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Teleology and Theory of Human Behavior

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In approaching the problem of fundamental concepts and units of social science, I do so merely as a psychologist. My colleagues in the other social sciences will have much to add, and they may well see fit to differ. I also limit myself to one topic—namely, the place of teleological constructs in the theory of human behavior. There is only incidental reference to the problem of units.

In reviving the old question of teleology, I realize that I am venturing down a pathway that for some centuries has appeared forbidding even to the angels, and that in taking a hesitant step in this direction I am identifying myself with a nonangelic group. Teleology means the explanation of natural events in terms of purposive constructs. This is a currently unpopular approach. I submit, however, that we should from time to time look again at the phenomena that invite a teleological explanation and make sure that we have done full justice to them.

Revolutions in Science

It is only recently that the students of man and society have been readmitted into the family of scientists. We appreciate the honor; we like to think of ourselves as scientists. Twenty-five hundred years ago, however, there was no question of a division within the family. Science, or philosophy, was one; it was man's quest for an understanding of everything. In Aristotle's day it included physics, biology, psychology, epistemology, logic, ethics, politics, and even the theory of poetry. In Aristotle's thinking there was no object or event or relationship that was not intelligible as an expression of law; and even the *summum bonum* was the embodiment of a rational principle. The Greek faith in reason was for many centuries to be smothered by a blanket of Christian theology. When the Greek faith was eventually revived, its claims were much more modest. The world of physical nature might be rationally understood, but the laws of human living were yielded to the theologians. The hope of modern social science is that the ideal of the ancient Greeks may some day be realized, that man may be restored to nature or, possibly, that our conception of nature may be broadened to encompass the laws of human behavior.

The history of science is studded with revolutions. The rationalism of the Greeks was revolutionary. In the 16th and 17th centuries we had a revolution of the New Science, as astronomy, physics, and biology began to throw off the shackles of the Christianized Aristotle. In Newton's great synthesis we have its finest expression. Darwin, in the 19th century, precipitated another revolution, the repercussions of which have not yet died down; and today we find ourselves in the midst of the greatest scientific revolution of all. History will in due course settle on a name for it. These are just the high points. In between the great revolutions there have been innumerable rumbles and revolts.

But where among the revolutions do we find the great revolution of the social sciences? We look for it in vain because it has not yet taken place. Why? I suggest that it is because the students of man have cravenly tried to pattern their fundamental concepts and methods after those of the natural sciences. I do not propose to canonize Aristotle, as the medieval theologians nearly did; but I do think that, just as the Renaissance was sparked by the rediscovery of the real Aristotle, so the social sciences of today can profit from a fresh look at Aristotle's argument for the unity of man and nature. The Renaissance scientists found his physics and his biology faulty, and we too may find weaknesses in his psychology and his sociology; but we cannot evade his challenge.

Aristotle's Causes

Aristotle's unified conception of the world rested on a fourfold theory of causality. There were material causes, efficient causes, formal causes, and final causes. Material and efficient causes had been recognized long before Aristotle. We find something like his formal causes in the materialism of Democritus. Final causes had, however, belonged to theology, and even the rationalist Plato had regarded them as separate from, if superior to, the laws of nature. The final causes represented the purposes of the gods, who, according to Greek mythology, could change the course of natural events at will. In the fourth century B.C. it required genius to incorporate final causes into a single teleological scheme that could include everything from the motions of matter to the creation of poetry.

The revolution of the New Science was in large part a revolt against Aristotle, but it was against an Aristotle who had been posthumously baptized as a Christian, whose final cause had become a Divine Purpose, the sole interpreter of which was the Church, and whose every dictum had become sacrosanct. Copernicus quailed before Authority, Galileo protested and then yielded, and Descartes quibbled; most of the scientists of the 16th and 17th centuries, daring as they were in their thoughts, hastened to make all possible concessions to Authority in

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order to retain some measure of freedom. One of the chief concessions they made was their freedom to consider man as a natural phenomenon. Even Newton, the model of the scientist, refused to study man in his entirety—and this at a time when the scientist could still be master of all knowledge.

The revolution of the New Science banished Aristotle's final cause, at least so far as physical nature was concerned, and even Aristotle's formal causes were laid open to question. The physical world that Newton envisaged was a world that could be described in terms of material and efficient causes, in terms of particles of matter that exist in space and time and are moved by force. Since Newton's day matter has lost much of its materiality; space and time have ceased to be absolutes, and force has been transmuted into a mathematical formula; but for all practical purposes the Newtonian scheme still works, and deep down we still have the conviction that Newton had his fingers on the fundamentals. Reality, our tradition tells us, Reality with a capital *R*, is tough and resilient stuff. No Science that is worthy of its capital *S* can ever really explain any phenomenon of nature without referring it to Something Real, like molecules or enzymes or genes or reverberating circuits in the cortex.

In the Newtonian scheme we seek in vain for anything that promises a true science of man. In the 16th century, the adventurous students of physical nature had rightly challenged the Christianized version of Aristotle's theory of the natural world. After the 16th century, the natural sciences went forward by leaps and bounds. By the end of the 19th century Science, with a capital *S*, promised to replace the gods of traditional theology. In retrospect, we realize that the scientists of the Renaissance had been faint-hearted when they were confronted with human problems, and that their successors were diffident about applying the principles of their new science to man. Galileo bowed before the Inquisition. Descartes, the father of mechanistic physiology, refused to extend his mechanical principles to the operations of the mind. Berkeley, who developed an ingenious (if incorrect) theory of space perception, took refuge in the mind of God. The philosophers eventually escaped with Kant into the realm of the transcendental. Early modern science was brilliant in physics, and only slightly less brilliant in biology, but in the science of man it was a dismal failure.

We cannot blame this failure on the social scientists of the Renaissance and post-Renaissance periods, for in those times there were no social scientists as such. The disciplines had not yet become specialized. At the end of the 16th century, Bacon could aspire to a mastery of all knowledge, and 200 years later Goethe could be active in optics, in botany, and in psychology as well as in the writing of poetic, dramatic, and philosophic works. If blame is to be assigned, it must be shared by all those who had the intelligence and the opportunity to look at themselves as scientific objects and who recoiled before the challenge. Better, however, to blame no one and simply to realize that societies and individuals must achieve considerable maturity before they can begin to study themselves scientifically.

Independence of Social Science

It was not until the latter half of the 19th century that the sciences of man began to assert their independence, and by that time the conception of science had become established as essentially that of Newtonian physics. We can understand how the students of man, groping for basic concepts and methods, should have patterned their explanations after Newton. The best example is to be found in the history of associationist psychology. The British empirical tradition was grounded in Newtonian physics. John Locke was living in a Newtonian world when he sought to base the primary qualities of sense on the properties of matter and to reduce the secondary qualities to terms of the primary. For Locke, the element of mental life was the "idea," the psychological analog of the Newtonian material particle. Locke was not completely consistent in his empiricism, for he conceded the existence of "mental powers."

During the succeeding century and a half, however, a completely associationist theory was gradually hammered into shape. By the mid-19th century, James Mill had banished the soul and the mind and had presented the world with a strictly Newtonian doctrine of man. The "mind" of man consisted of nothing but its contents, elementary sensations and ideas, chained together and compounded in accordance with a single law, the law of association by contiguity. Jeremy Bentham had similarly reduced the problems of individual and social motivation to a single principle, the principle of utility. Bentham's elements are simple pleasures and pains. Every human act is, and should be, based on a calculation of probable pleasant and painful outcomes. At the mid-19th century, it looked as though all the phenomena of human behavior and experience might be accounted for in terms of the prevailing concepts of natural science.

Newtonian science rests, essentially, on Aristotle's material and efficient causes. Newton was not an irreligious man, but he refused to admit teleology into the realm of science. Aristotle's formal causes may have caused Newton some trouble, but I have neither the space nor the scholarship to discuss the question. What is clear, however, is that psychological science in the mid-19th century was strongly opposed to the formal, as well as to the final, causes.

Then came Darwin. With Darwin there was a shocking upsurge of Aristotelian teleology. The historian of science must be amused by the fact that the most strenuous opposition to Darwin came not from the Newtonian materialists but from the pious people whose doctrine he was unwittingly to support. It is true that Darwinism was a threat to traditional religion, with its belief in special creation, and that Darwin's bulldog, Thomas Henry Huxley, smote the clerics hip and thigh, contending that man should be regarded not as a child of God but as a natural product of organic evolution.

What is most challenging about Darwin, however, is his reintroduction of purpose into the natural world. He may not have intended to do this—again, my scholarship is inadequate—but this was clearly one of the consequences. The Darwinian debate seethed with expressions, such as "nature red in tooth and claw," that seemed to suggest a mechanistic explanation of evolution, but these were accompanied by "the struggle for survival," "the progressive adaptation of species to their environments," and similar expressions that more than hinted at a final cause. The philosopher Bergson in his concept of the *élan vital* postulated something more than a mechanical principle; the biologist Charles Lloyd Morgan argued for the principle of emergence in evolution; the biologist Hans Driesch defended a frankly vitalistic position; the psychologist William McDougall made the concept of purpose central in his psychological system; the new science of anthropology took courage from Darwin's successes and proceeded to search avidly for evidence that would support an evolutionary theory of society. The defenders of religion, instead of yielding to the Darwinian enemy, finally encompassed him. Without much difficulty they recognized in the evolutionary principle a further indication of God's eternal purpose. Darwin, the scientist who tried to restore man to the realm of natural law, became the unintentional herald of a new teleology.

Final Causes

As I have said, I am not trying to canonize Aristotle, but I believe that Aristotle's doctrine of causation may still have some relevance. For almost 2000

years after his death the final cause reigned supreme. This was the period during which science, such as it was, was dominated by the Church. The revolution of the New Science, symbolized by Newton, represented an attempt to explain all of nature in terms of material and efficient causes, but it ran into difficulty when it tried to encompass the facts of human nature.

The Darwinian revolutionaries, perhaps unwittingly, reintroduced the final cause, and the stage was set for a debate between those who would explain nature mechanically and those who would explain it teleologically. Aristotle would not have been bothered by this difference of opinion, for he believed in the ultimate rationality of everything; but the post-Darwinian Newtonians, especially in psychology, have been bursting blood vessels in their attempt to contain the explanation of human behavior within the dimensions of space, time, mass, force and motion. Psychologists, of all people, ought to be keenly aware of the implicit assumptions in their own thinking. What is appalling is the evident fact that American psychologists are still trying to fit their phenomena into a Newtonian framework even after their hero, the physicist, has long since been toying with non-Newtonian concepts.

What I suggest is that the social scientists take another look at Aristotle's *formal* causes. The natural scientists did pretty well with the material and efficient causes; the final causes were captured by the theologians. The formal causes were lost in the shuffle. The Newtonians tried to dispose of them; the theologians tried to absorb them. It seems to me that the concept deserves further scrutiny. Let us glance at just a few examples.

The principle of homeostasis, originally propounded by Claude Bernard, was buttressed by experiment and presented as a theory by Walter B. Cannon. Cannon, in a presidential address before the AAAS, even dared to extend its application to the body politic. Physiological homeostasis is the principle whereby the body reacts to changes in its environment in such a way as to maintain steady states—steady states of temperature, water content, salt content, calcium and phosphorus content, and so forth. A physiological need generates a psychological need, and the appropriate behavior restores the proper balance.

It is important to note, however, that Cannon's steady states are not mere statistical averages; they are optima. The temperature at which the human body functions best, as recorded by a mouth thermometer, is 98.6°F. This is not an average of all possible temperatures; it is a statement of the *optimum*. Cannon's principle suggests that when organisms are disrupted they will veer toward a norm. Can this be explained in terms of material and efficient causes? Or does it require something more?

For the past 100 years, experimental psychologists have been familiar with the problem of phenomenal constancy. Under conditions of free vision, the object we see retains its apparent size in spite of changes in distance from the eye and consequent variations in the size of the retinal image; and its color, shape, and position are similarly resistant to changes in its illumination, orientation, and location. Some of the laws of phenomenal constancy have been worked out empirically and stated quantitatively. Yet, in advance of experimentation, we can still predict with a high degree of assurance on the basis of such a proposition as "The organism will strive, so far as possible, to preserve a stable world of objects, events and relationships." Is this a teleological principle?

A scant half-century ago, Sigmund Freud, who had begun to explore the causes of neurosis, concluded that the individual in his development achieves an ego that defends its integrity against real or imagined onslaughts from the world about him. Repression, rationalization, sublimation, projection, and reaction-formation are familiar mechanisms of ego defense. None of these has been adequately quantified, yet the psychological clinician depends on them. He knows that he can understand his patient's symptoms and guess his patient's future behavior if he assumes that the patient's ego will strive, by hook or by crook, to defend itself against attack. Some day the machinery of ego defense will be dissected into its nuts, bolts, switches, and transmission lines. For the present, what looks like a teleological principle seems to work.

These examples are from physiology, experimental psychology, and clinical psychology, and they could be extended indefinitely. I feel less confident about examples from economics, sociology, and anthropology, although I am told that there is still a law of supply and demand in economics and that the introduction of a new artifact into a society, such as a steel axe or a hydrogen bomb, will have predictable social consequences.

What is interesting is that in the sciences of man—and I include physiology—we can often make our best predictions on the basis of macroscopic observations and generalizations. The microscopists may eventually verify, or even correct, our statements, and they are beginning to do this in the fields of homeostasis and phenomenal constancy; but the fact remains that the initial hypothesis, the initial hunch, springs from an intuition as to whither man is going. Are we to exclude the directedness of human behavior from the realm of science as the Newtonian physicists did? Should we try to reduce directedness to terms of material and efficient causes, as the 19th-century psychologists did? Or shall we accept as facts the phenomena that invite a teleological explanation, and see what we can do with them? Needless to say, I favor the last alternative.

Teleological Explanations

I am not arguing that science should suddenly have a change of heart and reinstate Aristotle's final causes. The physical sciences have done fairly well without them. The biological sciences seem to be admitting formal causes without yielding to final causes, although some biologists are striving manfully to reduce formal to material and efficient causes. What I do suggest is that the social sciences, dealing as they do with the very phenomena that invite a teleological explanation, should not scurry away from these phenomena but should look at them fearlessly and be prepared to think in more global terms. A quarter of a century ago a much maligned psychologist, William McDougall, analyzed what he called "the marks of behavior," the most important of which was purposive striving. I think he was right. Among the many things that are characteristic of organisms is that they strive toward goals. We may deduce goals from the observed behavior of simpler organisms or we may observe them directly in our own experience. The fact remains that goal directedness is something we can observe. If science is to include the behavior of man, it must include the fact of purposive striving. Sticks and stones do not strive, but people do.

The most influential of contemporary psychologists, the American behaviorists, are still trying to stuff the science of man into a Newtonian bottle. They would like to see all of human behavior plotted bidimensionally within a simple scheme of space-time coordinates. I do not really deplore this. The scheme works well with rats, and with human beings who have the fortitude to memorize endless chains of nonsense syllables. It is a healthy and humbling experience to know that human, as well as animal, organisms can be made to behave like well-oiled machines.

In a world that cries for a deeper understanding of man, however, a world in which physical science has granted enormous new powers to a human agent who has scarcely begun to understand himself, I think it is high time that the students of man stop pretending to be scientists in the traditional sense and settle down to the business of looking at

man as he really behaves. I have no thought of disparaging Newton or his conception of the scientific conscience. I am simply suggesting that some of the phenomena that Newton rejected may now be incorporated within a broadened conception of science. These are the phenomena of form and purpose. Let us look at them as facts.

Some of my physicist friends object to my capping the history of scientific revolutions with a reference to an Einsteinian revolution, and they may be right. Einstein may not have revolutionized our conception of the physical world; but for us, social scientists, he is sufficient as a symbol. Einstein means to us not only the revolt against the rigidity of the Newtonian system but also the correction of a superficial relativism that has lulled too many social scientists into easy generalities. We usually think of Einstein's challenge as a challenge to our theory of space. For the social scientist it is *time* that is more important, for time is an essential dimension of purpose. If time runs in a straight line, then the only things we can consider as the causes of an event are the antecedent and concomitant conditions. The Newtonian system restricts us to these. If, however, we question the absoluteness of time and play with the idea that, in different frames of reference, the relationship between antecedent and consequent may be reversed, we may be left free to think that something that has not yet happened may be an essential condition of something that is about to happen. If the temporal relationship is relationally, rather than absolutely, determined, we might conceivably reincorporate purpose as a natural fact into the stream of natural causation.

Conclusion

My present feeling is that, if we were to reintroduce final causes now, we would be moving too fast. Some day we may have a natural science that is broad enough, both in its concepts and in its methods, to include the facts of human purpose. For the time being, I think it is expedient to concentrate on Aristotle's formal causes, and I suspect that the solution of formal causality may automatically resolve the problem of final causality.

One's thinking is always culture-bound. My own bias is against any sort of teleology. I do not want to admit transcendent, or even immanent, purposes into the universe. This may be a relic of my Newtonian upbringing. Nevertheless, the facts of human behavior and experience reveal purposiveness. Shall we consider these as facts of nature, or shall we deny them? If we accept them, shall we reduce them to "purposeless" terms, or shall we try to discover a unified science that is broad enough to encompass the full richness of experience?

Scientific Outlook: Its Sickness and Cure

Michael Polanyi

In the days when an idea could be silenced by showing that it was contrary to religion, theology was the greatest single source of fallacies. Today, when any human thought can be discredited by branding it as unscientific, the power exercised previously by theology has passed over to science; hence, science has become in its turn the greatest single source of error.

In saying this I am not rebelling against the preponderant influence of science on modern thought. No, I support it. But I am convinced that the abuses of the scientific method must be checked, both in the interest of other human ideals which they threaten and in the interest of science itself, which is menaced by self-destruction, unless it can be attuned to the whole range of human thought.

Lest these opening words sound vague and exaggerated, I shall nail down their demonstration forthwith by one name of two syllables: by the name of Lenin. The voluminous writings of Marx may point in various directions; the unspeakable deeds of Stalin are bordering on the pathological; but Lenin's doctrine is fairly clear and consistent. Let me show that the intellectual power by which it so widely triumphed both over its rivals and opponents was its claim to scientific certainty.

R. B. MacLeod has drawn a line directly from Newton to Bentham, and thence to modern sociology (*1*). This line is indeed the very axis of modern social theory. But the Newtonian outlook, as prefigured by Galileo and Gassendi, had established—by the work of Hobbes—a mighty bridgehead in political thought, even before the advent of Newton. In his *Leviathan* Hobbes founded for the first time a theory of society on the utter selfishness of its members, and his genius already foreshadowed there the monstrous tyranny that this conception of society may justify. On the other hand, MacLeod's axis should also be extended forward beyond Bentham, directly to Marx and Lenin. Dialectical materialism is a radically utilitarian conception of a progressive society that is advancing through conflict. It sees history moving inevitably toward greater productivity and regards this movement as the result of the rise of new classes over the dead bodies of obsolete social systems. It claims also that each new revolution of this kind is accompanied by comprehensive changes in law and morality, in philosophy and the arts, and, indeed, in every branch of human thought. This inexorable historic process bears the features of a new leviathan. It is the leviathan of Hobbes equipped with jet propulsion. Its driving force is supplied by a fierce demand for social justice—but these moral motives remain curiously concealed inside the monster.

Morality in Disguise

Herein lies a characteristic feature of all Marxist theory and Marxist policy: moral passions are masked as scientific laws which, by defining a historic necessity, sanction the machinery of violence which fulfills the necessity. Engels said that Marxism had transformed socialism from a utopia into a science. But actually, Marxism still relies on the emotional force of its utopian aspirations and

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