**Review**

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Edward O. Wilson, *Consilience: The Unity of Knowledge*, Random House, 1998.

**The Emperor's New Genes:
A Study in Fascist Pseudoscience --
How It Serves the Current Needs of the Capitalist Class:**

**A Review of E. O. Wilson's *Consilience*and a Critique of Biological Determinism**



-- From the blurb of *Consilience* by E. O. Wilson

**Introduction--the new Wilsonian politics**

     Published in 1998, *Consilience: The Unity of Knowledge* is Harvard biology professor emeritus E. O. Wilson's attempt to advance the pseudoscience that he first promulgated in *Sociobiology: The New Synthesis*, published 23 years earlier. The massive outpouring of objections provoked by the earlier work, both to its abundant scientific fallacies and to its fascist and anti-working-class political implications, have led Wilson to develop subtler ways of cloaking the same claims in this newer book.

     In both these books Wilson's main building block is that genes determine human behavior, no matter how complex that behavior--for example, war, rape, sexism, racism, selfishness, crime, aggression, violence, patriotism, xenophobia, hierarchy, tendency to form contracts, etc. Second he claims that the behaviors are therefore inherited by succeeding generations, third that these behaviors have been the subject of natural selection over the 2 million years of human evolution, fourth that the behaviors therefore are not caused by particular forms of social organization but rather that social organization is caused by the behaviors, and fifth that therefore any attempt to escape these is futile.

     But with *Consilience* Wilson adds a new dimension. No longer content to lay out a program, take it or leave it, Wilson now calls for the subjugation of the social sciences and humanities to biology--to his particular pseudoscientific brand of biology. The word "consilience," defined by Wilson as "the interlocking of causal explanation across disciplines," only exhibits part of the goal. The rest--the planned ascendancy of biology, and in particular genetics, to the position of supreme science--is entwined in the text. Even if you knew what "consilience" meant, you could not judge this book by its cover. It is also interesting that he doesn't call for explaining all of biology in terms of the sciences that underlie it, namely chemistry and physics, but consistency is not one of Wilson's strong points.

     Wilson's call to explain art and society in terms of biology is not a call to answer all of the questions raised by the social sciences and humanities in that fashion. Far from it. Rather it is an implicit call to *ignore* the vast majority of questions that these fields attempt to answer--questions such as, What is it about the social organization of capitalism that gives rise to unemployment, racism, crime, etc.?

     This call for subjugation is far too narrow to qualify as a theory. At best it qualifies as an allegory, or an analogy, or a metaphor. And as such, Wilson's brand of biology might itself be better classed with the humanities, rather than the sciences. *Sociobiology* and *Consilience* are more like religious tracts (idealist) in nature, rather than scientific (materialist). As with all non-materialist ideas, Wilson's pseudoscience lends itself to the use only of the current ruling class.

     And it turns out that Wilson has powerful sponsors in the capitalist ruling class who employ him as a weapon in their efforts to disarm us, the working class, hoping to head off any tendency for us to search for an escape from the horrors of capitalism. Members of the dominant Eastern Establishment (those who gained their wealth from banking, mining, oil, manufacturing, railroads, etc. in the 1800s) wing of the ruling class, such as Steven Rockefeller, meet with Wilson behind the scenes, advise him, grant him financial support, and fill their media and scientific journals with his pronouncements--as well as those of others who generally see eye to eye with him.

     Even more importantly, these meetings produce visits to university presidents (for example, Texas Tech University) urging them to rearrange their social science and humanities programs according to the program of subjugation proposed in *Consilience*--urgings backed by offers of financial support. The urgings filter down through department chairs. As with many of those who opposed the U.S. imperialist intervention in Vietnam--early in the war in the mid-60s--scientists who oppose the program often find grants drying up, tenure tracks disappearing, class schedules deteriorating, and pressures to publish accelerating. The fear builds, and the silence of the majority follows.

     There are always the more courageous professors who dare to speak out, but their science becomes more and more marginalized. Meanwhile they are held in reserve to demonstrate both that free speech still reigns and that the Wilsonians are the ones under siege, valiantly fighting to preserve science in the face of the politically motivated anti-science onslaught. The smoke and mirrors flood the public mind.

     This review then is intended first to expose Wilson's faulty justification for the subjugation of the social sciences and humanities to biology, second to expose the fallacies at the root of his sociobiological program, third to expose the methods and tricks Wilson uses in *Consilience* to give himself the appearance of a contrite and changed biologist, unfairly attacked by his critics, and fourth to show that, while appearing to have changed his outlook over the last quarter century, the essence of Wilson's sociobiological ideas remain the same. Our goal is to bring about an understanding of Wilson's fallacies and deceptive methods in order to enable the reader to convince others and help build a mass activist movement, as well as to persuade the reader that an understanding of the difference between science and pseudoscience is a matter of life and death.

**The mechanical versus the dialectical view of nature and machines**

     Before taking a closer look at *Consilience* and biological determinism in general, it will help to provide a fundamental philosophical framework through which we can tease out what is true from what is false. So we will begin with a brief explanation of the difference between the mechanical and dialectical views of nature.

     There are two distinct types of entities in the universe: 1) those that are assembled out of already-made parts, and 2) those that are produced, at least mainly, as a single whole entity, with the differentiation into more or less well defined structural and functional regions occurring subsequently.

     Those that are assembled out of already-made parts are generally, if not always, manufactured by humans or other animals (e.g., cars or buildings, or beaver dams or bird nests). Those that develop mainly as a single entity, possibly without any single objective division into parts, are generally, if not always, products of nature, and mainly develop without human or other animal intervention. Examples of the latter include humans and other animals, plants, mountains, the planet earth, the solar system, and the galaxy.

     The entire distinction between these two types of entities is based on their history--i.e., the history of the development of the entity, known in biology as its ontogeny. In the first type the parts are independently manufactured *prior to* assembly, while in the second, the entity develops as a whole, with differentiation into parts occurring *subsequently* and as part of its entire development, though its initial development may partly involve assemblage of separate parts.

     For example, a zygote (the first cell of a developing animal or plant following fertilization) is assembled from already-made parts, namely an ovum and a sperm or pollen, which initially involves human or animal intervention in the case of sperm, but from there on the developing animal/human or plant develops not from *assemblage* of parts but as a whole, with *differentiation* into different functional regions.

     Furthermore once the animal/human is developed and born, or the plant has grown, division of it into parts is to some degree arbitrary. We describe human parts as limbs (arms or legs), or heads, or internal organs (livers, hearts, brains), etc., but these are not uniquely separable from the rest of the organism even conceptually. For example, where do you sever the ligaments, or tendons, or blood vessels to separate them? And if you do, in fact, sever these attachments, the separated parts, more often than not, disintegrate rapidly. Whereas for a car, there is a unique division into parts, namely those that were manufactured separately before being assembled, and the parts can persist separated from each other without decaying.

     Because the second type of entity develops as a whole, each portion (however arbitrarily defined) is dependent on the rest of the entity for how and when it develops and into what it develops. Shared with the second type is the fact that once a manufactured entity is assembled, from there on its parts develop only in relation to the others, even if they did not require a relationship with the others for their initial construction. For example, in a car, friction causes wear, but the speed of this can be made more or less rapid through design.

     In addition to things like houses, dolls, or paintings, this assembled type of entity includes machines, which may or may not have moving parts. Nevertheless because people manufacture machines, it was easy for people to fall into the concept that even entities developed by nature are mechanical (i.e., assembled from already-made parts). Thus the mechanical view of nature was based on our own experience, whereas we have less experience making things as a unit or whole, at least things with moving parts. We can make sculptures or carvings as a unit, but they have no moving parts. We can also brew or cook, but during the process these involve the help of nature, in the form of chemical reactions, to change the parts that we assemble.

     It required creative insight for philosophers such as Marx and Engels to realize that there are entities that are *not* mechanical in nature. The mechanical view of the world is not entirely incorrect, however, since assembled entities such as machines do indeed exist. Rather it is the extrapolation of this view to *all* entities that deviates from the truth. And the extrapolation even to machines, failing to account for their wearing out, misses the point as well.

     Examples of the application of a mechanical view to entities that are not, in fact, machines, include the following: Lucretius in ancient Rome speculated 2000 years ago that all matter is *assembled* from atoms. Laplace wrote in the early 1800s that all matter is assembled of particles that interact with each other, in terms of their positions and velocities and forces between them, and concluded that if we knew where everything was at one point in time we would be able to predict the entire future development of the universe. Rousseau wrote about society as a social contract in which already-made individuals come together and agree to form a society with rules for everyone's benefit.

     Similarly Wilson writes that societies are assembled from people, who in turn are the passive slaves of genes. In particular, the various forms of social organization are assembled from gene-directed human behaviors. Evolutionary psychologists view an infant's brain as assembled from modules of thought and tendencies. And so on.

     Since the mechanical view of people and societies denies the reality that each develops as a whole, each with its own history or ontogeny, and with parts that cannot be uniquely separated, it fails to describe either people or societies adequately. In addition, it does a wholly inadequate job of accounting for the development of entities in nature, such as plants and animals, as well as atoms and molecules, glaciers and oceans, stars and galaxies.

     Even the conventional view held by chemists and physicists is mechanical, insofar as it is predicated on the notion that molecules, atoms, and subatomic particles are already made before they are assembled into units of matter. As such it misses the reality that these microscopic entities are only arbitrary divisions of matter and that the nature of each of them depends on the rest for their own development, structure, and function.

     Indeed the conventional view holds that the smallest known subatomic particles don't even have any structure, but rather are irreducible. This view has stalled physics and chemistry for many decades and prevented scientific progress beyond the apparent quantum mechanical paradox that the entities are both waves and particles, that indeterminism of the position or velocity of a particle is a fundamental property of nature rather than a consequence of an inadequate mechanical view. (Bohm--references at the end)

     Opposed to the *mechanical* view of nature is the *dialectical* view. The dialectical view is much harder to come by--both in its origins as well as in the ability of each of us to grasp it without a significant amount of struggle. This is because none of us has the experience of directly and consciously producing any entity that is not manufactured out of parts. A trivial exception is a sculpture or a carving, in which we reduce a larger entity to a smaller one. So the mechanical view more closely corresponds to our direct experience than the dialectical view. But the dialectical view allows us to describe nature far more accurately and completely, accounting for things that the mechanical view simply has to brush aside as unanswerable.

     In his book *Causality and Chance in Modern Physics*, David Bohm, a physicist who was blacklisted during the McCarthy era and went to teach in Britain, has a lucid explanation of the dialectical view of physics and subatomic particles. He shows how there are new laws at each level of organization of matter that cannot be reduced to the laws that apply at the lower levels. For example, one cannot explain temperature of a gas in terms of individual gas molecules, since it is a property only of a collection of gas molecules and has no meaning for a single molecule. Yet the temperature of a gas rests on two aspects of the individual molecule, ignoring all its other aspects, namely its relative independence of the other molecules except when it collides with another, and its elasticity when it bounces off another.

     Temperature is nothing more than an average of the motion of these molecules (combined with their mass), but it is only definable under the conditions that the gas has been allowed to come to equilibrium with no sources of energy being added or taken away from it. Any other molecules or other particles that share those characteristics of gas molecules, i.e., relative independence and elasticity, can give rise to a temperature, and this temperature is completely independent of the detailed construction of the molecules. Thus oxygen, nitrogen, sulphur dioxide, etc., all can have the same temperature even though they differ in their detailed structure. Furthermore this is a 2-way street. The properties of the lower level also depend to some extent on the properties at the higher level. For example, at high enough temperatures the molecules will break apart.

     Wilson even grants this emergence of new properties at higher levels of organization that prevents prediction of them from knowledge of properties at the lower level (p. 91), but then he drops the idea and glosses over it in favor of defining societies in terms of the genetically programmed behaviors of the individuals. British ethologist Patrick Bateson points out that the only behavioral property of humans that nature has selected is the *plasticity* of behavior that comes from a brain with a large cortex (outer layer of nerve cells). (Bateson) This plasticity then allows humans to learn without limit, to actively select behaviors from an array of possible ones, and to change themselves and their environment in accordance with their needs. Plasticity then is an emergent property only on the level of the organism as a whole. It is relatively independent of the detailed genetic structure of the organism (i.e., as it varies from one person to another--except for occasional congenital or developmental defects), and the directions it takes are not directed by the genes.

     Societies (higher level) have properties that are relatively independent of, and only depend on a few aspects of, individuals (lower level), but many properties of individuals depend on aspects of the social organization in which we are born and develop. This is the dialectical view that explains so much more than the mechanical view of people as assembled from their genes and other parts.

**Consilience as unification**

     On the surface Wilson's call for unification of the various branches of science is unobjectionable. Indeed Marxists consider all branches of science as merely looking at different aspects of the same real world. The real world then automatically unifies them at their root. However, the unity in Wilson's program is that of master or mistress and slave, while unity in the Marxist view is more like that of partners. The title *Consilience* serves only to mask that crucial distinction, but between the covers the book is quite explicit about the underlying goal.

     On the surface Wilson's claim that genes influence behavior is likewise unobjectionable. The fact that, apart from certain occasional birth defects, all humans have arms and legs, and a brain with a large outer layer (cortex)--all products of genes under certain conditions of development--indeed underlies our ability to learn to do such things as drive cars, play basketball, and knit. This is a further example of the way properties at higher levels of organization rest on a few properties at lower levels. But that is not all that Wilson intends to say. His claim is that genes do not merely *enable* the development of a wide variety of complex behaviors but rather that they *compel*, or at least *push*, us to engage in *a particular selection* of them. In other words, he ignores both the emergence of new features of human relationships at the social level as well as the dependence of individual human behavior on social organization. His view is, among other fallacies, one-sided, in that to him everything flows in one direction--from genes to individuals to society.

     However, in *Consilience* Wilson couches this asserted genetic control in fuzzy phrases like "epigenetic rules" and "bias." His defining statement for these two central concepts is on page 163 of the paperback version (italics are our emphasis, except where stated):

I have argued that the *etiology* of culture wends its way tortuously from the *genes* through the brain and senses to learning and social behavior. What we *inherit* are neurobiological *traits* that *cause* us to see the world in a particular way and to learn *certain* behaviors *in preference to* other behaviors. The genetically inherited traits are not memes, not units of culture, but rather the *propensity* to invent and transmit certain kinds of these elements of memory *in preference to* others.

As early as 1972 Martin Seligman and other psychologists had defined the bias in development precisely. They called it "prepared learning." By this concept they meant that animals and humans are *innately* prepared to learn certain behaviors, while being counter-prepared against--that is, *predisposed* to avoid--others. The many documented examples of prepared learning form a subclass of *epigenetic rules* (Wilson's italics). As recognized in biology, *epigenetic rules comprise the full range of inherited regularities of development in anatomy, physiology, cognition, and behavior. They are the algorithms of growth and differentiation that create a fully functioning organism*.

That lays out the essence of his pseudoscience that we hope to demonstrate to be fallacious, both factually and logically. It is important to note that if it is not true that the complex behaviors attributed by Wilson to genes are biologically inherited, then his entire structure falls to the ground in a pile of dust. Biological inheritance is a cornerstone of Wilson's program, and without it nothing is left. Given such a central position, one would expect that substantial evidence is required to bolster the contention.

     Wilson generally asserts, without evidence, the existence of genes for whatever aspects of human behavior he chooses. But in *Consilience* there is some pretense of providing evidence for the existence of such genes. The predominant form of this evidence for a genetic basis of a particular human behavior is the *universality* of the behavior. Secondarily Wilson invokes, and misrepresents, the concept of *heritability*--a deception quite popular among biological determinists, from Arthur Jensen in the late 60s to Richard Herrnstein and Charles Murray in the 90s. First let's explore the evidence based on universality, and then that based on heritability.

**Are Wilson's examples really universal, and does the universality of a human behavior constitute evidence for a genetic basis?**

     Wilson's logic is that, if a behavior is present in everyone across time and across societies, then it follows that it must be genetic. There might be behaviors for which the statement that it *may* be genetic would not be an unreasonable beginning for a program of scientific investigation, but as a definitive statement of proven fact there are two problems with it. One is factual and the other logical. The factual error is that the aspects of behavior that he singles out are not universal, and the logical error is that, even if they were, there are alternative explanations for such universality.

     First the factual error. Wilson's most often repeated example of such a human behavior is the fear of snakes. He goes on at length about the various rituals involving snakes in a variety of societies. However, (it's almost embarrassing to have to state the obvious) not everyone is afraid of snakes. As anyone knows who grew up in an area with poisonous or constricting snakes, babies and young children raised in proximity to snakes *have to be taught* to watch out for them. Without this teaching they are not necessarily afraid.

     One sexist difference, at least in the U.S., is that many boys are encouraged, either through peer pressure or parental guidance, to enjoy collecting and playing with snakes, while many girls are encouraged by the same mechanisms to develop fear or disgust in their presence--giving rise to a game of torment of one by the other. Thus one of Wilson's devices is to use the Big Lie technique--relying on the common assumption that if a false claim runs so glaringly counter to one's experience, there must be something to it if an official, or apparently scientific, source says it's so. The basis for this assumption, of course, is that there are also propositions that run counter to people's experience that are, in fact, true. So common experience is not a reliable arbiter of truth. Indeed, it is this unreliability that makes necessary the systematic methods used to carry out true (as opposed to pseudo-) scientific investigation.

     As to the logical error, even if a particular behavior *were* universal, there are alternative explanations to its having a genetic basis. In fact, even if a trait is biological it is not necessarily the result of direct lines of genetic inheritance. There is a phenomenon, well known to biologists, undoubtedly including Wilson, called evolutionary convergence.

     Convergence is illustrated, for example, by the variety of relatively unrelated species that can fly. These include birds, insects, and bats. Since these species do not have a common flying evolutionary ancestor, the fact that they all fly cannot be the result of common genetic inheritance, but rather that similar environmental conditions sometimes allow the evolution of similarly adapted features. And this evolution can happen independently many times in various evolutionary branches. Furthermore, on rare occasions even sheer coincidence can play a role, since chance and causality are both aspects of nature.

     Similarly for human behaviors, such as fear of snakes. This fear (wherever it exists) can just as easily be explained as a response learned as a result of repeated experience with harmful snakes in one society after another. It is logically flawed to imply, as Wilson does, that the only possible (or even most likely) explanation for a widespread (or even universal) human behavior is that it is genetically inherited. But this implication constitutes the main thrust of his speculative assertions and faulty logic throughout the book.

     Wilson's second favorite example of a universal human behavior is incest avoidance, which he goes so far as to claim "provides the fullest test of the genetic fitness hypothesis to date" (p. 188). He draws on the discovery of a 19th century scientist, the so-called Westermarck effect, named after its discoverer. Westermarck noted that to the degree that children are raised in close proximity to another person, whether a sibling or a parent, they fail to develop any sexual attraction to that person.

     Not having checked Westermarck's data, we don't necessarily dispute the observation, but Wilson goes on to attribute this to an epigenetic rule, even though he admits that "There is no conclusive proof that the Westermarck effect originated from genetic evolution by natural selection." However, such admissions, while scattered liberally throughout the book, get buried in heaps of supposed evidence and certainly forgotten in the following pages.

     Among the pieces of evidence he invokes for a genetic basis is the presence of the Westermarck effect in many non-human primates. Implicit in this observation is the assumption that all aspects of non-human primate behavior are genetic and not cultural (i.e., handed down from one generation to another through teaching and learning). But in recent decades scientists called primatologists, who study monkeys and apes, are learning that they develop significant degrees of culture. (de Waal)

     Again the main problem with Wilson's use of incest avoidance as an example of a universal human behavior is that he is explaining a "fact" that is not true. There have been a number of societies in which incest in the form of brother-sister marriages is accepted and encouraged. These include the rulers of the Incas, of ancient Egypt just over 2,000 years ago, of Hawaii, ancient China, and several East African kingdoms. (Harris) If these examples of incest are exceptions to a general rule, the burden of explaining them is Wilson's. Instead, relying on the fact that they are not commonly known, he ignores them.

     But we don't have to travel far in time or geography to find cases of incest. In the U.S. they are occasionally reported in the media, and there are entire support groups for incest survivors. Indeed the very existence of widespread rules and laws against incest suggests that there is not an *innate* revulsion at sexual relationships with one's relatives. Rather the social practices that accompany these laws train many people from an early age to develop such feelings.

     An alternative explanation for incest avoidance in many human societies is the repeated discovery of the high rate of birth defects in babies produced by closer relatives in large societies. Another basis still is that there are social and/or economic reasons to marry and engage in sexual relationships outside the family in order, for example, to cement alliances. It is both factually and logically fallacious to claim that incest avoidance must be a genetically based behavior.

     By assuming that incest avoidance is a genetically based behavior, Wilson implicitly rejects out of hand repeated discovery of birth defects as an explanation for its "universality." His attitude is reminiscent of the 30-year-old book *Chariots of the Gods* by Erich von Daeniken, who claimed that the Mayan pyramids constituted proof that earth has been visited in the past by travelers from outer space. Von Daeniken's claim was based on his contention that the Mayans were incapable of building such impressive structures. Clearly this unquestioned assumption of incompetence is implicitly racist. A similar charge may be leveled at Wilson, despite Wilson's explicit denunciations of "racialist fascism (p. 37)" and "the eugenics and racism implicit in Social Darwinism (p. 200)."

**The heritability hoax in one not so easy lesson**

     In the guise of defending the interests of apparent underachievers, Wilson argues against the desirability of a "truly egalitarian" society. He does so by first equating, incorrectly, such a society with one in which "all children (would be) raised in nearly identical circumstances. (p. 153)" Then he adds, "*Heritability* in such a society would increase. Any socioeconomic class divisions that persisted would come to reflect heredity as never before (our emphasis)." He goes on to claim that his noble goal is to lower the heritability of "measurable personality traits" such as "IQ."

     The arguments of other pseudoscientists have also relied heavily on a false presentation of the concept of "heritability," authors such as Berkeley education professor Arthur Jensen, with his article in the late 1960s claiming to prove that black people are genetically less intelligent than white, and Richard Herrnstein, co-author of the book *The Bell Curve* in the 1990s also claiming to show genetic inferiority of certain ethnic groups. Now the concept of heritability is a statistical one that requires a significant effort at study to comprehend. Since few people have the time or inclination to engage in such an effort, it is beyond the comprehension of most, likely including at least non-biologists Jensen and Herrnstein.

     However, whether or not they actually understand heritability, in answer to their writings there has been a large literature by those who do understand it, exposing their misuse of this concept. (Beckwith, Levins, Hopper, Layzer) Yet despite this abundant literature, Wilson and the others, apparently relying on the fact that most of their readers will be baffled by it, persist in misusing it. Wilson, however, adds a new twist. To co-opt some of the opposition, he borrows from them and warns of some of the possible misunderstandings about the concept of heritability, even as he continues to rely on that misunderstanding to cloak his objectives.

     Many anti-racists who have tried to master the real concept of heritability find that no sooner do they think they comprehend it than this comprehension wriggles loose and wanders away. Much of the misimpression, shared by many readers, is conveyed by this very misleading word when it is applied to humans. To the vast majority of readers, the term, if nothing else, implies that a behavior is inherited if someone has measured what purports to be its heritability. So let's explore what it is and what it isn't, beginning our discussion by explaining how the concept arose, and then briefly describing its essence. Finally we will propose a new name for the concept that more accurately describes its essence when applied to humans.

**How the concept of heritability arose**

     Plant and animal breeders over centuries have always looked for ways to breed them in order to maximize the prevalence of some particular desired features, such as high milk yield in cows or tender kernels in corn. They wanted to take those cows with higher milk yield and selectively breed them, hoping to get calves in the next generation that would inherit the ability to produce more milk. But there was a problem to solve. Not all the high milk producers in the herd had this ability on the basis of genetics. Some cows yielded more milk on a random basis due to unknown factors outside the control of the breeders, such as perhaps a hypothetical tendency only to eat the lower grass in which the nutrients were different than in the higher grasses, or to other factors like age, how many calves they had given birth to, etc. Such factors are not genetic and are therefore not inherited.

     The breeders were not always successful in getting high milk-yielding calves if they only bred the higher milk producers, because some of them were high milk producers for nongenetic reasons. So instead of trying to identify all of these nongenetic factors and control for them--by having the cows graze only in high grass, for example--the breeders placed the cows in an array of environments (nutrition, milking schedules, calving schedules, etc.) and looked for that group of environments that maximized the difference in yield between the highest producers and the lowest.

     Some environments, they found, almost equalized the yield among all the cows, but others spread them out better from high to low yield. By then raising the cows in one or more of the environments that produced the better spread in yields, they hoped to drown out that part of the difference in yield due to the nongenetic factors. In such a situation it was more likely that the high producers mainly did so for genetic reasons. Then when these high producers were selectively bred, the calves would be more likely to also be high producers, like their mothers.

     The range of environments that best spread out the yields from high to low was said to be the range that maximized the *heritability* of high milk production. In that context one can see the logic of using such a word. Of course, for certain other traits that were not genetic, such as frequency of pregnancy, the breeders would find that no environment that they tried would improve the spread in the trait among the herd, and so they would be forced to give up breeding for such a trait.

**The mathematical meaning of heritability**

     Because of the usefulness of the concept of heritability to plant and animal breeders, mathematical methods were developed to describe it. For example, if we wanted to measure the heritability of the height of a type of plant, we might set up samples from 12 different varieties of the plant, each in 10 different conditions of temperature and humidity (environments), for a total of 12 x 10 = 120 different plants, and then measure the height of each of the 120 plants. It's easiest to imagine 10 greenhouses, each with cuttings from the same 12 varieties, and arrange the array of 120 plantsinto one column for each greenhouse and one row for each variety.

     Mathematical manipulation of these 120 different heights would allow us to calculate the average height. We could also calculate the degree to which the individual heights differ from that average, a quantity that is usually expressed as something called either the standard deviation, or the square of that quantity, called the variance. For example, if every plant were exactly 7 inches high, then the average height would be 7 inches and the variance would be 0, since none of them would differ from the average at all. On the other hand, if some of them were 3 inches, some 4 inches, some 5 inches, and so on all the way up to some that that were 20 inches, then the variance would be significant, since they weren't all exactly the average 7 inches high. Suppose for the sake of argument the variance comes out to be 9 square inches.

     Now the total variance measured for this particular running of the experiment can be broken down into several parts statistically, and those parts would add up to 9. In particular one of the parts would be what you would get by calculating the variance for each of the different greenhouses (with their different temperature/humidity combinations--environments) and then averaging these 10 numbers. In any one of the 10 greenhouses, whatever variance (departures from the average height in that environment) there was would be due to the fact that the 12 plants were from 12 different varieties and hence had slightly different genetic make-up. Averaging these 10 variances gives a portion of the total variance that is called the part due to genetic differences.

     A second part of the total variance is derived from doing the opposite of what we did to calculate the first, namely calculating the 12 different variances for each of the different varieties and then averaging these 12 numbers. For any one of the 12 varieties, whatever variance there was in height would be due to the fact that the variety found itself in 10 different greenhouses (environments). Averaging these 12 variances gives a portion of the total variance that is called the part due to environmental differences.

     In general there would also be a couple of other portions of the total variance derived from any interaction between gene expression and environment as well as from any measurement error. An interaction between gene expression and environment would be manifested by, for example, variety F being the tallest plant in one greenhouse, variety B the tallest in another, and so on, whereas the absence of an interaction would be manifested by the same variety, say variety D, always being the tallest in every greenhouse, though the heights of all the varieties might be greater in some greenhouses and smaller in others. To simplify the concept of total variance, however, we'll ignore both interaction and measurement error and assume that they are zero. Then the portions due to genetic differences and due to environmental differences would add to 9, the total variance.

     So now we have the total variance in the heights of the 120 plants broken up into two portions, one due to genetic differences and one due to environmental differences. Say that the first comes out to be 2 and the second comes out to be 7, and together they add to 9. **The definition of *heritability* i*s that fraction of the total variance represented by the portion due to genetic differences***, namely 2 out of 9, or approximately 22%. The other 78% represents the portion due to environmental differences, but this is only true when the interaction portion and any random errors are zero. Otherwise the genetic and environmental portions would not add up to the total variance, without also adding in the interaction and random error portions.

     Finally it should be noted that the concept of heritability is *completely unrelated* to the average height of the plants. For example, the value of heritability would be identical to what we have already calculated in our examples above if every plant were half as large or if every plant were 10 feet taller. So claims that heritability tells us anything about the magnitude of any feature, let alone about what causes the feature to be so large or so small, are completely false and generally designed to confuse the inexperienced reader/listener.

**The mathematical quantity heritability only has meaning in controlled experiments that can be done with plants or animals, but are impossible to carry out with humans**

     Before we go on, it is also critical to point out that the above calculation of heritability was made possible only by virtue of having the entire array of 12 varieties in each of the 10 greenhouses. If there were one or more variety missing in any of the greenhouses, i.e., if one or more of the 120 combinations was absent, a calculation of each of the two variance portions and of the total variance could still be done by following the mathematical procedure, but the resulting two portions would not necessarily add up to the total variance.

     In other words, this is a *controlled* experiment in which we can guarantee that every environment is completely populated by the entire set of varieties, and conversely that every variety has available to it the entire set of greenhouse environments. Then, and only then, is there a meaning to the results of the mathematical manipulation. Though the math could always be done, the results would not necessarily correspond to anything real. One deception practiced by the Jensens, Herrnsteins, and Wilsons is to let the mathematical manipulation itself convince the reader that the results have meaning, and that the results correspond to what they claim they do. They gloss over the fact that the math can always be done, but that this fact alone doesn't imply that it has been done correctly or with any meaning, or, in particular, with the stated meaning.

     Another deception is that no such controlled experiment, with all the environments populated by all the varieties, can be performed on humans without first identifying 12 sets of identical 10-tuplets and putting them in a series of 10 cages, or the equivalent. With humans, instead of controlled experiments we have to be content with observations in whatever environments we find them in and with whatever amount of genetic variation there is available. The use of identical twins, if not 10-tuplets, is one method of at least controlling the genetics. But there is still no way to control the environments. So the observers are always forced to ignore significant departures from the assumed conditions, and they generally hide these departures from the unwary readers.

     In particular, in the real-life situations in which observations on humans are performed, rather than all varieties having access to all environments, there is generally a *correlation* between the genetic and environmental aspects that is uncontrollable and may even be unknown. For example, one common assumption by authors of various twin studies is that identical twins raised apart are raised in completely different, and random, environments, and that both fraternal twins and identical twins raised together have the same similarity of environments. However, these assumptions have been shown to be false. (Beckwith, Goldberger) But the Jensens, Herrnsteins, and Wilsons generally ignore that fact, and by pretending that there is no correlation between the environments of twins, they generate results that are even more misleading.

**Heritability is different in different experiments and is not generalizable from one experiment to another**

     A third deception popular among the pseudoscientists is to take the results from one observation done under one set of conditions with one set of individuals and generalize it to other situations. For example, for the discovery in our greenhouse experiment above, what Jensen and Herrnstein have done is the equivalent of declaring simply that the heritability of height among these varieties of plants is 22%, ignoring the particular set of greenhouse environments from which that figure was derived. Wilson, on the other hand, has learned to be less definite and does the equivalent of saying that experiments have shown a moderate heritability for height. Nonetheless, by generalizing out of context, they would all be lying.

     To see why we say that they would be lying, and to see that one cannot generalize about the heritability of height among these varieties of plant, let's just consider what the calculated heritability would be if we used only 5 of the 10 greenhouses. The total variance would in general be different from 9 and would depend on which 5 greenhouses we chose. In fact, the total variance could be either smaller or larger than 9. Suppose it were larger, say 20 instead of 9.

     On the other hand, the portion of the total variance due to genetic differences would be unchanged--still assuming that the portions due to random measurement errors and to interaction between gene expression and environment are zero. To see why, we have to say a little more about what it means to say that there is no interaction between gene expression and environment. This assumption means that the *variance* is the same in each greenhouse, namely 2, so that the average variance would also be 2, and whatever choice of greenhouses we made it would still be 2. This does not, we hasten to add, mean that the average *height* is the same in each greenhouse, only that the *variance* of the height is the same in each greenhouse. In the first greenhouse the plants could average 3 inches, in the second 4 inches, etc., but the departures from the average within each greenhouse would still be the same from one greenhouse to the next.

     With the total variance now 20 and the portion due to genetic differences still 2, the new heritability would be 2 out of 20, or 10%, instead of the previous 22%. So it is completely false to claim that the heritability for height of these varieties, regardless of the particular experiment from which that figure was derived, is 22%. Furthermore the value of heritability of a given feature is every bit as much dependent on the range of environments used in the experiment as on the strength of the feature's genetic basis. So heritability acts as an index of environmental range.

     Heritability therefore is not generalizable to any other experiment, except by coincidence. And the calculated figure is even more particular to the experiment when we drop the assumption that interaction and random error are zero.But this nongeneralizability is hidden by the Jensens, Herrnsteins, and Wilsons.

     For example, Jensen claimed that since the heritability of IQ scores was 80% (a falsehood) there was little that could be done to improve IQ scores of black students, which were lower than those of white students. (The difference in IQ scores is a property of the cultural bias of the test, and not of any difference in capabilities between black and white students.) But aside from the false premises, in order to understand Jensen's reasoning (fallacious as that was, too) it is useful again to consider the plant experiment.

     If the heritability of plant height had, in our hypothetical experiment, turned out to be 80%, then only 20% of the variance would have been associated with the 10 different greenhouses. So Jensen is saying, in effect, that the plants could only be at most 20% taller. But it isn't 80% of the *height* that is associated with the genes of the different varieties. Rather it is 80% of the *departures* from the *average* height (i.e., the variance)in each greenhouse that is associated with the genes of the different varieties. As we pointed out above, the heritability would still be the same even if all the plants were 10 feet taller, and, on the other hand, the heritability would be different if we only chose a few of the greenhouses for the experiment. So not only could the *heights* be increased by more than 20%, indeed without any apparent limit given the right environment, but even the *variance* of the heights could be increased by more than 20%, simply by choosing a different set of greenhouses.

     The average height is completely independent of, and different from, the *departures* (variance) from that average. Therefore 80% heritability of IQ scores, even if it were true of some particular experiment, would put absolutely no limit on how high IQ scores of black and white students could be raised, given the appropriate social and teaching environment. So no matter how you look at it, there isn't a shred of validity in Jensen's (claimed) fixedness of the (claimed) genetic (claimed) inferiority of black versus white IQ scores.

     Herrnstein makes similar false claims for heritability in *The Bell Curve*, but Wilson, with benefit of almost 30 years' experience, is much cagier. He grants that the heritability of measurable personality traits is changeable, but, as we mentioned at the beginning of this section, he turns even the changeability to his, and to the ruling class's, advantage. He uses it to argue against a truly egalitarian society, on the grounds that such a society would have the *undesirable* effect of increasing the heritability of measurable personality traits. But what is undesirable about such an outcome? Only by pretending that heritability is a measure of the hold that our genes have on our personalities does this become undesirable--and we have already seen that heritability is not a measure of cause.

     And again, it is beside the point whether or not they understand why. Their transgression lies in ignoring the literature by those who do understand heritability and who prove that it is not generalizable. (Beckwith, Levins, Hopper, Layzer)

**Heritability is without definition unless the trait is quantifiable**

     Still a fourth deception lies in the fact that heritability is only definable for features that are quantifiable, like height of a plant or number of gallons of milk per day. When the pseudoscientists are faced with a personality characteristic that is purely qualitative, such as intelligence, they simply make up a quantity and arbitrarily assign it to that characteristic. In the case of intelligence, they invented the concept of intelligence quotient, or IQ, but IQ has no more meaning with respect to the multi-faceted quality of intelligence than would a measurement of the length of a freight train obtained by adding the length of the first car in inches, the second car in feet, the third car in yards, and so on. You would always get a number, but it would correspond to nothing in the real world, and more importantly no one who didn't possess your code for units of measurement would be able to reproduce your result. When a result requires a secret code, it is not reproducible, and a result that is not reproducible by others is not objective or scientific. It does not describe the real world outside your own head. So the quantification of characteristics in order to derive a figure for their supposed heritability is another part of the deception commonly practiced by the pseudoscientists.

     Finally, in order to avoid the misleading implications inherent in the term "heritability," we suggest calling the concept the nongeneralizable pseudoquantitative environmental range index, or NPERI (pronounce it "enperry" if you like) for short. One immediate advantage of using such a complicated and long name is that, with the term "heritability," it would be hard to derive *any* impression from the name alone, let alone an inaccurate one. Yet the words are carefully chosen to more accurately represent the concept.

**Epigenetic rules and bias replace genes and determination**

     While *Sociobiology* postulated a version of a direct one-gene/one-behavior linkage, *Consilience*, with its formulation of "epigenetic rules" and "bias," appears more sophisticated and seems to be a weak concession to the strenuous opposition that Wilson encountered. Indeed *Consilience* is full of apparent inexpensive verbal concessions such as "may be," "tenuous," "reasonable to conclude," and "suppose." But as soon as Wilson makes such a concession, he follows it with language implying it is proven fact. Thus the reader can easily forget the holes in the foundation. However, in trying to fool the reader with these verbal tricks, Wilson also does us the favor of admitting that he is engaging in mere speculation.

     Let's explore the concepts of *epigenetic rules* and *bias*. Epigenetic rules, according to Wilson, are the "algorithms of growth and differentiation that create a fully functioning organism." (p. 163) This is not a new idea with *Consilience*, but rather simply gives a name to something that was implicit in *Sociobiology*. Inherent in the concept that genes control and determine any trait at all is the existence of some link between the genes and the development of the trait. "Epigenetic rules" are nothing more nor less than a name given to that link. Rather than weakening the link between genes and complex behaviors, giving this link the name "epigenetic rules" only serves to further consolidate it.

     Bias, according to Wilson, is "the genetically inherited... propensity to invent and transmit certain kinds of these elements of memory in preference to others. (p. 163)" Again, the notion of the genetic inheritance of a *propensity* for one behavior in preference to others seems on the surface to be a weaker formulation than a statement that these behaviors are downright forced on us. But let's explore the concept of a propensity, and in particular see how it differs from a capability.

     Both a propensity and a capability for a particular behavior exist before the behavior appears. But a capability, unlike a propensity, does not favor one development over another. In other words, just because we are capable of learning to be competitive in certain situations does not mean that we are incapable of learning to be cooperative in those same situations. Whereas a propensity for competition would tend to override cooperation.

     Consider, for example, the absurdity of claiming that humans have an *innate* propensity (as opposed to capability) for using a computer. This tendency would have had to lie dormant for a couple of million years, until computers were invented. Indeed even a tendency to read would have had to await the development of writing, and to speak would have had to await the development of language. And what experience could our 2-million-year-old ancestors have had on the savanna (grassland on which the oldest human skeletal remains are found in Africa) that would have allowed nature to select, say, a propensity to play computer games? And on what basis would one separate those complex cultural behaviors that have propensities from those that only have capabilities?

     Furthermore the concept of a pre-existing propensity to speak or read implies that even if the child were never around other humans and taught by them to speak or read, nevertheless the child would still possess the propensity for these behaviors. And how would one go about proving that these propensities either exist or don't exist? Indeed how would one go about proving that there was a pre-existing propensity to speak and read even in children who do learn to do these things? There is currently no criterion by which one could judge either way, in either case.

     Nor is Wilson offering such a criterion, though it is conceivable that some day such criteria could be developed to probe the human brain--through such methods as microscopic neurosurgery, functional imaging such as the developing areas of positron emission tomography (PET scanning) or functional magnetic resonance imaging (MRI), gene function analysis, or some other as yet to be discovered/invented methods. Then it might be possible to determine whether particular hypothesized propensities do or do not have their basis in human neuroanatomy and neurophysiology. But until such methods are developed, statements concerning the existence of human propensities for activities that are learned are necessarily purely speculative.

     Since Wilson, having been trained in the ways of science, almost certainly knows this, why does he present mere speculation about the existence of innate tendencies or propensities as though it were proven fact? Well, one problem for Wilson and the ruling class is that not all people engage in war or rape or any of the other traits that Wilson claims are genetic. Indeed only a very small proportion of the world's population does. In modern warfare, for example, only about 5% of the U.S. population actually fought in World War II. Furthermore, according to a study ordered by the U.S. Army right after World War II, approximately 1/3 of U.S. soldiers hugged the ground without ever firing their weapons, with another 1/3 or so simply shooting into the air without looking, leaving only 1/3 of U.S. soldiers, or less than 2% of the population, actually firing their weapons directly at the soldiers of the opposing army. (Stouffer) And this despite the fact that these soldiers were trained to kill and were under threat of the stockade, dishonorable discharge, or some other punishment if they openly refused to do so.

     And certainly rape is committed by a very small percentage of the population--men or women. So what do we invoke to explain the behaviors of the vast majority of the population, different alleles (the various forms taken by a particular gene, such as brown versus blue for the gene for eye color) such as an anti-war allele? An anti-rape allele? A home-front-war-effort-assistance allele? A theory--in this case the genetics of human behavior--that adds an ad hoc hypothesis every time a new challenge arises, explains nothing.

     Given the rarity of these actual behaviors, it isn't enough to satisfy the ruling class's needs for Wilson to claim that only a few people have the alleles for war, rape, etc. That would leave open the possibility of eliminating that part of the population through eugenics, to the betterment of the rest of humanity. And while that has been tried, both in the U.S. in the early part of the 20th century and by the Nazis in the mid-20th century, the current U.S. ruling class might like to avoid bringing back such methods, if possible.

     So Wilson's claim, in order to fulfill for the ruling class the role of disarming the working class, must be that these carefully selected behavioral alleles characterize the vast majority of the population, if not everyone. And since only a small proportion of the population actually engage in the behaviors, then, in order to preserve his generalization to the whole of society, Wilson has to postulate the innateness, if not of the behavior itself, then of a propensity or tendency toward the behavior in all humans.

     A second, and potentially more devastating, problem for Wilson's argument is that behaviors characterized by racism or sexism or crime tend to ebb and flow among the population over time, but the genetic composition of the population doesn't change back and forth that rapidly. Indeed this pace of changing social behaviors under varying social conditions constitutes such a challenge to the proposition that these behaviors or propensities are genetically determined that Wilson's only recourse is to ignore it completely and to hope that his potential followers will ignore it as well.

     And finally, a third problem is that the meaning of any particular behavior depends entirely on social context. For example, killing of one human being by another may be murder, but in other settings it may be, for example, execution, euthanasia, combat, self defense, etc. Furthermore, as societies have evolved over the millennia, entirely different meanings may have come and gone. So even if nature could select genes for killing other humans, it could not, apart from social context, select genes for meanings of that killing that are peculiar to specific social contexts.

     So despite the apparent weakening over the past couple of decades of his original formulation in *Sociobiology* to his more recent formulation in *Consilience--*i.e., from innate behavior to innate tendency, from genes to epigenetic rules, and from determined to biased--it is still Wilson's contention that genes, and not class-divided social organization, are the source of war, rape, racism, sexism, crime, etc. Oddly enough you won't find talk of a gene for exploitation or union busting or laying off workers in Wilson's writings. Apparently only the behavior of the working class is explained by genes.

     Assertion, speculation, and plausibility all pose as established fact in *Consilience*. Many anti-Wilsonian authors have pointed out that he is simply making up *Just So Stories*, named after a group of children's tales written 100 years ago by Rudyard Kipling, a British writer. In them Kipling explains such things as how the elephant got its trunk. According to the story, elephants used to have small noses, until a baby elephant's nose was grabbed one day by a crocodile, who pulled until the nose became long, and from that time on all elephants have had long trunks. Of course, Kipling meant these plausible-sounding stories to be taken as fiction, while Wilson means them to be taken as fact. Indeed this is a common approach of sociobiologists, evolutionary psychologists, and biological determinists in general.

**The adaptationist fallacy**

     Another cornerstone of Wilson's argument is that these complex behaviors, in order to have been selected by nature, must have carried some survival and/or reproductive advantage for those who behaved accordingly. In other words, those with these behaviors would have then been able to have more offspring so that in the next generation the behavior would become more common, and so on through scores of generations, until the behavior became the rule rather than the exception.

     One of the more ludicrous *Just So Stories* in *Consilience* is Wilson's explanation of how the loss of bowel and bladder control in response to extreme fear has survival advantage. While this may have been selected by nature in some animals, even in human ancestors, Wilson explains, with no sense of irony or humor, that the survival advantage for humans lies in "disencumbering the body to prepare for violent action and possible injury (p. 124)." Has he ever tried to fight or run while slipping on his own urine and feces? One might be disencumbered by dropping a load of bricks, but a load of ...? So even for a behavior that may, in other animals, have survival advantage, Wilson, in his zeal to find explanations for complex human behaviors, is a sociobiological "strict constructionist." This only exposes the degree of his unwillingness to examine his own hypotheses even for plausibility, let alone for provability.

     Such an actual physiological response is either no longer adaptive in the ancestors of those animals in which it may have been selected or an incidental feature that accompanied something else that nature selected in humans. (Gould and Lewontin) It is difficult to do anything more than speculate about a process that may have occurred millions of years ago. But thinly disguised speculation posing as science is Wilson's main stock in trade. Not that speculation has no role in science, but only insofar as it suggests experiments or observations to test the speculation. Without such proposed experiments or observations, speculation has no part in science. As such it can play no role in the consilience of biology with the social sciences and humanities.

**Are genes blueprints, or are they more like road maps?**

     Now let's explore what roles genes actually do play. First let's talk about DNA (deoxyribonucleic acid), which is the molecular material that carries the patterns inherited from one's parents, the so-called genetic material. DNA is like beads on a string, with about 3 billion beads (actually bases) in each cell nucleus in our bodies. Every cell has a nucleus except for our red blood cells, which shed their nuclei along with the DNA soon after they are born--at least in humans, though not in all animals.

     Among these 3 billion beads are much smaller groups of beads known as genes, each of which is actually used by the cell to produce another complementary string of beads (known as RNA) that in turn leaves the nucleus and is used to produce a third string of beads, this time amino acids rather than bases. Many of these amino acid strings (called polypeptides) become proteins, and different proteins serve a whole host of functions, including enzymes (catalysts that speed up other chemical reactions in the cells), structural components for the body, carriers of oxygen and other chemicals through the blood stream, and many, many other functions.

     About 99% of the bases in our DNA play no role at all in the individual organism, with only 1% or so constituting genes. But a gene is not merely a group of bases, it is also the *pattern* of bases--the order in which they are arranged along the DNA. To act as a gene, this order of bases is just as important as the order of the letters on this page. Furthermore each gene's pattern is represented billions of times over, once in every cell nucleus in our body. Furthermore, in general genes are not all in one piece but are spread out into separate pieces. Each cell nucleus in our body has a copy of the same pattern of DNA, which is split up into 46 packets known as chromosomes--except in our sperm or ova, in which there are only 23 chromosomes, ready to contribute half of the DNA in each of our prospective children. So half (23) of these 46 DNA patterns come from our mothers and the other 23 from our fathers.

     Finally each protein may be produced by a number of different gene segments in the cell nucleus, and conversely some portions of a gene may also play a role as part of still another gene. Indeed if this were not the case, the mere 30,000 or so different genes that each of us possesses in each of our cell nuclei would never be able to support the tremendous complexity of our bodies' structure and function. To support this complexity many more than 30,000 different gene patterns are required.

     Many biological determinists use the metaphor of DNA as a "blueprint" for building our bodies and our behaviors. However, while all metaphors have their limitations, this particular metaphor is a very bad one, as it carries with it a number of features that are not true about genes. For example, a blueprint is a plan, designed by a mind with an intention, that has a finished structure specified in it. The features that the concept of "blueprint" does have in common with genes is first that the final structure is separate from the blueprint and second that the blueprint is nothing without someone reading it and acting on it. In other words, genes, like blueprints are *passive* and depend on outside entities to act in accordance with the pattern that they contain.

     Unlike blueprints, however, genes do not prescribe what must be done nor do they prescribe a definite structure. In fact, a better metaphor for the patterns embodied in genes--remembering that this metaphor, like all metaphors, also has its limitations--is a street map of Boston, or a road atlas of the U.S. The traveler is free to start anywhere and to go anywhere that she or he wants. The map does not even suggest a starting point or destination. In addition, once the traveler has chosen a starting point and destination, the map doesn't even prescribe a route. Rather the traveler decides what route to take. In other words, the map, like a gene, is completely passive.

     To continue with what a map and genes have in common, most of the map is useless for any particular trip, and may remain useless for that traveler forever. Another traveler, however, may use portions of the map that the first did not, with the part that the first traveler used becoming useless to the second.

     And finally, once the traveler decides on a starting point, a destination, and a route, and follows the map, she or he may come up against construction that blocks progress along that route, requiring going back to the map and finding an alternative route. In other words, chance plays a role having nothing to do with the map. All these features of a map are shared with genes.

     Therefore to say that the map determines where a traveler starts, where she or he ends up, and what route she or he follows is clearly false. Yet that is the equivalent of what is said about genes by biological determinists, including Wilson. We see, therefore, either stunning ignorance or stark dishonesty on Wilson's part (we leave it to him to decide, since like a map this statement only offers choices.)

**What do genes really do? Are they active or passive?**

     Leaving metaphors aside, let's explore some of the claims made by biological determinists for the way genes determine traits. First of all to answer the question posed in the topic heading, genes don't *do* anything. They are completely passive. The organism, on the other hand, is active, and it acts in a particular set of environmental conditions with a particular set of genes at its disposal. Even when something occurs outside the voluntary control of the organism, the genes are the passive victims of their cellular surroundings and respond when "turned on" and go back to sleep when "turned off." Turning genes on and off is accomplished by a process of unwrapping and rewrapping that portion of the DNA in the nucleus of a particular cell or cells. When a gene is in use, it is said to be "expressing" itself--another word that implies an active, rather than passive, process. It's hard to get away from such words.

     For example, a recent study to investigate the cause of increased skin wrinkling in smokers found that their skin has higher levels of expression of the gene that produces a protein called MMP-1, which breaks down collagen, a protein that gives skin its firmness and consistency. The implication is that smoking "turns on" the gene and hastens skin "aging." In non-smokers the gene just sits around with a low level of expression, waiting to be put to use. But the train of events that ends with the MMP-1 involves many biological molecules other than the genes, such as RNA and ribosomes, the presence of all of which is essential to the process. No one of these controls the process any more than any other, yet each of them controls it to the extent that they have a veto, i.e., in their absence the process would stall. They operate somewhat like a jury in a criminal trial, in which no one by her/himself can bring about a guilty verdict, but the failure of any one member to vote for a guilty verdict can prevent it.

     Contrary to this view of the organism as active and the genes as passive, various biological determinists like Richard Dawkins, in his book *The Selfish Gene*, claims that the organism is the slave to the gene and its passive existence is only the gene's method of reproducing itself in the next generation. Wilson's claim is somewhat weaker, using the metaphor that the genes keep the organism on a short leash, i.e., limit its possibilities. While the existence of certain limitations is true in the trivial sense that people cannot fly by jumping off a building and flapping our wings, it is false in the sense that we have invented, developed, built, and flown airplanes and rockets. Again, genes act like a road map, and finding one route to be blocked, humans have found another route to their destination, flying.

     If genes determined structure and function by themselves then how could we explain the fact that, despite containing copies of the same DNA pattern, there are hundreds of different types of cells in the body, from nerve cells to muscle cells to bone cells to liver cells to kidney cells, etc.? If genes determined structure and function by themselves then how could we explain the fact that when the genes associated with the formation of a simple eye are transplanted into an insect they will lead to the formation of a compound eye? Or that the genes for human growth hormone when transplanted into a mouse cause increased size, but when transplanted into a hog embryo cause no change in size but less fat formation? (Hubbard, Rose)

     This concept of Wilson's, and other biological determinists, that the genes inhabit our bodies and actively direct our actions, independent of our will, is pure science fiction. It tells much the same story as other well-known works of sci-fi, such as *Invasion of the Body Snatchers, The Puppet Masters,* and *The Stepford Wives*. Furthermore it draws its illusory appearance of naturalness from its similarity to the hierarchical social relationships within capitalism: The boss directs workers; mental labor directs manual labor. In a communist world of social equality and cooperation, it will likely appear more natural that--paralleling the future relationships among human beings--DNA/genes are part of a cooperative venture and participate without dominating, along with other aspects of our biological makeup and with our culture, in the development of the individual.

**Conclusion**

     Hardly a week goes by without journals like *Science* and *Nature* carrying one or more articles either purporting to find, or simply taking for granted the existence of, yet another gene for some complex behavior, such as murder or math ability--along with an occasional article in which an author retracts an earlier claim for such a discovery, thereby adding, out of the same fiction, a second publication to their list. To ensure that those who don't read the journals are still infused with this biological determinism, every Monday the Science page of the *Washington Post*, for example, carries an uncritical summary of four or five of that week's journal articles.

     The overall effect ultimately is a chilling fear among many scientists of being blacklisted, resulting in rigidification of analysis in the universities and misinformation and discouragement among the lay public. Far from being a scientific advance, this is one of the faces of fascism (the most brutal forms of capitalist rule).

     With reference to those professors courageous enough to speak out and write to expose Wilson's pseudoscience, we agree that this is an important component of the struggle against it; otherwise, we wouldn't waste our time with this essay. But it is only a component. A mass activist movement is necessary to defeat these fascist ideas, though scientific exposure plays a major role in enabling such a movement to grow. Unfortunately the courage of Wilson's academic opponents often ends when they are faced with a mass demonstration against Wilson and his ilk, replaced by the fear that they will be associated with tactics not permitted by capitalist academic rules.

     But unless they link their efforts to a mass activist movement to defeat fascist ideas, these professors run the risk of becoming part of the problem. As long as they denounce mass activists, instead of lending public support, they are used by the ruling class as both evidence that academic terrorism is a figment of the imagination and as evidence that there is a powerful Marxist conspiracy to drown out the truth. The myth of the powerful Marxist conspiracy reverses the actual power relationships in capitalism, but the notable ability of the ruling class and their spokespersons to succeed with such doublespeak is a reflection of just where the power does lie--for the time being.

     It is manifestly apparent that merely exposing the factual and logical fallacies in *Sociobiology*, as important as that is, cannot defeat it--as the publication of *Consilience* almost a quarter century later demonstrates. And the capitalists will continue to do CPR (cardiopulmonary resuscitation) on these ideas because it is a life-and-death matter for their class that the working class remain convinced that capitalism, like a diamond, is forever. Defeat of this pseudoscience, therefore, can only be accomplished by defeat of the capitalist ruling class itself. Anything short of that, that leaves power in their hands, may afford careers to some among the opposition, but it will never terminate the endless Dracula-like reemergence of *Sociobiology* in newer, thinly disguised forms.

     Using the dialectical view, Marx and Engels were the first to look for and find the broad outlines of the history through which human societies have developed. The explanations of the progression from early hunter/gatherer to agricultural and herding societies to tribes to states, from slavery to feudalism to capitalism and, soon, to communism relied not on any particular feature of the different individuals who made up this series of social organizations, but rather in terms of the events that occurred within the societies as they struggled with nature to provide for their needs. Again, properties emerge at higher levels of organization (society) that don't exist at the lower levels (individual people), and these properties depend on only a few aspects of those at the lower level. This is as true in social science and in biology as it is in physics, and indeed in every arena of study.

     One of Marx's great insights was that people make their own history, but cannot do it in just any old way. Rather we have to use whatever social organization and tools we have at hand. Out of these we can make new ones, both social organizations and tools. And in so doing we change ourselves and nature along with our societies. Wilson's concept that epigenetic rules are the determinants of culture completely ignores the history through which societies have evolved, and the conditions in which they evolved. As such it ignores and sweeps into a dustbin all the interesting and meaningful questions for the working class. For the working class the most meaningful question of all today is, How do we rid ourselves of capitalism and establish a social order in which all humans can collectively provide for our needs? To accomplish that task, one necessary step is to expose and fight all forms of biological determinism, since biological determinism would deny that this is possible at all.

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