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## The Values of Science

IN EGYPT AND TUNISIA, ORDINARY CITIZENS HAVE TOPPLED AUTOCRATS; ELSEWHERE IN THE ARAB World, they still battle dictators, armed with little more than their belief in freedom, human rights, and democracy. What sort of society comes after the revolution? Many fear that the idealism of the revolutionary democrats will only pave the way for theological autocrats who preach an intolerant doctrine. But fighting extremism is best done not by censorship or autocracy but by embracing pluralism and defeating ideas with ideas. And here, science has much to say, particularly about the values that are needed for societies to be truly open and democratic, because these are the values of science.

As the British scientist Jacob Bronowski observed more than half a century ago, the enterprise of science requires the adoption of certain values that are adhered to by its practitioners with exceptional rigor. These values also provide the basis for enhancing human capabilities and human welfare. Truth and honor are of the utmost importance. Any scientist who manufactures data risks being ostracized indefinitely from the scientific community, and he or she jeopardizes the credibility of science for the larger society. A scientist may err in interpreting data, but no one can accept the fabrication of data. What other fields of human activity can rival this level of commitment to absolute truth? Teamwork has become essential in most fields of science, and it requires that all the members of the team receive the recognition they deserve. Contributions are also cumulative, and each should be recognized for his or her contribution. It is a sentiment well captured in Isaac Newton's famous statement that "if I have seen farther than most, it is because I have stood on the shoulders of giants."

Science requires the freedom to enquire, to challenge, to think, to imagine the unimaginable. It cannot function within the arbitrary limits of convention, nor can it flourish if it is forced to shy away from challenging the accepted. Science advances by overthrowing an existing paradigm, or at least substantially expanding or modifying it. Thus there is a certain constructive subversiveness built into the scientific enterprise, as a new generation of scientists makes its own contribution. Our respect and admiration for Newton are not diminished by the achievements of Albert Einstein. We can admire both. This constant renewal and advancement of our scientific understanding is a central feature of the scientific enterprise. It requires a tolerant engagement with the contrarian view that is grounded in disputes arbitrated by the rules of evidence and rationality.

Science demands rationality and promotes civility in discourse. Ad hominem attacks are not accepted. Science treats all humans equally. Scientists are concerned with the content of the scientific work, not with the person who produced it. Science is open to all, regardless of nationality, race, religion, or sex. These values of science are universal values worth defending, not just to promote the pursuit of science but to produce a better and more humane society.

The new Arab societies we are building must be open pluralistic societies that are producers of knowledge and new opportunities. Our youth have sparked our revolution, just as other young people have transformed societies, reinvented business enterprise, and redefined our scientific understanding of the world we live in. Today, as they lead the rebuilding of our societies, they must embrace the values of science. Together, all armed with these values, we can think of the unborn, remember the forgotten, give hope to the forlorn, include the excluded, reach out to the unreached, and by our actions from this day onward lay the foundation for better tomorrows.

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