

Social Construction of Genetic Research

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Abstract

Genetic research has been hailed as the milestone of humanity; the most influential and important endeavour of modern science. Everything from tone-deafness (the inability to register various audio frequencies and discern one from the others) to breast cancer has so far been attributed to a particular sequence of proteins in the nucleus of each of our cells. This, however is not so surprising if one takes into consideration the fact that modern science has been travelling along the path of biology to obtain simple answers to complex questions. Beginning with race, to facial features, to head features, to brain size and complexity, to cell research, to molecular biology and now the gene, scientists have been looking for an answer by continually delving deeper and deeper into the “moving parts” of the human body.

The aim of this essay is to make the reader aware of the endogenous and exogenous factors involved in the natural sciences, to realise that science is not a matter of objective truth, but is as dogmatic and self-sustaining as any religion. Indeed, it is no surprise that religion has now been replaced by science as scientific agents begin to explain the Truth ‘out there’ as it really exists, which for the common man suffices as magic. The key concept in this discourse is the necessity of the postmodern weltenshaung. Postmodernism has several seminal themes which will be briefly explored to understand the thought process of science as paradigmatic.

Introduction

This enquiry is not to be misread as an attack on science. Instead it ought to be taken as a warning to the non-scientific community that science is not in a world of its own; it does not exist in the world of Truth¹, but rather is very much integrated with the dominant social forces, pulling and pushing for advancement. This essay is also not meant to be all-encompassing; there have been many papers and critical books written on the subject and hence, ought to be seen as a brief overview of science's struggle to remain 'inside the box' to sustain, and support the prevailing dominant ideology of other disciplines: social, economic, political etc.

Specifically, this essay will concentrate on science's fallacious belief that it is in a world of its own. I will attempt to show that science's consensus on certain overarching theories are arbitrary decisions. The premises of the critique of bio-reductivism will arise from the basic tenet of the postmodernist view that science is *not* objective and free from other social forces, that social forces influence the type of scientific research conducted, its methodologies, observation-laden theories, and theory-laden observations. If they are influences from other disciplines, and their decisions are arbitrary, then could the current allopathic reductivist viewpoint on biology be a completely incorrect way of conducting medicinal science?

I

A paradigm, in the most general sense of the term, consists of the values, beliefs, techniques etc. shared by the members of any given community[2, p. 253]. Thomas Kuhn pointed out that the scientific community is not exempt from having these paradigms - a particular mode of agreed upon discourse.

Paradigms

The fundamental units of scientific knowledge are not theories, but *solved practical problems*. These solved problems are the models of further research; some of these solved problems hold special promise for future research, becoming the authoritative basis for future research. These special fundamental units of scientific knowledge then become exemplary achievements, or paradigms. The combination

¹Hereafter, objective truth, when in reference to "the world out there" will be capitalised and referred simply as 'Truth'.

of this theoretical discourse, practice, and instrumentation provide for an understanding *through use*, rather than abstract reasoning. Further, this paradigm both inspires future research and is what regulates its evaluation. The theory then is not important; one may not deductively infer from theories, rather it is what one must be able to do with, or make practical use of, the fundamental units of knowledge, those pieces of solved problems. [1, p. 100]

Scientists are not necessarily intent on challenging these overarching exemplars. “Most” of our observations are explained through these theories; when an observation does not fit with a particular theory, scientists ad hoc patch their theory, or declare the observations incorrect. This is important because observations of the real world are seen as the final judgement: yet the *way* the observations are interpreted still must fall under the judgement of a scientist (or many scientists.) Two implicit items within this “judgement” are theory-laden observations, and observation-laden theories.[1, p. 92]

Theories and Observations

A theory is merely a metaphorical redescription of what is being observed or experimented upon. Einstein noted that time is *like* a river flowing through space. Matter scattered throughout space causes time to change its flow, direction, and speed. It is important to remember, that time, much like many other theories is merely *like* something that we are all familiar with (so as to understand the original thing better). The brain has been treated as a computer in order to account for phenomena related to memory, perception, and inference. Gases have been redescribed as a set of particles. This theory (read: metaphor), like the one of time, is supported because the various phenomena associated with gases, such as pressure and temperature, *can be understood and practically applied* as the motions of these metaphorical particles.

In a similar manner, the brain has undergone several different revisions of metaphorical analogies, based on the prevailing economic modes of production (something which I will go into further detail later.) Originally, the brain was thought to be similar to the hydrolic press, the telephone network, and now the computer metaphor prevails. The cell has also been subject to such metaphors; they were considered little powerhouses with their own energy balances. Currently, due to our so-called information revolution, the concept of the cell is nothing more than a method of information exchange and control. Richard Dawkins (1976) explained the genetic composition of animals as hosts, whose primary purpose is to spread the information contained in “selfish gene.”

What we most often lose sight of, especially in complex theories, is that the metaphorical thing *neither is* the original, nor does it have the same essential properties as that ‘original thing’ with which we are drawing the link. Hence, scientific theory is created by a change of familiar discourse into a new context, and in turn the phenomena within the new context becomes documents of the theory. (Barnes, 1996) The theory then explains the observations, but the proceeding observations support the theory, leading towards a circular argument in support of this new theory: which comes first? Metaphors may help us to understand particular phenomena, but it may also be a hindrance to our research methodologies.[8, p. 53]

It is important to note that we, as humans, are *always* behind the veil of subjectivity. No one person may escape completely from his blinders to see the world *as it really is*. We conceive of a world constituted of the objects we believe to exist within it.[1, p. 82] When we, as humans in a non-scientific context, make any particular observations regarding the existence of an indisputable object, say sitting right in front of us, we cannot be *absolutely sure* that the object exists; yet we make the assumption that the object exists because in *similar situations* (when we have previously observed an object in front of us) we were able to touch, and feel the object, act and react upon this object.

Scientists behave in this very same way: from previous observations they believe that there are objects (visible or invisible) which exist and have particular characteristics. These objects include the electron, electromagnetic wave, quarks, glue-ons etc. Further, once *constructing* these unperceived and inperceivable objects, they blame the objects for all kinds of observations and experiences. The electron is one such object which is *still* in actuality a theoretical object, but raised to the level of an *actual* material object due to its incorporation in so many facets of the real (read: practical) world. Without the electron there would be no way to *explain* the computer chip, light, the nuclear reaction. In this way, scientists are not unlike the tribal and religious subcultures in how they maintain their belief systems. The difference between the two is that science makes the assertion that the observed and “explained” phenomena does indeed logically exist.

What is interesting, is that theoretical objects are not treated as different “things” in and of themselves. Since the idea of the corpuscle was first developed, we were well underway to reducing all things to their basic components. Under this paradigm all “basic components” are essentially identical to each other. Hence an atom of hydrogen is identical to all other atoms of hydrogen; an electron is identical to all other electrons. This reduction of all items to basic components allows for a simple unification theory: maximises explanatory value, minimising theory overhead (a very capitalistic methodology). Yet there is an added as-

pect of problem-solving within a theoretical discourse; if any of these problems solved lead towards contrary or contradictory conclusions, then these conclusions do not debunk the paradigm within which the scientist is working. Rather, the conclusions tell more about scientists performing the experiments rather than the so-called objective world. Most of these scientists are called cranks, new age scientists, or pop-scientists.

One such scientist is Rupert Sheldrake propagating his theory of 'morphic resonance'. The theory basically states that all human and non-human memories are stored in a universal 'ether'. Steven Rose (1998) performed a joint experiment with Sheldrake to test his hypothesis of morphic resonance, by using the birth of chicks. In the experiment, the chicks that had a novel birth, Sheldrake argued, would alter the behaviour of successive chicks because the memories were stored in the 'ether.' While Rose hypothesised that the chicks born after the novel hatching experience, would have no change in their behaviour. The experiment turned out in favour of Rose, according to him and many other 'normal' scientists. Sheldrake, however, was still convinced that the facts (these observations) still supported *his* theory.

Just as Sheldrake was able to view the observations in such a way that it supported his theory, subjects of an ethnomethodological experiment fit a set of random 'Truths' to their mental schema. Harold Garfinkel, leading ethnomethodologist illustrated the interpretation of so-called objective data in a counselling experiment[1, p. 89]. The subjects in this experiment were told that the purpose was to formulate new ways in which counsellors can give more efficient and effective advice to patients. The subjects were told to ask questions to the counsellors that pertained to a personal problem the subjects wished to solve. They were told that every question they asked of a counsellor would be responded in a 'yes'- 'no' fashion. What the subjects did not know was that the yeses and nos that would be given to them were already predetermined at random. Hence, the answers would have nothing to do with the questions asked; yet they presumed that the answers had *meaning* behind them. The subjects were then asked to tape-record their feelings about how the session was going after each question and answer.

Garfinkel's findings were that the presupposed pattern of counselling (that they were getting meaningful answers to their problems) was responsible for their general sense of 'what was really happening.' If a question came up that contradicted their previous questions, they would note that the counsellor did not know enough information, or that the counsellor had a particular state of knowledge that rendered him or her incapable of understanding the question as the subject had asked it. The point is that "great effort was expended on consistency-restoring activities,

when apparent contradictions in answers were encountered.”[1, p. 90] In a similar manner, scientists make the so-called facts fit the prevailing theories.

Paradigm Shifts

A paradigm shift occurs when a discipline reaches a crisis state that calls into question the explanatory powers of existing paradigms. A crisis state is reached when new problems, which cannot be solved through theoretical discourse, practice and instrumentation, are no longer seen as anomalous and ad hoc solutions are no longer convincing.[2, p. 254] The paradigm shifts are discontinuous, non-cumulative and abrupt changes in the discourse, very little is carried over from the old paradigm.

(It is important to understand the difference between scientific breakthroughs and paradigm changes. Scientific breakthroughs are *not* paradigm changes. They are merely complete puzzles that could not before be solved within the current paradigm. Hence the discovery of say a cure for cancer would only be a scientific breakthrough if the cure were to come from allopathic procedures in modern medicine’s paradigm. ‘Breakthroughs’ such as Robert Atkin’s *revolutionary* new diet program, which concentrates on the intake of fatty food, and a suspension of all carbohydrate intake, is not considered a breakthrough and accordingly in the popular media as such, because it is working within a different health paradigm.)

There are many instances throughout history where there have been paradigm shifts in science: the Ptolemean / Copernican shift, Newtonian / Einsteinian shift, etc. I will reflect on two, put forth as examples by Kuhn (1996), for major paradigm shifts in science.

The first of these is Newton’s *Principia* and the occult qualities afforded by the ‘invention’ of gravity. Before Newton’s discovery, the scientists of the time had dispelled the belief that items had innate properties other than the directly observable ones; color, taste, and even smell were secondary properties which could be explained in terms of size, shape, position and motion of elementary corpuscles. This was the mechanico-corpuscular view of the world. They had eschewed the innate and essential properties of objects, such as, for example, the tendency to fall due to the object’s essential property to “stay” on the ground. It is important to note that this mechanico-corpuscular paradigm was useful in that it explained, if not solved, many of the standard physical problems in a number of different sciences. Hence, gravity, interpreted as an “innate” attraction between every pair of particles of matter, was considered an occult quality. Kuhn wrote that the search for a mechanical explanation of gravity was one of the most challenging

tasks taken by those physicists whom accepted Newton's ideas. The scientists were in a slight bind: they were unable to "practice" science without Newton's paradigm, nor find a mechanical explanation for Newton's gravity. "... *scientists gradually accepted the view that gravity was innate.*"[6, p. 105, emphasis added] The result was a reversion to a scholastic standard of innate qualities.

The second example is that of Clerk Maxwell's wave theory of light. It was scientific "knowledge" that light needed a material ether to travel from its source to its destination. The scientists were in a bind, in that they were unable to present any proof of the existence of this material ether. The electromagnetic theory of light proposed by Maxwell, however, had no reference to a medium able to support light waves, making it even more difficult to prove. Yet Maxwell's theory was so *practically* useful that it was difficult to do science without. By the early 20th century, this paradigm was finally adopted; scientists accepted the view that there was indeed no ether.

The importance of these two examples are that adoption of either one or the other paradigms were made not because of cumulative scientific achievements or problem solvings; there were no external standards for the rejection or acceptance of either one. Rather there was "simply a change *demand*ed by the adoption of a new paradigm." [6, p. 108, emphasis added] The question then is *why* do scientists choose one path rather than another? We will examine next this necessity of scientific revolutions, and the influences of extra-scientific disciplines upon science itself as a proposed reason.

II

Scientists would like to believe that their discipline is in search for an objective truth about 'the world out there.' Many of them believe, especially the 'natural philosophers', physicists, that the mother of all sciences is so far removed from socio-economic influences that their field *must* represent an objective reality. Yet, as we have shown in Section I, scientists decisions to include or exclude certain paradigms are based on arbitrary decisions of 'what works.' At the very least, the skeptic of any social constructionist critique must conclude that science goes with what is 'practical' and can be applied to the real world. If acceptance of Maxwell's theory coincided with the promulgation of wireless devices, then one can superficially see how the practicality is dictated by the other disciplines' usefulness of science's progress. (Let us say, for example, engineering, and all aspects of the economic implications of the commercialisation of radio-the distinction of use,

as either communication devices, or mass media devices, does not affect our enquiry.)

Postmodernism

An attack on biological determinism, or bio-reductivism must necessarily evolve from a postmodern perspective. Postmodernism is about rejecting the problems of a positivist modern perspective; biological determinism dictates a positivist perspective in that genes are supposed to control individuals, and since society is comprised of individuals, then genes can explain why there are (among other social ills) class stratification. The current scientific paradigm consists of the following general premises: the autonomous social atom, and extreme individualism. Hence, the bio-reductivist viewpoint: the whole is understood *only* by taking it to pieces.[7, p. 10] It just so happens that this viewpoint does not rise from no where, but with the development and maturation of capitalism (something we will discuss at length in the next subsection.)

To understand the postmodern premises for the charge of a subjective scientific institution, we must elucidate Steven Best's (1997) characterisation of the postmodern discourse. First, postmodernists reject any unifying, universal schemes in favour of difference and plurality. Within the context of the bio-reductivist argument, postmodernists would reject the theory that the human genome project is *the* key to understanding 'human nature.' The postmodernist would, however, accept the dominance of local environmental factors guiding one's behaviour. Second, postmodernists renounce any sort of closed structure, fixed meaning, and rigid order, in favour of indeterminance, incompleteness, and uncertainty. Once again, the key problem with the bio-reductivist point of view is the existence of certain positivistic elements. If a female is identified with having the gene for x , the postmodernist would reject the necessity of development of x , arguing that environmental factors have yet a major role in the existence for x in the beginning. Indeed even geneticists themselves release 'breakthroughs' (of the sort previously touched upon) with so many qualifiers and conditional phrases so as to render the breakthrough useless. R. C. Lewontin identified this type of statement: "We read repeatedly about how 'science has discovered' something, but more often than not, those announcements are hedged with qualifiers. Biologists discover 'evidence for' genes that 'may one day' lead to 'a possible' cure for cancer." The postmodern perspective on genetic research can be seen as 'spin control' for the media; it is, however, ironic and unfortunate that this 'spin control' rarely makes it to the popular evening news.

Postmodernists also abandon naive realism, unmediated objectivity and truth in favour of perspectivism, hermeneutics, and intertextuality. According to Ziauddin Sardar (2000) the Strong Programme, began at Edinburgh University, promoted the theory of ‘sociological finitism’ (a way of looking at how the world is connected through language), which was a variation of the realist theory. While some of their material can be used from a postmodernist perspective, most of it cannot because of their links to the existence of a ‘real world’ out there. Barry Barnes (1996), and David Bloor, the founder of the Strong Programme, point out that naive realism “operates with marvellous efficiency in the assimilation of new experience; it is put to use to maintain, extend, revise and reject existing knowledge, and thereby serves *both as that which sustains the status quo and that which changes it.*”[1, p. 88, emphasis added] Hence, the postmodernist’s allergic reaction to naive realism; you might as well ask a prisoner to guard his own cell; or ask a chemical company to patrol its own environmental effects. Yet that is exactly what is happening in the commercial world.

Kuhn’s academic ‘normal science’ has been replaced by corporate industrial science.[10, p. 37] The most important tenet of postmodernism as applied to this critique of biological reductivism is the deconstruction of boundaries between areas of enquiry. Science, specifically genetic research is not in a world unto itself; it is being influenced by the economic world, the political world, and the social world (to name but a few.) There are no boundaries between areas of enquiry because all of the different fields influence each actor within the field. Industrial science, commercial genetic research, manufactures both the ‘facts’ of science and the ‘Truth’ they are supposed to express. Even the scientific method is nothing more than opportunistic logic: manifested as a “locally situated form of practice ... rooted ... in local social action.”[10, p. 41]

Economy, Politics and Ideology of Science

As R. C. Lewontin observed (1992), science provides us with two functions: the practical implementation of various ‘natural phenomena’, and the explanatory power over nature. Medicine is an example, however, of a purely empirical process in which whatever works is valid - not very scientific after all. (The evolution of syphilis from an ‘act of god’ to a narrowly defined genus-species organism underwent such ‘whatever works is valid’ treatment.) Lewontin also pointed out that the explanatory powers of science also serve another purpose, that of legitimation. [7, p. 5]

Science had undertaken the task of explaining human behaviour, among other

“scientific” phenomena, as being something with ‘natural laws’. Underlying all of science’s attempts to explain the natural world through these ‘laws’ was the legitimization of the status quo. It is then no surprise that the Roman Catholic Church had been replaced in this domain; the church once offered the necessary explanations and legitimations for the status quo, through the doctrine of a supernatural being, namely God. For science to have replaced the church as the explanatory institution, they had to share some basic necessary components. Lewontin describes three such components:[7, p. 7]

“... the institution as a whole must appear to derive from sources outside of ordinary human social struggle ... to descend into society from a supra-human source. Second, the ideas, pronouncements, rules, and results of the institution’s activity must have a validity and a transcendent truth [going] beyond any possibility of ... human error. And finally, the institution must have a certain mystical and veiled quality, so that its innermost operation is not completely transparent to everyone.”

The mystery of conversion from the church to science, then, is not so mysterious.

Since science has replaced the church as the cognitive authority, then why would science deem some paradigms as pseudo-science, while arbitrarily accept other paradigms. In order for the bio-reductivist argument to hold, it must prescribe the seminal tenet that the *only* way to understand how anything works is to take it apart. While this might work very well for human created tools, this Cartesian dualism does not translate properly into the domain of bio-life sciences. Hence, scientists are continually self-patrolling their borders to keep out that which does not subscribe to the reductivist viewpoint. Those theories they accept as science are ones which can be subsumed, if not, co-exist peacefully, not disturbing the legitimating factor of western politics (and by proxy economics).

Michael Ryan (1984) argues that the political deconstructive analysis can be taken a step further into the domain of rational knowledge by putting into question the *process* of rational conceptualisation. If we cannot detach the isolatable pieces of knowledge from the contextual dependencies, those qualifiers noted previously, and internal dependencies on external factors, then the concepts, which we construct from “rational knowledge” must “abstract from a world that denies the possibility of a knowledge based on ‘adequate’ conceptual categories.”[9, p. 143]

An important observation of a deconstructionist view is that the act of knowledge is instituted through training and practice, whether formal or informal. The

science teacher is a teacher because of the amount of knowledge in a particular field; hence knowledge itself is a form of bias, because of its selectivity (what is relevant, and what is not) according to a historically determined institutional norm of what ought to be included and known. *There is no such thing as neutral teaching*; neutral teaching would work only if scientific knowledge would exist before being paradigmatically biased. Hence, if all knowledge is educated or formed, then it follows that we can never truly have unbiased or 'natural' knowledge.[9, p. 142]

The question then remains that if learning goes one way, rather than another logically possible way, which way does it lean? If science is an inductive learning machine 'tuned to convention', then the outcome of this machine's operation is not increased control and prediction over biological experiments and arguments, but rather an *increased utility of particular cultural resources for particular kinds of prediction and control*, that of the dominant ideology - capitalism.[9, p. 144]

Let us take an example of political influences over biochemistry from history. In the beginning of the 20th century, the dominant account of cell operation was the protoplasm theory. This dominant paradigm theory, stated reactions occurred as a result of a homogenous substance located in the cell called protoplasm. The entire cell was considered necessary to effect any chemical reactions. Pasteur, a French scientist in the 19th century, showed that by killing the cells, you would kill the chemical reactions that may occur. The dominant (holistic) paradigm allowed the special relation of specific reactions to specific micro-organisms. It also allowed for the perfection of many *industrial* processes through the identification and selection of distinct strains of micro-organisms necessary for particular kinds of chemical reactions. Barnes (1996: p. 131) noted that the reigning political machine, and stronghold of the Catholic church in the country was placated by Pasteur's anti-reductionist strategy. Pasteur's success was during the second empire, which emphasised holism, and anti-materialism. In fact, there was such an integration of the church's ideology, the political machine, and scientific research, that the official government post was occupied by the minister of education and religion.

When the enzyme theory was 'discovered' there was much resistance to this new method of effecting chemical reactions. The new enzyme theory poignantly implied that protoplasm (this homogenous life giving substance) was not needed for chemical reactions, initiating the mechanistic and reductionist approach to biology, that there was nothing specially different about chemical reactions in a test tube, versus those occurring in the body. It is quite expected that there were many objections to this new paradigm. At first, everyone objected to the fact that

the results were unable to be reproduced. While others stipulated that there was a failure to eliminate ‘fragments’ of protoplasm; even if you crushed the cell, would the protoplasm be destroyed? Others yet accused the experiment of not being the same reaction as when it is in the cell. There was even the excuse made that the so-called enzyme was being mistaken for protoplasm itself! [1, p. 129-136] All of these excuses made to maintain the status quo, the reigning paradigm, were similar conflict-resolving techniques used by the subjects in Garfinkel’s ethnomethodology experiment. It was, needless to say, eventually accepted as part of standard biochemistry that enzymes indeed existed, and that biochemical reactions could take place outside of an organism’s body.

The old reigning paradigm, although holistic, demonstrated that the scientists were very biased and relative, not to mention pragmatic: there was an entire chemical industry built around the concept of protoplasm. These old scientific ‘facts’ represented a world whose practical and material complexity did not represent any form of objective truth.

As Ryan argued in his chapter on Reason and Counterrevolution in *Marxism and Deconstruction*, (1984: p.143) all knowledge is a form of practice, where practice is the construction of categorical representations. Practice in “natural” knowledge was the manipulation through the construction of dehistoricized and transcendentalized formal concepts; those concepts existing in a sort of ethereal world, get translated back into a historical, social, economic and political world, such as that of the ‘protoplasmic world’, becoming categorical and authoritarian! It was almost forty years after the concession of the enzyme paradigm that the industrial processes adopted this new method.

Final Notes

I would like to remind the reader that this paper pertains to the blind faith the Western world has placed on science. Yet Western science is not about finding Truths located ‘somewhere out there’ in a supposedly ‘real world.’ Western science is about a process of legitimisation of the status quo through categorical and authoritarian control. What we must all realize is that scientists are also human, with the same social, economic, and political pressures as every other institution. The capitalist world does not conflict with the reductivist and positivist paradigm of science because it meshes very well with their logic of industrial capitalism, rationality!

“The best conceptual abstraction is the one that presents the most truth

in as little space and time as possible ... the minimisation of ambiguity, irrationalism, discontinuity, and dissonance, in conjunction with the maximisation of cognitive instrumental mastery.”[9, p. 144]

The scientific community is not in a world of its own. It relies on the funding from the political world, or even the biased (as demonstrated in the previous section) educational institutions. Just as capitalism cannot take into account the small details like the wishes of consumers and workers, without damaging the profit margin, science, in the name of rationalism, isolates for itself a domain of knowledge; it demands efficient focus on its domain, necessarily leaving out society, politics, economics, and so forth. Let us never forget this as we enter the 21st century, it will, I predict, go down in infamy as the century man finally completed his egoistic quest to play God.

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