On the social responsibility of scientists

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Summary. - The author outlines the history of genetics in the United States, looking at all the social and political implications of it, too often underestimated by the geneticists themselves. In contrast to physicists, who were forced to recognize the consequences of their role in the development of the atomic bomb and who openly carried a historical burden from their past, geneticists had no historical memory and were essentially ignorant of their own "atomic" history: the Eugenics movement in the first half of 20th century, which significantly affected social policy in the United State and Europe. Few geneticists, in fact, until recently, were aware of the Eugenics movement itself. It was only with the extreme misuse of genetics by German scientists and the Nazi Government that some English and US geneticists for the misrepresentation and misuse of science and also calls for a better interaction between scientists and those who work in other social fields; a communication gap between the two cultures holds dangers for us all.

Key words: genetics, eugenics, human genome project, social responsibility, Nazi.

Riassunto (*La responsabilità sociale dello scienziato*). - L'autore illustra la storia della genetica negli Stati Uniti, senza tralasciare le disastrose ricadute sociali e politiche, troppo spesso sottovalutate dagli stessi genetisti. A differenza dei fisici, che sono stati costretti a riconoscere le conseguenze del loro ruolo nello sviluppo della bomba atomica e che si sono sobbarcati del peso del loro passato, i genetisti non sembrano aver conservato una memoria storica. Sono stati essenzialmente ignoranti rispetto alla loro storia "atomica" visibile nel movimento eugenetico, nella prima metà del 20° secolo, che ha fortemente influenzato la politica sociale negli Stati Uniti e in Europa. Pochi genetisti, infatti, fino a poco tempo fa, erano consapevoli dell'esistenza stessa del movimento. Soltanto dopo il drammatico abuso della genetica da parte degli scienziati tedeschi e del governo nazista i genetisti statunitensi e britannici hanno cominciato a farsi sentire. E' questa mancanza di consapevolezza che l'autore vede come la principale responsabilità dei genetisti rispetto alla misrappresentazione e abuso della scienza e fa appello anche ad una maggiore interazione fra gli scienziati e coloro che lavorano in altri settori sociali, nella consapevolezza che la mancanza di comunicazione fra le due culture può generare pericoli per tutto il genere umano.

Parole chiave: genetica, eugenetica, progetto genoma umano, responsabilità sociale, nazisti.

Introduction

During the 20th century, science and technology progressively came to dominate many aspects of peoples' daily lives and the course of history itself. One of the questions that has repeatedly arisen within the scientific community is how much responsibility do scientists have to insure that their work will be used to benefit rather than to harm people. At times, groups of scientists have become so alarmed about the consequences of scientific advances that they have taken political action to counter the potential negative effects of their work.

Physicists after World War II became the most politically active group of scientists in the United States because of the development and dropping of the atomic bomb. Physicists in the United States were forced to recognize the consequences of their role in the development of these weapons. In the decades following the use of atomic bombs in Japan, fears over the dangers of these weapons were kept fresh by tensions of the Cold War. This was a heavy burden for physicists, at least, for those who felt a sense of social responsibility. In the 1950s and '60s, these scientists lobbied in the United States Congress for greater public control over atomic weapons, going to the public for political support. They began the widely circulated *Bulletin of Atomic Scientists* magazine that argued for peace, cessation of nuclear testing and reduction of nuclear weapons [1]. Physicists were prominent in the formation of the Pugwash group that organized meetings between United States and Soviet scientists to reduce tensions.

The Eugenics movement

The history of genetics, my field, has its own "atomic bomb" - the Eugenics movement in the first half of the 20th century. But, in contrast to physicists, few geneticists, until recently, were aware of the Eugenics movement that existed in the United States, in Canada, and in Europe during this period. Fewer still were those who realized that geneticists played a significant role in this movement [2]. In contrast to physicists, who openly carried a historical burden from their past, geneticists had no historical memory; geneticists were essentially ignorant of their own "atomic" history.

Eugenicists believed that human social traits and aptitudes were inherited. In the United States, they argued that the quality of the country's gene pool was deteriorating. They called for policies that would increase the number of people with "good genes" and decrease the proportion of the population that carried "defective genes". The rediscovery of Mendel's laws of inheritance at the beginning of the 20th century opened up the field of the genetics as we know it today. This scientific basis for studying the inheritance of traits in all organisms including humans quickly came to represent powerful support for the Eugenics movement. Eugenicists used the new concepts of genetics to support their claims for the inferiority of certain ethnic groups and the lower social classes.

Many prominent geneticists believed in Eugenics and even became active in the Eugenics movement in the United States. In the early days of this movement, between 1906 to 1915, most of the leading geneticists were seduced by or promoted Eugenic theory. For instance, every member of the first editorial board of the major journal *Genetics* gave support to the Eugenics movement. Textbooks in Genetics written by eminent geneticists included sections on Eugenics. Professors taught courses that were devoted to Eugenics or that had sections on Eugenics in most of the Colleges and Universities in the country. Eugenics was considered a respectable scientific discipline [2].

Scientists wrote about Eugenics in magazines read by the public. For example, the magazine called Popular Science, in the decade of the 1910s, was full of these articles [3]. Some examples include a report on "Jewish psychopathology" in which a Doctor Wilson argues that Jews are a highly inbred and psychopathically inclined race, and that among the "frankly feeble-minded," the Jews stand next to the top of the list of those immigrants who were tested. David S. Jordan, an evolutionary biologist and president of Stanford University, in his article "The Biological Effect of Race Movements" spoke of "the lower races" stating that they were immigrating into the United States from Asia and Europe, lowering our own average. A Doctor Jordan from the University of Virginia concluded that "negro traits such as cheerful temperament, and vivid imagination" were due to single genes.

These statements were made by respectable scientists. For instance, Harvard-trained geneticist Charles Davenport who was the leader of the Eugenics movement, had done very impressive scientific work. He was the first to show that Huntington's disease was inherited as a dominant genetic trait. But he also argued that social phenomena such as criminality, poverty, intelligence, and even the tendency of some men to run away to become sailors could be attributed to single genes. His conclusions were based on nothing more than crude family studies or population-based use of IQ tests. Davenport also claimed, with even less evidence, that racial mingling between races would lead to inferior progeny.

The combination of a social movement with an apparently scientific base allowed the Eugenicists to significantly affect social policy in the United States. A majority of States passed laws that allowed sterilization for low intelligence, certain kinds of criminality and other characteristics [4]. These laws were based on the claims of the Eugenicists that those traits named were genetically determined. Tens of thousands of people in the United States were sterilized under these laws. Many States also passed laws that forbid marriage between individuals of different races, based on scientific theories of the inferiority of hybrid races. Finally, the United States Congress passed the immigration restriction act of 1924 which dramatically reduced the number of people allowed in the country from Southern Europe (e.g. Spain, Italy and Greece), Eastern Europe, and from other cultures considered inferior. Eugenicists played a significant role in gathering support for this legislation.

As the field of genetics matured, many geneticists who had supported the Movement withdrew their backing. The increasing sophistication of genetics made clear just how complex human genetics can be. This falling off of scientific support began well before the passage of much of the Eugenic legislation. Nevertheless the recently disaffected geneticists rarely spoke out publicly against policy proposals of the Eugenicists, and by the time they did it was too late.

Thomas Hunt Morgan, one of the most prominent geneticists of the day privately criticized the genetic arguments used by Eugenicists, but he never said anything in public. He explains his reluctance to publicly confront the social consequences of these arguments in a 1915 private letter. He says "if they [the Eugenicists] want to do this sort of things well and good, but I think it is just as well for some of us to set a better standard and not appear as participators in the show. I have no desire to make any fuss". So here were geneticists who had contributed to the Eugenics movement, not even recognizing that they had some responsibilities for the consequences of their actions. They remained silent [3].

After the passage of the immigration restriction act of 1924 the Eugenics Movement in the United States began to fade, but its impact elsewhere was only beginning to be felt. In 1923 Adolf Hitler attempted his famous Putsch. Escaping arrest he was hidden in the house of his close friend, the publisher Julius Lehmann. When Hitler was finally caught and imprisoned in 1924, Lehmann sent him a copy of one of the books published by his press. In jail Hitler read passages from this book such as the following: "Fraud and the use of insulting language are common among Jews" "in general a negro is not inclined to work hard" "the Russians excel in suffering and in endurance" "in respect of mental gifts the Nordic race marches in the van of mankind". The authors of this book also stated: "what historians regards as degeneration sickness and aging of a nation, what they look upon as the decline of a Nation, are the outcome of reverse selection of the racial constituents of the people concerned". Reading these quotes one might have thought that this was simply some extreme racist tract, but in fact it is not. These quotes are from the most widely used human genetics text of that era. Its authors were German geneticists Erwin Baur and Fritz Lenz, world famous for their contributions to genetics, and German anthropologist Eugen Fischer. Fischer, after an illustrious career in anthropology, was appointed Rector of Berlin University. The text used genetics as a mantle of respectability to characterize races and ethnic groups by their genetically based personality traits. A contemporary German geneticist, Benno Muller-Hill, who has exposed the role of German geneticists in the Nazi era, argues that sections of Hitler's "Mein Kampf" dealing with human genetics and eugenics read as if they were directly influenced by this German genetics text [5].

Furthermore, and what should be of great interest to American geneticists, the text relied on very little in the way of German scientific research to support its conclusions. Its main source of data and conclusions came from the United States, from people who were supporting the Eugenics movement there. And when laws began to be passed in Germany, public officials used the experience in the United States to fashion the laws and win support for them. The first Eugenic sterilization program in Germany was modeled after the 1907 sterilization law from the State of Indiana.

Among the writings that detail the role of German geneticists and doctors in the Eugenics policies of Nazi Germany, those of the geneticist Benno Muller-Hill are the most striking. In 1988 Muller-Hill published the book Murderous Science which for the first time exposed to German society just how deeply involved scientists and doctors were in the planning and support of the sterilization and murders of millions of people [6]. The publication of this book was a courageous act. Many of the scientists of the Nazi era were still alive and influential in German Universities. Professor Muller-Hill became "persona non grata" among much of the genetics community of Germany. His book while reviewed in other countries was not even covered by German newspapers or journals. And it was not until 1999, that finally the German scientific establishment began to explore the role of scientists before and during the Nazi era [7].

One lesson from this history is the importance of scientists to speak out on issues such as this. Who knows what the impact would have been if a united and socially conscious genetics community in the United States and other countries had expressed its indignation at the misuse of its field.

With the extreme misuse of genetics by German scientists and the Nazi Government some English and US geneticists began to speak out more openly. At the 7th International Congress of Genetics in 1939 a number of them issued a manifesto criticizing eugenic programs. There were very prominent geneticists among the signers. But this opposition of geneticists to the misapplication of their field was too little and too late and had very little effect. Eventually, the universal revulsion at the Nazi eugenic policies after World War II led to rejection of many of the general claims of the eugenics movement. In particular the position that human behavioral traits and social problems had their origins in genetics was replaced, perhaps with the equally extreme position that the environment was the determining factor in such issues. Some of these positions are reflected in two statements issued by UNESCO in the early 1950s, supported by some of the same geneticists who signed the 1939 statement [3].

Since that period, geneticists in the United States have essentially obliterated this history, erasing memory of it from genetics texts and from the culture of genetics. But, other social and political events were to cause turmoil in the scientific community, In the late 1960s, the Vietnam War, the Civil Rights Movement and eventually the worldwide trend to radical politics reached the scientific community in the United States. This largely started with physicists again, who now became heavily critical of the use of new technologies based on advances in physics to pursue the war in Vietnam. There were also a small number of biologists who opposed the US development of biological weapons. With the formation of physicists in 1969 of the organization "Science for the People", scientists from many fields joined the radical science movement.

I along with some other biologists became involved in several controversies over certain research areas in genetics. One of the issues we dealt with, and continue to deal with today, relates to studies in human behavioral genetics. In the late 1960s and continuing into the 1970s, certain scientists claimed genetic evidence for strongly deterministic inheritance of such behaviors as criminality and human intelligence. An influential article by University of California psychologist Arthur Jensen suggested that blacks were inferior to whites in intelligence [8]. Other scientists mistakenly claimed that men with an extra Y chromosome (the XYY male) were inclined to criminality [3]. And, more recently, scientists publicizing the new field of sociobiology have argued that a whole range of our behaviors are strongly genetically determined as a result of our evolutionary heritage [9]. They have proceeded to propose that sociobiology has implications for social policy. The claims made by these scientists, which have received widespread publicity, remind one of the eugenics period. But this revival of biological determinist thinking has met little criticism by geneticists. In part, this must be blamed on the lack of social memory within genetics of the history of the eugenics movement. Other than a small number of geneticists mainly working with the radical science organization, "Science for the People", geneticists have played very little role in exposing the misrepresentation of their science.

On the other hand, development of the recombinant DNA techniques for gene cloning in 1973 led geneticists for the first time to organize to insure the safety of their new technology. A group of prominent geneticists initially called a moratorium on gene cloning research and then issued guidelines for how the research should be done, with the intention of preventing any serious health consequences [10, 11]. I believe that this effort by older prominent geneticists was a direct consequence of the preceding period of activism within science by a small number of younger people. Major scientists like Paul Berg and James Watson were directly challenged by younger scientists to consider possible dangers of their research, and they did. To their credit, they took the challenge seriously.

Yet, later, many of these scientists came to regret this step, thinking that the research was inhibited for too long as a result of the moratorium, the guidelines and the increasing public involvement in regulation of the research. Among them James Watson, for instance, was not happy about the scares that had been raised among the public by the discussions of recombinant DNA research, even though ultimately the research was allowed to proceed without any hindrance.

The ELSI Working Group of the Human Genome Project

Interestingly, years later, in 1989, Jim Watson started something that also appears to flow out of the activism of the early 1970s. When he was appointed director of the Human Genome Project (HGP) in the United States, Watson announced that a significant percentage of the budget of the HGP would go to supporting an organization he called the *Working Group on Ethical and Legal and Social Implications (ELSI) of the Human Genome Project* [12]. This was a highly unusual precedent in science; that is, a scientific project was started and at the same time a project was started to anticipate the problems that might derive from that project. I was appointed by Watson to the first ELSI committee. Of the 7 members of the working group on ELSI, 5 of them had medical degrees or PhDs in science. Most of these 5 were either researchers or had experience in research. The other two members of ELSI were Thomas Murray, a leading and very thoughtful ethicist in the United States who had a degree in social psychology, and Patricia King who is an African/ American lawyer at Georgetown University and has spoken up very eloquently on problems of genetics and racial discrimination. Similar groups on ethics were set up around the world at the same time. Despite the fact that this ELSI group was dominated by people with scientific background, most members of that group were people, like myself, who had already expressed concerns about the ethical and social implication of genetics.

The ELSI Working Group was given two tasks when the program was started. One was to outline how the funds of the ELSI program would be used, and the other was to define specific consequences of HGP that should be confronted immediately. One such issue was the implications of the new human genetics for health insurance, a particularly serious problem in the United States because the country has no national health insurance plan. We asked whether genetic information about people would be used to deny health insurance. As the HGP generated more and more genetic information about genetic diseases and conditions, it might be that fewer and fewer people would be able to obtain health insurance. That this was a serious issue was confirmed in a series of studies that revealed many incidences of genetic discrimination where people were given genetic tests and then lost health insurance or were unable to obtain employment [13]. The ELSI Group also was concerned about what would happen as more and more genetic tests were introduced into the clinical setting. How did doctors, pediatricians or clinical geneticists, who would be offering such tests to people, communicate information to them? A third issue that seemed to require immediate attention was the privacy of genetic information. As the makeup of individual's genes were determined by genome sequencing who would have access to that information? Could that information be used against them? For each of these topics, we established sub-groups that would study the issues and make proposals.

During this time, James Watson, as Director of the HGP, left our group totally to its own devices; that is, we could pursue whatever problems we thought were of interest and we had the money to pursue them and set up consortia of groups that would work on these issues. Whatever we requested, we got. At the same time, we were aware of a significant amount of hostility among the scientists on the HGP. Articles would appear in journals such as *Science* magazine with quotes from scientists criticizing the ELSI program. An official of the National Institute of Health said: "I don't understand why you want to spend all this money subsiding the

vacuous pronunciamentos of self-styled ethicists". Some of the science types looked on ELSI as a welfare program for ethicists. These statements reflected a widespread hostility of the geneticists on the HGP towards those people who were trying to deal with the ethical, legal and social consequences of the project. Our group was disturbed by this split between the scientific and the "ethical" wing of the project. We were also disturbed that a number of geneticists on the project were publicly promoting a genetic reductionistic point-of-view, arguing that the HGP would solve many of the world's social problems [3]. For instance, James Watson stated in Time magazine that "We used to think that our fate was in our stars. Now we know, in large measure, our fate is in our genes". Also, in the pages of Science, Daniel Koshland, who was editor of the magazine, argued that the HGP will ultimately lead to a cure for the homelessness. He stated that most homeless people are mentally ill, that mental illness is genetic, and that the HGP was going to cure mental illness. Now, there is no genetic evidence behind these claims for this all-empowering genetics. Rather the statements by these scientists may reflect an exaggerated belief in the power of genes which is derived from the success of genetics in illuminating numerous biological phenomena.

Perhaps the most main-stream contemporary example of classical eugenics point-of-view is found in the book *The Bell Curve*, written by the political scientist Charles Murray and psychologist Richard Herrnstein [14]. This book received widespread attention and sold millions of copies in the United States. In this book, the authors suggest that people with genes for lower intelligence and for anti-social traits are outbreeding those with better genes in the United States. This "dysgenic" trend, as they call it, is the root cause for a number of social problems, according to them. To remedy these problems, Murray and Herrnstein propose that women from the upper classes should be encouraged by new social programs to bear more children and that welfare and remedial education programs should be ended.

Only a few researchers such as Luca Cavalli-Sforza and Steven Jay Gould have spoken out against the genetic arguments of these authors. Essentially the field of genetics remained silent. One leading geneticist who is active in the HGP, David Botstein, offers a possible explanation for why this silence has persisted [15]. He said in a recent speech "People keep asking me why I do not rebut The Bell Curve. The answer is because it is so stupid that it is not rebuttable". The answer appears to ignore the potential social consequences of theories such as that found in The Bell Curve,, when they remain unchallenged. Oddly enough, in the next sentence Botstein who is Jewish speaks of the fact that most of his immediate family was murdered by the Nazis. Whether the theories are stupid or not seems beside the point, when the stakes may be so high. Perhaps Botstein's attitude harks back to Morgan's suggestion. Morgan who I quoted earlier, said he didn't think "scientists should appear as participators in the show" Again I think that if geneticists knew a little more of the hidden history of their field, they would act more responsibly.

The ELSI group was very disturbed by these trends, by *The Bell Curve* and by what we saw as problems in general in the field of human behavior genetics. We knew that there had been a good deal of publicity for findings in human genetics that related to human behavior. But, there has also been much turmoil in human behavior genetics. In fact, many geneticists are coming to recognize that human behavior is made up of so many factors that the simplistic treatment of it in genetic studies is not warranted.

The ELSI group, which by then had expanded, adding more scientists, a lawyer, an educator and sociologists, decided to make a statement about The Bell Curve [16] and to set up another project to consider issues in human behavior genetics. It was during this period that Jim Watson resigned from the directorship and was replaced by Frances Collins, a leading human geneticist. While Frances Collins himself probably is more concerned about ethical issues than Watson, what became clear at this point finally was that the geneticists in the HGP, including Collins, felt that they knew better than ELSI members what ethical issues were important. They had little trust in a group they described as "philosophers" and "self-styled ethicists". The result was that Frances cut ELSI meetings down to one a year, reduced its funding, including eliminating funding for examination of behavior genetics issues. Frances himself saw the privacy issue as the main one to focus on. He appeared to feel that the other issues that we were dealing with were not important. As a result, the chair of the ELSI committee and several others resigned [17]. The group was reformed more strongly under Frances Collins' control.

I have learned a lot, much of it discouraging from my experience on the ELSI Working Group. This experience reflects more broadly the problems in communication between scientists and those interested in the ethical, legal and social implications of science. I have talked as though the problems were all the fault of the scientists, i.e. that geneticists have no respect for the people trying to deal with the ethical and social issues. This is largely true, but also I think part of the problem is that people in the ethical, philosophical, and sociological field often really didn't have too much understanding of the genetics. They would make mistakes in their interpretations of genetics research, making it easier for the geneticists to dismiss their suggestions for what steps should be taken to deal with some of the social and ethical consequences. This gulf between the two camps reminded me of an earlier era, when in the late 1950s, the Englishmen C.P. Snow, who was both a chemist and

a novelist, published his famous lecture "Science and the two cultures" [18]. Talking about scientists and people in the humanities, he said: "I felt I was moving among two groups, who had almost ceased to communicate at all, who in intellectual, moral and psychological climate had so little in common that instead of going from Burlington House or South Kensington to Chelsea, one might have crossed an ocean".

Despite the fact that Snow appeared even-handed in laying blame in the early part of his lecture, in fact, he ultimately saw the major fault lying with people in the humanities. He felt that scientists were much more sensitive to many of the things the humanities dealt with than people of the humanities were as regards to science. He also even argued that there is a moral component right in the grain of science itself. Unfortunately, Snow seemed to suffer from the same scientific arrogance that I was to witness later among genome scientists.

The gap that Snow talked about, although I disagree with his analysis of it, still exists. There is still a gulf between scientists and academics in other fields. While Snow's solution is for people in the humanities to learn more science, I feel the reciprocal has to be true also. I have worked for many years in the Genetic Screening Study Group of Boston, which includes geneticists, other scientists, doctors, anthropologists, sociologists, and lawyers. Beginning with good will and trust, the interactions in this group between people in different disciplines has been a very productive interaction for me. We discuss the implications of genetics from the perspectives of all of these disciplines. We develop a deeper understanding of the strengths and weaknesses of our respective fields. We read each other's papers, and offer criticisms from our different perspectives. We all feel enriched by these interactions.

Concluding remarks

The Genetic Screening Study Group is a small effort. If we are to deal with the enormous impact of contemporary science, whether it be the Human Genome Project, or other advances yet to come, we will need much more in the way of interaction between natural scientists and people in other fields. Scientists should understand more of their own history, should be familiar with the philosophy of science, and should understand the social and ethical issues better than they do. People in other fields, sociology, ethics, philosophy, etc.,who deal with scientific issues, must also make more of an effort to educate themselves better in the sciences that they are commenting on. While the 20th century may have become increasingly dominated by science and technology, the 21st century will be so even more. The communication gap between the two cultures holds dangers for us all.

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