The Story of Scientific Freedom

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Two Warring Approaches

Science is the search for Truth in the external material world, and spirituality is similar search in the internal world of the mind. In this sense, they are complementary to each other, and not antagonistic. Both of them have a common enemy, dogma. Science and spirituality attempt to tell us what Truth is really like, whereas dogma tells us what it would like Truth to be. Science and spirituality discover, explain and clarify Truth. But, dogma tries to dictate what Truth should be. Science and spirituality spur human beings on in their journey to Truth, whereas dogma tries to stifle and suppress all such attempts. In this sense, Truth and dogma are antagonistic to each other.

The war between these two approaches to Truth has been going on since the dawn of history, and is likely to continue so long as humanity lasts. The history of science is nothing but a record of this struggle waged by free-thinkers against dogma and obscurantism. It was an uphill task for science to establish itself firmly as a respectable discipline, and demanded of its adherents many sacrifices. The upshot of all this is the right for freedom of expression that scientists enjoy today. But, it is always wise not to forget the lessons the past can teach us, so that we do not repeat the same mistakes. Hence, a brief record of this struggle of science against its opposing forces is attempted here.

Science and Dogma

Science, as we know it today, is a product of the West. It had its origins in Greece about 2600 years ago. The Greeks respected scholarship and produced many great thinkers, whose names are household words even today. They lived in a country that was endowed with great natural beauty. They led a life of leisure, thanks to the abundance of resources, and thanks to the slaves brought from Africa. Life was easy for them, and gave them ample opportunity to indulge in speculations about Nature. Unfortunately, this kind of life does not encourage hard work or labour, and certainly not dirtying one's hands. The consequence was that they became great philosophers, speculating about Nature, but considered it below their dignity to subject their hypotheses to experimental verifications. At that time, science, the study of natural phenomena, was not different from philosophy, so much so that till the time of Newton, science used to be called 'Natural Philosophy'.

One of the most towering figures in philosophy at that time was Aristotle. He was so dominant a figure that his ideas ruled the intellectual world of Europe for almost 2000 years! Aristotle is revered even today as the

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founder of Western Logic, which has been utilised in developing logical circuits for computers. There is hardly any field of human thought to which he has not contributed. But not all his contributions are of an equal calibre. Some of his statements appear today to be ridiculous. For example, he said that women have a lesser number of teeth than men! If you plant a seed in soil kept in a pot, the seed sprouts into a plant by converting the soil into the plant material! He could have easily counted the number of teeth of an average man and woman, and reassured himself that his hypothesis was wrong. He could also have planted a seed in a pot full of soil and ascertained that the weight of the pot increases with the quantity of soil remaining the same. But, that was against the Greek temper of *infra dig.*

His most famous statement was the Geocentric Hypothesis, which later became, in the hands of the Roman Catholic Church, a dogma and Holy Gospel. According to this, the earth is the centre of the solar system, and the sun and other planets go round it. Even though there were other Greek philosophers who disputed this, such was the stature of Aristotle that all their voices were stifled. This was the first victory of dogma over science!

The only Greek thinker, whose work in science is respected and is valid even today, is Archimedes. He was truly a scientist in the modern mould, because he was bold enough to soil his hands and do experiments. He is considered the first experimentalist in the history of western science. But historical circumstances prevented the thinking community from following in his path for almost 1800 years!

With the crucifixion of Jesus the Christ, the movement he had set in motion was literally hijacked by Paul. Swami Vivekananda once said that Christianity had become Paulianity! The new religion needed not only a theology but also a philosophy of its own. In the absence of any such thing, the early Christian Fathers simply adopted Greek philosophy as their own, accepting all its tenets *in Toto.* Aristotle's Geocentric Hypothesis became an integral part of Christian dogma. Denial of this hypothesis was declared anathema, punishable by death, mostly by being burnt at stake. A dark curtain of ignorance and superstition descended upon Europe, ushering in the Dark Ages. Free-thinking and inquiry were smothered. Persecution of such thinkers began in right earnest with the establishment of the infamous Spanish Inquisition. Science, for all practical purposes, vanished from Europe, and took shelter in the Middle East.

The Role of Renaissance

After a long period of horror, lasting almost a millennium, saner voices began to be heard in Europe, risking persecution and death. Giordano Bruno was burnt at stake for questioning the dogma. Copernicus came up with his heliocentric hypothesis, publishing it in a book. Before the Roman Catholic Church could wake up to this event, and start persecuting Copernicus, he wisely shed his mortal coils, but left behind a legacy.

The work of Copernicus was continued by another great figure, Galileo Galilei of Italy. Galileo lived right in the centre of Roman Catholic territory and knew that he could be persecuted any time. Nevertheless, he wrote his book *A Dialogue between Two Worlds,* containing an imaginary dialogue between the proponents of the geocentric and heliocentric hypotheses. Galileo could not help take a dig at the Church, and named the proponent of the geocentric hypothesis as 'Simplicio', meaning 'simpleton or fool'. This enraged the Church and led to the famous incident of the

judgment of Galileo. He was spared the stake, but was banished to exile, to live in solitude.

Free-thinking and science could finally rescue themselves from the clutches of the Church through a strange development. This was the advent of Martin Luther, who rebelled against all the tenets of the Church, and started a protest movement, which later became Protestantism. The Kings of the North of Europe quickly adopted this new faith, to escape from paying taxes to the Catholic Church, and their countries became a safe haven for all scientists and thinkers. A further fillip was given to freedom of thought by a famous French savant who said, 'I do not agree with what you say. But, I will defend with my own life your right to disagree with me'. Thus started the Era of Renaissance and Science grew by leaps and bounds, in this clean atmosphere of freedom of thought and speech. Is it any wonder that scientists, even today, are very jealous of their freedom?

Era of Technology

This state of affairs lasted for about two and a half centuries, till the Industrial Revolution came into full bloom. Science found itself to be the handmaiden of technology, but still did not lose sight of its main purpose—the exploration of Truth in the physical world. The scientific community got split into two groups—theoreticians and technologists. The freedom enjoyed by the scientists was not in any way affected. But, things started changing as technology entered the field of Military Science. Meanwhile, Europe saw the rise of two dictatorships in the beginning of the twentieth century, one in Russia by Stalin under Communism, and the other in Germany by Hitler under Nazism. At the same time appeared two revolutionary concepts in science, the Quantum Hypothesis of Max Planck and the Theories of Relativity of Einstein, both in Germany. This period of the first half of the last century is still considered the Golden Period of Science. Paradoxically, this was also the period when scientists in Europe were persecuted. This is a sordid story of human history, and shows how fragile freedom can be.

Both Stalin and Hitler were reputed to be haters of Jews. Hitler was more open about his hatred, but Stalin was more subtle. Unfortunately for science, most of the prominent personalities exploring fundamental truths of Nature at that time belonged to the Jewish community, who were responsible for the growth of the two theories, the Quantum Theory and the Relativity Theory. Hitler promptly dubbed these theories as 'Jewish Science', and prohibited their study in educational institutions and research establishments. Most of these scientists were sent to concentration camps. Some of them, like Einstein, were fortunate to escape to safer places, like England and the United States. Hitler ordered all the remaining scientists to concentrate their attention on the design and development of rockets and the atomic bomb. Some scientists, using this opportunity, became sycophants of Hitler and even started persecuting their own fellow scientists.

Post-war Scenario

This state of affairs ended with Hitler's death and the surrender of Japan. Most remaining scientists of Germany and Japan were then arrested and deported to the United States on the one side and the Soviet Union on the other. This did not improve the lot of these scientists in any way. Very soon, the Cold War between the US and the Soviet Union started, and the scientists were sucked into this madness, with the State dictating the fields

of research. Anyone desirous of a tenured position in a University had to tow this line in order to get funding. The scientists compromised with this situation. But, their natural love for freedom found an expression in basic research, which was their first love. There was a parallel growth of knowledge in the Military Sciences and the Pure Sciences.

With the ending of the Cold War in the late 1980's, symbolized by the fall of the Berlin Wall, there was a sea change in the priorities. Military Sciences did continue to develop, but equal attention was now given to basic research, especially to space explorations. The focus of attention shifted to explore the neighbourhood of planet earth, followed by deep penetration into outer space. The objective was not so much military-oriented. It was to know more about our planet, the solar system and the universe.

The end of the Cold War ushered in another activity that had been noticed earlier, but sadly ignored in the cacophony of the Cold War, Environmental Pollution, its impact on humans, animals, plants and the oceans. Climate Change became a reality. It needed an international cooperative effort to tackle this immediate danger. It became evident how little we know about our own planet! This spurred on basic research at all levels, ushering in once again the era of the exploration of Truth, in a free atmosphere of Freedom.

Science always prospers in a free environment. Political turmoil acts as a brake on its growth, but can never destroy it. Pure Science, as an enterprise is here to stay. This brief history of scientific freedom indicates clearly how zealous scientists are of this treasure. One has to just attend the sessions of any scientific congress to witness how free and frank the discussions are. These are occasions when new ideas are floated, subject to incisive logical discussions, and either accepted or rejected, without causing any rancour.

One great quality of science is that it is no respecter of age, gender, nationality or personalities. One stands or falls by his or her own merits. There are instances when even well established noted Nobel Prize winning scientists have had to bow down to lesser known younger people. Einstein could never digest the consequences of the Uncertainty Hypothesis of young Heisenberg, in spite of proof piling up. But, towards the end of his life, he confessed, 'Maybe, I am like an ostrich burying its head in the sand, wishing this hypothesis to go away.'

This author has been fortunate in his life to rub shoulders with some of the giants of his subject, even from student days. But he has always been treated as a fellow worker and colleague, never as a subordinate. Surely, this must have been the atmosphere prevailing during the Vedic Age. Otherwise, how could the sages have produced such an immortal literature like the Upanishads!

Conclusion

Science in India, on the other hand, has never had a conflict with religion. This tradition, which had been lost for almost two millennia, has now been restored, thanks to the exposure to western thought. India has always respected learning.

The very large numbers of young Indians, who go abroad every year in pursuit of knowledge, are a testimony to this fact. It should be our fervent prayer that this respect for knowledge, its growth and propagation will be preserved in future also. □