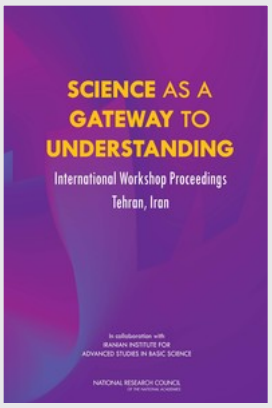

Science as a Gateway to Understanding: International Workshop Proceedings, Tehran, Iran (2008)

DETAILS

184 pages | 8.5 x 11 | PAPERBACK
ISBN 978-0-309-12879-7 | DOI 10.17226/12539

CONTRIBUTORS

Glenn Schweitzer and Yousef Sobouti, Editors; Office for Central Europe and Eurasia; Development, Security, and Cooperation; Policy and Global Affairs; National Research Council

SUGGESTED CITATION

National Research Council 2008. *Science as a Gateway to Understanding: International Workshop Proceedings, Tehran, Iran*. Washington, DC: The National Academies Press. https://doi.org/10.17226/12539.

6

Understanding Others, the Science Way

YOUSEF SOBOUTI
Institute for Advanced Studies in Basic Science

In their study of nature, physicists often resort to the reduction to basics. However, most natural phenomena are complex; and when confronted with such complexity, a physicist tries to identify the prominent features of the phenomenon, strip away the insignificant details, and reduce the problem to a manageable and understandable model. As a student of physics, I wish to follow the same procedure to understand others.

Astronomy as a study of the skies became an exact science as early as the times of Hipparchus and Ptolemy. Through observations of the motions of the heavenly bodies, inquisitive men had understood the order prevailing in the skies and were able to predict astronomical events, such as tides, eclipses, conjunction, and opposition with incredible accuracy. Similarly, ancient geometry, born out of everyday practices in land surveying and building construction, also became an axiomatic science at about the same time.

No one disputed the legitimacy of these two disciplines. They were appreciated by everyone, irrespective of social and cultural status. They could be taught and learned in any language and by anyone who was interested. At no time or place did their tenets become sanctified, nor were any of their practitioners promoted to the state of sainthood. In short, astronomy and geometry emerged

as two culture-free intellectual constructions of man's mind as early as 20 centuries ago.

All this was possible because both disciplines were observation-based and relied on natural facts to support their conclusions. These facts left no room for dispute, or rather they offered a built-in mechanism to resolve disputes. One could convince or be convinced by one's fellow practitioners through logical reasoning and turn to the facts as the supreme arbitrator. In what follows, we expand on this culture-free and dispute-free nature of some of the contemporary sciences in the hope of turning away from controversy and toward "understanding others, the science way."

Unlike astronomy and mathematics, other creations of man's intellect were not so blessed. Physics, the modern terminology for the invisible sciences of the ancients, had to wait until the era of Galileo and Newton in the sixteenth and seventeenth centuries, respectively, to begin its axiomatization, which still is being revised and refined. In spite of their astonishing achievements, chemistry and biology are still in their infancy, and the social and psychological sciences have at best emerged as empirical disciplines. Supernatural ideas and beliefs are not represented by any formal scientific discipline. Why has it taken so long for most of the natural sciences to arrive at acceptable levels of clarity and to be perceived and understood as value-free?

One astonishing and almost universal tendency of the ancient thinkers was their holistic approach to the observation of nature. In contrast, the practice of modern science divides complex issues into small components in an effort to understand them stepwise, from the simple to the difficult. A consequence of the ancients' lofty and unachievable goal was the tendency to resort to metaphysical concepts whenever hypotheses fell short of factual evidence. Ad hoc as they are, such notions differ from time to time, place to place, mind to mind, and culture to culture. As such, they potentially nurture the seeds of controversy. Then, in order to defend them, when confronted with opposing viewpoints, man invariably has looked for support from believers, patrons, and patron-institutions. Let us look at some historical examples.

In the fifth century B.C., Socrates was tried by a jury of 500 Athenian elites. The main charges against him involved the divergence of his philosophical points of view from the accepted values of Athenian society. In 400 B.C., both the philosophical ideas of Socrates and the social values of Athenian society were vague concepts. Neither the defendant nor the prosecutor was able to provide unequivocal evidence to support or discredit claims and counterclaims. The result was tragic: Socrates was convicted and made to take a deadly potion.

Centuries later, a bigger tragedy took place. The teachings of Jesus of Nazareth and those of the orthodox faith of his community confronted each other. Both sides were committed to their doctrines and had disciples and believers to defend their causes. The logic of one side, however, was not acceptable to the other. Inevitably, it ended in tragedy.

Throughout history, such tragic episodes have repeated themselves. The pattern is always the same: two factions oppose each other over a vaguely conceived cause, such as a religious belief, a social value, a moral code of conduct, a philosophical doctrine, or a material interest. The opponents differ in their logic, the disputes remain unresolved, and unjustified measures are used.

Let us consider examples from Muslim society in the first millennium. Abu Nasr Farabi (873-949) and Abu Ali Sina of Avicenna (980-1037) were undoubtedly the greatest philosophers of their times, as well as devout Muslims. Abu Hamed Ghazzali (1058-1111), an equally renowned thinker and a great theologian, however, was at odds with these philosophers. He maintained that the teachings of philosophers, including mathematics, weakened the pillars of the faith. He called Farabi, Abu Ali and, for that matter, all philosophers heretics. Fortunately, the Islamic societies in their flourishing period between the seventh to the twelfth century were tolerant enough to let the verdict pass without harsh retribution. Ghazzali's defiance of philosophy and intellectual reasoning did, however, leave long-lasting impressions for years to come. The great theologian had zealous followers amongst the elite and the commoners, and their influence eventually led to the suppres-

sion of free thought and the acceleration of intellectual decline within Islamic societies.

Let us proceed to sixteenth- and seventeenth-century Europe. The Ptolemaic model of the geocentric universe combined with the Aristotelian viewpoint that man stands second to the Almighty in honor put the earth in a noble position in the scheme of creation. Somehow, this notion worked its way into the teachings of the Church. Taking the earth out of the center of creation was a sacrilegious act; and Copernicus, fearing his fellow theologians, chose to postpone the publication of his heliocentric theory of the universe to the very last day of his life in 1543. Galileo (1564-1642) was wise enough to deny altogether the motion of the earth in the Court of Inquisition and avoid any unpleasant consequences.

In the early twenty-first century, many of the natural, human, and social sciences have achieved acceptable levels of universal clarity, and their practitioners have learned to reconcile differences through sober dialogues. This is a welcome development, yet there are many global issues that are not satisfactorily cast in objective terms and other issues that may never be viewed objectively. The following are examples:

- Economics: Is it better to allow open competition in a free market at the risk of wiping out the disadvantaged who lack the resources necessary to compete, or is it better to allow the state to control the production and consumption of goods at the risk of corruption?
- Governance: Should a democratically-elected ruling body answer only to its own electorate, or should it be accountable to its neighbors as well?
- Human rights: Are human rights defined by western ethics or eastern standards?
- Ethics: Are they consistent throughout the faithful Christians, the devout Muslims, the Jews, and the believers in other faiths?
- Imperialism: To what extent can foreign powers lay claim over sovereign states?

- Scientific morés: Who defines the moral codes for emerging sciences and technologies?
- Environment: What are the rights and responsibilities of nations that manage the earth's resources?

Indispensable as they are in everyday life, none of these issues has the well defined and undisputed foundations that are the hallmark of modern science. They are prone to controversy. Though judges can be called upon to resolve differences and their verdicts can be enforced, judges are often unable to convince conflicting parties that their verdicts are correct and final. How can we resolve these dilemmas or at least ameliorate the situation? Let us return to the tradition of exact science for precedence:

- No concept, no matter how widely popular, is sacred.
- No person, no matter how wise and knowledgeable, is a saint.
- No one presents one's beliefs as evidence of one's righteousness.

Strict observation of such seemingly simple rules in nonscientific cases is not easy. A conscious effort to adopt such an approach, however, should be rewarding and should help one better understand others.

It is, of course, naive to maintain that disputes between individuals, societies, countries, or economic blocs are the result of a lack of understanding. On the contrary, it is often conflict over material resources and thirst for domination that causes large-scale calamities. Nonetheless, the scientific world of the twenty-first century has managed to create a legal and international infrastructure to condemn, if not prevent, the primitive, brute logic which asserts that the strong can take the possessions of the weak. Such infrastructure impedes acts of aggression, or at least is expected to do so. Nowadays, an aggressor does not need to operate openly,

but rather can remain hidden in a maze of international conventions and protocols.

Finally, I am aware that the aforementioned technique of reduction to basics has oversimplified the problem. After all, long before the formulation of exact sciences, man's inexact creations, such as sports, arts, music, poetry, literature, and commerce brought people together. Here, I only wish to point out that today's science, by all standards, is the most vigorous force behind the development of all societies. It is used by everyone. Logically, its value-free methodology could serve as a common language for dialogue amongst people. It is worth the effort, even though hermeneutic philosophers tell us that the task is not an easy one. No matter how hard one may try, one's intellectual horizon clouds the circumstances. In the words of Wilhelm Dilthey, the existence of other people has always been a scandal for objective thinking.

ACKNOWLEDGMENTS

I wish to thank my physicist colleagues, M. R. Hydari Khajepour and B. Farnudi, for fruitful discussions in preparing this essay.

DISCUSSION

Etienne Guyon: Many people talk about the relativity of science—what we believe today may be proven wrong tomorrow and so on. Are there things that are right or wrong and things that are not relative? We cannot, of course, foresee what is going to happen, but can you at least give definite examples that differentiate between what is right and wrong?

Yousef Sobouti: Professor Guyon, I think we agree on one point: the laws that we have discovered and attribute to nature have their domain of validity. We should not extend and extrapolate them beyond their domain of validity. Rather than say, "We knew

something was right yesterday, and today we have proven it wrong," I prefer to say that what I knew was right yesterday is also right today. However today, with advanced technology, we may have finer observations that fall outside the domain of validity of the laws we knew. To explain these finer details, we may have to revise yesterday's laws and extend their domain of validity to accommodate the new observations. This is the way I look at nature, not in a black and white way to say that Newtonian mechanics were right up until yesterday, and relativistic dynamics threw it away. That's not true. Newtonian mechanics were quite correct within their limitations and were sufficient from the seventeenth to early twentieth centuries. But today we have further empirical evidence that finds Newtonian dynamics inadequate for their explanation. So we have revised it by the introduction of relativistic dynamics. In my opinion all findings of man throughout history are correct to a certain extent. And that certain extent has been changed through the years, maybe day-by-day, and still is being continued.

William Wulf: There are questions that affect science and are not reducible to scientific inquiry. What constitutes the legitimate application of science in a societal context is one question that is most often mentioned. But the method of deriving a scientific fact is not necessarily open to scientific inquiry by itself. The debate in many countries today about the use of stem cells and cloning is a current example, or a more horrific one is the kinds of medical experiments done by the Nazis in World War II. Would you elaborate your view on that?

Sobouti: My answer to your question on the use of stem cells is as follows: biology, biotechnology, and genetic engineering are still not exact sciences. They are not axiomatized yet. Once they become axiomatized, that is, once they are understood better than what we understand today, then many of the objections we now raise will simply be swept away.