stood up and said, ‘We must not allow anyone who eats meat or wears jewelry to join the church.’”

The apostles and elders met to address this question. Considering the relationship between Jews and Gentiles at this time, this was probably a fierce discussion. The Jews had traditions that led them to consider the Gentiles as heathen. According to Jewish law, you didn’t marry them, you didn’t eat with them, and you didn’t enter their houses. Now, all of these “heathen” were accepting Jesus and joining the church. I am sure that the Jews who had been following God all along said that the standards were falling. In defending their views, they quoted the Old Testament rules about circumcision.

“After much discussion, Peter got up and addressed them: ‘Brothers, you know that some time ago God made a choice among you that the Gentiles might hear from my lips the message of the gospel and believe. God, who knows the heart, showed that he accepted them by giving the Holy Spirit to them, just as he did to us. He made no distinction between us and them, for he purified their hearts by faith. Now then, why do you try to test God by putting on the necks of the disciples a yoke that neither we nor our fathers have been able to bear? No! We believe it is through the grace of our Lord Jesus that we are saved, just as they are’” (Acts 15:7-11).

Thus, in the early development of the institutional church, Peter applied grace. James summarizes the decision at that first General Conference session:

“When they finished, James spoke up: ‘Brothers, listen to me. Simon has described to us how God at first showed his concern by taking from the Gentiles a people for himself. . . . It is my judgment, therefore, that we should not make it difficult for the Gentiles who are turning to God’” (Acts 15:13-19).

The basis of the decision was not a string of quotations from the Old Testament. The Judaizers were doing that. The leaders didn’t get out the policy book, the church manual, or
the student handbook. James expressed what seemed to be the consensus of the group after their discussion. And that consensus was expressed in six words: “We should not make it difficult!”

Human institutions tend toward making things difficult, toward being exclusive. We like to belong to a privileged group and to be chosen for the platinum credit card and the first-class upgrade on the airplane flight. The party of the Pharisees wanted to use their “club” to elevate their exclusivity.

Rules and Relationships
What does “Don’t make it difficult” mean in an institutional setting? I would suggest it means rational rules mediated by relationships. If institutional rules are understandable and explainable to a reasonable person, then they are not difficult! Notice I said “a reasonable person.” (I know that we don’t always deal with reasonable persons.) Adventist institutions are presented with a complex task. On the one hand, we must uplift the gospel, the story of salvation, freely given and not behavior dependent. On the other hand, we must accomplish this task in a social setting that requires a rather long list of behavioral standards.

Discipline is necessary for every institution, including schools. No group can achieve community unless it holds some things in common, unless it has discipline. But the human inclination is to apply punishment, not discipline. Discipline is redemptive, whereas punishment is punitive. In a disciplined community, the members express responsibility for one another by making sure correction is applied redemptively.

Postmodernism defines reality and truth as personal preference rather than external standards. It says: “What you do is none of my business—until it begins to hurt me!” This selfishly focused individualism is destructive and tears down community.

Categories of Rules
I believe dividing rules into three categories can help us understand our task.

1. Some behavior standards are integral to our doctrinal beliefs. Rules relating to Sabbath activities and co-educational dorm rooms would fall under this category. They are an expression of fundamental church teachings, are supported by Scripture, and must be considered non-negotiable.

2. Some behavior standards grow out of our religious cultural heritage. Among other things, these include wearing jewelry and attending movie theaters. We refrain from or embrace these items because they form a part of our image—this is who we are. They are part of our conservative religious tradition. I believe it is within the right of the institution to apply these behavior standards in its own setting. However, when we explain these rules to students, we should make it clear to them that salvation does not depend on adherence to these
rules. The rules simply reflect our corporate culture and how we wish to represent ourselves. We don’t exclude people from the church nor do we make judgments about them if they don’t follow these rules, but in the small community of a school, we have decided to adopt certain policies. It is rather like requiring everyone to wear uniforms.

3. Some behavior policies are necessary rules of engagement for situations when adolescents and adults are living in close proximity. These include such things as where you are allowed to park your car, what time the cafeteria serves lunch, when the dorm closes, and whether you’re allowed to eat in class or at the library.

In order to create rational regulations, we need to understand these categories of rules. It is important that we don’t seek to place heavy moral implications on transgression of behavior standards that are simply institutional or cultural norms.

Of course, even when administrators feel they have a good rationale for a rule, students and parents may not agree. So in the end, it is the relationship that balances law and grace. The Old Testament provides us with a perfect illustration. The Shekinah glory or presence of God resided in the Mercy Seat above the tablets of the law. It was there that mercy and law joined. The presence of God brought them together. In New Testament times, Jesus showed us through His life and teachings how to combine law and grace. He died to uphold the law but also to give us grace.

And so in the setting of Christian education, we have incarnational teachers, deans, and administrators who combine law and grace in their lives. They model living the rules and loving the students. The institution does not communicate grace either by throwing out the rules or making them innocuous. It communicates grace by having grace-filled people, those who have experienced the gospel in their own lives, mediate the rules of institutional life.

**Melting and Molding**

We first must melt students with our love before we can mold their opinions. Too often, we seek to mold their opinions before we melt them—and they rebel. Through loving relationships, we can unite grace and law. The chart below illustrates the grace-full school.

M. Scott Peck says: “The Church likes to refer to itself as the ‘Body of Christ.’ But it behaves as if it thought it could be the Body of Christ painlessly, as if it could be the Body without having to be stretched, almost torn apart, as if it could be the Body of Christ without having to carry its own cross, with-

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<td>Law</td>
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out having to hang up on that cross in the agony of conflict. In thinking that it could be thus painlessly the Church has made a lie out of the expression the 'Body of Christ.'"

Being an institution that represents God’s grace and law means being the body of Christ. It is an incarnational experience that requires, as Peck says, carrying the cross, which is often painful. To avoid pain, we go to one extreme or the other—legally applying every rule to every student or simply looking the other way while pretending that we are applying grace.

At the beginning of this article, we used Moses as an illustration of someone who would not ignore the sins of the Israelites when they worshiped a golden calf. He carried out some very severe punishment. But when God suggested to Moses: “I have seen these people, . . . and they are a stiff-necked people. Now leave me alone so that my anger may burn against them and that I may destroy them. Then I will make you into a great nation” (Exodus 32:9, 10), Moses manifested the love of a true leader. He “went back to the Lord and said, ‘Oh, what a great sin these people have committed! They have made themselves gods of gold. But now, please forgive their sin—but if not, then blot me out of the book you have written’” (Exodus 32:31).

Moses mediated the law with such love that he was willing to relinquish his own salvation for the people he served. That kind of love will always communicate grace, even in an institution with many rules.

And, of course, Christ is our ultimate example. He took the ultimate step of identifying with humanity—He became one of us. “The Word became flesh and made his dwelling among us” (John 1:14).

So, is institutional grace an oxymoron? No, unless the people of the institution are not incarnational representatives of Jesus and His love. In the early church, we have a picture of what happens when Christians don’t represent Christ.

“But the early Christians began to look for defects in one another. Dwelling upon mistakes, giving place to unkind criticism, they lost sight of the Saviour and of the great love He had revealed for sinners. They became more strict in regard to outward ceremonies, more particular about the theory of the faith, more severe in their criticisms.”

When they lost sight of the love of Jesus, they became strict about outward ceremonies and more concerned about the theory of the faith than about the love of God. When Christ is incarnate in the lives of the administrators and teachers of the institution, we will truly have institutional grace.

Dr. Leonard Brand tells a story of one of his leprosy patients named Pedro. For 15 years, Pedro had lived with no pain sensation in his left hand, yet somehow the hand had suffered no damage.

Pedro revealed that when he was born, he had a birthmark on his hand. The doctors verified that a tangle of arteries brought extra blood to that spot. As a result, the blood flowed swiftly through that part of his hand, keeping its temperature close to that of the heart, too warm for the leprosy to flourish.

So it is with our schools. When we keep our students close to our hearts in love, grace and law flourish together, and we can truly model “institutional grace.”

Dr. Gordon Bietz is President of Southern Adventist University in Collegedale, Tennessee.

NOTES AND REFERENCES
1. All Bible texts in this article are quoted from the New International Version.
A round the world, too many children are growing up vulnerable to deadly and preventable diseases. In the U.S., misinformation or lack of information are the main reasons so many children are unprotected. In developing countries, children’s vulnerability to preventable diseases is due to a variety of factors such as underutilization of existing services, unavailability of vaccines, and cost. These deficiencies have led to such a dramatic drop in immunization/vaccination rates that many experts believe preventable illnesses such as measles, whooping cough (pertussis), diphtheria, tetanus, polio, chickenpox (varicella), and tuberculosis will soon again become a real threat. In fact, more than 70,000 Americans of all ages (and some two million children in other countries) continue to die each year from preventable diseases, and many more suffer needlessly.

It is estimated that immunizations have prevented more than three million childhood deaths annually from measles, neonatal tetanus, and pertussis, along with more than 400,000 cases of polio. For this decade, the global disease control goals set by the World Health Organization (WHO) are to reduce measles morbidity by 90 percent and measles mortality by 95 percent; to eradicate poliomyelitis worldwide, and to eliminate neonatal tetanus.

This article seeks to inform teachers and educational administrators about the importance of immunizations in preventing potentially deadly diseases in children and adults. We will first discuss how vaccines work to protect the body from disease, and the immune system’s response once the body is exposed to infectious agents. We will also discuss vaccine recommendations in the U.S. and interna-

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tionally, describe the risks and benefits of immunizing, along with some of the consequences of contracting various vaccine-preventable diseases, suggest school immunization policies, and advise how to respond when parents object to immunizing their children. It is not our intent to be judgmental, only to present the facts.

**The Body’s Fight Against Disease**

**The Immune System:** Our bodies were designed with wonderful defense mechanisms against infectious diseases. The skin acts as a major barrier to germs. Its lubricating oils, along with saliva, sweat, and tears, contain bacteria-killing chemicals. Impairment of these defenses affects the body’s ability to fight disease. For example, when a cut breaks the protective barrier, germs and viruses can attack and cause infection. In certain circumstances, like immune system deficiencies, the body may be overwhelmed by diseases that it would otherwise be able to combat successfully.5

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<th><strong>Glossary of Terms</strong></th>
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<tr>
<td><strong>1. Immune system</strong>—“the internal organs, tissues, cells, and mechanisms that protect the body against disease by producing antibodies against foreign bodies (antigens).”</td>
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<td><strong>2. Immunity</strong>—“the state of being not susceptible to a particular disease or infection.”</td>
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<td><strong>3. Antibody</strong>—“a specialized protein produced by the body that combines with a specific antigen; antibodies play the central role in immunity to specific pathogens.”</td>
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<td><strong>4. Antigens</strong>—“any of a number of substances—including toxins, foreign proteins, and microorganisms—which, when introduced to the body, cause antibody formation.”</td>
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<td><strong>5. Vaccines</strong>—are created by using inactive or weakened antigens. They provide immunity by “inducing a mild infection that triggers the body’s own natural immune defenses.”</td>
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<tr>
<td><strong>6. Vaccinations/Inoculations</strong>—an injection or oral form of a vaccine administered for the purpose of protection against disease.</td>
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<td><strong>7. Pathogen</strong>—a microorganism that causes disease.</td>
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<td><strong>8. Morbidity</strong>—measures the prevalence or the incidence of acute or chronic diseases.</td>
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<td><strong>9. Mortality</strong>—death or death rates—in public-health terms, as caused by disease.</td>
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When invading germs or microorganisms (infectious agents) get into the body, the immune system calls on specially programmed cells, called lymphocytes, to wage an attack. They form protective proteins called antibodies. Once the body develops a strain of lymphocytes to make antibodies against a specific invader (such as measles), the person is usually protected against the disease for life. Proteins (known as antigens) coat the pathogens and help trigger the immune response. Being vaccinated/inoculated with a modified, inactive, or fragmented antigen (which still contains the protein) will generally provide the same immunity as contracting the disease. Many vaccinations confer immunity for life, but some (such as tetanus) need to be repeated at certain intervals.

Some people question whether it is better to be naturally infected (by getting the disease) rather than to be vaccinated (immunized) against it. The National Network for Immunization Information (NNII) answers: “No! Diseases cause suffering and, in some cases, permanent disability or death. Vaccines protect from the disease without risking the serious adverse effects of that illness.”

What Are the Risks of Not Immunizing?

Up to 30 percent of U.S. families hold misconceptions about immunizations. This influences their decision whether to have their children (and themselves) vaccinated. They do not realize how susceptible they and their children are to disease or how deadly the consequences can be. (See chart on page 15.) Many parents—and even doctors—have never seen anyone with polio, diphtheria, or tetanus, but many have heard or read sensationalized and sometimes misleading stories in the media, on the Internet, or by word of mouth about some rare side effects experienced by a child who recently received a vaccination. As Dias and Marcuse put it: “alleged adverse events associated with vaccines make the 6 o’clock news, immunization successes do not.” Nonetheless, immunizations are extremely important ways that parents can protect their children, themselves, and the community against deadly infectious diseases. The benefits of immunizing vastly outweigh the risks. However, schools should address sensitively parents’ concerns about the safety of vaccines and provide them with as much information as possible. In many cases, such people are simply misinformed.

What Are the Risks of Immunizing and the Possible Side Effects?

The risks of immunizing are few. They may include brief and mild side effects such as “soreness where the shot was given, fussiness, and fever. In very rare cases, vaccines can cause a serious reaction.” The vaccine development process

The Importance of Vaccines

- “It is much better to gain immunity from a vaccine. Vaccine-preventable diseases can kill; they can cause permanent disabilities such as paralysis from polio, liver damage or liver cancer from hepatitis B infection, and deafness from meningitis caused by several bacteria (Hib, pneumococci, and meningococci). In addition, brain damage can result from measles, Hib meningitis, or pertussis. If a woman gets rubella while pregnant, her baby could have serious birth defects.
- “Immunity from a vaccine offers protection against future disease that is similar to immunity acquired from a natural infection. Several doses of a vaccine may be needed for a child to have a full immune response.
- “For some vaccines [i.e., tetanus and Haemophilus (Hib) flu], the vaccine is better at creating immunity than a natural infection would be.”

includes testing on animals and volunteers, when any adverse reactions are recorded. A vaccine is approved for use on the public only when it can be shown that the risks of immunization are far less than the risks of contracting the disease. If children contract certain infectious diseases, there is a real risk that permanent damage or death may result. In addition, they will suffer unnecessary pain and have to miss many days of school. These risks far outweigh the risk of a few side effects from vaccinations.11

What Are the Benefits of Immunizing?

Vaccines are very effective, and most children who receive these vaccines will be fully protected. However, the vaccines do not “take” in some children. Even the children who do not develop full immunity will benefit from vaccines. Some will experience a milder form of the disease, and because other people in their community are being immunized, all children are less likely to be exposed to the disease.12

Recommendations

**Adults:** Although this article concentrates on the need to immunize children, adults also need protection against infectious diseases. Researchers report that many adults do not choose to be vaccinated, not only because of their fear of side effects13 but also because they think that immunization is only for children.14 They may believe they’re unlikely to contract the disease.15 Therefore, school officials should take these factors into consideration when writing and enforcing immunization policies. While it’s probably unrealistic to try to make this a requirement for admission, schools can inquire about the parents’ level of protection against certain diseases and inform them of the importance of being immunized.

Make sure that school employees (and volunteers) have their immunizations up to date. Employees and students planning to study abroad or to go on international missions or tours may need additional doses. Ascertain whether women in their childbearing years have had rubella (German measles) or have been vaccinated against it. Rubella not only poses a threat to the young mother-to-be, but also to her unborn child.16

Health-care employees and students, food handlers, people with compromised immune systems, and those who work with dangerous substances (i.e., certain bacteria or viruses) may need to be vaccinated against diseases such as tuberculosis, hepatitis B, influenza, and typhoid.17

You may have seen television programs (such as *Little House on the Prairie*) where an outbreak of smallpox, diphtheria, or another disease killed half the town or where doctors had people quarantined in one house outside of town so that the rest of the population didn’t contract the disease. In 1918-1919, more than 20 million people worldwide died from influenza, and the disease continues to kill about 36,000 Americans each year.18 When they hear the term *epidemic*, people think of smallpox or the plague during the Dark Ages, but epidemics are not a thing of the past. Dias and Marcuse19 reported on a recent outbreak of measles in Alaska, which spread to many children who had not been fully immunized. Vaccines have been shown to protect society from outbreaks such as these.

**Infants and Children:** The following immunizations, recommended by the World Health Organization (WHO), are the standard internationally for infants under 1 year old: GCG against tuberculosis, diphtheria, pertussis, tetanus, oral polio (three doses), measles, hepatitis B, and yellow fever. In the U.S., the recommendations are pretty much the same, with a few exceptions: mumps, diphtheria, tetanus, measles, rubella (German measles), pertussis (whooping cough), haemophilus (Hib) meningitis, hepatitis B, chickenpox, and tuberculosis.
Influenza vaccine is also recommended for children 6-23 months of age. Polio vaccine also should be given. Although the disease has been nearly eradicated in the U.S., there is still the threat of an outbreak of epidemic proportions.

Infants should also be inoculated against pertussis (whooping cough), which can develop into pneumonia and is potentially fatal. Some parents have refused to allow their children to be immunized because the pertussis vaccine can cause adverse effects that range from minor irritations (fairly common) to brain damage (very rare). The risk is greatest in children who have experienced convulsions with fevers. Certain harmful side effects attributed to the pertussis vaccine, luridly described on some Internet Web sites, occurred after the administration of the now-obsolete whole-cell preparation. The new cellular vaccines have fewer side effects than the old vaccine. Nonetheless, the U.S. National Childhood Vaccine Injury Act, which went into effect October 1, 1988, promises compensation for any child injured by recommended childhood vaccines, including coverage of medical expenses, pain and suffering (up to $230,000), and protected loss of income for the child.

Many people now believe that mandatory protection against smallpox should be reinstated worldwide because of the very real threat of bio-terrorism. Health-care workers will probably be among the first to be immunized. Debate centers around the need to assess the risks of the vaccine as compared to the probability of a bio-terrorism attack.

Most immunizations should be given before children start school (see immunization chart on page 14). In addition to retaining copies of their children's immunization records, parents should also be aware of how long ago certain vaccines were administered. For example, if a teenager steps on a nail, the doctor will want to know if he or she has had a tetanus shot in the past 10 years.

Other immunizations are recommended for special populations (i.e., the very young, elderly, chronically ill, or those at high risk for disease) or for people who will be exposed to various diseases. Student missionaries and other travelers to developing countries may require immunizations against the following diseases: tetanus, diphtheria, polio, rabies, typhoid, hepatitis A and B, meningococcal disease, yellow fever, Japanese encephalitis, and influenza (flu). They should be aware that they may be exposed to other serious diseases (particularly in developing countries) for which no vaccines are available (i.e., ebola) or for which existing vaccines are only less than ideally protective (i.e., cholera, tuberculosis, and malaria). In areas where natural disasters such as hurricanes have created conditions ripe for disease, immunizations such as tetanus and typhoid may be necessary. Travelers need to plan ahead, as some vaccines (such as the one for hepatitis) require multiple shots over a period of time to ensure full protection.

Children, Adolescents, and Young Adults: The American Academy of Pediatrics (AAP) recommends the following specific groups

Resources

- National Network for Immunization (www.immunizationinfo.org/)
- Parents of Kids with Infectious Diseases (PKIDS) (www.pkids.org/)
- The Vaccine Page (www.vaccines.com/)
- Center for Disease Control (www.cdc.gov/)
- National Immunization Program (NIP) (www.cdc.gov/nip/)
- National Healthy Mothers, Healthy Babies Coalition (HMHB) (www.hmhb.org/parent.html#immunization/)
- CDC International Traveler's Line (1-877-FYI-TRIP or 1-877-394-8747)
- Global Alliance for Vaccines (www.vaccinealliance.org/)
- Institute for Vaccine Safety—John Hopkins University (www.vaccinesafety.edu/)
- The Vaccine Page (www.vaccines.com/)
- National Center for Infectious Diseases (NCID) (www.cdc.gov/ncidod/)
who have never been infected or vaccinated with chickenpox to receive immunizations. They include: (1) all healthy children 12 to 18 months; (2) all healthy children 18 months to 12 years of age who have never had chickenpox; (3) all family members living with individuals who have compromised immune systems (e.g., HIV/AIDS); and (4) all susceptible health-care workers.27

School Immunization Laws
Throughout the U.S., proof of immunization is required for school entry. The legislation requiring this ranks as one of the most important efforts to protect children and to safeguard public health. These laws have significantly reduced the infectious disease rates in the U.S. However, preschoolers in many areas are at risk because the laws do not require them to be immunized. School officials should take this into account when assessing the immunization status of their students and their families.

Vaccinations in the 21st century are even more vital than a hundred years ago to protect public health, considering the threat of bio-terrorism. It is particularly important to educate people about the importance of vaccination because they have little or no memory of the deadly effects of these diseases.

School Recommendations
In the U.S., parents must be informed in writing about the benefits and risks of immunizing their children before they are vaccinated. This is a useful policy to apply elsewhere as well. School officials should refer parents to their physician or health-care provider if they have any questions regarding the benefits and risks of immunizations.29

Teachers, school administrators, and school nurses must stress the importance of immunizations in their contacts with students, parents, and the community. Parents should be required to submit immunization records or forms before their children are allowed to enter school.30 The school nurse should file these forms in a safe place and organize a system to review them regularly, informing parents when additional vaccinations are needed. In small schools without a school nurse, the head administrator must ensure that children receive required immunizations. Records should be checked on a yearly basis.

In the U.S., public schools have established policies to handle a family’s refusal to have their children immunized based on religious or philosophical beliefs. Adventist schools for the most part do not subscribe to these policies. In general, if a parent refuses to have his or her child immunized (except in unusual cases such as a severe allergy to a certain

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<tr>
<th>AGE</th>
<th>Hep-B</th>
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<th>*DtaP</th>
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Schedule for the Most Commonly Recommended Immunizations

* Sometimes DTP and Hib are given together in one shot. ** This dose of Hib may not be needed, depending on the brand. Children should also receive Tb (tuberculosis) vaccine once between 11 and 16 years of age (NNII, 2000).

Please note: The parent should check with a health-care professional to determine his or her preferred immunization schedule and suggested vaccinations, which needs to be personalized for each child.
children. This is a significant problem if unvaccinated children are allowed to participate in school activities, as they could pose a threat to the school community. Adventist schools would be wise to include a formal statement in their immunization policy to address this problem.

Summary/Conclusion

Whether to immunize their children against preventable diseases is a simple choice for some parents, a very difficult one for others. The media tend to sensationalize rare cases of adverse reactions to a vaccine. Schools should assure parents that such cases are unusual and that most children (and adults) benefit from being vaccinated against deadly diseases. Parents should be encouraged to investigate the pros and cons of immunizing their children. Health-care providers and medical experts do not take it lightly when even one child suffers ill effects from vaccination. Researchers are trying to discover as much as they can about deadly disease, its consequences, and how to protect the public. They are also developing safer vaccines with fewer side effects.

As early as the elementary level, teachers should talk to students about the importance and benefits of immunizations. Children are the best mediums for disseminating messages to their peers.

Vaccines and Vaccine-Preventable Diseases

- **DTaP vaccine**—protects against diphtheria, tetanus, and pertussis (whooping cough). “Diphtheria is a very serious disease that can make people unable to breathe or move. It can cause health problems. One out of 10 people who get diphtheria die.” “Tetanus can cause muscle spasms that make a person unable to open his or her mouth or swallow. Three out of 10 people who get tetanus die.”
- **Td vaccine**—protects against tetanus and diphtheria. Pertussis “can cause spells of violent coughing and choking, making it hard to breathe, drink, or eat. Babies can get pneumonia, become brain damaged, or even die.”
- **Hepatitis B vaccine**—protects against hepatitis B. Hepatitis B “causes flu-like illness with loss of appetite, nausea, vomiting, rashes, joint pain, and jaundice. In some people, the virus stays in the liver for the rest of their lives, possibly causing severe liver disease, cancer, or liver failure, resulting in death.”
- **Hib vaccine**—protects against a “form of meningitis, pneumonia, and a deadly airway infection called epiglotitis.” Hib Meningitis “causes an infection of the lining of the spinal cord and brain and is very serious for children under five (5) years old—especially infants.”
- **IPV I (inactivated polio) vaccine**—protects against polio. Polio “can cause paralysis and even death.”
- **Pneumococcal Conjugate vaccine**—protects against “other forms of meningitis and pneumonia, and serious infections of the blood called bacteriemia.”
- **MMR vaccine**—protects against measles, mumps, and rubella (German measles). Measles “cause a rash, fever, cough, and watery eyes. It can also cause pneumonia, brain damage, hearing loss or death.” Mumps causes a painful swelling of the saliva glands and can lead to serious problems such as arthritis, inflammation of the brain and spinal cord, and hearing loss. Mumps can cause swollen testicles and occasionally sterility in adult males. Rubella (German measles) “causes fever, swollen glands, and a rash. But if a pregnant woman gets rubella, it can be very dangerous for the unborn baby. The baby can be born blind, mentally retarded or have hearing defects.”
- **Varivax vaccine (Chickenpox vaccine)**—protects against varicella. Varicella can cause fever, rashes, and blisters, which cause itching and may leave scars. It is usually not life-threatening. Chickenpox may recur as shingles (herpes zoster), which causes severe nerve pain and a rash and can be dangerous for people with weak immune systems.
- **Influenza vaccine**—protects against influenza. Influenza usually causes cold-like symptoms but various strains may be more severe, i.e., chills, fever, all-over muscle pain, nausea, vomiting, and headache, even death.—Source: *Community Connection, Community Facts: Community Health Systems of San Bernadino, California,* 1997.
their parents. Although some parents are careful to keep their children's vaccinations up to date, they may not be as conscientious about their own protection. Your students' preschool-age siblings should also be targeted by the school's immunization programs. Although children must be vaccinated before entering school, waiting until they are 5 or 6 years old can put large parts of the population at risk for serious infections.

Immunizations protect more than the vaccinated child—they guard the health of other students, teachers, administrators, school employees, parent volunteers, visitors (grandparents, siblings) and anyone else who attends school functions, as well as the local community. The old saying “an ounce of prevention is worth a pound of cure” will never go out of date. 

Teachers, school administrators, and school nurses must stress the importance of immunizations in their contacts with students, parents, and the community.

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NOTES AND REFERENCES
4. Ibid.
6. Ibid.
9. Ibid., p. 2.
10. NNII.
12. NNII.
14. Ibid.
15. Injury to the developing fetus could include heart disease, blindness, brain damage, deafness, or other serious complications, even death. See Hales, An Invitation to Health.
(Hereafter abbreviated as CDC 2001.)
20. NNII.
28. If their provider is unwilling or unable to give them the needed information, parents can call the Centers for Disease Control and Prevention (CDC) hotline (U.S. only) English: (800) 232-2522; Spanish: (800) 232-0233 or log onto the CDC Internet site: http://www.cdc.gov/.
Imagine that the items below are part of a true/false test. How would you respond to the following statements about American history?

T F “In daring to sail westward in 1492, hoping to reach the Indies, Christopher Columbus was challenging the prevailing belief of his day that the Earth was flat.”


T F “In Harriet Beecher Stowe’s *Uncle Tom’s Cabin* (1852), Uncle Tom, the main character, was depicted as a meek, submissive, obsequious old slave.”

T F “After World War I, Henry Cabot Lodge led the fight in the U.S. Senate against Woodrow Wilson’s League of Nations primarily because he was an ‘isolationist’ who strongly opposed U.S. involvement in foreign wars.”

T F “Harry Truman was in obscurity when President Roosevelt picked him as his running mate in 1944.”

Although each of the above statements is false, many students come to history classes believing them to be true, and these concepts frequently show up as “facts” in textbooks. Such misinformation is only the tip of the iceberg. More serious issues involve the neglect of entire aspects of history, such as the story of the Spanish colonization of the American Southwest, or the distortion of past history to favor a group or nation, as when teachers fail to discuss the effects of American support for anti-Communist dictators such as the Shah of Iran. Indeed, to the extent that we as teachers allow students to be unquestioningly dependent upon textbooks, we may unwittingly perpetuate a version of history that has little relationship to reality.

**Criticisms of Textbooks**

Over the past several decades, individuals and groups representing a variety of organizations and perspectives have examined the textbooks used in high school history classes. Overwhelmingly, they have reached negative conclusions. Evaluating both American and British textbooks during the mid-1960s, a group of prominent historians led by Ray Allen Billington, distinguished scholar of the
American West, concluded: “The repetition of half-truths, and the consistent monopolization of credit for the author’s country, creates in the reader an impression of one invincible nation, forever right, forever triumphant, and forever superior to its neighbors.”

During the 1970s, an organization concerned with portrayal of ethnic groups concluded that “the perspective dominating textbooks has always been white, upper-class and male” and when including information about minorities, the books seldom present the “perspective of the people described.” Shortly thereafter, Frances FitzGerald, whose earlier work on the Vietnam War had won several prizes, observed in a widely read book that “the market sets limits to the publishers’ truth-giving powers.” Consequently, “What a textbook reflects is thus a compromise, an America sculpted and sanded down by the pressures of diverse constituents and interest groups.”

The emergence of the Religious Right in the 1980s created a new set of challenges for textbook publishers. Paul C. Vitz, professor of psychology at New York University, argued that a “liberal and secular mindset” had excluded “religion, traditional family values, and conservative political and economic positions . . . from children’s textbooks.” To cite specifics, he said that none of the books he examined “recognizes the continuity of the revival and evangelical movements throughout American history since the Colonial Period” and gave little serious attention to either Catholics or Jews. About the same time, Paul Gagnon, an education professor at the University of Massachusetts, researched history texts for the American Federation of Teachers. He observed that the texts were “at one and the same time over-detailed and under-detailed: the first because they try to mention something about everything: the second because they fail to develop major themes in depth.” Furthermore, “they are weak on economic and intellectual history, on our place in the larger world, and on the importance of individual actions and character.”

More recently, a representative of the “critical theory” approach to education has concluded that “the school history lessons of the past represent what those in power and their educational allies wish to have passed on to youth—all in the name of historical objectivity, critical thinking and civic literacy.”

One would think that after all of this criticism, the writers and publishers of textbooks would have fixed things, but in 1995, James Loewen, professor of history at the University of Vermont, observed, “Frances FitzGerald’s 1979 study, America Revised, was a bestseller, but it made no impact on the industry.” Much of the problem arises from the textbook production process. FitzGerald had observed: “Today, texts are written backward or inside out, as it were, beginning with public demand and ending with the historian.” More than 15 years later, Loewen found the same problems: “History textbooks stand in a very different relationship to the discipline of history than most textbooks do to their respective fields. ‘Society’ determines what goes into history textbooks.” As a result, textbooks distort history in several ways.

Although he was speaking about British and American textbooks, Billington’s categorizations remain useful: (1) “Bias by Inertia” presents outdated information and interpretations; (2) “Unconscious Falsification” emphasizes what is good about one’s country; (3) “Bias by Omission” tends to overlook unfavorable facts and interpretations; (4) “Bias in the Use of Language” uses words that favor one side over another; and (5) “Bias Through Cumulative Implication” suggests that one’s nation won all the wars and invented all the new technologies.” As Loewen points out, the problems with American history textbooks often begin with their grandiose titles: The Great Republic, The American Way, Land of Promise, Rise of the American Nation.

These problems are not limited to American portrayals of
history. The Billington study, for instance, found biases in both British and American textbooks. The Soviet Union altered photographs and periodically rewrote its history in accordance with changing political demands. And recently, an Indian official stated: “All references in history books that hurt the feelings of people of any caste, religion, region or language will be removed. Schools will not be allowed to teach history that hurts the sentiments of our people. . . . I want history books to contain only what is acceptable to all.”

Because a society’s history is intimately connected to issues of identity and purpose, all historical accounts involve bias. Textbooks in particular are subject to social pressure. Consequently, teachers need to approach their subject critically.

### The Necessity for Truth-Telling

The problem of truthful history should concern historians and Christians for at least two reasons. First, as Christians, we have a moral responsibility to speak the truth as best we can. Because those who came before us were also fellow creatures made in the image of God, they deserve to be represented as accurately as possible. Jesus’ words are instructive: “For in the same way you judge others, you will be judged, and with the measure you use, it will be measured to you” (Matthew 7:2, NIV). Applying His words to history, we might say, “For in the same way you remember others, you will be remembered.” Christ’s statement, “‘Love your neighbor as yourself’” (Matthew 22:39), offers guidance if we realize that our “neighbor” includes our predecessors as well as our contemporaries.

Second, since history makes a significant contribution to the civic education of young people, it is important that students gain an accurate understanding of the past. If their future decisions as citizens are based on myths, half-truths, and lies learned in history classes, those decisions are likely to be ill-formed and perhaps even dangerous. “Students need an honest, rigorous education,” Gagnon argues, “that allows them to penetrate Orwellian rhetoric and accurately compare the claims and realities of our own society and those of others.” Loewen makes a similar point: “For history is central to our ongoing understanding of ourselves and our society. We need to produce Americans of all social-class and racial backgrounds of both genders who command the power of history—the ability to use one’s understanding of the past to inspire and legitimize one’s actions in the present. Then the past will seriously inform Americans as individuals and as a nation, instead of serving as a source of weary clichés. Products of successful American history courses know basic social facts about the United States and understand the historical processes that have shaped these facts. They can locate themselves in the social structure, and they know some of the societal and ideological forces that have influenced their lives. Such Americans are ready to become citizens because they understand how to effect change in our society. They know how to check out historical assertions and are suspicious of archetypal ‘truths.’ They can rebut the charge that history is irrelevant, because they realize ways that the past influences the present, including their own present.”

Although both of these authors are writing specifically about American history, their arguments are no less applicable to the histories of other countries, world history, and church history. As Loewen’s statement implies, telling the truth about history requires not only factual accuracy but also attention to the experiences and perspectives of diverse peoples. No longer can we focus only on the social and political elite; a balanced history must include, among other things, the working classes, ethnic minorities, and women. The Christian teacher should add to this triumvirate (often called “class, race, and gender”) the frequently neglected subjects of religion and religious...
minorities. Truthful history further requires attention to slowly changing structures (i.e., social, economic, and political systems) that help students understand ongoing processes instead of the “events” that tend to dominate most historical thinking. Finally, honest history looks at the role of the historian’s or teacher’s values and beliefs in reconstructing the past. Our students need to understand why knowledgeable people often disagree in their accounts of the past and how to effectively critique varying interpretations.18

Telling the truth about history is a moral obligation that requires effort. As Christians who are committed to teaching our students well, we must not be like those Indiana teachers of whom a survey “revealed that fewer than one in five stay current by reading books or articles in American history.”22 We need to demonstrate to our classes that history is not a cut-and-dried collection of facts, but a multi-faceted story whose meaning is much contested and therefore open to continued discovery and critical scrutiny. Although the challenge is great, the history teacher today has available a great many resources that make it possible to move beyond textbooks and conventional wisdom toward a broader and more accurate understanding of the past. The work required to incorpo-

General Resources for Truth-Telling

How do teachers arrive at the “truths” of history? How are they to know whether the history presented in the textbook, or even in their college classes, is accurate? History courses cover such broad areas that it is impossible for the teacher to keep up with the thousands of articles and books that appear every year. But don’t despair, for there are an increasing number of resources that will help you access the findings of modern scholarship and apply them to your teaching.

A first step in the pursuit of truthful teaching is simply to become more aware of the problem areas. Reading one or more of the textbook studies referred to above,21 even though most of them are not rather old, can suggest questions to ask about current textbooks. Books such as Loewen’s Lies My Teacher Told Me and Paul F. Boller’s Not So! go beyond criticism by providing substantive historical information that corrects common historical errors and improves our understanding of often-neglected topics. Critical evaluations of textbooks and other materials, including videos and CD-ROMs, appear in The History Teacher, Teaching History, and the World History Bulletin.22

Unfortunately, there are few resources for teaching the history of Christianity or Seventh-day Adventism. One exception is Vincent Carroll and David Shiflett’s Christianity on Trial.21

Despite the lack of materials, however, we must commit ourselves to truth-telling, for church history courses should be as rigorous and honest as other classes. Multiple perspectives, geographical balance, and factual accuracy are just as necessary for understanding the history of the church as for addressing secular history. And while they may be more difficult to access, primary sources are the best means by which teachers can achieve these objectives.

OAH Magazine of History

Two American history resources provide in-depth information and practical teaching aids. First, the Organization of American Historians publishes the quarterly Magazine of History.23 Each issue of this journal focuses on a particular topic in American history, such as “The Great Depression,” “Science and Technology,” or “Environmental History.” The Spring 2002 issue on the “World War II Homefront” is a good example of the content of this publication. First, after a general article surveying recent research on the homefront, three articles briefly examine the experiences of women, African-Americans, and Japanese-Americans. These easily read essays offer a way for the busy teacher to “catch up” with recent scholarship about previously neglected groups.

The heart of the magazine then offers five lesson plans, including primary source material, on topics ranging from “Rosie the Riveter Remembers” to “Propaganda Posters” that enable the teacher to readily translate the scholarship into usable classroom activities. These lesson plans are followed by articles on ERIC/chESS and Internet resources on the World War II Homefront. After articles suggesting ways to introduce World War II oral history into the classroom and use the Internet to enhance student learning in history classes, the journal closes with reviews of two books on the teaching of history and social studies and a listing of seminars, conferences, and new Web resources. Accompanying a review of James Percoco’s Divided We Stand are materials for teaching about gender, race, and Anglo-American relations in a manner that recognizes their complexity.23

National Center for History in the Schools

A second major resource is the National Center for History in the Schools, which produces a variety of materials for history teachers. In the mid-1990s, the center stirred a storm of controversy with its publication of national standards for both United States and world history.22 Responding to the controversy, which largely revolved around the alleged lack of emphasis on “traditional” American heroes such as George Washington in favor of women and minorities, the Center published a revised set of standards for both American and world history.23 Teachers will find the standards an invaluable tool as they seek themes to (1) help them organize and select from the mass of information that appears in textbooks and (2) give attention to multiple perspectives and minority experiences. In its section on “The Emergence of Modern America (1890-1930),” for example, under
rate these materials and ideas into our teaching will bring its own rewards—including more knowledgeable and, quite possibly, more interested students and a feeling of confidence that we are doing the best possible job of communicating the past to a new generation.

Dr. Gary Land is Chair of the Department of History and Political Science at Andrews University in Berrien Springs, Michigan, and author of Teaching History: A Seventh-day Adventist Approach (Andrews University Press, 2000).

NOTES AND REFERENCES

1. Paul F. Boller, Jr., Not So! Popular Myths About America From Columbus to Clinton (New York: Oxford University Press, 1995), pp. 3, 35, 66, 86, 144. Boller analyzes the sources of these and other beliefs as well as the evidence that reveals their mythic character.

Telling the truth about history is a moral obligation that requires effort.


Political cartoons and other original documents help students understand differing points of view.


14. “Pundits, Mullahs Will Decide What Is History,” *Asian Age* (December 4, 2001), p. 1. I wish to thank Burton Rumble for bringing this article to my attention.


16. Ibid., p. 164.


26. Ibid, pp. 111-112. Lessons From History: Essential Understandings and Historical Perspectives Students Should Acquire (Los Angeles: National Center for History in the Schools, University of California, Los Angeles, 1992) is a statement of history standards written in a largely narrative style.


29. Ibid., p. 164.


31. The “Women in World History Curriculum” also provides materials to help teachers integrate women’s history into their courses. For information and a catalog, see http://www.womeninworldhistory.com.

32. Loewen, Lies, p. 280.

How do teachers arrive at the “truths” of history? How are they to know whether the history presented in the textbook, or even in their college classes, is accurate?

First-person accounts written by minorities, women, and others whose stories rarely appear in textbooks can make history come alive for students.

It is a little-known fact that seven blacks served in the U.S. Senate and House of Representatives between 1869 and 1873.
Throughout history, humans have tried in various ways to escape physical and emotional pain and to alter reality in a search for joy and peace. Unfortunately, the methods used to transcend reality have often involved intoxicating or psychoactive chemicals. This is of special concern to teachers and educational administrators because research indicates that young people begin to use alcohol and illicit drugs in adolescence. For example, studies conducted by University of Michigan researchers in their Monitoring the Future Study show that more than half of America’s high school seniors have used an illicit drug and about 80 percent have used alcohol. The study also reveals that more than 40 percent of American high school seniors have used an illicit drug in the past year, with the majority of 12th graders reporting being drunk in the last year.

A relatively new drug has joined the pharmacopoeia of substances used—Ecstasy, also known as the “love drug,” ingested for its euphoric effects. First discovered in 1912, Ecstasy is referred to by scientists as MDMA due to its chemical composition (3,4-methylenedioxyamphetamine). Because it had no specified uses in treating diseases, MDMA disappeared from the public eye for some years. However, psychotherapists “rediscovered” it about 1978, prescribing it to enhance the effectiveness of psychotherapy.

By Tania L. Gainza and Duane C. McBride

Beginning

What made MDMA unique and successful in psychotherapy were its psychological effects. It not only seemed to make people happier, but also broke down social and psychological barriers, allowing patients to open up more quickly to their therapists and others in group therapy. Because of its success and few known side-effects, an illegal market soon developed. In Europe, it spread like wildfire.

Studies conducted by University of Michigan researchers in their Monitoring the Future Study show that more than half of America’s high school seniors have used an illicit drug and about 80 percent have used alcohol.
through underground parties that became known as “raves.” It was not long until similar all-night dancing events began occurring across the U.S.  

During the 1980s, a host of legal issues arose in relation to MDMA. The U.S. Government placed it on Schedule I in 1985, making it completely illegal, even for medical purposes. This occurred because MDMA was initially confused with methylenedioxyamphetamine (MDA), which has been shown to produce severe neurotoxic effects. Although researchers now have a clearer understanding of the nature of MDMA, it remains a Schedule I drug at the federal level. However, at the state level, policies vary widely. Some states have not passed any laws regarding Ecstasy, while others have followed the federal example.  

**Use Trends**  
Despite its widespread illegality, Ecstasy has become the new hot drug. The 2001 Monitoring the Future Study found that Ecstasy use among 8th, 10th, and 12th graders had increased significantly in the previous five years. In 1997, 3.4 percent of 8th graders, 5.6 percent of 10th graders, and 6.1 percent of 12th graders reported having used Ecstasy at least once. By 2001, the rates had increased to 5.2 percent, 8 percent, and 11.2 percent respectively for these grade levels. The number of U.S. high school seniors who have tried Ecstasy has almost doubled in the past four years.  

**Chemical Properties and Biological Mechanisms**  
What makes Ecstasy so attractive to young people is its effects on the nervous system. The reason for this becomes clearer when we examine its chemical formula, which shows it to be a cousin of the psychomotor stimulant amphetamine and the hallucinogen mescaline. Its structural formula is shown in the above figure.  

Rudnick’s and Wall’s animal studies found large amounts of serotonin traveling through the brain synapse about a half hour to an hour after ingestion of Ecstasy. Van Aerts, Schwartz, and Kish theorize that this leads to a significant increase in serotonin receptor binding. As serotonin passes through the synapses, users experience a sense of euphoria.
and openness. They also report relating positively toward everyone around them. Ecstasy is thus seen as the “perfect party drug” since it breaks down social barriers.\cite{14}

**Effects of Ecstasy**

In addition to feelings of well-being, Ecstasy users also experience some serious consequences due to the excess movement of serotonin in their neural synapses. Some of these effects include depression,\cite{15} long-term memory impairment (as well as other kinds of memory decline),\cite{16} exhaustion, blackouts, nausea, jaw-clenching, eye-twitching,\cite{17} rapid heartbeat, and hypertension.\cite{18} Studies conducted by two groups of researchers, led by Verkes and Cami, found psychomotor and cognitive performance to be lower for Ecstasy users.\cite{19}

What about long-term neurological damage? Summarizing the research to date, Baggot and Mendelson conclude that animals exposed to MDMA show long-term changes in the brain. These changes include decreases in the concentration of serotonin and metabolites. Ecstasy also decreases the level of tryptophan, a brain enzyme that works with serotonin, and causes long-term changes to the axons and cell bodies of the brain. However, it is not known if these axons are permanently lost or if the brain adapts to the drug. More research needs to be done on the long-term consequences of Ecstasy use.\cite{20}

Men and women seem to experience somewhat different effects from the use of Ecstasy, with women seemingly being more sensitive to the subjective effects of the drug.\cite{21} Liechti and associates found that female subjects showed significantly higher increases in positive basic mood, depersonalization,
and altered perception of space and time. Women were more likely to experience all the psychological effects (including thought disturbances and hallucinations) more frequently and to a higher degree. Consumption of Ecstasy has also been tied to psychological effects such as flashbacks, psychosis, and the onset of panic disorder.

Studies have also shown adverse effects on users’ sleep patterns and on the babies of women who ingested Ecstasy during pregnancy. A follow-up of babies exposed to Ecstasy before birth showed a significantly increased risk of congenital defects, especially cardiovascular and musculoskeletal anomalies. Eleven of the 127 women in the study miscarried.

Other concerns involve the effects of combining Ecstasy with other drugs and alcohol, as well as the likelihood of buying an adulterated product. Pills sold as Ecstasy may be a mixture of MDMA and other substances, or may contain other drugs entirely. MAPS and Baggott found that half or less of the tablets/capsules sold as Ecstasy may actually contain MDMA. Both of the studies found additive and other substances in the samples they tested. The most common additive was dextromethorphan (DXM), a cough suppressant. Other common additives were caffeine, 3,4-methylenedioxethamphetamine (MDE), and other MDMA analogues. (MDE and other analogues have similar effects to MDMA.)

Studies have shown that these other ingredients can have “an unrecognized role in adverse reactions attributed to MDMA.” This is especially true of DXM, since the amount usually found in Ecstasy tablets is “considerably higher than the usual therapeutic dose of 15 to 30 mg (taken up to 4 times daily).” These high doses can contribute to the effects associated with Ecstasy consumption, such as rapid heartbeat, rapid eye movement, and psychosis.

Context of Use

The context of consumption can alter the consequences of Ecstasy use. Since the drug is often used at raves, many of the effects are exacerbated by dehydration, increased body temperature resulting from dancing for hours, and mixing of the drug with other illegal substances that are sold at the raves. This may lead to impaired blood clotting and hypotension (drinking a large amount of water to compensate for dehydration, which produces an abnormal electrolyte balance). The 2000 annual report put out by Drug Abuse Warning Network (DAWN) on Club Drugs showed that these symptoms have led to emergency room visits and even death in extreme cases.

Another important concern about Ecstasy is whether it produces a loss of self-control leading to unwanted sexual behavior or even rapes. Unlike excessive consumption of alcohol and ingestion of other drugs like rophenol, Ecstasy use does not produce a loss of consciousness or of self-control because the user remains aware of his or her surroundings. However, abuse of Ecstasy is associated with high-risk sexual behaviors among gay and bisexual men.

Assessing Damages

According to the DAWN report on Club Drugs, between 1994 and 1999, 5,620 U.S. emergency room (ER) visits were connected to the use of Ecstasy. Such visits went from 250 in 1994 to 2,850 in 1999, almost an 11-fold increase. The DAWN report also states that 27 deaths were conclusively linked with MDMA ingestion between 1994 and 1998. The report showed that ER visits had increased significantly in 1998 and 1999.

Some laws have been passed as the result of several Ecstasy-related deaths. The Illinois General Assembly recently passed statute HB126, known as “Kelley’s Law,” in remembrance of Kelley Baker, who died from an Ecstasy overdose. One of the most sweeping laws thus far passed in the U.S., HB126 toughens the penalties for possession of MDMA or any of its derivatives.

Despite the severe physiological and psychological consequences of taking Ecstasy, many people continue to consume it and to consider it relatively safe. However, it is “safe” only in the sense that no violence accompanies its distribution and trafficking and because, unlike alcohol and other drugs, it rarely causes loss of consciousness. Users assume that Ecstasy will make them feel good without significantly affecting their health. Because use can be discreet and easy, this makes it more attractive to potential users. They can ingest the drug without leaving a social event or using needles or other drug paraphernalia.

Methods of Ingesting Ecstasy

Because it is sold in pill form, Ecstasy is usually ingested orally. However, a few users have consumed it either by inhalation or injection. The drug is hard to identify, as the pills vary in size, shape, and thickness and come in many colors with a variety of logos. It is usually produced in bright colors ranging from red to purple but may also be beige or white. Logos range from Mitsubishi automobile symbols to popular cartoon images. Several Web sites show the varying appearance of Ecstasy pills currently being sold. (See picture on page 26.)

Research conducted by Carlson has revealed that Ecstasy tablets sell for $10 to $50 each. The average dose ranges from one to two and a half tablets (50 mg to 150 mg). In the beginning, most users were white, middle-class males, but now many ethnic groups have joined in. Typically, users are in their late teens or early twenties.

Dependence and Preventative Measures

Tolerance to Ecstasy consumption builds quickly. Thus, to
get the same effects, users need to ingest higher doses. As larger amounts of Ecstasy are consumed, more negative physical consequences occur. Although addiction is so rare that most of the literature fails to mention it, users may need to be treated for psychological dependence. Treatment methods are similar to those employed for amphetamine and cocaine addiction—detoxification, substitution with other drugs, and various types of psychotherapy.

The usage trends and risks of Ecstasy use suggest that it may soon become an epidemic. Currently, the drug seems to be replacing cocaine in popularity. Consequently, efforts to prevent and diminish the use of Ecstasy have become a major agenda topic for U.S. health-care agencies. Many states have passed new laws. Other agencies, organizations, and states are using different types of media, including Web sites, to inform people about the dangers of the drug. On page 26 is an example of a billboard put up by local counties.

### A Global Picture

Ecstasy is not just a U.S. problem. Many other countries are experiencing similar difficulties with its use. According to Sterk, it is the second-most-used drug in Europe after marijuana. Australia has also had many deaths as a result of Ecstasy ingestion. Dr. Rodney Irvine, in his presentation at the 2001 MDMA conference in Bethesda, Maryland, cited the 1998 Household Survey for Australia, which showed that 2.4 percent of the population had used Ecstasy in the past 12 months, out of 22 percent of people who reported using illicit drugs.

### Health-care professionals and scientists are only beginning to learn about Ecstasy and its effects. Additional research should be done to investigate MDMA’s effects, toxicity, and to develop effective interventions for both the general population and for ethnic minorities. However, while researchers continue to search for additional proof of harm, Ecstasy will continue to wreak havoc on young people.

### Our Role as Educators

Ecstasy and many other illegal drugs are harmful, not only to the physical body, but also to the cognitive, personal, and spiritual dimensions of our students’ development. Abstinence should be the strong focus of all discussions concerning use of Ecstasy or other illicit drugs, as well as harmful though legal substances like alcohol and tobacco.

Lonely children, as well as those who are easily influenced by peers and are desperate to be part of the “in group,” may be tempted to use Ecstasy and other drugs. Every human being needs love and happiness. Ecstasy seems to promise love, happiness, and acceptance with few risks. The people who attend raves have a motto: peace, love, unity, and respect. Whoever enters receives all of these, with no questions asked. It does not matter what you look like or where you are from. You are loved and accepted as you are. Sadly, this superficial acceptance is usually short-lived, and many young people reap serious consequences from using Ecstasy even once.

Our schools need to take the place of those raves. Love, acceptance, unity, and respect should be part of the school culture, not reserved for a few students who are perceived as having “earned it.” One way to do this is to create a sense of community in our schools. The article by Gary Hopkins and Tim Gillespie on page 30 offers some ideas for accomplishing this goal.

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Over the past several years, many educators have read about the concept of “connectedness” as it relates to relationships with students. The study that was instrumental in introducing this concept, at least from a health perspective, is referred to as the National Longitudinal Study on Adolescent Health (NLSAH)\(^1\) by Resnick, et al.

Resnick and colleagues demonstrated that when students feel connected at school, they enjoy a number of benefits. They commit fewer violent acts; tend not to use tobacco, alcohol, or marijuana; and delay first sexual intercourse longer than young people who do not feel as connected at school.\(^2\)

The researchers also questioned the students about their sense of connectedness at home. Regardless of whether they were from single-parent homes, regardless of race or of ethnicity or socio-economic status, students who sensed a feeling of connectedness at home demonstrated protection from emotional distress, suicidal thoughts and attempts; cigarette, alcohol, and marijuana use; violent behavior; and early sexual activity.

So, it’s easy to conclude that students need adults in their lives with whom they can connect, both at school and at home. This very simple concept is borne out by research on resilience, that is, the capacity to maintain competent functioning in the face of major life stressors. Resiliency appears to develop over time in the context of environmental support. Resilient individuals are those who, despite severe hardships and the presence of risk factors, develop characteristic coping skills that enable them to succeed in life.\(^3\)

Researchers have found that resilient individuals have a strong commitment to self and/or their God, and are willing to take action to deal with problems. They relate positively to their environment, have a strong sense of purpose, and develop an internal locus of control that enables them to see life’s obstacles as challenges to be overcome. Resilient youth appear to be able to use their religious faith to maintain a positive vision of a meaningful life.\(^4\) Resiliency seems to be all about hope; it is the sense that adversity can be overcome, that there is life beyond the obstacles of today.
Accounting for Success

Rather than focusing on the shortcomings of students who are at risk of academic failure, drug use, or other at-risk behaviors, the resilience paradigm attempts to identify factors that account for success.5

When one reviews the available research on what strengthens resiliency among young people, one factor emerges again and again—sincere and enduring relationships. From studies conducted around the world, researchers have identified a number of factors that enable children of misfortune to beat the odds. Supportive older adults or mentors, ranging from teachers to clergy, help young people become more resilient.6 An important factor turns out to be the presence in their lives of a charismatic adult—someone with whom they identify and from whom they gather strength.7

Relationships with adults who provide care, warmth, and unconditional love help convince young people that they can overcome the odds. Such relationships appear to provide youngsters with a sense of self-esteem and self-worth that makes successful coping more likely. One study found that resilient youngsters all had at least one person in their lives who accepted them unconditionally, regardless of temperamental idiosyncrasies, physical attractiveness, or intelligence.8

Thus, resiliency to the stressors of life such as drug-abusing peers, violence on TV and/or in videos, or the influence of a less-than-ideal home appears to come through supportive relationships!

The combination of these two concepts, connectedness and resilience, will create even more positive outcomes. Both of these require that people, most often adults, get involved in young people’s lives and build close relationships with them.

School as Community

A third concept, more specifically school-focused but in many ways very similar, is that of community. More specifically, school as community. Loosely defined, school as community means the fostering of quality social relationships between students, among teachers, and between staff and students. It is through such relationships that “school as community” becomes very closely related to connectedness and the predictors of resilience.

Researchers at the Developmental Studies Institute have done a great deal of work in this area. They use a 37-item questionnaire in which they ask students (usually grade-school level), to rate how much they agree or disagree with the various statements, using a four-point scale (1 = strongly disagree to 4 = strongly agree).9 Here is a partial list:

1. People care about each other in this school.
2. Students in my class treat each other with respect.
3. Students in this school treat each other with respect.
4. Students at this school are willing to go out of their way to help someone.
5. Students in this school really care about each other.
6. Students in my class really care about each other.
7. Students at this school work together to solve problems.
8. When I’m having a problem, some other student will help me.
9. Teachers and students treat each other with respect in this school.
10. My class is like a family.
11. In my class, the teacher and students together plan what we will do.
12. The teacher in my class asks the students to help decide what the class will do.

When students perceive their school as a community, the benefits are huge and include the following:10

Teacher Attitudes
- High expectations for student learning
- Higher belief in constructivist learning
- Higher trust in students
- Higher emphasis on teacher authority
- Higher sense of efficacy as a teacher
- Higher enjoyment of teaching

Some health benefits also result when students perceive school as a community. Battistich and Hom11 found that sense of community was associated with less drug use and less delinquent behavior.

From studies conducted around the world, researchers have identified a number of factors that enable children of misfortune to beat the odds.

- Higher overall job satisfaction

School Climate
- Higher principal competence and supportiveness
- Higher parental support
- Higher stimulating learning environment
- More positive teacher-student relations

Academic Attitudes, Motivation, and Behavior
- Higher frequency of reading outside of school
- Greater enjoyment of reading
- Greater enjoyment of class
- Enjoy school more
- Higher task orientation
- Lower ego orientation
- Less work avoidance
- Greater preference for challenges
- Greater intrinsic academic motivation
- Higher academic self-esteem
- Greater trust in and respect for teachers
- Greater enjoyment of helping others learn
- Higher academic aspirations
- Higher educational expectations

Academic Performance
- Higher reading scores
- Higher mathematics scores
- Better reasoning skills

Social/Personal Attitudes, Motives, and Behavior
- Greater concern for others
- Greater sense of autonomy
- Greater sense of efficacy
- Higher conflict resolution skills
- Greater acceptance of outgroups
- More prosocial motivation
- Greater democratic values
- More altruistic behavior
- Higher general self-esteem
The interrelated concepts of connectedness, resilience, and school as community demonstrate that positive things can happen when people assist and help one another. The Bible is replete with instructions to love our brother. 1 Corinthians 13 makes this very clear—if we speak in all tongues but don’t love, we are no more than a clanging cymbal. If we have the faith to move mountains and don’t love, it’s not worth anything. If we give all that we have and don’t love, we are wasting our time. Applying this to the academic arena, it is clear that when students have people who care about them, they do better in school, and teachers and administrators are more successful, too. Does it seem hard to believe that the simple concept of love could cure so many problems at once?

Think about other religious schools in your community. These schools often apply the principles of school as community very well. These often require that a parent or surrogate volunteer at the school for two or three hours each week, or their child isn’t allowed to enroll. Adventist schools could profitably follow this example.

Applying the concept of school as a community requires more than the commitment of teachers, administrators, and staff. It requires the involvement of adults who get involved and care for the students in participating schools. Most communities have a sizable group of retirement-age adults. They have an untapped well of life experiences we can draw from in helping create caring communities in our schools. While they may be reticent to work with certain age groups, it should still be possible to match senior citizens with young people at various developmental stages who could benefit from their experience and attention.

But that is simply one solution. The educational implications of connectedness are enormous. Rather than being driven by a search for the perfect curriculum or higher test scores, we must become teachers who look into the hearts of our students and build relationships. With such overwhelming evidence about the impact of relationship and community building, we cannot ignore the effect these changes will have on our students, as well as on the learning environment.

The bottom line seems to be the philosophy: “the more, the merrier.” The more responsible adults with whom the students interact, the more resilient they will be to at-risk behavior. They will be better able to make good decisions about character and responsibility. They will grow into adults who understand how to overcome hardships. And they will do this by observing and connecting with the adults who participate in their lives.

It is our responsibility to connect with students and to connect them with adults who can serve as resources and mentors in their lives. By looking beyond the textbook and into the hearts of our students, we will impact their lives for eternity. 

Dr. Gary L. Hopkins is Assistant Professor of Health Promotion and Education in the School of Public Health at Loma Linda University in Loma Linda, California. As a health researcher, he studies both risk behaviors among adolescents and items that predict protection from dangerous behaviors. Tim Gillespie, M.Div., is the Campus Pastor at Loma Linda Academy in Loma Linda, California.

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10. Ibid.
Consider the following statements:

Statement 1: A is a human being. B is a chimpanzee. A and B share many similarities, but A and B each have numerous different attributes.

Statement 2: The similarities show that both A and B descended from a common origin, i.e., a common ancestor. The differences suggest that A and B did not follow the same evolutionary path.

Statement 3: The similarities show that both A and B had a common origin—i.e., a Creator, God. The reason for the differences is that the Creator chose to make each species unique and distinctive.

The initial statement is data—observable, knowable, and open to experimentation. Statements 2 and 3 are not data—they are conclusions drawn from assumptions about the meaning of the initial statement: the first by an evolutionist, the second by a creationist.

This illustration reveals that knowledge/information can be divided into two separate concepts—data and interpretation. Since data are subject to alternative interpretations, students and researchers must carefully distinguish between the information actually included in the collected data and the “information” derived from the data, which is presented as evidence for a hypothesis. Scientists endeavor to be as objective as possible in this regard, but several factors (biases) can influence their selection and interpretation of the data.

The distinction between data and interpretation is no less important in the science classroom than in the science laboratory.

For teachers, the greatest difficulty in separating data from interpretation occurs with the use of textbooks, a prime source of classroom information. In the science classroom, the textbooks often include more interpretation than data. Students need early training to help them distinguish between the

By Elaine Kennedy
two. This will require additional effort on the part of teachers, but it should have positive results. With practice, students will become more analytic and require fewer explanations from the teacher.

**Knowing the Difference**

What is data? How can anybody tell the difference between data and interpretation? Data consist of measurements and observations used as a basis for reasoning, discussion, or calculation. Observable data are usually regarded as unalterable facts, although they may or may not be true. As technology and science progress, “facts” are discarded, modified, or replaced with new data. For example, measurements may form the basis for identifying an object or phenomenon. However, the identification may actually be an interpretation. For instance, fossils of extinct organisms are often classified through measurements of various body parts that have been preserved. Despite the accuracy and precision of the measurements, correct identification is difficult because, with many of the extinct shelly fauna, scientists do not know whether large organisms whose structures are similar to those of small organisms represent different species, genders, or developmental stages. Identifications and comparisons are, therefore, not data; they are interpretations. Science, of necessity, must use identifications and comparisons as data.

Much controversy in the scientific literature is generated by a rather significant problem: interpretations drawn from limited databases. This point needs to be emphasized in every unit that is studied in any science classroom.

**Complexity of Data and Interpretations**

As an illustration of the complex interplay between data and interpretation, consider two steps involved in the process of identifying rocks and minerals:

1. **Step 1. Interpreting light properties.** The researchers’ description of a rock’s properties is based on their microscopic examination of a very thin slice of rock (commonly referred to as a “thin section”). Polarized light (light waves that vibrate in only one particular plane) is used to conduct a series of tests on each mineral in the thin section. Mineralogists use the resulting patterns to determine the mineral composition of the sample. Therefore, the identification of the minerals is an interpretation based on the light property descriptions.

2. **Step 2. Identifying rocks.** To identify rock samples, scientists examine the contact between two types of mineral and measure how much of each is present. A geologist studying the rock considers the mineral identifications “data,” even though they are actually an interpretation of an interpretation. (The mineralogical “data” were derived from the light property descriptions.) Once the rock is identified, that information is used as data as well.

Just how valid is mineral or rock identification? It depends on the methods used. Conclusions can be drawn by comparing the sample with standards. For example, three thin sections may have the same mineral composition, but their mineral contacts may be very different. If the mineral grains are interlocking, the sample is said to be an igneous rock. If the mineral grains are altered, distorted, elongated, and aligned, it is a metamorphic rock. The same minerals cemented together form sedimentary rock. When terms and procedures are well defined, identification is fairly easy and relatively reliable.

Since data are defined as only what can be measured or directly observed, teachers need to help their students learn to interpret what they read in order to arrive at reliable conclusions (and evaluate other people’s conclusions!). They need to understand that an interpretation is an explanation, a
Since data are defined as only what can be measured or directly observed, teachers need to help their students learn to interpret what they read in order to arrive at reliable conclusions (and evaluate other people’s conclusions!).

Multiple Levels of Interpretation

Several levels of interpretations exist. For example, the name oolite not only identifies a particular rock type but also implies a history of environmental and depositional conditions involved in its formation. How can a name acquire that much interpretative information?

1. The researcher finds a rock with round, beadlike particles cemented together. The particles surround a larger object in the sample, which consists of a different substance. A thin section of the sample is selected and analyzed with respect to its mineralization. The first level of interpretation is identification of the mineral composition of the little beads. For the purposes of this illustration, we will say that they are particles of calcium carbonate.

2. Identification of the structure of the round, bead-filled rock is based on an analysis of the relationship of a small piece of rock or shell material to the calcium carbonate that has precipitated around it. This structural information, coupled with the shape (roundness) of the particles, causes the observer to identify the beads as oolites.

At this point, one might think that the exercise is complete and that identification of the sample is as simple and straightforward as identifying the mineral and its structure. However, a third level of interpretation is introduced to explain how the oolites were formed.

3. The third level relies on observations of modern environments. Geologists know that oolites are typically formed near a shore by the agitation of warm, shallow saline waters. Researchers apply this knowledge to the oolitic rocks found on a mountainside. In other words, geologists use what they know about the modern setting to interpret the earlier environment. They assume that the ancient oolites on the mountain formed there in the same way that modern oolites form in the ocean or the Great Salt Lake in Utah. That interpretation seems quite logical, and the conclusions appear obvious. However, the associations may not be correct.

The exercise is not over. This set of interpretations is now added to other data (which also have multiple interpretations) to arrive at a final description of a particular rock exposure. The process is duplicated at other exposures or outcrops of rock over a broader region in developing a model.

4. Geologists use other rock types and additional data to develop models of geologic events in Earth’s history. For example, cemented quartz grains are called sandstones. Patterns in sandstone may occur as the result of a process known as cross-bedding. Typically, cross-beds are formed as currents (wind and/or water) deposit sand and silt on the slope of dunes sheltered from the wind. By integrating a broad range of data and interpretations (the minerals, rocks, oolites, and cross-bedding), geologists develop a fifth level of interpretation: modeling. Models provide scientists with a generalized framework for developing predictions and drawing conclusions about events that may have occurred in the past.

Why is it necessary to clearly distinguish between data and interpretation when evaluating research? Data are actual measurements and observations. Interpretations are an attempt to identify or explain what is measured and observed. An interpretation’s validity depends on how well it accommodates the available data. Interpretations may change as the database changes. This interplay between data and interpretation is what makes science so successful and progressive.

Bias During Data Acquisition

Scientists realize that they are prone to errors and misconceptions. Hence, they try to maintain an attitude of objectivity in research. This commitment to objectivity has created an aura of infallibility around science and scientists. Reports in the popular press and on television oversimplify the work of scientists, implying that when a scientist draws a conclusion, all competing theories have been refuted and all ques-

Conclusions about how ancient rocks, such as the oolite above, were formed are based on observations of modern environments.
tions have been resolved. This encourages a false sense of security and confidence in science. Some scientists do little to dispel this image.

To complicate matters, the scientific community has adopted the position that any researcher having a religious bias is nonscientific; therefore by definition, creation science cannot be true science. Such an attitude fails to recognize its own biases.4

Here are some biases that influence science—some technical, others subtle and unconscious factors:

1. **Sampling constraints.** The first problem in gathering data is sampling bias. Every scientist has some preconceived ideas that influence his or her selection of data. Random sampling helps minimize these problems,5 but even so, sampling choices often favor a particular hypothesis.

2. **Systematic errors.** A scientist may have a “blind spot,” a failure to recognize data. For example, it is common for a paleontologist who specializes in fossil snails to collect a wider variety of gastropods than other people searching a mountainside. However, that same individual will discover fewer clams and corals than other fossil collectors do at the site. An accurate tally of the types of fossils can have a significant impact on the interpretation of that site, but the bias of the researcher may affect the accuracy of the count.

3. **Technological constraints.** Scientists can incorporate large quantities of data and interpretations into computer-generated models to do analyses involving pattern recognition. However, the use of gigantic databases does not necessarily ensure that models adequately reflect complex systems and processes. The models created by computer-generated software produce technological biases because their simplified parameters limit the model’s applications to real systems.7

4. **Quality of data.** Data analysis introduces bias because qualitative or subjective interpretations are embedded in the conclusions. For example: In using potassium-argon dating techniques, the quantity of these elements in a given sample can be measured very accurately and precisely. However, it is difficult to know just what the data mean. Conclusions about the age of the sample depend heavily on numerous assumptions and are affected by problems in the methodology, including human error.8 Current technology cannot measure the age of the fossiliferous sedimentary rock directly; thus, the conclusions are biased because they are based on an analysis of associated igneous material, which may or may not provide valid ages. Descriptive data (information that is not quantifiable) are even more problematic.

5. **Financial constraints.** The scientific method requires rigorous testing before theories can be accepted. However, time and monetary constraints limit the crucial testing process. New data are incorporated into current theory because it is easier to get material published if one’s conclusions are widely accepted by the scientific community. The funding process has an incredible influence on research today.9 No papers published, no money for research. It’s that simple.

The rigorous testing demanded by the scientific method is not cost-effective, so ideas and concepts are frequently rushed into print and then cited in subsequent publications.

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**Helping Students Separate Data From Interpretation**

This exercise can work in various disciplines. Science teachers can use a chapter from a science textbook or an article from a newspaper or a popular science magazine that presents conclusions as facts. Use several examples and use at least one that presents conclusions without any data. History teachers may use several paragraphs from a history textbook or articles from a newspaper or magazine. Teachers in other disciplines such as Bible, English, and health can use a textbook or magazine article to create a helpful exercise for their students.

Before class, select a paragraph or section from the source, make copies to share with students, or write it on the chalkboard. Highlight or underline those items in the paragraph that can be measured or observed directly. Highlight or underline (in a different color) conclusions, speculations, and other statements that tell the reader what to believe. For additional assistance on this project, teachers may contact the author by E-mail at ekennedey@univ.llu.edu or consult the Geoscience Research Institute at http://www.grisda.org/.
Monetary pressures increase the technical bias by limiting the experimental process. Students should be aware that research funding exerts significant control over what gets into print.

**Implications for Science and Religion**

When it comes to the interface between science and religion, several points need to be noted:

First, not all data are accurately measured, and it is sometimes difficult to differentiate between data and interpretation. Multiple interpretations of any database are not only possible but also plausible. Although data interpretation can be very complex, the simplest scenario is usually preferred to more complex ones in theory development.

Second, bias is present in every interpretation because all scientific interpretations are at least partly subjective.

Third, the public needs to understand how science works. People sometimes get alarmed because scientific interpretation.

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**Can You Find the Data?**

The fictional article below is typical of the science news appearing in newspapers around the world. It contains a lot of information, but not all of it is scientific data. Much of it is actually interpretation of the data. Certain choices have been made that favor a particular hypothesis.

Circle or underline the data as you read the “news article” and then check your answers on page 39. What can you conclude from just the data?

**Science News Notes: Unicorn Fossils Found**

*SoCal Times*

**HMMAHA, EUROPE, JULY 23, 2002.** A stunning display of fossils dated to about 400 A.D. were found in a newly opened quarry near Glwddenston, Hmmaha, Western Europe. Researchers suspect that the deposit may yield approximately 35 unicorns.

The discovery was made by Dr. I. M. Looking, senior fellow and vertebrate paleontologist at Hmmaha University, a small school near the dig site. U. R. O’Kay, development supervisor at the Wee R. Rich Quarry, invited Dr. Looking to do an assessment before the company opened a new section of the quarry. According to Dr. Looking, unicorns were thought to be imaginary creatures, part of the fairy-tale world of knights in shining armor, magical castles, and dragons. “No one really believed they existed until now,” said Dr. Looking.

Although the site is located near Lake Tsestegee, the sand and gravel quarry was at one time part of a river that wound its way through a forest. This supports the notion that unicorns lived in wooded areas. Snail shells found in the gravel also support this conclusion. A full assessment of the significance of the find will require several years of excavation and research.

Numerous fully intact skeletons were found in the upper gravel deposit, indicating that the animals were buried very quickly after death. To date, three complete skeletons have been recovered from a gravel deposit three meters thick. Channel sands underlie and overlie the gravel, which was probably a point bar located at a bend in the river.

According to Dr. Looking, unicorns ate berries and plant shoots and are related to the ancestor of the modern horse, though unicorns are somewhat larger than the earliest member of the horse family, Eohippus *(Hydracotherium)*, which was only nine inches tall at the shoulder. This means that the line of descent for unicorns and horses branched some 45 million years ago.

For centuries, folklore has attributed special healing qualities to unicorns’ horns, but Dr. Looking refused to comment on this possibility, saying that it would require further research.
tions are changing constantly, making it hard for them to know what to believe. However, that is the nature of science—that is how it advances.

Fourth, although science provides relevant information about the world around us and scientific discoveries have often been a blessing to humankind, Christians should not base their theological beliefs on specific scientific concepts. If science is allowed to dictate theology, then every time scientific interpretations change, theology will have to change, whether or not the alterations are consistent with one's belief system and experiences.

At the same time, theology must not dictate how scientists do their work or the conclusions they form. Concepts such as “fixity of species,” based on theology taught by church leaders in the 17th and 18th centuries, and geocentric theory are some of the ideas that contributed to conflict between science and theology.

The Bible can provide both legitimate working hypotheses and constraints for science. In fact, Scripture often suggests avenues for investigation that would not be considered by most non-Christians. Such research should acknowledge any scriptural bias that may be present. As in all good science, the data must be carefully evaluated.

Conclusions

Scientists are fully aware of many of these issues. However, especially in the area of origins, science alone cannot assess the complete database because the scientific approach does not consider the possibility of supernatural involvement in nature or in Earth history. Furthermore, neither creation nor evolution scientists observed the events that occurred long ago in the universe, nor can they replicate them. Both processes are needed in order to draw reliable scientific conclusions from the data.

Most scientists believe there are irreconcilable conflicts between science and Scripture. For example, Ayala states, “To claim that the statements of Genesis are scientific truths is to deny all the evidence. To teach such statements in the schools as if they were science would do untold harm.” In fact, scientific evidence does not prove either a long or short history for life. The available evidence provides very limited information.

Data are not the primary problem in reconciling science and Scripture. It is the interpretation of the data that creates conflicts. It has been said: “Not only is the present the key to the past, but the present is the key to the future.” Both the historical accounts of a worldwide flood and the prophetic accounts of Christ’s second advent proclaim the falsity of that concept.

For Christians, the Bible provides a philosophical basis for belief as well as a source of information that suggests an additional way to approach the study of nature. Using this perspective, some harmony between science and Scripture may be achieved. In fact, Christians may be the ones most likely to find harmony because they recognize God as the Creator of nature and its scientific laws.

Elaine Kennedy, Ph.D., is a geologist at the Geoscience Research Institute in Loma Linda, California. GRI is supported by the General Conference of Seventh-day Adventists for the purpose of exploring the interface between science and religion. Dr. Kennedy received her doctorate in geology from the University of Southern California in 1991. She is currently working on two projects: (1) statistical analyses of trace element distribution in the fine-grained mudstone matrix of the basal breccia associated with the Tapeats Sandstone in the Grand Canyon; and (2) determination of the depositional environment of the sandstones and shales associated with the dinosaur nests sites in Patagonia, Argentina. Her mailing address: 11060 Campus Street, Loma Linda, CA 92330; U.S.A. E-mail: EKenedy@univ.llu.edu. You may also consult the Institute’s Web site: http://www.grisda.org/.

NOTES AND REFERENCES

5. Ayala, et al., p. 5.
6. Ibid., pp. 5, 6.
7. Ibid., p. 6.
12. Ibid.
13. Alan Baharfall, 1978. Personal communication that echoes the sentiment of James Hutton in 1788, “The results, therefore, of our present inquiry is that we find no vestige of a beginning—no prospect of an end” (from Transactions of the Royal Society of Edinburgh).
14. 2 Peter 3:3-10.

Answers

The only data enclosed in the “news note” on page 38 are the following items: (1) site in a sand and gravel quarry; (2) near Lake Tseteege, 15 miles north of Glwddenston in Hmaha, Western Europe; (3) snail shells, (4) three complete skeletons (though the fact that Dr. Looking had nothing with which to compare them introduces an element of speculation here), (5) upper gravel has fossils, (6) gravel bed with fossils is three meters thick; (7) gravel bed is overlain and underlain by sand deposits.
Reproductive cloning dominated the science news for several years after the announcement of Dolly the sheep’s birth in 1997. The extended debate has produced a broad consensus that cloning is too risky at present to apply the procedure to humans. The same conclusion was reached by the Christian View of Human Life Committee sponsored by the General Conference of Seventh-day Adventists. Scientists’ continuing inability to clone nonhuman primates and the report that multiple genes are inappropriately expressed in all cloned animals certainly reinforce those decisions. Furthermore, despite public fascination with the subject, there are relatively few practical uses for the technology. Even as a reproductive aid for infertile couples, reproductive cloning will likely find only limited use in human medicine.

In less than three years, reproductive cloning has been eclipsed by stem-cell biology with its conceptual power and medical potential. The spotlight of debate shifted dramatically to embryonic stem cells shortly after their discovery in 1998. Public discussion accelerated when President George W. Bush addressed the subject in a national speech, and the debate continues. On September 3, 2002, California Governor Gray Davis, in a press conference featuring paralyzed actor Christopher Reeve, signed state legislation that approved funding for embryonic stem-cell research in direct conflict with federal prohibitions. A few days later, former First Lady Nancy Reagan allowed her dissatisfaction with current stem-cell policy to become public. In June, Former President Gerald Ford spoke out in the Washington Post, calling a ban on embryonic stem-cell research the equivalent to “slamming the door to lifesaving cures and treatments.” Though recent geopolitical events have pushed biomedical topics to the inside pages of newspapers, students (and probably their parents) are likely to be confused, or at least curious, why thoughtful scientists, respected politicians, and well-known personalities are butting heads with the U.S. Government over what seems to be a promising avenue of medical research. Furthermore, the stem-cell debate offers teachers an unrivaled opportunity to help their students examine and share their ideas about what makes human life valuable.

By Anthony J. Zuccarelli

In less than three years, reproductive cloning has been eclipsed by stem-cell biology with its conceptual power and medical potential.
Adult Stem Cells

To understand the debate, we must first review a few concepts from human cell biology. Cytologists tell us that our bodies are mostly made up of “differentiated” cells that perform only the limited functions required for specific tissues. Scientists have identified more than 200 differentiated cell types—myocytes (muscle cells), neurons (nerve cells), erythrocytes (red blood cells), and so on. Highly specialized cell types, like the three just mentioned, cannot divide at all. Other differentiated cells may divide a few times and then stop. Consequently, differentiated cells cannot create more of themselves. Nor can they “change their spots”—a mature neuron cannot become a myocyte or any other type of cell. Under natural conditions, differentiation is a one-way street.

Fortunately, many tissues contain a few unspecialized stem cells. Whether they are obtained from a fetus, a newborn, or an adult, they are called “adult stem cells.” Given the proper environment, they divide repeatedly to make more stem cells, a property called “self-renewal.” Unlike differentiated cells, adult stem cells have not been trained to perform the specific tasks of specialized cells. The training program is called “differentiation”—an orderly process in which particular cellular genes are activated, while others are switched off permanently. Differentiation occurs most notably during the embryonic and fetal development, but it continues after birth to produce differentiated cells that have short lives or that must be replaced regularly (e.g., blood and epithelial cells).

Multipotency

In contrast to the fixed functions of differentiated cells, adult stem cells from a particular tissue are “multipotent,” which means they can mature into any one of several cell types found in that tissue. Hematopoietic stem cells from bone marrow, for instance, can mature into erythrocytes or any of a dozen other cell types commonly found in the blood and immune system. This flexibility accounts for their alternative name, “multipotent stem cells.” The role of adult stem cells in the body is to generate replacements for cells that die as the result of damage, infection, or ageing. Without a means to replace those cells, human life would be quite short.

The enormous interest in stem cells results from their two distinctive traits—multipotency and self-renewal. If stem cells could be isolated and grown in the laboratory, they might be used therapeutically to replace human tissues that have been destroyed by disease or trauma. Such transplant tissue would be perfectly compatible with the donor’s immune system.

Unfortunately, several obstacles hinder that achievement. First, adult stem cells are scarce. Bone marrow, a well-known source of adult stem cells, contains only one per 10,000 cells. Other body tissues may contain more stem cells, but never exceeding one per several hundred differentiated cells, and their numbers decrease with age. The low numbers mean that one must have a large mass of normal tissue, a rare commodity, to obtain enough adult stem cells for most purposes. It seems unlikely that epileptics or Parkinson’s sufferers would have spare brain tissue from which neural stem cells could be isolated to treat their disease. For some tissues (like the heart and the insulin-producing cells of the pancreas), no stem cells have been identified. Also, separating adult stem cells from the large number of differentiated body cells is a difficult process. Furthermore, though they are self-renewing in the body, it is no simple matter to re-create their preferred growing conditions in laboratory cultures.

A further difficulty is that adult stem cells have limited flexibility. Typically, an adult stem cell can become one of the cell types found in...
the tissue from which it came. For example, a nerve stem cell may become a neuron, a glial cell, or an oligodendrocyte—all components of nerve tissues—but it cannot become a pancreatic cell or a bone cell. Some animal studies suggest that such cells' developmental flexibility sometimes exceeds expectations. Adult stem cells from one tissue have been reported to develop into cell types characteristic of other tissues, though recent studies dispute claims of broad flexibility. In any case, there is no evidence that an adult stem cell can produce all 200 specialized cell types.

The stem-cell debate offers teachers an unrivaled opportunity to help their students examine and share their ideas about what makes human life valuable.

### Embryonic Stem Cells

The small numbers and limited capabilities of adult stem cells account for the enormous interest in their embryonic counterparts. In contrast to their more mature cousins, embryonic stem cells have unlimited flexibility and can become any cell type; they are often called “pluripotent stem cells.” They are also self-renewing and tend to be easier to propagate in the laboratory. One embryonic stem-cell line has been grown for more than two years through more than 300 doublings. The cells’ ability to propagate indefinitely suggests that we can grow embryonic stem cells in culture until they increase to a mass large enough for transplantation. Their pluripotency suggests that once we learn how to mimic the signals that provoke them to differentiate, we may be able to make any type of differentiated cell needed by patients. Tantalizing reports show that embryonic stem cells can differentiate into dopamine-secreting neurons that will actually reverse the symptoms of Parkinson’s disease—at least in rats and mice.

The clinical potential of both types of stem cells has touched off an explosion of research, but our knowledge is still very limited. As a result, novel stem-cell therapies that go beyond the well-established use of bone-marrow cells are likely to be decades in the future. Nevertheless, the list of potential medical applications is impressive. Any condition that causes the death or depletion of a specific cell population may eventually benefit from stem-cell therapy. Some promising targets include Type I diabetes (loss of pancreatic islet cells), Parkinson’s disease (loss of dopamine-producing neurons), rheumatoid arthritis (destruction of cartilage and chondrocytes), multiple sclerosis (loss of myelin and myelin-producing cells), macular degeneration (loss of retinal visual receptors), cirrhosis (loss of liver cells), osteoporosis (loss of bone and bone-forming cells), spinal cord injuries (loss of spinal neurons), heart failure (loss of myocardocytes), leukemia (cancer of blood cells), and many other diseases. Significantly, there are few treatment options for many of these diseases.

### Source of Embryonic Stem Cells

No one disputes the potential value of stem-cell therapies. Bone marrow and its constituent stem cells have been used to treat blood disorders for 30 years. Rather, the debate converges on the source of embryonic stem cells—very early embryos.

After a human egg is fertilized, the resulting zygote divides repeatedly, typically arriving at the blastocyst stage about five days later. At this point, it is a pinhead mass of about a hundred cells that takes the form of a hollow, fluid-filled sphere. On the inside surface of the sphere is a small cluster of cells called the “inner cell mass.” Embryonic stem cells are derived from the inner cell mass of blastocysts.

Most cell biologists agree that it is unnecessary to create embryos specifically to produce stem cells, since early embryos are available from other sources. In vitro fertilization is widely used to aid couples who are unable to conceive by nat-
ural means. In 1999, for example, more than 30,000 babies were born in the U.S. as the result of in vitro fertilization, about one million children worldwide since 1978. Doctors fertilize six to 14 eggs from each woman. Usually two to four are implanted in the patient’s uterus to achieve a reasonable probability of pregnancy. The healthiest of the remaining embryos are frozen in case the first implantation attempt fails or the couple wants to enlarge its family at a later time. If we accept in vitro fertilization as a treatment for infertility, then excess embryos will exist.

By some estimates, more than 100,000 embryos are currently in frozen storage. When patients decide not to use certain embryos, they can offer them to other couples, require that they be destroyed, or allow them to be used for research, provided that they do not develop beyond a specified stage. Almost all of the existing embryonic stem-cell lines were derived from such “extra” embryos. Many find it difficult to argue that it would be better for the embryos to be discarded as waste than for them to be used to save the lives of others.

**When Is Life Human?**

Because, under the proper conditions, blastocysts might develop into human beings, we must consider carefully how they should be treated. What degree of protection do they deserve? The debate centers around a knotty question: When does human life begin? Or more precisely, when does morally relevant personhood begin? The answer depends upon the moral doctrine one uses to assign human value.

Some Christians find biblical support for the belief that human life begins at birth. Others subscribe to the concept that a new and unique person comes into existence at the moment of fertilization. This second doctrine leads to the conclusion that no benefit to others can justify the purposeful destruction of embryos.

Still other committed Christians hold that the moral value of an embryo develops gradually, like the brightening of a predawn sky, up to the moment of birth. There are many vital stages in this process. Certainly, implantation in the uterus is essential because without it, no further development can occur. Somewhat later, the earliest elements of the nervous system appear, which eventually support organized neurological activity. Human life could not exist without a functioning brain, so that is a key frame in the moving picture of prenatal development. At another point, the fetal heart begins to beat. Much later, at quickening, the fetus makes its first detectible movements, and still later, it is capable of sustained life outside of the womb. These are all critical steps in the progress toward birth. A developmental view suggests that the embryo gradually attains human potential and increasing symbolic moral value. It also allows the possibility of embryo research after taking into account the stage of development and the objective of the research.

**Embryo Status**

The blastocysts from which embryonic stem cells are ob-

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**Sources of Stem Cells**

![Diagram of胚膚幹細胞](image)

- **Inner cell mass**
- **Blastocyst**
- **Fetus**
- **Teratocarcinoma**
- **Embryonic stem cells**
- **Embryonic germ cells**
- **Embryonal carcinoma**
- **Pluripotent stem cells**

**DNA**

**Sources of Stem Cells**
dence in a physical body, but that it represents the whole person energized by life. It follows logically that the basis for human dignity includes the capacity for higher functions such as consciousness, autonomous reason, and ability to establish interpersonal relationships—attributes that Adventists have identified as elements of the image of God. An essay by Adventist ethicist James Walters explored the basis for decision-making in neonatal intensive care. In it, he outlined the concept of “proximal personhood” as a means for assigning moral value based upon a reasonable potential to achieve a personal life with self-awareness.13

**Therapeutic Cloning**

Concern about using early embryos is the first ethical obstacle to the use of embryonic stem cells. Biologists admit, however, that simply having a few embryonic stem-cell cultures and the knowledge to convert them into differentiated cells won’t be enough to achieve broadly applicable cell therapies. Stem cells are marked with surface features that make them incompatible with the immune systems of some recipients. The only way to prevent rejection of stem-cell implants is lifelong treatment with immune-suppressing drugs. Such drugs have serious toxic effects and make recipients more susceptible to infections, but they would be essential in the absence of other options.

The most discussed alternative to immune-suppression therapy links stem-cell therapy with human cloning. It may be possible to create patient-specific embryonic stem cells using a technique originally named “therapeutic cloning” but now frequently called “nuclear transplantation therapy.” In this process, the nucleus from the patient’s cell is transplanted into an enucleated egg. The egg is incubated in vitro to the blastocyst stage, when embryonic stem cells can be extracted. Tissue transplants derived from such stem cells would, in principle, be perfectly compatible with the patient who provided the nucleus.

The principle of therapeutic cloning has already been successfully demonstrated in cows, mice, and rats.14 But there are likely to be difficulties in adapting it for use in humans because the procedure consumes valuable resources. One estimate suggested that it would take more than 280 human eggs transplanted with patient nuclei to create one “custom” embryonic stem-cell line.15 In addition to the $4,000 price tag for each human egg, the time and technical effort to derive an embryonic stem-cell culture for each patient would be incredibly cumbersome and expensive. Furthermore, therapeutic cloning is ethically distasteful to those who believe that a zygote is fully human.

**Beyond Therapeutic Cloning**

Are there other ways to avoid the problem of transplant rejection without the use of human eggs and therapeutic cloning? The British have taken the most direct approach—a stem-cell bank. They plan to collect existing and newly created embryonic stem-cell lines in order to include all of the major variations in cell surface antigens. To cover all of the antigenic tissue types, at least 5,000 different cell lines will be required. With a sufficiently diverse collection, it should be possible to select a cell line that matches any patient and to stimulate its differentiation into the specialized cells that the patient needs.

A second, more distant possibility would be the creation of “universal donor” embryonic stem-cell lines. Genes that encode major cell surface antigens in existing stem cells could be modified to create derivatives that are not recognized as foreign in most or all patients.

Some technical steps required for such genetic alterations have already been accomplished.

Researchers are also trying to understand how the internal environment of an egg “reprograms” nuclei. The egg cytoplasm somehow erases the nuclear memory of the differentiated state and resets it to the embryonic condition. Some chemical factors involved in reprogramming have been identified and isolated. If all of the conditions for reprogramming can be identified, scientists might be able to apply the process directly to adult cells. Bathing cells from a patient in a reconstituted egg environment could transdifferentiate them directly into the cell type of choice or convert them into stem cells. Tissue replacements could then be designed without the use of human eggs. Though this approach is admittedly futuristic, it is no more improbable than many recent developments in biomedicine.

**Stem Cells Summarized**

Some observers have overstated the usefulness of adult stem cells at the expense of embryonic stem cells to favor their philosophical posture of zygotic personhood. However, almost all scientists in the field agree that, in light of their therapeutic potential, too little is known to judge the relative merits or to limit research to one or the other. Embryonic and adult stem cells will likely provide complementary tools.

About 76 embryonic stem-cell lines derived before President Bush’s address have been approved for study with federal support.16 The research community must now produce evidence that there is actual—as opposed to theoretical—benefit to be derived from embryonic stem cells. That evidence will be a persuasive argument for their continued use and development.

**Gene Therapy**

Gene therapy raises different questions. It does not create new persons by asexual means. It does not consume fertilized
about 600 studies. There have been some promising results, began 12 years ago, nearly 4,000 patients have been treated in.

Gene therapy is the modification of the genetic material in human cells to prevent, cure, or ameliorate a disease or defect. The added genetic material may encode information that is entirely new to the cells or it may represent additional copies of genes the cells already possess. The source of the introduced genetic material is typically human, but in some cases, it may come from other organisms, or it may be entirely synthetic. Genetic modifications may be intentionally temporary or lifelong.

**Somatic Gene Therapy**

Gene therapy has two major subdivisions. Somatic gene therapy includes the genetic modification of cells that are not involved in reproduction. Many different organs and tissues have been targeted, including bone marrow, liver, muscle, skin, thyroid, intestines, lungs, vascular endothelium, heart, joints, brain, etc. If, for example, the gene for blood clotting factor VIII were introduced into liver cells of a patient with Type A hemophilia, its ability to supply a missing clotting protein would alleviate symptoms of the disease.

Somatic therapy’s goal is the same as that of conventional medicine—to save the life or relieve the suffering of a particular patient. It does not attempt to achieve any therapeutic effects in the offspring that the patient may subsequently produce. In fact, it intentionally avoids making genetic changes in the germ (reproductive) cells of the patient.17

Techniques for accomplishing somatic gene therapy in humans are under intensive development. Since clinical trials began 12 years ago, nearly 4,000 patients have been treated in about 600 studies.18 There have been some promising results, but most tests of human gene therapy have been disappointing.19 This is not due to a shortage of genes that would have therapeutic effects, but to the difficulty of getting them into cells.

The “delivery problem” has been the major technological roadblock. The most common approach is to use viruses. Therapeutic genes are inserted into disabled virus particles to exploit the incredibly efficient mechanisms that viruses use to inject their own genes into cells during infection. Essential genes are removed from the viruses to prevent them from replicating, and they are replaced by therapeutic genes with the molecular signals to control them.20 Some viruses used to ferry therapeutic genes may be familiar: relatives of HIV, certain cold viruses, and the viral agent in smallpox vaccines. All viral vectors have inherent limitations and impose some risks.

The 1999 death of 18-year-old Jesse Gelsinger, a participant in a gene-therapy trial, though inadately understood, has been attributed to an unusual inflammatory reaction initiated by the virus used in the study.21 Though easier to produce and less immunogenic than viruses, certain chemical or physical agents (e.g., liposomes, DNA-lipid complexes, and “gene guns”) have also been used to introduce genetic material into cells. Their lower efficiency has limited their use.22

It is now generally accepted that the introduction of therapeutic genes into somatic cells is conceptually comparable to transplanting cells or organs for therapeutic purposes. Consequently, it raises no novel issues beyond safety and efficacy, as long as the intent is to treat clearly defined diseases.

**Genetic Enhancement**

Difficulties arise, however, when somatic gene therapy goes beyond the remedial. Once it becomes routinely successful in treating disease, we may expect proposals to use gene therapy to produce super-health. Current experience with cosmetic surgery suggests that the far side of this frontier is the exotic land of “enhancement,” a world beguiling in prospect but ethically treacherous. Who could resist a genetic treatment to reverse pattern baldness or to help lose a few pounds? How about increased resistance to cancer, infection, or heart disease? We already know several dozen alleles that reduce the incidence of cancer. An altered cell surface protein makes a few people resistant to HIV. Members of one fortunate community have an enzyme that protects them from heart disease no matter what they eat. Why not give everyone the genetic advantage now enjoyed by a few? But it doesn’t stop there. There is little doubt that there are genes that influence height, intelligence, life expectancy, and every other human trait.

There are no simple prescriptions here. A proposal to limit gene therapy to treating disease suffers from the difficulty of defining “disease” unequivocally; it sometimes grades imperceptibly into the normal range of human variation. Also, the concept is influenced by culture. However, there is merit in the notion that gene therapy should be limited to conditions that are either demonstrably life-threatening or severely disabling.
I reject the “slippery slope” objection that seeks to forbid gene therapy because it will inevitably lead to enhancement. We do not prohibit every endeavor that, when pursued without restraint, might lead to undesirable consequences. Everything we do carries risk, which we attempt to balance against the benefits of our acts. Our deliberation implies that we can prescribe limits to our behavior. The reflection of God’s image that remains invites us to responsible action.

Germline Gene Therapy

Germline gene therapy is the second major category. It would purposely make genetic changes in all body tissues, including those that produce sperm and eggs. Such genetic alterations would be transmissible to the offspring of the original patient. In fact, the goal of germline therapy would be to affect all the descendants of a treated patient. Its justification would be the cost-effectiveness of permanently eliminating a genetic defect in a lineage rather than treating each affected individual separately. In this respect, it represents a fundamentally new objective for medicine. Germline modification in animals requires manipulation of fertilized eggs or very early embryos and several generations of controlled matings. Such techniques are inherently inefficient and unsuitable for use on humans.

Beyond the technical issues, germline alterations raise many unique ethical issues. God places enormous value on human freedom, but how does one get informed consent from persons who do not yet exist? Thoughtful individuals may make different choices regarding changes in their genes. The therapeutic choices of one generation may not be the preferences of the next. Furthermore, though we can assess the safety and efficacy of somatic therapies using animals and carefully controlled human tests, prospective evaluation of germline gene therapy is difficult, perhaps impossible. The “catch-22” is that we cannot foresee all the long-term consequences, but once changes are made, they will be permanent. Will the eradication of an undesirable feature also eliminate a secondary, but highly valued, trait? Animal tests cannot predict the subtle effects that gene changes may have on cognitive functions, yet these are the very capabilities that must be carefully guarded. Because of the multiple unknown risks and unresolved ethical issues, there is currently a moratorium on attempting germline gene therapy in humans.

Christian Motivation

Some might ask why we should concern ourselves with these arcane matters of genetic medicine. God has charged Christian health-care personnel with the responsibility of preserving life and alleviating suffering. The Scriptures portray God as endlessly concerned with the moral and physical restoration of His creatures. “And he sent them to preach the kingdom of God, and to heal the sick” (Luke 9:2, NIV).

Christ gave explicit instructions to continue His healing ministry. Christian health professionals therefore have a moral obligation to use the most effective methods to prevent or treat disease. Adventists in particular appreciate the ministry of healing as part of God’s work on Earth.

We are powerfully driven to control disease, conditions that disrupt the order and harmony that God intended. Genetic medicine need not be an expression of human pride or arrogance. To the extent that it can prevent disease and restore health, we are obliged to investigate its potential. When the aim is to alleviate suffering and when we use our creativity with courage, caution, compassion, and prayer, genetic medicine has the same moral justification as traditional medicine. On the other hand, an attempt to redesign ourselves into creatures with new and superlative powers would be perilous. A balanced view of our God-likeness reminds us that we tamper with fundamental human attributes at great risk. However, we dare not neglect the opportunities and resources He provides. Ultimately, we are accountable to the Maker of the universe who holds us responsible for the care of each other and of the Earth.

Anthony J. Zuccarelli, Ph.D., is Professor of Microbiology and Biochemistry at the Loma Linda University School of Medicine, Loma Linda, California. He teaches molecular biology and genetics and administers the Medical Scientist Program (M.D.-Ph.D.). He is interested in molecular genetics and microbial evolution. His laboratory focuses its efforts on the molecular history of antibiotic resistance and virulence genes on pathogenic bacteria. In his spare time, he enjoys reading and thinking about the impact of biotechnology on individuals and society, as well as the ethical issues raised by advances in medicine. Part 1 of this article, “Reproductive Cloning,” appeared in the Summer 2002 Journal of Adventist Education.

NOTES AND REFERENCES


22. See Endnote 20.

**Corrections**

Chart 1 on page 13 of the October/November 2002 issue included an incorrect element in the key. It should have appeared as follows:

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**Valuegenesis**

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The JOURNAL OF ADVENTIST EDUCATION Web site address was listed incorrectly in the Of Interest to Teachers page in the October/November 2002 and December 2002/January 2003 issues. It should be: http://education.gc.adventist.org/jae/.

The caption on page 3 of the December 2002/January 2003 issue omitted two names. The list of North American Division college/university presidents in the back row should have read as follows: Left to right: Gordon Biuetz, Southern Adventist University; Charles Scriven, Kettinger College of Medical Arts; Randal Wisbey, Columbia Union College; David Greenlaw, Florida Hospital College of Health Sciences; Delbert Baker, Oakwood College; Richard Hart, Loma Linda University; Syl van Lashley, Atlantic Union College; N. C. Sorensen, Walla Walla College; and Fred Thomas, Southwestern Adventist University.

The name of the president of Southwestern Adventist University, Fred Thomas, was printed incorrectly in the December 2002/January 2003 issue. We apologize for this inadvertent error.

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The December 1999/January 2000 issue focused on school boards and drew a great deal of interest even from people who don’t regularly subscribe to the Journal. Almost 13,000 copies were ordered for school board members around the world. The Summer 2000 issue which featured a special report on Adventist education worldwide, was distributed at the General Conference session in Toronto, Canada, and at the North American Division teacher convention in Dallas, Texas.

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