When and where do people learn about psychology? In this chapter, we suggest that the sun never sets on the teaching and learning of psychological science. The term psychological science emphasizes the scientific nature of the discipline. Psychological science is communicated in a variety of formal and informal settings. Formal settings include a wide array of academic institutions and professional development venues, whereas informal settings include popular media, Web sites, podcasts, networking sites, family discussions and religious communities. Psychological science is taught to students across the life span, in a wide range of contexts, at all hours of the day and night, in most parts of the world, and using many instructional modalities. Psychological science is local, national, and international. Psychological science appeals to a diverse audience. In this chapter, we explore quality control of the discipline’s content and address the misconceptions that are commonly held by the public. We also describe when and where people learn
about psychology, and we conclude with recommendations for the future of undergraduate education in psychological science.

THE CURRENT STATE OF AFFAIRS

Psychological science is taught in various classroomlike settings, but individuals also learn about psychological topics in a variety of settings in and out of the classroom. In the section that follows, we briefly describe both the formal (preschool–college curriculum) and informal (e.g., families, media, folklore) contexts in which individuals encounter psychological information.

Formal Learning of Psychological Science

During the last several decades, the teaching of undergraduate introductory psychology courses to a wide variety of audiences in many types of locations has increased. Five primary avenues for this instruction are precollege, community college, 4-year institutions, departments outside of psychology, and professional development programs.

Precollege Programs

Psychology content is delivered throughout the kindergarten–Grade 12 curriculum in several ways. In pre-high-school the most common method is to include psychological science information in general science courses. Although this content is not generally attributed to psychology per se, information about the brain and central nervous system, sensation and perception, health and wellness, eating disorders, diversity awareness, and even animal behavior is often included in the elementary and middle school science curriculum. One concern is the lack of specific training in psychology that is often prevalent in these pre-high-school teachers.

Most commonly, however, the first explicit exposure to psychological science occurs through introductory psychology courses that are offered as part of the regular high school curriculum. These “regular” psychology courses are different from Advanced Placement (AP) and International Baccalaureate (IB) courses. Regular psychology courses are often year-long high school courses that address topics covering the spectrum found in most AP, IB, or introductory psychology courses. They can also be semester long or shorter courses that cover fewer topics. Teachers of Psychology in Secondary Schools (TOPSS) recommends that teachers of regular high school psychology courses base their course content on the American Psychological Association’s (APA’s) National Standards for High School Psychology Curricula (APA, 2005). These standards suggest teaching at least one unit from each of the five domains of psychology (methods, developmental, biological, cognitive, and
variations in individual and group behavior). Psychological science content is also found in nonpsychology high school courses such as family and consumer science, health, and anatomy and physiology. Public, private, and home schools also offer psychological content in direct and indirect ways.

Perhaps the most impressive initiative to deliver college-level psychology instruction to high school students is the AP program sponsored by the College Board. The AP Psychology Exam was first offered in 1992, when approximately 4,000 students took the exam. By 2008, AP psychology had become one of the most popular AP course offerings, and more than 132,000 students took the exam (K. D. Keith, personal communication, June 24, 2008). Worldwide, at least 4,257 high schools offered psychology as an AP course, including countries such as China, Brazil, Pakistan, Mexico, and France.

Dual-credit arrangements between high schools and community colleges have increased dramatically, with 71% of U.S. high schools offering some form of dual-enrollment credit, involving 1.2 million students (Waits, Setzer, & Lewis, 2005.) Dual credit means that a college-level introductory psychology course is delivered either by an approved high school teacher (usually with a master's degree or higher) or a community college teacher. Almost all (98%) public community colleges in the United States participate in some form of dual-credit arrangement (Kleiner & Lewis, 2005).

Finally, the IB program includes psychology for students in the 2-year Diploma Programme for high schools. The IB Diploma Programme is aimed toward 16- to 19-year-olds and requires three components of all students: the Extended Essay (a 4,000-word essay on a topic of choice); Theory of Knowledge (an interdisciplinary course focused on critical thinking about the basis of knowledge); and Creativity, Action, Service (a 150-hour service learning component). Furthermore, students take coursework in six different subject areas: Language 1A (which includes the student's first language and literature), Language B (which includes a second modern language study), Individuals and Societies (which includes history and psychology), Experimental Sciences (which includes biology and chemistry), Mathematics, and Arts and Electives (which include visual art, music, a third modern language, and further choices from Individuals and Societies, Experimental Sciences, and Mathematics). Only 2% of U.S. high schools offer an IB program.

Community College Programs

Community colleges play a key role in higher education. As of January 2008, approximately 46% of all college undergraduates were enrolled in community colleges (American Association of Community Colleges, n.d.). Community colleges provide a connection from high school to college through programs that allow students to earn course credits leading to associate degrees and eventually bachelor degrees at 4-year institutions. In addition, community colleges serve as a gateway to higher education for traditionally underrepresented groups. Approximately half of all ethnic minority students
who are in college attend a community college. Furthermore, as of January 2008, 39% of all students in community colleges are first-generation college students (American Association of Community Colleges, n.d.) Small classes and ready access to professors make community colleges appealing to students who seek a local and affordable opportunity for higher education.

For many students, the introductory psychology course is their first and perhaps only formal exposure to the science of psychology, and half of those students take that course at a community college (Phillipe, 2000). Moreover, approximately 50% of all psychology majors take at least some coursework at community colleges (D. Smith, 2002). By frequently providing their first taste of the field, community colleges are at the forefront for recruitment and training of future psychology majors.

Finally, community colleges prepare students for the job market. World economic conditions require a workforce with postsecondary education, and employers increasingly rely on students who are served by community colleges. Many citizens who do not have access to traditional 4-year colleges rely on community colleges to meet their educational needs. Community colleges provide numerous opportunities for career changes, lifelong learning, and personal development courses in psychological science.

Four-Year Programs

The APA Monitor on Psychology ("Psychology Is," June, 2008) reported that psychology is the fourth most popular undergraduate major at 4-year institutions. In the last 30 years, the number of psychology degrees conferred has increased by more than 75% (U.S. Department of Education, 2007). This rise in popularity occurred even as psychology struggled to find a standard core curriculum (see, e.g., Benjamin, 2001; chap. 3, this volume). The average psychology degree requires 37 credit hours of psychology coursework (Stoloff, Sanders, & McCarthy, n.d.) and is usually classified as a social science. Regardless of the structure of the curriculum, traditional psychology majors often start their training during their first semester in college. Exceptions to this may be students who began even sooner by earning AP, IB, or dual-enrollment credit for the introductory psychology course or students who decide on a major later in the course of their undergraduate education.

Introductory psychology is one of the most frequently selected courses in the undergraduate curriculum, second only to English composition in percentage of credits earned by bachelor's degree recipients (Adelman, 2004). Psychology classes may include traditional lecture and laboratory components, and some institutions now offer online classes that mirror the objectives and coverage of traditional lecture-based courses. Schools such as Drexel University and Troy University offer their entire bachelor of science degree in psychology online. Hybrid (lecture and online combined) courses are also becoming increasingly popular.
In addition to traditional majors, psychology coursework reaches three other groups of students: nonmajors, military personnel, and students studying abroad. Nonpsychology majors usually receive their only psychological science experience as part of their school's general education program, but many other disciplines require a psychology course as part of their major. Students who transfer from community colleges or other 4-year schools generally take their first psychological science course at their first institution. For many students, their first exposure to psychology may be their last. This means that the discipline and its representatives must ensure that there is some quality control implicit in when and where people learn about psychology.

Undergraduate psychological science courses are taught to members of the U.S. military, who receive academic credit for taking these courses in stateside and overseas locations. For example, the U.S. Navy provides professors to teach courses in psychological science to sailors at sea. Traditional students also learn about psychology overseas while participating in study abroad programs. These programs can last anywhere from a few weeks to a full semester or school year. In addition, some schools, such as James Madison University, have alternative spring break programs that require psychology majors to apply knowledge gained in psychology courses in a variety of short-term experiences, either nationally or internationally. Thus, students encounter psychology courses in different configurations and types of institutions all around the world.

Programs in Other Disciplines

Psychology courses are valued and often specifically required in a variety of other disciplines. For example, nursing, education, business, criminal justice, family studies, and mortuary science often require courses such as introductory psychology, life-span development, or educational psychology. In addition, these programs often recommend psychology courses as electives, (e.g., psychopathology, biological psychology, social psychology, health psychology, learning and memory, sensation and perception).

Some departments offer courses incorporating content that is psychological in nature but taught by nonpsychology faculty. For example, degree programs in business, education, mortuary science, and nursing often cover office management, sensitivity training, human growth and development, classroom organization, behavior modification, death and dying, psychopathology, psychopharmacology, and social psychology, among others. Thus, course content based on psychological research and theory is covered in many settings outside of psychology, raising concerns about teachers' expertise, accuracy of material presented, and appropriate recognition of psychological science as the source of the content. Principle C of the APA "Ethical Principles of Psychologists and Code of Conduct" (APA Ethics Code; APA, 2002a) states that "psychologists seek to promote accuracy, honesty, and truth-
fulness in the science, teaching, and practice of psychology” (p. 3). Countering misinformation and misperceptions is a primary responsibility of teachers of psychology, who must continue to campaign for accurate and ethical instruction in and application of the content of our discipline, regardless of who is doing the classroom instruction.

**Psychology in Professional Development**

Professional development training targets specific skills to enhance individuals’ occupational productivity. Typically, the content of the training is derived from undergraduate psychology courses but reduced to its essentials and presented as a series of recommended applications in a specific setting. These training sessions usually last at least 1 hour but may require a full workday. For example, day care providers may receive information on implementation techniques of guidance and group management (at the appropriate developmental level), child development, or their commitment to professionalism.

Professional development training typically involves face-to-face group sessions, but differences in language, culture, and educational background influence how sessions are conducted. Future growth in online versions of these sessions is expected. Although sessions may occur any time, the training is usually reserved for orientation of new employees, continuing education of workers, or responding to a crisis or awareness of a specific training need. Audiences might include teachers and support staff in schools, paraprofessionals who work in health care, or first responders such as police officers and firefighters. In addition, community health centers have workforces with varied educational backgrounds, and they might receive diversity training or instruction in certain workplace skills such as communication and conflict management. Professional development training in these and other areas may serve as an introduction to the content of psychological science.

**Informal Learning of Psychological Science**

Imagine this scene: A physician takes her seat on an airplane and strikes up a conversation with a business executive in the next seat. They exchange pleasantries and the executive asks, “What do you do?” The physician replies, “I’m a physician.” What is the next question from the executive? It’s likely to be something like, “What’s your specialty?” Now imagine that the person was a psychologist rather than a physician. How likely is it that she would be asked about her specialty? The executive is more likely to ask, “Are you analyzing me now?” rather than recognize the many ways in which people can study and practice psychology. This vignette illustrates a public perception problem faced by the science of psychology. Many people, perhaps most people, are either uninformed or misinformed about the nature of psychology.
Because of the influence of the mass media, the occupation of psychologist is almost universally perceived by the general public as that of a clinician. Although clinical is the largest specialty field in psychology, only half of all psychologists in the United States are clinical psychologists. Has a community psychologist ever appeared in a TV show or movie? Has a human factors expert ever been the lead character in a novel or a play?

This issue is not faced by most disciplines. People have a reasonably accurate idea of what is included in the fields of history, biology, and chemistry, or at least they are aware of their own lack of knowledge in these areas. Biology and chemistry are perceived to be technologically complex and therefore worthy of respect. In contrast, psychology’s problem is that it is interesting and imminently accessible to any armchair theorist. Everyone is an “expert” in psychology.

“Real” psychology is typically represented narrowly, or not at all, in the media. Often, portrayals of psychology or psychologists convey an impression that could not be more at odds with the one that psychologists want to convey. Students entering psychology classes are likely to believe that TV and radio “psychologists” are doing what real practitioners do and psychology is limited to counseling others. They are likely to believe that the most influential historical figure in psychology is Sigmund Freud. They are also likely to share stories about what they learned while visiting one of the 3,270,000 sites returned when “dream interpretation” is searched on Google. Furthermore, they believe wholeheartedly in what they learned about themselves by filling out the dime-a-dozen unscientific personality inventories so widely available in magazines and on the Internet. They are eager to start studying astrology, graphology, and a host of paranormal phenomena because they believe that this truly is the “stuff of psychology.” Countering misinformation and misconceptions is a primary ethical responsibility of teachers of psychology.

A wealth of valid, empirical psychological content is available in the media, if one chooses to search for it. Scientific American Mind is visible at most newsstands. There is an excellent science section (Science Times) in the New York Times that has some psychologically related content almost every Tuesday. A growing number of podcasts provide sound psychological information. There are excellent trade books written by psychologists to better inform the public about what psychologists do. Sometimes even 60 Minutes and other similar TV news programs provide accurate portrayals of the field. Nevertheless, the most common available information is misinformation. Principle A of the APA Ethics Code (APA, 2002a) states, “Psychologists strive to benefit those with whom they work and take care to do no harm” (p. 3). Accurate psychological information can benefit people; inaccurate psychological information can lead to harmful decisions in many realms. Leaving accurate presentation of psychological science to happenstance or
to those not trained in the field almost ensures that the public perception of psychology will be distorted, at best.

When introductory courses are taught in fields other than psychology, most of the subject-related knowledge students bring with them on the first day is reasonably accurate. The same assumption cannot be made in introductory psychology courses. According to Principle C of the APA Ethics Code (APA, 2002a), "Psychologists seek to promote accuracy, honesty, and truthfulness in the science, teaching, and practice of psychology" (p. 3). Countering misinformation and misperceptions is a primary responsibility of teachers of psychology. Therefore, it is ethically incumbent on those who teach psychological science to dispel misinformation and teach empirically based psychological science.

Regardless of time and place, at the foundation of psychological science is ethics. Sound ethics makes for good science by establishing standards and guidelines for conducting research and for teaching. Teachers of psychology have an ethical responsibility to provide instruction in psychological science by presenting accurate information, correcting misrepresentations, and monitoring the integration of diversity in both formal and informal settings.

RECOMMENDATIONS

The following recommendations address the diverse nature of the teaching and learning of psychological science. Applications to formal and informal settings are targeted in these recommendations. Each recommendation is consistent with the APA Ethics Code. Regardless of when (kindergarten through graduate school) and where (formal and informal settings) psychological science instruction is provided, adherence to the APA Ethics Code can increase the probability that the instruction and interactions are appropriate and effective.

Recommendation 1: Rename the Discipline of Psychology as Psychological Science

Perhaps the single most prominent action to launch the new blueprint for undergraduate psychology is to recommit the discipline to the underlying belief that psychology is an empirical science grounded in the scientific method. More than any other source of belief or understanding (Peirce, 1972), the scientific method provides the best way to differentiate science from pseudoscience. To this end, we recommend that the discipline of psychology be referred to as psychological science. We realize that this is an enormous request that will require great patience and persistence to achieve. This name change would clarify for the public what psychology is and what it is not.
When this change is implemented in elementary and middle schools, a new generation of students will reach high school and college understanding that they are studying science when they take psychology courses. This name change also reflects the history of psychological science from the ancient Greek philosophers to Descartes to the British empiricists to Wundt's first psychology laboratory to the present emphasis on scientific psychology. Psychological science celebrates the breadth of the discipline as evidenced by the many specialties and the scientific basis for all of them. Indeed, this scientific basis ties the specialties together.

To this end, one facet of this recommendation is renaming college psychology departments as departments of psychological science to reinforce the fact that psychology is a scientific discipline and should be identified as such. Change is most often greeted with resistance, but this recommendation can phase in gradually and will catch on just as other new buzzwords have in the past. Psychologists may need to take into consideration the idea that they may not be welcomed in the natural science camp, and some may attribute the effort to change as an indication of a self-esteem problem for psychology. This will not be an easy transition, but it is definitely worth the effort.

Endorsement of this change by leaders in the APA and the Association for Psychological Science will be a necessary component for this type of change to occur. Perhaps the effort could be initiated by the participants in the National Conference on Undergraduate Education in Psychology, which was sponsored by APA. If participants could convince their administrations to change the name of their departments to Department of Psychological Science, the trend could be launched in a reasonably short time frame. Because these participants were selected for their leadership in the area of academic psychology, their widespread influence may be enough to get the initiative off the ground. Similar efforts will gradually change attitudes of other academic decision makers to be more consistent with psychology as a legitimate science.

**Recommendation 2: Acknowledge Psychological Science Contributions**

The substantive content of psychological science should be recognized as such wherever it is found. Virtually every introductory psychological science textbook defines psychology as the “the scientific study of behavior and mental processes.” Psychological content is ubiquitous. For example, child development degree and certification programs in education and family studies departments, marketing and management specialties in business departments, and patient care in nursing programs depend on psychological science for their content and intellectual rigor. Many of these disciplines include content that originates from psychological science, such as classroom management techniques, employee incentive programs, child discipline, parenting styles, grief and loss, health management, and eating disorders. When people
in other disciplines value and use the research, we recommend that they acknowledge the specific contributions of psychological science.

Although psychological science enjoys a pervasive presence across many disciplines, public perception and professional recognition of its contributions are weak. Psychologists should be integral resources when psychology is taught to students, regardless of context. Part of this recommendation is the creation of a task force to develop specific action plans to encourage the recognition of psychological content in all areas in which it is relevant and to promote the use of psychologists in teaching and consulting roles whenever psychological science is presented, both formally and informally. When students or the public are taught about medical advances, physicians are called on to represent their field. Similarly, psychologists should insist that they be called when psychological science is presented.

**Recommendation 3: Identify and Expand Psychological Science in Elementary and Middle School Curricula**

Elementary and middle school science and health textbooks often include psychological science content. Exposing young students to this important learning opportunity is good, but they may not realize that the content is psychological in nature. Two related recommendations are (a) psychological information in the curriculum should be appropriately attributed to psychological science, and (b) school curricula should include information labeled *psychological science* so that children can appreciate what the field of psychological science has to offer. Furthermore, we recommend that textbook publishers engage psychologists to develop appropriate curricular materials. This early exposure to appropriately labeled psychological information will facilitate a more accurate perception by the public in future years, promote critical thinking, and inoculate children against psychological misinformation in formal and informal settings. An overall increase in psychological literacy will result.

**Recommendation 4: Establish Psychological Science Courses as a Science Requirement**

The value of a basic education in science is the acquisition of critical thinking skills and the capacity to apply these logical strategies in novel situations. Evaluating information and its sources, appreciating the complexity of issues, and consuming information critically are timeless skills. The value of an educated citizenry is undeniable. Psychological science is better suited to provide these strategies of critical thinking than are traditional sciences such as biology, chemistry, and physics. At the high school level, psychology courses that follow the *National Standards for High School Psychology Curricula* (APA, 2005) address both the scientific methodology and critical thinking
skills found in science courses as well as conclusions drawn from such methodology and reasoning. Students demonstrate greater critical thinking and science reasoning skills after taking undergraduate psychological science courses than after taking chemistry courses (Lehman, Lempert, & Nisbett, 1988). Compared with courses in psychological science, physics, chemistry, and biology courses spend much time addressing content and findings and conclusions of research and little time teaching students how to evaluate the quality of those findings and conclusions (Macias & Macias, 2009). We recommend that high schools and colleges accept a course in introductory psychological science to satisfy general education requirements in science.

When psychological science courses satisfy science requirements, additional resources available for science education might be dedicated to training teachers and purchasing supplies.

As this recommendation is implemented, high school teachers of psychology should not lose their certification to teach psychology. Teachers of psychology often seek training in statistics and research methodology to bolster their knowledge of the discipline. Allowing these dedicated teachers to document their efforts and to continue providing sound scientific instruction for students will help ensure a successful transition.

**Recommendation 5: Expand and Improve Psychological Science Web Resources**

*How to Think Straight About Psychology* (Stanovich, 2007) characterizes psychological science as “a body of knowledge that is unknown to most people” (p. ix). This lack of awareness is compounded by a public perception that psychological science is dominated by Freud and a general belief that psychology is merely a set of commonsense conclusions. Consequently, Stanovich characterized psychological science as the “Rodney Dangerfield of the Sciences.” Dangerfield, a popular comedian from the 1970s and 1980s, is famous for the catchphrase “I don’t get no respect.” Similarly, portraying psychology as parapsychology or pop psychology rather than psychological science explains the discipline’s lack of status among the sciences.

Stanovich (2007) provided several examples of misrepresentations of psychological science. Perusing the collection in the psychology section of a bookstore reveals tomes on topics such as parapsychology, telepathy, clairvoyance, psychokinesis, reincarnation, and psychic surgery. With some notable exceptions, radio and TV stations rarely broadcast reports of psychological science, but they routinely present bogus therapies and publicity-seeking personalities not connected to the field. If the public is interested in a particular psychological question, the media will provide a story, often without assistance from psychological scientists.

In his APA presidential address, Zimbardo (2004) extolled the benefits of establishing positive relationships with the media as they “are the
gatekeepers between the best, relevant psychology we want to give away and
that elusive public we hope will value what we have to offer" (p. 340). He
went on to say that it is "essential to our mission of making the public wiser
consumers of psychological knowledge to learn how to communicate effect-
ively to the media and to work with the media" (p. 341).

The basis of several recommendations is an insistence that a compre-
hensive and persistent national effort involving the media needs to occur
to improve the perception in the public mind of psychology as a scientific dis-
cipline. To support this effort is a recommendation to strengthen the Web
presence of psychological science to better (a) educate the public about psy-
chological science, (b) alert the public quickly when misinformation is in
the "public eye," and (c) investigate sources and patterns of misinformation
reported about psychological science. This Web presence should become as
popular and easily recognizable as Google for finding accurate information
about psychological science and reporting inaccurate portrayals of psychol-
ogy. Over time, the ability to differentiate a social psychologist from an in-
dustrial and organizational psychologist will be as easy as differentiating a
pediatrician from an obstetrician or a dentist from an orthodontist.

One possible form for such a public education Web site is Psychology
Matters (http://psychologymatters.apa.org/), which presents information
gleaned from psychological research on the applications of psychology in
daily life. Expanding the site's content about psychological science to in-
clude knowledge as well as application and making the content easily acces-
sible to the public are avenues for successful implementation. For example,
a list of "Frequently Asked Questions," clearly organized by themes and easily
searchable, would provide the public with ready access to answers to their
questions. One of the possible themes could be myth busting to ensure that
the public and the media correctly understand psychological science. One
important audience for this content would be teachers of psychological sci-
ence at all levels who regularly need accurate information to address con-
temporary issues and answer questions posed by their students.

Second, the Web presence will alert the public when accurate or inac-
curate information about psychological science is publicized. Accurate por-
trayals are identified as such; erroneous or misleading content is presented
along with its author and/or source followed by a brief paragraph explaining
the fallacies and what the correct content should be. This accurate informa-
tion would provide psychological science stakeholders with the necessary
knowledge to respond to and correct inaccuracies through letters to editors,
op-ed articles, discussions in class, and conversations with friends and col-
leagues. After some time, this content would be reformatted and posted in
the educational part of the Web site.

Finally, data on the types, sources, frequency, and prevalence of misin-
formation about psychological science are limited; thus, the third function of
the Web presence is research. A mechanism would be created for psycholo-
gists and the public to report the author, source, and content of the misrepresentation, and this information would then be automatically entered into a database. Researchers and policy makers could use the resulting database to grasp more concretely the scope and patterns of the misrepresentations and identify authors and sources consistently reporting erroneous information about psychological science. These analyses would facilitate efforts to contact those writers, commentators, editors, journals, newspapers, magazines, or other media outlets to educate them about psychological science and to increase the likelihood of accurate reporting.

Recommendation 6: Raise Public Awareness of Psychological Science

The final recommendation is that additional resources be developed to acquaint the public with the breadth of psychological science. For many years, APA has made available print and video materials about careers in psychology. For example, there is a DVD and associated brochure called Psychology: Scientific Problem Solvers—Careers for the 21st Century (http://www.apa.org/students/brochure). We laud this ongoing effort to provide accurate information about specialty areas. However, the rapidly changing nature of the field and the speed with which presentations begin to look outdated require frequent updates of both the content and presentation medium (e.g., Web sites, podcasts, streaming video, Second Life, Blu-ray). Individuals showcased in these materials should be a diverse group of established professionals as well as younger persons embarking on their careers and representing different ethnicities and cultures. Information about these materials should be distributed widely. One of the best potential vehicles for highlighting these resources may be regular reminders in the various publications and listservs of TOPSS, Psychology Teachers at Community Colleges, Society for Teaching of Psychology, and other psychology teaching organizations.

CONCLUSION

As a result of seemingly unlimited interest and technological advancements, psychological science is taught anywhere in the world at any time of day or night. It is a fascinating field of interest to individuals at many stages of the life span. All psychology teachers have an ethical responsibility to ensure that accurate scientific content is presented with quality. The discipline must ensure its reputation as a science making a difference in the world, adhering to the highest ethical and scientific standards.