

On Reductionism

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Between the time of Descartes in the 17th Century (c. 1630) and our own time there occurs, as yet another of the facets of the ideological, cultural, and intellectual revolution of modernity, a transformation of the canons and goals of rational inquiry. This transformation occurs in virtually every domain of thought including, theology, philosophy, literature, politics, economics, and art, but its typical seminal form is to be found in the sciences, the natural sciences. Briefly described, the transformation is of 'rational analysis' into 'reductionism'.

Descartes had, in the *Rules for the Direction of the Mind* (1625-28), set out the elements of 'rational analysis' which became the basis - when combined with experiment and observation - of modern scientific method:

Rule V

Method consists entirely in the order and arrangement of those things upon which the power of the mind is to be concentrated in order to discover some truth. And we will follow this method exactly if we reduce complex and obscure propositions step by step to simpler ones and then try to advance by the same gradual process from the intuitive understanding of the very simplest to the knowledge of all the rest.

Rule VII

For the consummation of knowledge it is necessary to examine each and every item which pertains to our design in a continuous and uninterrupted process of thought and to include all of these in an adequate and orderly enumeration.

Rule IX

We should bring the whole force of our minds to bear upon the most minute and simple details and to dwell upon them for a long time so that we become accustomed to perceive the truth clearly and distinctly.

Descartes summarizes the purpose of the Rules in his commentary which accompanies the Rules themselves:

" ... it is only concerning genuinely simple and absolute matters that we can have certain knowledge" (from the commentary to Rule VIII), and " ... all human knowledge consists of this one thing, that we perceive distinctly how these simple natures combine to produce other things." (commentary to Rule XII)

It would be inaccurate and unjust to saddle Descartes with the responsibility for having originated the reductionism we are concerned with. Descartes' own goal in the *Rules*, the *Discourse on Method*, and in his other writings was modest and laudable. He states his purpose clearly in Rule IV: "Method is necessary for discovering the *truths of nature*" (emphasis added). That is, Descartes was devising a systematic approach - a method - for use in the natural sciences and mathematics. I do not believe we can discern in his writings nor attribute to him as motive the use of 'rational analysis' to undermine inquiry in theology, philosophy, morals, art, or law. There is not, so far as I can discern, an ideological component in Descartes' *Rules* or *Method* which would transform 'rational analysis' into reductionism.

We may note, however, in Descartes a certain tendency of thought which, as it becomes associated with the

scientific method he is developing, abets the cause of reductionism when it appears later. This tendency is to assimilate knowledge to methodically acquired information, i.e., to identify "knowledge" with the findings of science and mathematics and to identify the quest for knowledge with the methodic procedures of scientific investigation. The unstated implication is that what is outside the domain of science and mathematics lies outside the domain of knowledge - in a peripheral realm of uncertainty, opinion, speculation, belief, feeling, or superstition. What cannot be methodically studied cannot, properly speaking, be known. This assimilation of knowledge to methodic, scientific knowledge is the import of Rule II:

We should be concerned only with those objects regarding which our minds seem capable of obtaining certain and indubitable knowledge.

and Rule VIII

If, in a series of things being investigated, we come upon one which our intellect cannot adequately comprehend, we must immediately call a halt. We should not examine what follows, but refrain from a useless task.

The implications of these two Rules are clearly spelled out by Descartes in his commentary to Rule II:

And so, in accordance with this rule, we reject all knowledge which is merely probable, and judge that only those things should be believed which are perfectly know, and about which we can have no doubts.

and,

Now from all of this it is to be concluded, not that arithmetic and geometry are the only subjects to be studied, but only that in seeking the correct path to truth we should be concerned with nothing about which we cannot have a certainty equal to that of the demonstrations of arithmetic and geometry.

It is to the great credit of Descartes, Galileo, and others in the sixteenth and seventeenth centuries that they laid the foundation of modern scientific method and established modern science on a basis of systematic inquiry and empirical observation.

They freed modern science from the strictures of Medieval Aristotolianism and scholasticism which were a hopelessly inadequate framework for the scientific study of nature.

II

By the Twentieth Century Descartes' 'rational analysis' as the basis of scientific method has become transformed into 'reductionism' -- or, more accurately, has become ensconced within a reductionist perspective that uses 'rational analysis' for metaphysical rather than scientific purposes and eventually transforms both scientific method and science itself into an ideological arm of the modern mind.

It is more important to recognize *that* such a reductionist perspective develops than to state precisely when the development occurs. From the point of view of the Twentieth Century reductionist attitude, in retrospect, Descartes would already be a reductionist; from the point of view of Seventeenth Century science and metaphysics, reductionism -- in the sense it is used here -- was undreamed of.

Although we may discern analogues of the reductionist mind in the Seventeenth and Eighteenth Centuries, indeed, well before the Seventeenth Century, and although there are anticipatory forms of reductionism

(Deism, Laplacean determinism, ideological Darwinism) in the Eighteenth and Nineteenth Centuries, the wide dissemination of the reductionist attitude as a style of culture, as a vision of reality, and as an existential and philosophical problem occurs in the Twentieth Century.

At this point we need to state precisely what is meant by "reductionism". As already indicated, it is similar to but is not identical with 'rational analysis'. Rational analysis in Descartes thought and empirical specification in scientific method is the attempt to understand an object of inquiry -- usually an aspect or quality of "nature" -- by a precise and exhaustive detailing of the particulars, the constituent elements, which compose the object. This detailing is one of the most marvelous and most important aspects of modern scientific method. Rational analysis -- or empirical specification -- has, in chemistry and physics, taken us from the earth, air, fire and water of the ancients to Dalton's atomic theory to what today is called particle physics which seeks to detail the elusive sub-atomic particle/events. In biology, we have moved in little more than a hundred years from the taxonomy of specially created, eternally static species to the concept of evolution through random variation and natural selection to an increasingly complex detailing of genetic coding in the DNA/RNA molecular structures in the chromosomes of cell nuclei. Astronomy has moved from the elegantly simple but primitive notion of the two-sphere universe to the concept of solar and galactic systems to the idea of a finite-but-unbounded rapidly expanding universe whose contents now include not only the traditional earth, sun, planets and stars but also quasars, pulsars, X-ray "sources", black holes, neutron stars, antimatter, and those great clouds of interstellar dust and gas. Science as we know it would not exist without rational analysis or empirical specification; in many ways the growth of science is measured by the increased differentiation and precise measurement of "constituent elements".

Reductionism is similar to the process of detailing just described in science. But where science *as science* is indifferent (i.e., value neutral) to the common sense or metaphysical status of the object of which the details are a part, reductionism is an attitude of radical skepticism or hostility to the object or entity studied and finds the ultimate meaning of the "object" not in its inherent qualities but in the parts which compose it and in the lateral relation of those parts. We might render the relation of object to constituent elements (or of whole to parts) in scientific method as follows:

A is composed of (has as constituent parts) B & C

or

A (B + C), where A is the whole and B, C are the constituent elements or parts.

In reductionism the relationship may be rendered in this fashion:

$$A = B + C$$

What is significant here is that the whole (A) is regarded as the sum total of its parts (B + C), or that the *meaning of A is the same thing as* (is identical to) the meaning of the parts B + C.

On the face of it in this schema, reductionism is innocuous and apparently not unlike the detailing we described as an essential feature of scientific method. We have to understand, however, the subtle metaphysical shift that is represented in the schema by the = sign. If the whole is *identical* (=) with the constituent parts, *then there is no whole*; there are only the constituent parts. The study of any phenomenon becomes *and must remain* the study of parts as the meaning of a whole rather than of a whole as the meaning of its parts. When this subtle turn is taken by the modern mind in appropriating science and scientific method for its own anti-metaphysical ends, rational analysis becomes reductionism: the skeptical faith which eliminates from the mind's purview all 'entities' of whatever sort and leaves in their place only myriad particulars having only one level of meaning.

In the next part of this lecture we shall advance a variety of illustrations of reductionism; suffice it to conclude here with the observation that it is precisely in accordance with the skeptical, reductionist attitude of the modern mind that Karen Quinlan, the young New Jersey woman "brain dead" from an overdose of valium and gin consumed at a party, should be detailed into several particular functions each of which becomes ultimate for a discipline of thought, and where there was once a whole person there remained only the carrion for lawyers, parents, physicians, theologians and politicians to fold their wings over.

III

Victor Frankl, in an essay on "Reductionism and Nihilism," wrote:

Reductionism is more than just saying time and again that something is nothing but something else. It is an approach and procedure that deprives the human phenomena of their very humanness by reducing a human phenomenon in dynamic terms to some sub-human phenomenon, or deducing human phenomena, in genetic terms, from sub-human phenomena.

Reductionism deprives human phenomena of their humanness: reductionism collapses the significant "comprehensive entities" in terms of which the human world can appear as a *human* world. What distinguishes reductionism from science is that where science (through empirical specification) takes as its object nature, and where science is directed to nature, reductionism is aimed *against man*. Reductionism is the anthropological equivalent of secularism in theology: secularism presents an alternative to the traditional idea of God (and the associated ideas such as Church, salvation, faith, etc.); reductionism presents -- in an aggressive and hostile form -- an alternative to the traditional image of man and the host of ideas associated with that image. Reductionism reduces to their particulars -- hence destroys -- the significant wholes (i.e., comprehensive entities) that make man man.

A comprehensive entity, or significant whole, is a concept for describing the relation of a whole to its elemental parts where the whole is of a logically and ontologically different order than the elemental parts and where the meaning of the whole *as a whole* is greater than the individual *or* aggregate (lateral) meaning of its elemental parts or particulars. To use a spatial and hierarchial model for the ontology of wholes, the whole belongs to a "higher" level of *being and meaning* than the "lower" level parts which it includes. Reductionism places the meaning of the whole on the same level as the elemental parts and for an account of the meaning of the whole gives an account of the meaning of the lower level elemental parts; reductionism not only assumes that the meaning of the whole and the meaning of the parts are one and the same, it essentially identifies the whole with the parts. Reductionism collapses (or reduces) the higher level of meaning and being into the lower level of elemental parts; when this collapse occurs what is left is not the whole but its parts. In the reductionist perspective, the whole bears the same relation to the parts as love or passion bear to sexual activity in the Masters and Johnson experiments: viz, no relation -- there no longer is any whole; all discourse -- and all meaning -- is restricted to the discrete (or laterally related) elemental parts.

Reductionism -- the skeptical and hostile attitude of the modern mind to the traditional image of man -- destroys those comprehensive entities (meaningful wholes) necessary to man's humanity: it "reduces" certain key concepts (entities): 'person', 'tradition', 'community', 'speech', 'action', and others to the particulars in which these entities are rooted. Or, put another way, reductionism eliminates symbolism (symbol is a more familiar, though less general, word for comprehensive entity). A symbol, in most accounts (cf. Tillich, *Dynamics of Faith*) has two parts: that which signifies (part, lower level particular) and that which is signified (whole, higher level meaning). In a symbol there is that which points but there is also that which is "participated in" (Tillich). Reductionism reduces all symbols to signs -- to pointers -- but to pointers lacking a terminal, participatory meaning. The symbolic tokens such as 'man', 'person', *etc.*, lose their symbolic nature: 'man' becomes a fragmented aggregate of an infinity of particulars grouped and studied by disparate, equally

fragmented disciplines, sciences, "-ologies". 'Action' as a symbolic token for the intentional, volitional performance of man in relating himself to the world or to other men becomes, in the reductionist view, the whole set of somatic events -- stimuli, impulses, reflexes -- studied by disciplines such as anatomy, physiology, neurology, *etc.*, or action becomes the patterns of externalized reflex -- parallel to the somatic events -- which becomes the issue in "behavior" which is studied also by a variety of disciplines such as behavioral psychology, ethology, political science, economics, linguistics, *etc.* Similar observations can be advanced about the fate of other symbolic tokens such as 'community', 'family', 'speech', 'work', 'vocation', 'love', 'emotion', 'morality', *etc.*

When man or person and the associated symbolic tokens or comprehensive entities through which man makes his human appearance in the world disappear, man himself disappears and what is left is the reduced remainder: unrelated, unintegrated, fragmented, disparate parts. "Alienation" becomes almost an euphemism for describing the despair which accompanies the sense of loss generated by the reduction of the human world to its particulars. Reductionism leaves us at the end of Modernity with the ghost of man brooding over a great abyss wherein swirl in endless trivial concatenation the myriad particulars of his former self.

"Tis all in pieces
All coherence gone."

IV

Perhaps surprisingly it has been scientists, more than the members of any other discipline, who have been most vocal in pointing out the scientific and societal threats of reductionism. It is easier, the the first place, for persons trained in scientific method to recognize reductionism because of its great similarity to empirical specification. In the second place, the scientific community since the time of Galileo has been sensitive and quick to respond to any form of religious, political, or ideological suasion that would compromise the essential freedom of science. The attempt to resist such suasion has not always been successful and science has sometimes succumbed to the temptation to vest its pursuits in the matrix of authority of some ideological or philosophical position. A residuum of anti-clerical skepticism tempered the position of many Darwinians in the last century. Even reductionism has had its appeal among scientists, but in the main it is scientists who have been in the vanguard of opposition to the reductionist threat not just to science, but to humane values. The late Michael Polanyi, perhaps the severest and most comprehensive critic of reductionism, was a major scientist of this century and was drawn into philosophical debate primarily because of the threat to scientific freedom, political democracy, and to humane values that he saw in reductionism. His works *The Contempt of Freedom*, *The Logic of Liberty*, *Science Faith and Society*, *Personal Knowledge*, and *The Tacit Dimension* have as a common theme the criticism of reductionism in all its scientific, cultural and moral forms. The one book I know of which attempts to deal with reductionism as its single theme *Beyond Reductionism*, edited by Arthur Koestler, is the product exclusively of a group of scientists.

Yet, it must be recognized that reductionism, while it has spread far beyond the bounds of science was mostly nurtured on the soil of science. Science, in particular the life sciences, has had an almost fatal fascination with reductionism. The growth of "reductionism" in science and philosophy on the face of it reflects the attempt to formulate an adequate, empirical (i.e. non-metaphysical) scientific method and epistemology. In this sense scientific reductionism may be viewed as an effort to disengage scientific method from political ideology on one side and metaphysical suasion on the other. The problem with scientific reductionism arises from the fact that the history of science in the modern period is not of a "pure" discipline -- the cause of science has been one not only of method but vision. That is, science, either by design, convenient allegiance, or through default becomes ensconced in ideological or metaphysical issues which set it against the traditional world view of the West or which attempt to make it into the positive ally of an alternative ideological or metaphysical vision that masks its own presence by pretending to appear as

"scientific". Reductionism then becomes a crypto-religion -- an implicit metaphysics -- grafted onto or parasitically feeding upon the growth and prestige of science while the true goal of the reductionism (the latent metaphysics) lies beyond science. The issue is confused from two sides: First by naive traditionalists, who, while recognizing the threat of the implicit metaphysics, attack the scientific enterprise as such, and second, by scientists themselves who have subscribed to the implicit metaphysics of reductionism and who defend it, in the name of science, as science. I am inclined to regard the first as mere fools, the second as dupes. Both fail to perceive the significance of the issue of reductionist metaphysics. And ultimately both work to the detriment of science. The traditionalists attack science openly and may compromise its legitimate place and contribution in society. The duped scientists erode it from within by transforming science into ideology and metaphysics which will ultimately make science subservient to an extra-scientific cause.

The issue is further confused by those who argue that scientific reductionism is a concern that now belongs to the history of science: that the classical form of scientific reductionism is Newtonian mechanics or the appropriation of now outdated mechanical models in the life sciences. I think the effort to import mechanical models into the life sciences -- an effort which is not yet spent -- is reductionist, but modern science continues to be reductionist even after the physicists have abandoned Newtonian mechanism and Laplacean determinism.

We must recognize, however, that reductionism does not occur only in science. (In fact, according to Polanyi, science has often found a reductionist approach in a particular branch of science to be especially fruitful in guiding research and discovery, e.g. in neurology.) The significant forms of reductionism at the end of modernity are extrascientific. In *religion*, there has occurred since the middle of the nineteenth century, repeated attempts by theologians, sociologists, anthropologists, political philosophers, economists, and others to deny or undermine the significant cultural role of religion by reducing religion to an "origin" in some non-religious quality of man's psyche or social needs. The import of these efforts is that religion is not a substantive aspect of human life or culture and need not be taken seriously because it derives from non-religious factors which can be explained in other terms. The most notorious of these reductionist critiques of religion is that of Freud in *The Future of an Illusion*, but Freud was preceded by Feuerbach, Marx, Huxley, Durkheim, and Russell who developed reductionist views of religion.

In *psychology*, both "action" and "personality" have been reduced to "behavior". In *literature* and *art* the products of creative genius have dissolved into the fragmentary documentation and enumeration of countless particulars counted none-the-less by impotent critics and graduate students. In Polanyi's account the most serious consequence of reductionism is in the related areas of *politics* and *morality* where a reductionist critique of human values has reduces the ideals -- which traditionally governed individual and group action and which constituted the norms whereby political and ethical responsibility were assessed -- to an imperious "necessity" which is indifferent to our professed ideals and values. These values, after reductionism has severed the dynamics of society from them become (in Polanyi's view) "homeless": there is no longer a supportive matrix for the guiding values that once formed our communal ethics. Such values are potent intellectual and psychic forces, says Polanyi, which will not be denied; but lacking context, they appear as the driving force of political "necessity" --moral fury masked as revolutionary progress. Reductionism destroys the context of our moral passions (values) and these reappear as the impetus of overtly "a-moral" political processes that have devastated the western nations in the twentieth century. The reduction and subsequent "a-moral" reappearance of traditional political and moral values Polanyi calls "moral inversion". It is "a-moral" moral fury which drives us to embrace the various forms of collective society and consciousness as veritable realizations of the Kingdom of God on earth. The collective, to the morally inverted mind, will always appear as the consummation of our best and yet most secret hopes.