Genetics and Equality

Equality of opportunity makes the genetic diversity among men meaningful.

Theodosius Dobzhansky

All men may have been created equal; most certainly they are not all alike. The idea of equality derives from ethics; similarity and dissimilarity are observable facts. Human equality is not predicated on biological identity, not even on identity of ability. People need not be identical twins to be equal before the law, or to be entitled to an equality of opportunity.

And yet, equality is often confused with identity, and diversity with inequality. They are confused so chronically, persistently, and obstinately that one cannot help suspecting that people have deep-seated wishes to confuse them. The source of these wishes is not hard to find. The glaring inequalities of the rich and the poor, the powerful and the weak, the masters and the slaves, are difficult to reconcile with the idea of universal brotherhood of men to which many people pay lip service. The escape from this paradox is made by blaming Nature, or the Creator, for having made some of us able and others inept, some clever and others stupid, some hard working and others lazy. The favorite argument of conservatives has always been that social and economic status merely reflects intrinsic ability.

If, on the contrary, you maintain that people should be equal, then it is convenient to argue that the differences between them are accidental and trivial. A temptingly plausible notion is that the infant at birth is a blank page which is filled in later by environment, education, and good or bad luck. Liberals are by predilection environmentalists. Oddly enough, some liberals come close to agreeing with diehard conservatives, that if it were shown that people are genetically diverse then attempts to ameliorate their lot by social, economic, and educational improvements would be futile, and perhaps even "contrary to nature."

What Is Inheritance of Behavior?

The trouble with these views is that they oversimplify the actual situation, and oversimplification here amounts to falsification. Indeed, people are genetically, biologically, unlike. Excepting identical twins, no two persons living have the same genotype; every human is genetically probably unique and nonrecurrent. What we inherit is, however, not fixed qualities, but potentialities. Everyone's potentialities are determined by his genotype, but the realization of these potentialities depends on the succession of the environments which he meets in life. Human behavior, and all other qualities without exception, can, in principle, be influenced and modified both by genes and by environment.

To say that health, or intelligence, or musical ability are inherited does not mean that those who inherit them will be healthy even in unhealthy environments, intelligent without opportunity to develop intelligence, or will necessarily be musicians. Some environments are more and others less propitious for human development and self-realization. The crux of the matter is that an environment optimal for one genotype may be mediocre for another and adverse for the third. If our aim is to provide for everyone conditions for the fullest possible realization of his socially valuable potentialities, then it is not good enough to have an educational system, or a health service, tailored for the so-called average man.

This aim is displeasing both to conservatives and to some liberals. The former are likely to argue that the endowments of most people are puny and not worth bothering with. The latter feel that treating individuals differently somehow contravenes the principle of human equality. And yet modern, complex, technologically advanced societies require the fullest development of the useful potentialities of all their members, not alone of an exceptionally well-endowed minority. Equalitarianism, carried to the extreme of providing optimal conditions for the development of only those of mediocre ability, would amount to a denial of the very equality of opportunity which the equalitarians are seeking. Is it fair to deny conditions for optimal development to those whose abilities are higher or lower than average?

Let us make two assumptions, one a generalization of biologically ascertainable facts, the other a frank value judgment. People vary in ability, energy, health, character, and other socially important traits, and there is good, though not absolutely conclusive, evidence that the variance of all these traits is in part genetically conditioned. Conditioned, mind you, not fixed or predestined. Heredity determines these traits only in the sense that persons with different genes may develop differently when their life experiences are fairly similar. Excepting some pathological conditions, human heredity is not an inexorable fate; it is rather a predisposition, proclivity, or predilection, which leads men to seek different environments and to react to them in different ways (see *1, 2*).

The second assumption is that the genetic diversity is mankind's most precious resource, not a regrettable deviation from an ideal state of monotonous sameness. The human animal possesses a capacity to be trained for the performance of a variety of functions which human societies stand in need of. This capacity is genetic, but the attainment of the variety needed is facilitated by the genetic diversity.

The problem is, then, not how to suppress the genetic diversity, but how to utilize it in a manner both socially advantageous and in accord with the ethical principles which we hold binding. Innumerable solutions have been proposed, starting with Plato's *Republic*. The solutions range from rigid class and caste societies to societies which aim to provide some equality of op-

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portunity and permit social mobility. It is often assumed that caste and class societies put much stock in genetic differences among men, while the democratic ones underestimate or deny such differences. I submit that this need not necessarily be so. In point of fact, at least a modicum of equality of opportunity is a prerequisite for utilization of human diversity. Conversely, caste and class societies thwart and squander the assets of diversity.

Genetics of Caste Societies

For the sake of clarity, we shall consider the genetic consequences of the extreme situations, of rigidly closed castes with no intercaste mobility whatever, and of open societies with complete equality of opportunity. The existing societies, and those of which we have historical records, occupy various intermediate positions in terms of this polarity.

In a strict caste society, a person's social position is simply that of his parents. No talent or achievement will make one a member of the Brahman caste in India; to be a Brahman one has to be born a Brahman. Nor can a Brahman be demoted to membership in a lower caste. In the heyday of the caste society in India, almost every vocation, calling, profession, and craft was the privilege (or curse) of a certain caste or subcaste (*3, 4*). This had some undeniable advantages. No worry, hesitation, or soul-searching attended the choice of a career, for one merely needed to follow the footsteps of one's parents.

The caste system has endured in India for about 2 millennia. It is debatable whether the leaders of Hindu society consciously thought that every occupation was best served by a special breed of men, and arranged the genetic system accordingly (*4*). Be that as it may, India has performed the grandest genetic experiment ever attempted with human materials. For possibly as long as 100 generations, people were bred for genetic specialization in different occupations. The results deserve more study than they have received; it appears, however, that the "experiment" turned out to be a failure, in the sense that the castes have not become genetically specialized for their respective occupations. Modern India has discovered that the low castes contain at least some individuals capable of performing quite creditably the functions heretofore reserved for the high ones; and it has also discovered that the converse is true.

To a biologist this failure comes as no surprise. The chief cause of the failure was not the occasional breach of caste endogamy rules, owing to concubinage and illegitimacy. It was rather that a more potent genetic selection operates in any human society, including caste society. In any society an individual is confronted with a variety of challenges; to respond to them successfully he must before all else be able to learn, to profit by experience, and to modify his behavior accordingly. Biologically as well as sociologically, the highest fitness often depends upon flexibility rather than rigidity of behavior, upon educability rather than adherence to old ways. This is even more true of family lineages than of individuals. The rule that sons follow the vocations of their fathers does not preclude all change, and the ways of the ancestors eventually become unprofitable for the descendants. This again puts the prize on the ability to learn. One does not need to travel to India to discover this. Millions of workers who now handle complex machinery are sons or grandsons of "timeless peasants" who knew only how to till the soil. Surely the change did not have to wait for genetic mutations that made engineers out of farmers.

The selection for genetically conditioned educability has not been confined to some societies or to some classes. It has been species-wide. Educability is common property of all mankind, on a par with such traits as walking upright, the 9-month pregnancy term, the ability to learn a language, and others. The educability has not, however, done away with genetic variability. All races and classes include persons of great contrast: some with strong bodies and others with weak; the restless and complacent; those with talents or aptitudes for music, singing, painting, poetry, mathematics, wrestling, sprinting, and those without any special ability. The development of these abilities is doubtless contingent on favorable environments and may be frustrated or hampered by unfavorable ones. This is not incompatible with genetic conditioning.

The genetic shortcomings of caste and class societies should now be clear. They have not concentrated the genes for special abilities and aptitudes in particular breeding groups. They have left most of these genes unutilized. Stories of poor but talented boys overcoming their handicaps make edifying reading, but they fail to tell us how many equally talented boys met obstacles too formidable to surmount. Social upheavals which dislodged the old elites have demonstrated again and again that new elites can be recruited from below. This is one of the few things that the Russian Revolution has made incontestable. The old intelligentsia and the old gentry had some admirable qualities, but plenty of talent lay dormant in the formerly underprivileged classes.

Genetics and Social Mobility

The occupational groups in a society become genetically meaningful in proportion to the freedom of social mobility which a society provides to its members. Consider what might happen in a society with complete equality of opportunity. Suppose that this society needs musicians, wrestlers, scientists, poets, and chess players. Persons endowed with marked aptitudes for these callings may be willing to undergo the training and exertion needed to develop professional excellence. They may do so for the sake of material rewards, prestige, or because excellence and achievement tend to make the efforts self-rewarding.

The professions of musicians, wrestlers and scientists may thus come to include many or most persons who possess the genetic wherewithal for achievement in their professions. An important adjunct of this state of affairs has to do with the so-called assortative mating. One is more likely to marry a person of similar than one of different tastes, background, and upbringing. Anyway, one is more likely to marry someone one meets often than someone geographically or socially remote. A son or a daughter of a musician or a scientist, even if they are not themselves interested in music or science, will nevertheless be likely to meet members of families of other musicians or scientists. This does not mean that children and grandchildren of musicians will always be genetically endowed for music; it does mean that they have a greater chance of being so endowed than children of nonmusicians.

We may seem then to be back where

we started—equality of opportunity appears to lead to formation of genetically specialized occupational classes. The all-important difference is, however, that the traditional classes impede social mobility. Insofar as excellence and mediocrity have even small genetic components, restriction of social mobility frustrates the genetic selection. For the sake of argument, let us assume that the social classes of old Europe were at some past time descended from groups of people with genetically different aptitudes. The question that presents itself is whether as time went on these genetic differences increased, decreased, or remained constant. The crucial point here is that, especially with privileged classes, the qualities that enable people to climb the social ladder upward are not the same which are valued in people who have reached the top, and especially in those who have inherited their social status. The selection which might have operated when the classes were being formed did not operate, or operated differently, after their formation. If the descendants who do not possess the competence of their forebears are not removed to other social classes, the genetic selection is not only obstructed, but what is more, it is switched to paths which may actually be inimical to the maintenance of the original qualifications which the class was supposed to possess. Caste and class boundaries lead to erosion of genetic differences which may originally have existed between the castes or classes. These boundaries may promote a genetic divergence of a sort entirely different from the original one. Anyway, they are not likely to accomplish what their champions have always claimed as their function—maintenance of the ancestral qualities.

Genetic professional groupings under equality of opportunity will thus be quite different from the fixed castes or classes. Considered genetically, one essential difference will be that equality of opportunity will promote gene exchange between the professional groups. Moreover, this exchange will be a selective one. A person with a genetic endowment qualifying him for musicianship may become a musician, regardless of the profession of his parents. And vice versa, an offshoot of a musical family with a body of a champion wrestler may elect wrestling as a career. Although they never fully succeeded, castes and classes always aimed to become genetically closed systems, like breeds of domestic animals. Genetic elites stemming from equality of opportunity will be genetically open systems of a kind having no close analogues in the biological world below man.

Adaptive Norm, Genetic Load, and Genetic Elite

Although no two persons (excepting identical twins) are genetically alike, this does not necessarily make them either equal or unequal. However, since human diversity is in part genetically conditioned, equality and inequality entail genetic consequences. Full understanding and evaluation of these consequences would require better knowledge of the genetic architecture of biological (Mendelian) populations than is at present available (*2, 5*). Without going into technicalities, the problem may be stated most simply as follows. According to the "classical" hypothesis, individuals of a biological species are essentially homozygous for "normal" genes established by natural selection in the process of evolution. Only a minority of the gene loci are represented in populations by two or more alleles, and then one of the alleles is normal and beneficial and the others are more or less defective and are maintained by recurrent mutation. This view implies at least a possibility of existence of a single optimal human genotype, a sort of Platonic archetype of the human species; all existing genotypes are then deviants from this one ideal. The balance hypothesis, on the other hand, envisages the adaptive norm of a species or population as a great array of diverse genotypes, heterozygous for many genes, adaptive to different environments and ways of life. Naturally occurring heterozygotes are often, though not always, fitter than the homozygotes; evolutionary changes consist of adaptive remodelings of the gene pool of a population rather than of establishment of single optimal genotypes.

The evidence now available stands, in my opinion, in better accord with the balance hypothesis than with the classical one. And the balance hypothesis makes better sense when applied to man. There is no normal man, and there is no optimal human genotype. The multitude of genotypes that fit their carriers to live in societies with other men and to leave surviving descendants comprise the adaptive norm of the human species. The adaptive norm merges by insensible gradations with the genetic load on one side and with the genetic elite on the other. The genetic load consists of genotypes which cause diseases, malformations, and constitutional weaknesses, or interfere with the adjustment of their carriers to human environments. The genetic elite are genotypes which confer fitness decidedly superior to the average of the adaptive norm.

One must always keep in mind that the biological or Darwinian fitness (also termed adaptive or selective value) is not the same thing as bodily strength, or intellectual capacity, or excellence in human estimation. Neither are they completely unrelated. Understanding of their relationships requires what Wright (*6*) describes very neatly as research "in the unpopular and scientifically somewhat unrewarding borderline fields of genetics and the social sciences." As a guideline in this research, Wright suggests that the social fitness of a genotype "may be treated in terms of the balance between contribution to the society and social cost" of its carriers. For the bulk of the population, which corresponds very roughly but by no means precisely to the biological adaptive norm, there is an approximate balance between contribution and cost either at relatively modest or at relatively high levels. Where the social contribution is at levels much higher than the average, one may perhaps speak of social excellence and social elite; to what extent this elite is genetically conditioned is, of course, an open question; that it is not identical with the genetic elite as defined in terms of Darwinian fitness is indisputable. Essentially the same problem arises in connection with the genetic load. A lethal genotype which causes death of the embryo before implantation in the uterus has a Darwinian fitness of zero, makes zero social contribution, but incurs little or no social cost. On the other hand, genotypes which cause subnormal health or mental or physical disability are social as well as genetic burdens.

In his thoughtful book (*7*) Gardner wrote: "It is possible to have excellence in education and at the same time to seek to educate everyone to the limit of his ability. A society such as ours has no choice but to seek

the development of human potentialities at all levels. It takes more than an educated elite to run a complex technological society." In the light of genetics this makes sense. Full development of human abilities is thwarted by inequality of opportunity in caste and class societies. Nonfulfillment of human potentialities is a waste of human resources. This may have been unavoidable in a world in which man eked out a meager existence from recalcitrant nature. The cultural flowering of ancient Greece may have been impossible without slave labor, and the social graces of baroque Europe may have been impossible without the toil of its peasants and artisans. But to waste human resources is inexcusable in a world of technology able to produce enough and to spare. Even those who are convinced that their substance is finer than the common clay can no longer demand that the growth of others be stunted so that they themselves may blossom.

To say that equality of opportunity is a necessary condition for human self-realization and self-fulfillment is not to solve problems, it is merely to state them. And perhaps the central problem is, in Gardner's words (*7*): "How can we provide opportunities and rewards for individuals of every degree of ability so that individuals at every level will realize their full potentialities, perform at their best and harbor no resentment toward any other level?"

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News and Comment

Medical Research Funds: NIH Path Through Congress Has Developed Troublesome Bumps

Important elements in both the Senate and the House are showing increasing dissatisfaction over Congress's decade-long honeymoon with medical research.

There is no possibility of reversing the role of the federal government as the principal source of funds for medical research; it is well established in that role, and there is no demand for reducing support or developing alternative sources of funds. What is stirring the discontent is the generous and uncritical attitude that Congress regularly takes toward the budget of the National Institutes of Health, which is the principal channel for federal funds for medical research and allied activities. Along with defense and beating the Russians to the moon, medical research has regularly found no built-in opposition on Capitol Hill. NIH, perhaps uniquely among federal agencies, goes to its appropriations hearings prepared, not to defend its budget requests, but to explain, in response to friendly questioning, why it is not asking for more. The outcome of these hearings invariably has been appropriations above the Administration requests. Since there is no political mileage in opposing medical research, the appropriations have regularly been passed by both houses, despite the grumblings of a few critics. These grumblings have risen year by year along with the NIH budget, until at present they constitute what NIH officials regard as something more serious than mere background noise from fiscal conservatives.

The critics are dissatisfied, first, with Congress's practice of giving NIH more than the Administration has requested for it, and then, with NIH's procedures for supervising the use of the money by its research grantees. The opposition is expected to come to a head shortly when the Senate takes up an NIH money bill that provides a total of $900.8 million, which is $120.4 above the Administration's request. Leading the opposition is Senator William Proxmire, Democrat of Wisconsin, who has introduced an amendment to cut the appropriation back to the Administration's figure. In previous years, such efforts were considered unlikely to meet with success, but last year a similar amendment, offered by Senator Prescott Bush, Republican of Connecticut, attracted 37 votes and lost by a margin of only 13. Pressure in behalf of the expanded appropriation would increase if the margin narrowed, but a few years ago there was no possibility whatever of lining up 37 senators against enlarging the NIH appropriation.

The House has already passed its version of the NIH budget, adding only $60.4 million to the administration's request. The bill in that chamber went through without any significant effort to sidetrack it or lower the amount (the vote was 371 to 24), but the opposition for next year is finding sustenance in a report issued last week by the intergovernmental relations subcommittee of the House Committee on Government Operations. The gist of that report was that NIH is pouring funds into medical research without making very much of an effort to keep track of how the funds are being used. NIH officials, in testimony before the subcommittee, did not dispute the charge that their follow-up on grants is quite limited; they argued, rather, that the most productive method in financing research is to pick good people with good projects and let them carry out their work without encumbering them with excessive reports or visiting inspectors. The subcommittee, expressing a skeptical view of human nature, doubted that this was a wise way to deal with federal funds. The report came too late to have any effect on the NIH budget in the House, but it is being cited in the Senate in support of the argument that generosity puts no pressure on NIH to watch its pennies.

The congressional generosity enjoyed by NIH is a phenomenon that produces