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Social Shaping of Science and Technology :

Science ,Technology and Meaning

We call Archimedes a scientist because he not only observed that bodies feel lighter when immersed under water but he went ahead and asked the question why and found the answer which today we know as the 'Laws of Buoyancy'. Later, engineers, with that precise science of buoyancy were able to build a new technology, better more economical and efficient modern ship for the betterment of mankind.

True science stands in awe of that mystery. There is a sense then in which a man of science too can believe in an invisible transcendent reality of values. Science cannot take the place of absolute values but the ideal of truth, which is his guiding force, is an absolute value. Or otherwise, the public authorities should decide what should be the truth.One obvious implication of this should be:" The completely secularized view of man as a social animal divested of all the trappings of a transcendental faith reduces man essentially to what society makes him to be… " [1]

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Science ,Technology and Meaning

True science then, was that which enables a man to disentangle and attain his natural good; and such a science is also the art of life and the whole of virtue. The autonomous moralist differs from the Sophist or ethical skeptic in this: that he retains his integrity. In vindicating his ideal he does recant his human nature." [2]

The term technology comes from the Greek word technique meaning "craftsmanship" By technology we mean any technical means which people use to improve their surroundings. Thus technology may be said to be the development and application of

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[1]. *Dayakrishna:Social Philosophy, part 1 pp 15-16.In India…p)*

[2] *George Santayana:The Life of Reason..422. G.Childe:'What Happened in History.'(Hermondswak.Penguine Books.1964.)p.215-216.*

tools, machines, materials and processes   that help to solve human problems. People use technology all the time to improve their ability to do work. Through technology people communicate better. Technology allows them to make more and better products. Our buildings are better through the use of newer technology. We travel in more comfort and speed as a result of technology.

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We can see how Science, Technology & Society are interdependent in many respects. Development in science and technology has often changed mind set and value system in society ,as per the following co-relation pattern between the two. With the introduction of a   a powerful new model of the universe by scientists like Copernicus & Newton was marked by increased respect for science and for human reasoning in peoples' mind. Printing press technology made it possible to spread knowledge far an wide across Europe. Scientific -technological achievements inspired philosophers, such as Hobbes, Locke, and Rousseau to reexamine human nature. They viewed human beings as *rational agents* capable of thinking for themselves and acquiring knowledge through science and books. In addition, they interpreted society as a creation of informed rational citizens working together through social contracts . These socio political changes were followed by new   ways of looking at ethics and politics as exemplified in the ethical theories of Bentham and Kant and in political changes incorporated by the American Revolution , the French Revolution etc.

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In the political sphere, and even outside it, proposals and ideas were not accepted simply or even primarily on the say-so of some particular individual relying on his personal prestige or authority.

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In fact our history of civilization is full of many such technologies evolved by mankind by accidents but which never developed into science and engineering. As case in point is the technology that we Indians had been using for thousands of years, the use of hanging wet mat, called *'khas'* on doorways to keep the room cool in hot summer days. If some intelligent Indian student had asked seriously the question why the wet hanging mat keeps the room cool, he would have probably discovered the science of evaporation that when water evaporates it absorbs heat from surrounding air. In fact it took mankind hundreds of years to learn that science which eventually led to the engineering of the new technology called Air Conditioning.

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Technology shaping society and vice versa and the relationship between science and technology.

When we look at the modern civilization, look at all these machines, and the machines in turn behind them, and so on, we find an immense network of technology, one on top of the other. This is a cumulative result of efforts of thousands of years of human civilization. It embodies the human knowledge of solving real problems in the design of standard tools, machines, materials or the process. In fact as a human activity, technology predates both science and engineering. Thus the Stone Age implements: the wooden spear, the stone axe, the grinding stone etc all may be said to primitive human technology. It may be mentioned at this stage that technology is not confined to the Homo Sapiens alone. Animals also use technology; for instance, some monkeys use sticks to extract ants from ant holes; some birds use stone to break shells to eat. The boat or ship may be taken as an example of human technology that was invented and had been used by mankind from prehistoric times. In fact it was thousands of years later that genius like Archimedes discovered buoyancy, the 'science of floating bodies'.

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 Technology is changing everything we do by creating new entities (such as software, nano particles, or Internet),by changing the scale of activities (e.g. vast amounts of data about people can be stored and analyzed ,and not infrequently without people being aware of this), by generating new kinds of knowledge (for instance about illnesses ,the human genome and so on).(Feenberg,2003).
By Technology we mean the concrete apparatus, a car, for example, or as a certain knowledge and infrastructure of apparatuses and equipment as expressed in terms like

"nanotechnology". But the goodness should also appear in the subject, that is, in the human being who makes use of the technology respecting commonly accepted human values. The way science and technology has shaped human society and its values, technology is also a human activity that needs to be sustained by its human and socital roots.

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Science and Technology, and their Human Roots: Philosophy of Science and Technology

Successful technologies change our lives. Up until the last fifteen years cars had changed things, now computer act as very powerful technology allowing us to shop online ,relax online with computer games and other modes of entertainment, interact with people from all over the world, help getting our news ,study for our degrees ,and find most of the confrontation that we require. E-mail, chat rooms ,blogs, and other forms of computer mediated communication have altered how we communicate .There is far deeper impact of this change on us and our mode of perceptions as traditional limitations of time, space and quantity are gradually losing their grip preparing us for a post human future where the only limit will be the subject, the human being, who has not more than twenty-four hours a day available for communication . We now aim for machine perfection in our new avtars as cybrogs .we ourselves are turned into a market commodity.

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Social Shaping of Science and Technology

Scientists and Moral Responsibility

Despite admitting the fact that there is some difference between pure and applied science, or between science and technology, *Ron Yezzi* takes science to include technology understanding "the science" we talk about when we consider "science without humanity as one of the root causes of violence". Having casually referred to how Marxism and the thought of John Dewey both raise interesting questions about the possibility or desirability of separating pure from applied science , *Yezzi observes : "* With respect to

whether or not scientists should be morally responsible for the consequences of their discoveries, I am always struck by the absence of any human concerns in the inherent structure of many *natural sciences*. For example, in physics, the fundamental concepts and their relations have nothing whatsoever to do with a human level of existence. That is to say, the subject matter of physics--matter, motion, energy, elementary particles, quantum states, laws in the form of equations--never deal with human beings as human beings. Similarly, the technology produced by physics, even nuclear weapons, does not require any reference to human beings in the knowledge of physics used to construct the technological objects. [3]

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Yezzi continues: "So what gives rise to the moral responsibility of natural scientists? I answer that it derives from their being human themselves.In other words, the physicist, as a physicist, has no moral responsibilities. Yet since physicists are also human beings, they have moral responsibilities as human beings to deal with the implications of their work. The same claim applies to the social or behavioral sciences--although I think that we can go a step further. When we turn to social or behavioral sciences, where the subject matter is human beings as human beings, moral responsibility attaches to the inherent structure of the sciences themselves. We are human beings studying human beings. Hence purposes, or intentions, of human betterment are present both in the subjects being studied and in the scientists doing the studying. Accordingly, a moral responsibility to make human affairs better rather than worse becomes a legitimate, desired task of the social or behavioral sciences. Social scientists studying child abuse should not let their

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[3] *Ron Yezzi, Science Without Humanity as One of the Root Causes of Violence*
http://krypton.mnsu.edu/~yezzi/sciviol1.html

moral beliefs put up methodological or assessment blinders; but they still should seek ways of making the lives of children better rather than worse. Attempts by social or behavioral scientists to eliminate this moral responsibility by seeing themselves as perfect emulators of the "hard" sciences distort the subject matter and interests of their sciences. "[4]

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Ron Yezzi position on the human dimension of science and technology is that one should remain respectful of the human roots of these disciplines and as scientists and technologists we all are humans first and foremost. "I take it as established then that, as a matter of intellectual recognition, scientists have moral responsibilities to serve the interests of humanity. I also will just assume that scientists have an emotional appreciation of the value in serving the interests of humanity"(ibid).This leads to his submission that science without humanity can be a cause of violence . In talking about *violence*, Yezzi prefers to associate the term with *intense harm* as much as with physically destructive activity that allows him to accommodate psychological violence as well as violence to the quality of human life . In a general sense, scientists ignoring their moral responsibilities create situations that increase the *potential* for science being the cause of violence. Thus scientists can proceed without humanity when they ignore the destructive force of technological products such as weapons. For example, they may make possible production of poison gas without considering how it may be used as a technique of genocide. It is not hard to come up with additional examples.

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[4] *Ron Yezzi, Science Without Humanity as One of the Root Causes of Violence http://krypton.mnsu.edu/~yezzi/sciviol1.html)*

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Social Shaping of Science and Technology

Those who believe in technological determinism are optimist of technological solution of all our problems, including our moral concerns. Is it just the machine or the hardware that one form of technology, if it is destructive to mankind, can be corrected or destroyed only by help of another technology of a different sort under the watchful eye of technology? 'In the summer 1998 blockbuster GODZILLA, technology runs amuck. Literally. And it is not a pretty sight. Technology comes in the guise of a giant lizard, the product (in this resurrected version) of radioactive experiments by the French in the South Pacific, dating back to the 1960s.Moving quickly from its home in French Polynesian , this unintentional by-product of technology makes its way to New York city and begins the process of reproducing itself more efficiently than a photocopier."[5]

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[5] Qwilliam Thompson, General Introduction. CONTROLLING TECHNOLOGY. Ed. ERIC KATZ , Prometheus Books.N.York.2003)

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Technology shaping society

If this is a problem related to one type of technology it is to be corrected by help of another one .In this movie, the hero is a biologist/geneticist fresh from assignment studying the effects of the Chernobyl radiation on the local worms, finally succeeds in destroying the mutant Gila monster.

Are technological solutions the only ones that matter? Is kit so that mankind's destiny and the destiny of this earth that we habitat are to be decided by a handful of technical experts or does technology itself confront humanity with issues that go to the very core of who we are and how we live? Is this a sad realization on our part that it is technology that controls man rather than man controlling technology? Is there something wrong with technology, or, with its user? If technology always serves human interests, are "human" interests always "humane"? Which "humans?" Who profits and who loses as a consequence of new technologies? Do those who control technological developments

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[6] Qwilliam Thompson, General Introduction. CONTROLLING TECHNOLOGY. Ed. ERIC KATZ , Prometheus Books.N.York.2003

have the appropriate vision of the good for human life, and do they know how to create and use technology to achieve that good? Who in fact controls technology? [7]

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Technology shaping society

Problems of Overconfidence

Ron Yezzi observes that when scientists get overconfident about what science can do, they at least "set the stage" for violent consequences. This is a major theme of the movie, "Jurassic Park." Mentioning about the associated problems in this regard, that of overconfidence, Faustian bargains and oversimplification, *Yezzi illustrates it as follows :*

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" Faustian Bargains

Faustian bargains occur when the promise of a scientific benefit masks greater consequential burdens that are ignored for the sake of the benefit. There is not so much a total absence of humanity as there is a stilted conception of it. So a new manufacturing plant provides jobs for people without taking account of the pollution costs for a greater number of people. Or a new textile factory in a third world country improves the quality of textile goods without considering how the technology puts large numbers of local workers out of a job--in a way that produces greater poverty or other hardships. Or a society accepts western style industrialization without recognizing how it will radically affect the traditional culture." [8]

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[7] Qwilliam Thompson, General Introduction. CONTROLLING TECHNOLOGY. Ed. ERIC KATZ , Prometheus Books.N.York.2003

[8] *Ron Yezzi, Science Without Humanity as One of the Root Causes of Violence http://krypton.mnsu.edu/~yezzi/sciviol1.html*

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Lesson :Oversimplification

Yezzi talks about the problem of **Oversimplification thus : "**When science oversimplifies human behavior, it can increase the potential for violence to human beings. For example, what are alleged to be adequate scientific studies of race over the past few centuries have laid the foundation for violence against various social groups. Another case may be the overextension of a field such as behavioristic psychology. Behavioristic psychology can function well as a *technique* for modifying and changing human behavior; but it treads on dangerous ground when it becomes an *interpretation of human nature*. As an interpretation of human nature, behavioristic psychology reduces human beings to something less than they are. By challenging notions of human dignity as--for example, B. F. Skinner did-it raises the potential for violence being done to human beings in the name of desirable conditioning. "[9]

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 When scientists are distracted from the consequences of their work, they create situations with a potential for violence.This, according to   is the problems **of Distraction."** It is not that they do anything actively themselves to cause violence, but they omit doing what is necessary to prevent possible violence. My two problems of distraction are insulation from effects and overspecialization. " [10]"It is the nature of contemporary science that an active agent is often insulated from the consequences of actions. It is often pointed out that dropping a bomb from a plane flying at high altitude insulates a soldier from the human consequences of the bomb in a way that fierce hand-to-hand combat on the

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[9] ibid.
[10] ibid .

battlefield does not. Similarly, the specialization of activities and the "long reach" of science and technology can insulate, or distract, persons from the consequences of their actions. So the chemist who works out the formula for the poison gas may have nothing to do with the production or administering of the gas--thereby providing insulation from the effects of the chemist's own actions. This problem also arises when an economist is willing to prescribe unemployment as a cure for inflation, without any personal contact with, or appreciation of, the consequences for workers who lose their jobs. "[11]

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Ron Yezzi does not think that there are simple answers to problems where science without humanity can cause violence. He finds that the problems becomes even more difficult when one accepts violence as sometimes being justified--as opposed to a strictly pacifist position. "But we need to be aware of, and struggle with, the issues,"*Yezzi warns us.*

Science and value:
Recent controversies and instances of misconduct in science have attracted considerable media attention. In addition, the power of new technologies developed through science and engineering - especially as portrayed by the media - have inspired growing popular concern. Science and Engineering Ethics offers a forum for the examination and discussion of ethical issues arising in the practice of scientific research and engineering, and in the practical application of that work.

[11] ibid.