Trans. Nat. Aca. Sci. Tech. Philippines 22: 3-6 (2000).
ISSN 0115-8848

HUMAN REASON, SCIENCE, AND PHILOSOPHY[1]

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I begin by noting a basic element of scientific thinking. In 1916 Albert Einstein completed his General Theory of Relativity, with conclusions and predictions on space, time, gravitational fields, that modified/corrected Newton's theories. The latter had governed as accepted principles for the previous two centuries. A measure of Einstein as a scientist is that he expressly required that his conclusions and predictions be validated, and he himself stipulated three empirical tests for the purpose. The tests by other scientists confirmed the General Theory, the third test being completed in 1919. And yet, through it all, Einstein retained the openness of mind that is essential to the scientific attitude: he felt that the validation did not yet categorically prove his theories failed any of the tests, then it was clear that they were untenable.

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Not all intellectual propositions and writings on life, matter, and the universe are scientific in the Einstein sense. This is when they are not susceptible of validation or empirical verification. In the scientific world the leading examples of non-empirically verifiable thinking are those of Marxist ideology and Freudian teachings. This class of non-empirically verifiable thinking may be termed a *dogma*. A related type of thinking is recognizable as *doctrinaire*, which is characteristic of some religious thinking.

I contrast scientific thinking on the one hand, and dogmatic thinking on the other. The former proceeds from the attitude "I must know, so that I can believe"; while the latter starts with the attitude "I must believe, so that I can know and understand".

But not all human thinking is neatly comprehended in the two classes of the dichotomy. Human beings are rightly said to be endowed with reason and some

[1]Keynote Address, 22nd Annual Scientific Meeting, National Academy of Science and Technology, 5-6 July 2000, Manila.

think rationally without being scientists, while others think according to belief without being dogmatic.

This is because human life is larger than either or both science and dogma. The members of the Academy, reputed to be scientists, are not scientists twenty-four hours a day. They have to cope with life and its wondrous complexities of emotion, bias and conviction, ambition, and chance for most of their waking hours. That they make time to think scientifically attests to the fact that they are a rare breed.

Indeed, there is more rational thinking by ordinary individuals than we normally credit them with. An individual, as family head, for instance, whether deprived or rich, schooled or unschooled, makes decisions that cover the moment or look to the future; the decisions are shaped by limited options and knowledge of facts, by resource constraints, and changing life goals. But if, in analyzing the decisions we input the contextual and operating factors, we will have to concede more than a slight degree of rationality in the decisions. They are not scientific, but they are products of reason.

What I am leading up to is the point that when human thinking is freed from constraints, it can become fully rational- and scientific. Scientific thinking, in other words, requires independence of mind and *freedom*.

I return to my introductory note on empirical testing or validation as a basic element in scientific thinking. The scientific mind autonomously incorporated a built-in corrective against error or ambiguity. This corrective is logic in scientific methodology, the principle of *order*. It is this order that disciplines and strengthens scientific theories.

And so we come to two principles that are inherent in scientific thinking: Freedom and Order. Freedom and Order liberate and discipline the scientific mind. Freedom makes thinking a human adventure; Order imposes objectivity and stability of thought.

Next, because human beings are endowed with reason, the principles of freedom and order operate *pari passu* in human communities. The best human communities guarantee freedom to their citizens; but unrestricted freedom leads to anarchy; human communities therefore maintain order among their citizens; but total order leads to totalitarian control not only of thinking but also of behavior. In the end, the truly best communities maintain a delicate balance of freedom amidst order, and order amidst freedom. It may be concluded that science flourishes most in communities where there is this balance between freedom and order.

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We turn, finally, to philosophy and science. The word "philosophy" is derived from a compound of the Greek "philo", love; and "sophia", wisdom. Philosophy is the love of wisdom, and a philosopher is a lover of wisdom.

The word "science" is derived form the Latin root and means the acquisition of knowledge through study. Scientific thinking focuses on the knowable, beginning with empirical data, then analyses of their interrelationships, theoretically formulated in equations of conceptual variables and arriving at logical conclusions. The power of scientific thinking and the knowledge it has generated are awesome. Einstein's theories alone led to the making of the atomic bomb, space travel, electronics, and quantum physics; works by a host of other scientists made possible impressive increases in food production and still continuing advances in medicine, to refer to only a few cases.

So - science, in generating knowledge, expands the options of human beings and communities. But it is not scientists who decide what use is to be made of scientific knowledge. It is human communities, through political leadership, that decide on the ends and purposes they aim to attain with scientific knowledge. In sum, science *per se* is descriptive, not prescriptive.

The acknowledged early masters of philosophy are the Greeks Socrates who lived *ca.* 469-399 B.C. and Platon, *ca.* 427-347 B.C. Their thinking was as rational and logical, they were as inquisitive, as modern scientists. But their concern was different. Their concern was based on the proposition that it is the nature of the human being to strive to perfect himself or herself, and that the human community must seek the perfection of the individual. In short, Socrates and Platon were concerned with the end, the good, the WHY? of human life. Their thinking was aimed at philosophical *wisdom*, the ability to judge on right and wrong in life.

If scientific knowledge explains the HOW? of phenomena and matter in the universe, philosophical wisdom defines the WHY? in human life and conduct. The wisdom of philosophy is prescriptive.

The disciple of Socrates and Platon, Aristoteles (384-322 B.C.), faithfully continued the concern of his masters with philosophy. But he extended his own labors into physics, biology, logic, metaphysics, and ethics. In a sense, he married philosophy with science. Aristoteles's influence is still felt in modern times. St. Tomasso Aquino, the official philosopher of the Roman Catholic Church, was a avowed Aristotelian.

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You will have observed that I had recourse to some truisms in my presentation. I asserted that human beings are endowed with reason. It is the intrinsic tendency to reason that distinguishes human life on the one hand, from non-human life and inanimate physical matter on the other. It is reason in human society that makes both science and philosophy possible. In return, society's options are broadened by scientific knowledge, and society's choices among its options are directed to what is right and beneficent by philosophical wisdom.

I cannot close without saying how privileged and honored I am to have been asked to speak before this distinguished audience.