Image from: **Jackie Grebmeier, a National Science...** in *The Multimedia Encyclopedia of Women in Today's World*

Summary Article: **Scientists**
From *Encyclopedia of Giftedness, Creativity, and Talent*

Scientist comes from the Latin root *scientia*, which means knowledge or understanding, and generally refers to one who helps build an organized system of thought about the nature of the world. Scientists study natural phenomena using disciplined and systematic methods. Through logical and objective application of these methods, they gain understanding about living or nonliving things, and often work to improve the human condition through careful application of what is known. Their work covers an enormous range of fields. The National Institutes of Health listed more than 125 major science careers. The huge range of careers is categorized into two major branches that vary depending on the source but generally include the natural sciences (study of living and nonliving things), and the social sciences (study of people and society). The branches are also categorized along lines of the formal sciences (mathematics, logic, and statistics) and the applied sciences (engineering and technology). In a conceptual sense, scientists use objective methods to observe and explain the world. More specifically, they use detailed prescriptive methods to outline a series of steps that consider prior knowledge and assumptions, ensure careful data collection and analysis, and result in meaningful reporting and further study. This series of specific strategies is commonly referred to as the *scientific method* and is the process that helps bind together a large number of people involved with disparate areas of science and wide-ranging expertise. This entry describes the scientific method and science performance.

Scientific Method

The scientific method is a set of objective processes by which scientists, collectively and over time, gain accurate insight about the world in which we live. Most scientists rely on quantitative methods that generally include some variation of the following steps: (a) observe a phenomenon or a cluster of phenomena; (b) articulate a hypothesis that explains the phenomena; (c) design a study, including analyses to test the hypothesis; (d) conduct the study; (e) collect data; (f) analyze data; (g) draw conclusions regarding the hypothesis, particularly whether the results of the study support it or not; and (h) report the completed study, including all of these steps as well as limitations of the study and questions for further research. Scientists, however, are making increased use of qualitative methods that supplant or augment existing quantitative methods and in general rely on the following steps: (a) participate in the setting of inquiry and observe the context; (b) observe the phenomenon directly; (c) collect observational data and verbal data via interviews and focus groups; (d) analyze observations, verbal data, and other materials; (e) allow emergent themes to guide the next steps.

Scientists acknowledge that personal and cultural beliefs can alter both perceptions and interpretations of natural phenomena. Those with certain beliefs may sometimes see things as reinforcing their beliefs, even when they do not; this is called the confirmatory bias. Scientists must guard against this and other biases—for example, cultural bias—by using procedures specifically designed to minimize them when testing a hypothesis or formulating a theory. Such procedures are central to the scientific method.

Science Performance

The No Child Left Behind and other policy reports purport that the United States is behind other nations in science and that students from the United States lack the basic skills to become scientists and meet the needs of a technological society. Major institutions such as the U.S. National Academics, National Aeronautics and Space Administration, and the National Science Foundation have also expressed concern about declining performance of students in the United States on measures of science proficiency. Such institutions have called for improved K-12 education in science, technology, engineering, and mathematics (STEM); improved training for STEM teachers; and increased numbers of college graduates with STEM degrees. Those conclusions, however, have been challenged by Harold Salzman and B. Lindsay Lowell, who pointed out statistical errors with the comparison data. Their reevaluation of the data used for international comparisons led them to conclude that students in the United States perform as well as many of their international counterparts on average, but that STEM educational improvements should be aimed primarily at low performers.

Scientists directly affect the quality of life. To maintain or improve the world's economy, security, and health, it is important to prepare a diverse citizenry that is literate not only in scientific concepts and facts as well as in the scientific method as ethically executed.

See also

Critical Thinking, Multicultural Creativity, Research, Qualitative, Talent Development

Further Readings

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