

Reading Passage (294): Scientists of the Past

In the past, when scientists discovered new ideas, they published them in journals, all of which were later stocked in libraries for university students and professors to study. This was an extremely arduous process that took a very long time. It would not be unusual once a scientist had finished writing an article that it would be years before the article was printed and made available to the general public.

In addition, scientists of the past were not very specialized. For example, Charles Darwin's research in the 1800s seems to have known no bounds — he studied everything from evolutionary theory, to geology, to human emotions, to soil ecology, to tropical corals, to barnacles and botany. Moreover, consider the diverse interests of one of our founding fathers Benjamin Franklin, who was a leading author, printer, theorist, politician, postmaster, musician, inventor, satirist. In addition, he was a major figure in American Enlightenment and the history of Physics, particularly regarding electricity. Incredibly, he even facilitated civic organizations such as fire departments and universities.

Finally, relatively few guidelines and rules pertained to the ethics, safety, and environmental impact of scientific research. For example, in the 1830s, while traveling on the *Beagle*, Charles Darwin amassed for scientific study a vast collection of animal and plant specimens from around the world without any environmental restrictions. In the 1880s, Louis Pasteur tested a vaccine by exposing groups of vaccinated and unvaccinated sheep to anthrax bacteria without being subject to any rules regarding the humane rights of the animals he tested. In the 1890s, Marie and Pierre Curie's studies of radiation were carried out without any environmental or safety precautions — and, in fact, their research notes from those years are still so radioactive that scholars wishing to study them must sign a risk waiver!

Writing Prompt: Summarize the lecture explaining how it is different from the information you just read.

Lecture (374 words): Scientists Today

Science will always look for explanations for what goes on in the natural world and test those explanations against evidence from the natural world — but exactly how this gets done may evolve. The scientific enterprise is not static. Science is deeply interwoven with society, and as it has changed, so too has science. Here are just a few examples of how modern scientific practices have been transformed.

The rise of the Internet has enabled scientific results to be publicized more rapidly than ever before possible. Journal articles are often made available online even before they are printed. This swift distribution of information can speed the pace of science since the latest studies can be scrutinized, replicated, and/or built upon with very little lag time. And as more and more journals provide records of reader comments on e-published articles, the process of peer review is being extended: many more scientists can provide feedback on a particular article and they may do it long after the article's original publication. But the information flow doesn't stop there. Journalists can also quickly access the latest scientific findings and begin to publicize them to the broader population.

As our scientific knowledge has advanced and the questions we seek to answer have become more complex, science has become more specialized. For example, unlike Darwin, whom you just read about, a modern scientist is much more likely to focus on a narrower topic: salamander development, for example, or ancient climate changes in aquatic ecosystems. It's not that modern scientists' interests range less widely, but that our knowledge has expanded to such a degree that developing the expertise (and resources) necessary to conduct research at the cutting edge of a field can represent a huge investment of time and effort. Because of this, modern scientists tend to be more specialized than their predecessors.

Today, scientific studies are subject to significant regulation from government agencies and scientific bodies — but historically, relatively few guidelines and rules have pertained to the ethics, safety, and environmental impact of scientific research. As society and the scientific community have become increasingly concerned about these ramifications, scientific and governmental organizations have set up guidelines to minimize potentially negative impacts and ensure that research is carried out ethically.