

**SPEECH OF HIS HOLINESS PIO XII
TO THE PARTICIPANTS IN THE I INTERNATIONAL SYMPOSIUM
OF MEDICAL GENETICS***

Monday, September 7, 1953

You are welcome, gentlemen, that you have wanted to take advantage of your *Primum Symposium Internationale Geneticae Medicae* to visit us. We respond to your delicate attention by manifesting Our joy of being able to spend a few moments with you.

During these last years a number of natural science congresses have gathered here. The characteristic of your science, the one that distinguishes it among other branches of biology and medicine, is its youth. But, despite his young age, he stands out for his rapid development and for the broad goals, we could almost say reckless, that your specialty was proposed.

These objectives arouse a lively interest on the part of institutions that deal with man as a moral personality, of his education, of education that should give him a mature, firm character, aware of his responsibilities in his way of thinking and acting. In the decisive questions facing time and eternity. In response to the desire that You have manifested to us, we have not been able to refuse to tell you some words in relation to your work and your efforts.

In fact, among the very diverse specialties of biology, the most dynamic research is perhaps that of genetics, that is, of the science of the hereditary transmission of certain characters that is carried out from one generation to another, according to the fixed rules. In Our explanation, we would like, above all, to mention some data provided by the literature on the specialty; They are undoubtedly the domain of your competence and we leave you the care to appreciate its accuracy. To these data, we would like to add some basic considerations that can serve as a norm for the metaphysical and moral appreciation of this or that theoretical principle of current genetics and, better still, for its application in real life.

I

Your science has made known the initial cell of a new life generated by means of fertilization. This cell you say that is formed by the fusion of the nuclei of two sex cells belonging to a couple of different sex. You teach us that the new living being is built, from this initial cell, by normal and continuous cell divisions under the direction of the genes contained in the nuclei and carriers of the inheritance of ancestors. But your science gives a more complete and deeper understanding of this initial cell in its origin, its structure, its dynamism, its purpose and its inner richness. She sees there both a point of arrival and a point of departure. The point of arrival of a long previous evolution and of the transmission of the hereditary heritage of two branches of the kinship by the long series of past generations, from the beginning of the species in question to a new individual. The starting point of the series of descendants to whom hereditary heritage can and must be transmitted to continue without ceasing the series of generations.

The works of genetics project here their gaze on the depth and extension of the structure and laws of life; the mysteries of atomic physics are evoked to this purpose with intensity. These works give an account of the results acquired until the day, facts already well determined, but also numerous problems that still await solution, both from the point of view of the theory and its practical application.

Genetics not only records the facts, but also pronounces on the nature and laws of the inheritance. The transfer of hereditary heritage, says the former, is carried out according to strict laws, some of which are well known, while others require a deeper examination. The Mendelian laws, first established by Agustín Gregorio Mendel, which has deserved a little of your science and to whom a scientific institute has been dedicated in the city of Rome, are schemes for the transmission and distribution to the descendants of elements carrying the inheritance, that is, of genes. It is a group of genes that is found in the nucleus of the sexual cells, which constitutes the material support of the characters. Genetics states that heredity comprises the set of genes of all sex cell chromosomes; it indicates the multiple combinations produced by the meeting of the transmitted genes; she speaks of homozygotes and heterozygotes; It draws attention to the fact that in heterozygotes, that is, in the encounter of genes carrying varieties of the same characters, it is the case that certain genes have, so to speak, and below them, the genes "recessive", which are supplanted by the others, the so-called "dominant". However, they are conserved integrally in the inheritance and are transmitted with it also to the following generations, which, in the absence of dominant genes, can reappear in all their old freshness. it indicates the multiple combinations produced by the meeting of the transmitted genes; she speaks of homozygotes and heterozygotes; It draws attention to the fact that in heterozygotes, that is, in the encounter of genes carrying varieties of the same characters, it is the case that certain genes have, so to speak, and below them, the genes "recessive", which are supplanted by the others, the so-called "dominant". However, they are conserved integrally in the inheritance and are transmitted with it also to the following generations, which, in the absence of dominant genes, can reappear in all their old freshness. it indicates the multiple combinations produced by the meeting of the transmitted genes; she speaks of homozygotes and heterozygotes; It draws attention to the fact that in heterozygotes, that is, in the encounter of genes carrying varieties of the same characters, it is the case that certain genes have, so to speak, and below them, the genes "recessive", which are supplanted by the others, the so-called "dominant". However, they are conserved integrally in the inheritance and are transmitted with it also to the following generations, which, in the absence of dominant genes, can reappear in all their old freshness. in the encounter of genes carrying varieties of the same characters, it is the case that certain genes have, so to speak, and below them, the "recessive" genes, which are supplanted by the others, the so-called "dominant" " However, they are conserved integrally in the inheritance and are transmitted with it also to the following generations, which, in the absence of dominant genes, can reappear in all their old freshness. in the encounter of genes carrying varieties of the same characters, it is the case that certain genes have, so to speak, and below them, the "recessive" genes, which are supplanted by the others, the so-called "dominant" " However, they are conserved integrally in the inheritance and are transmitted with it also to the following generations, which, in the absence of dominant genes, can reappear in all their old freshness.

Your works underline a characteristic of hereditary transmission: genes are almost unassailable and of a rigid immutability. This has been proven thousands of times that, for example, acquired skills or mutilations do not change them and do not pass to posterity. The literature on

the subject designates this opinion under the name of "classical genetics". However, recently Russian geneticists have fought it and denied the stability of hereditary factors.

On the other hand, everyone recognizes without question the capacity for adaptation and reaction of hereditary factors to external circumstances, particularly from different climates. Thus, one and the same plant, with the same patrimony, could acquire, according to the climates, an aspect in such a different way, that the layman would catalog it as a plant of another species. Genetics says here: heritage does not basically contain any external form, but only the ability to react to different climates by this or that external form; the patrimony would not contain, therefore, more than a norm of reaction.

Such modifications, explains genetics, are not rare in the hereditary process; there is, however, no change in the constitutive elements of the patrimony. Living beings receive their individual characteristics, the "phenotype", the heritage and the environment. The heritage, it is claimed, is more or less plastic in the sense that it can be shaped by the world environment. Each living being, in its definitive age, is the result of the collaboration of the heritage and the environment. Neither the medium nor the heritage is everything.

However, there are also, according to genetics, changes in the same heritage that are called "mutations". These occur in an essentially different way from the modifications. Genes, these complicated giant molecules, can undergo a structure change due to the intervention of different natural agents. Thus, for example, under the action of cosmic rays, the modified gene-molecule in its structure makes different characters appear in growing organisms. The characters of the living being, and they are thousands, can be modified almost completely. It is thus possible to artificially cause the mutations, for example, by certain irradiations of reproductive cells, without being able, at times, to determine in advance the result of such interventions. Through mutations, nature and man can produce "select". Being adapted and prepared for life affirms itself to others less adequately equipped. Often it will happen that the latter degenerate, perish and disappear.

The fact and the theory of modifications and mutations show, therefore, that the inviolability of heritage, which has been spoken of at the beginning, sometimes suffers a certain alteration.

What biology and genetics in particular teach about germ cells, the factors of inheritance, modifications, mutations and selection, goes beyond individual and diverse species and goes back to the question of origin and evolution of life in general, even in the group of all living beings. And the question arises: Is this phenomenon constituted by the fact that all living beings come from a single being and its inexhaustible germ through descent and evolution according to the manner and under the influences that have been indicated? The question of large groups explains why the works of certain geneticists associate the theory of inheritance with those of evolution and descent. The one invades the others.

In the recent works of genetics it is read that nothing better explains the connection of all living beings than the image of a common family tree. But at the same time it is noted that it is no more than an image, a hypothesis, and not a proven fact. It is also believed that if most researchers present the doctrine of offspring as a "fact", it constitutes a premature judgment. It could very well also formulate other hypotheses. On the other hand, it is said that renowned wise men do them without denying that life has evolved and that certain discoveries can be

interpreted as preformations of the human body. But -continue- these researchers have underlined in the clearest way that to their understanding is not known absolutely, still what the terms "evolution", "offspring", "transit" really and exactly means; that, for the rest, no natural process is known by which one being produces another of a different nature; that the procedure by which one species engenders another different one remains perfectly impenetrable, in spite of the numerous intermediate stages; that it has not yet been experimentally arrived at to derive a species from a different one; and, finally, that we would not know at what end of evolution "manhood" has suddenly passed the threshold of humanity. There are still two unique discoveries about which the controversy has not calmed down to the present; this would not be a regressive advance in the evolution of the material discovered, but of the dating or date setting of the geological layer. The last conclusion that follows is this: as the future demonstrates the accuracy of one or the other interpretation, the usual image of the evolution of humanity will find confirmation in it or it will be forced to establish or admit a totally new image. It is believed that it must be said that investigations into the origin of man are still in their infancy; that the representation that we currently have of him could not be considered definitive. Here is what is said about the relations between the theory of inheritance and that of evolution. the usual image of the evolution of humanity will find in it a confirmation or it will be forced to establish or admit a totally new image. It is believed that it must be said that investigations into the origin of man are still in their infancy; that the representation that we currently have of him could not be considered definitive. Here is what is said about the relations between the theory of inheritance and that of evolution. the usual image of the evolution of humanity will find in it a confirmation or it will be forced to establish or admit a totally new image. It is believed that it must be said that investigations into the origin of man are still in their infancy; that the representation that we currently have of him could not be considered definitive. Here is what is said about the relations between the theory of inheritance and that of evolution.

The literature of genetics shows that all this does not only have a theoretical interest, that is, that it is an enrichment of our knowledge about nature and its activity, but that it also possesses a high practical value: firstly, in the domain of beings deprived of reason, genetics allows a better use, for the benefit of man, of the vegetable and animal kingdom.

But also for man, the laws of inheritance are loaded with meaning. The initial cell of the new man is already, from the first moment and in the initial state of its existence, an admirable architecture and an incredibly rich specification of structures. It is full of teleological dynamism governed by genes, and these genes are the foundation of both well-being and discomfort, vital resources or languor, strength or weakness. This consideration explains why research on inheritance always finds more interest and points of application. The aim is to obtain what is good and valuable, to affirm it, to promote it and to perfect it. It is necessary to prevent the deterioration of hereditary factors; it is necessary, as far as possible, to alleviate the deficiencies already manifested and to take measures so that the hereditary factors of lower value are further abuzz by merging with those of a paired homozygote. It is necessary to ensure that positive full-fledged characters unite with a similar hereditary heritage.

Such are the tasks proposed by genetics and eugenics. Hence his extraordinary specialization to the genetics of blood groups, the study and genetics of the twins.

Here is what we wanted to ask your specialty without wanting to express our opinion. The appreciation of purely specific questions corresponds to the competence of your science. Our purpose was to establish a common basis on which we would like to develop the considerations of principle that we would like to add now.

II

The fundamental requirements of scientific knowledge are truth and truthfulness.

The truth must be understood as the concordance of the judgment of man with the reality of being and the action of things themselves, as opposed to the representation and ideas that the spirit introduces there. A conception reigned and still reigns today, according to which the message that the objective reality itself offers penetrates the spirit as through a lens and, in its way, qualitatively and quantitatively modifies. In this case we speak of dynamic thoughts that imprint their form on the object, as opposed to the static thought that simply reflects it, unless, in principle, the former is not intended to be the only possible type of human knowledge. The truth would then be neither more nor less than the concordance of personal thought with the public or scientific opinion of the moment.

The thought of all times, based on sound reason, and Christian thought in particular are aware that the essential principle must be maintained: the truth is the agreement of the judgment with the being of things determined in itself, without it must therefore deny what in the conception of truth cited above, erroneous as a whole, is partly justifiable. We touch on this question in Our Encyclical *Humani generis* of August 12, 1950, and we insist there on a point that we believe we should repeat now: the need to keep intact the great ontological laws, because without them it becomes impossible to understand reality; We think, above all, of the principles of contradiction, of sufficient reason, of causality and purpose.

Your writings allow us to suppose that you agree with Our conception of truth. You want in your research to reach the truth and base yourself on it to draw conclusions and ground your systems. You affirm the existence of genes as a fact and not as a simple hypothesis. You admit, therefore, that there are objective facts and that science has the possibility and the intention to understand these facts, not to elaborate purely subjective ghosts.

The distinction between certain facts and their interpretation or systematization is as fundamental to the researcher as the definition of truth. The fact is always true, because ontological error can not exist in it. But this does not end the way for its scientific development. This presents the danger of formulating premature conclusions and committing errors of judgment.

All this imposes the respect to the facts and the set of facts, the prudence in the enunciation of scientific propositions, the sobriety of the scientific judgment, the modesty so appreciated by the wise and that inspires the conscience of the limits of the human knowledge; this favors the openness of the spirit and the docility of the true man of science far from clinging to his own ideas when they are insufficiently founded, and, finally, it leads to examining without fear the opinions of another and judging them.

When this disposition of mind is possessed, the veracity is united in a completely natural way to respect for the truth; that is, the concordance between personal convictions and scientific positions, expressed by the word and by the writing.

The demand for truth and truthfulness still raises an observation about scientific knowledge: it is rare that a single science deals with a specific object. There are often many who treat you, each one under a different aspect. If your survey is correct, the contradiction between its results is impossible, because it would suppose a contradiction in the ontological reality. But reality can not be contradicted.

If, in spite of everything, contradictions arise, they can not be more than a faulty observation or the erroneous interpretation of an exact observation or also of the fact that the observer, surpassing the limits of his specialty, has entered into a land that I did not know. We think that this indication is also imposed with evidence to all sciences.

Although the theory of inheritance, based on the knowledge of the structure of the cell nucleus and recently also on the structure of the cytoplasm - and of the immanent laws of hereditary transmission - can tell why a man has certain characters, he is not still able to explain "all" that man's life.

It needs to be complemented by other sciences from the point and time that arises the question of the existence and origin of the spiritual principle of life, the human soul, essentially independent of matter. The conclusions of the genetics on the initial cell and the development of the human body by normal cell division under the direction of the genes, what this science affirms on the modifications, the mutations, the collaboration of the heritage and the environment, is not enough to explain the unity of man's nature, his intellectual knowledge and his self-determination. Genetics as such can not say anything about the fact that a spiritual soul is united, in unity of human nature, to an organic substratum that enjoys a relative autonomy. Psychology and metaphysics or ontology must intervene here not to oppose genetics, but to substantially complete their data. On the contrary, philosophy can not ignore genetics when, in the analysis of psychic activities, it understands that it must remain in contact with reality. One can not try to deduce all the psychism - however conditioned it may be for the body - from the "anima rationalis" as "form corporis", and affirm that the amorphous "raw material" receives all its determinations from the spiritual soul immediately created by God and nothing of the genes contained in the cell nucleus. understands that it has to remain in contact with reality. One can not try to deduce all the psychism - however conditioned it may be for the body - from the "anima rationalis" as "form corporis", and affirm that the amorphous "raw material" receives all its determinations from the spiritual soul immediately created by God and nothing of the genes contained in the cell nucleus. understands that it has to remain in contact with reality. One can not try to deduce all the psychism - however conditioned it may be for the body - from the "anima rationalis" as "form corporis", and affirm that the amorphous "raw material" receives all its determinations from the spiritual soul immediately created by God and nothing of the genes contained in the cell nucleus.

The multiplicity and diversity of sources of knowledge still call attention to a fact of decisive importance: the distinction between the knowledge acquired by personal study and that which is due to the work of another; Therefore, to his testimony. When one is sure that this testimony is worthy of faith, it constitutes a normal source of knowledge, which neither in practical life nor

in science can be overlooked. Abstraction made of the urgent need to resort from time to time to the testimony of another, the attitude of the spirit indicated above in the true wise leads him to verify that, in his field, the experienced specialist always acquires with objective truth a more familiar narrower than any other profane.

We can not help but apply to the testimony of God what we have just said about human witness. Revelation, and therefore, the formal and explicit testimony of the Creator, also reaches certain domains of the natural sciences and certain theses of your specialty, such as the theory of descent. Now, the Creator satisfies to a great degree the demand for truth and truthfulness. Judge, then, yourselves if it is in accordance with scientific objectivity to decline this testimony, so that its reality and its content offer all guarantees.

As far as the theory of offspring is concerned, the essential question here is that of the "origin of the physical organism of man" (not of his spiritual soul). If your sciences deal diligently with this problem, theology, the science that has Revelation as its object, has also devoted a very lively attention to it. We ourselves, twice, in 1941, in an address to our Academy of Sciences [1], and in 1950, in the Encyclical cited above [2], we have invited to continue the investigations with the hope of registering perhaps one day certain results, because, until the present, nothing definitive has been obtained. We have exhorted ourselves to treat these issues with the prudence and maturity of judgment that demands its great importance. We have taken from your specialty works an appointment, where, after having confronted us with all the current discoveries and the opinion of the specialists to the purpose, we invited the same sobriety and where a definitive judgment was reserved.

If you reflect on what we said about research and scientific knowledge, you must understand that neither on the side of reason nor on the side of thought oriented in the Christian sense are barriers to research, knowledge, affirmation of the truth. There are barriers, but they do not serve to imprison the truth. Their purpose is to avoid that unproven hypotheses are taken as established facts, that the need to complete a source of knowledge for another is forgotten, that the scale of values and the degree of certainty of a source of knowledge are erroneously interpreted. There are barriers to avoid these causes of error; but there are not for the truth.

Genetics does not only have a theoretical importance, it is also eminently practical. It is proposed to contribute to the good of individuals and the good of the community, to the common good. He wants to dedicate himself to this task mainly on two fields: the one of the genetic physiology and the one of the genetic pathology.

It is a fact of experience that natural dispositions, good or defective, strongly influence the education of man and his future behavior. No doubt the body, with its aptitudes and its organs, is only the instrument, while the soul is the artist who uses this instrument; undoubtedly, the skill of the artist can often compensate for the defect of the instrument, but a perfect instrument is handled better and more easily; and when its quality falls below a certain limit, it is absolutely impossible to use it, dispensing with the fact that, above all comparison, body and soul, matter and spirit, constitute in man a substantial unity.

However, to continue the aforementioned comparison, genetics teaches to better understand the instrument in its structure and its variations and to put it in a position to play a better role. Observing the line of a man, one can, on the condition of remaining within certain limits,

establish the diagnosis of dispositions that he has received in his patrimony and the prognosis of hereditary characters, which will be manifested as good, and, what is even more important, of those who also drag a tare.

However limited the direct influence on hereditary heritage may be, practical genetics is not entirely reduced to the role of a passive bystander. Daily life shows, of course, the extremely detrimental effects of certain ways of acting of parents in the natural transmission of life. Such procedures, with poisonings and the infections they cause, should be prohibited as far as possible, and genetics seeks and indicates the means to achieve this end. Their conclusions reach in particular to the combinations of patrimonies of diverse lines; it indicates those that must be favored, those that can be tolerated and those that should be discouraged from the point of view of genetics and eugenics.

The fundamental tendency of genetics and eugenics is to influence the transmission of hereditary factors to promote what is good and eliminate what is harmful; this fundamental tendency is irreproachable from the moral point of view. But certain methods to achieve the end pursued and certain protective measures, are morally debatable, as well as an overestimate for the purposes of genetics and eugenics. Let us quote the statements of one of the most important current geneticists; In a letter that he has just addressed, he regrets that, despite his enormous progress, genetics, "from the technical and analytical point of view, has been immersed in multiple doctrinal errors, such as racism, the mutationism applied to phylogenesis. , to explain in modern terms Darwinian evolutionism,

Indeed, there are certain measures of genetic and eugenic defense that good moral sense, and Christian morality above all, must reject in principles as in practice.

Among the number of measures that harm morality is "racism", already alluded to, *eugenics sterilization* . Our predecessor Pius XI and We ourselves have been forced to declare contrary to the natural law not only the eugenics sterilization, but all direct sterilization of an innocent, definitive or temporary, man or woman. Our opposition to sterilization was and remains firm, because despite the end of "racism" has not stopped desiring and trying to suppress through sterilization a descendant charged with hereditary diseases.

Another way leads to the same end: the *prohibition of marriage* or its physical impossibility by the internment of those whose inheritance is tared, are equally rejectable. The objective pursued is good in itself, but the means of achieving it injures the personal right to contract and use of marriage. When the bearer of a hereditary tare is not fit to conduct himself humanely or, consequently, to marry, or when he later becomes unable to claim for a free act the right acquired by a valid marriage, he may be prevented from licit way to procreate a new being. Apart from these cases, the prohibition of marriage and matrimonial relations for biological, genetic and eugenic reasons is an injustice, irrespective of the one that imposes such a prohibition; that is, either an individual or the public authorities.

There is certainly the right and, in most cases, the duty to warn those who are really bearers of a very tared inheritance, the burden they can make to gravitate on themselves, on their spouse and on their offspring; This burden can become intolerable. But to discourage is not to prohibit. There may be other reasons, especially moral and personal ones, of such a kind, which authorize the contracting and use of marriage even in the aforementioned circumstances.

To justify direct eugenics sterilization or the alternative of admission, it is intended that the right to marriage and the acts it implies is not violated by sterilization, even prenuptial, total and certainly definitive. This attempt at justification is doomed to failure. If for a sane spirit the fact in question is doubtful, the inability to marry is equally dubious, and it is then time to apply the principle that the right to marry persists while the opposite is not proven with certainty. So, then, in this case, marriage must be allowed; but the question of its objective validity remains open. If, on the other hand, there is no doubt about the mentioned fact of sterilization, it is premature to affirm that the right to marriage does not remain, despite this,

We can speak of other erroneous attempts to avoid hereditary defects and that the cited text calls "preventive means and abortive practices". These are not to enter into the problem of eugenic indications, because they are in themselves rejectables.

Here, gentlemen, what we wanted to say.

The practical principles pursued by genetics are noble, worthy of being recognized and encouraged. For the appreciation of the means destined to obtain these ends, the knowledge, always conscious, of the fundamental difference between the vegetable world, and the animal, on the one hand, and man, on the other, is essential. In that, the means to improve the species and the races are at your entire disposal. In this, on the contrary, in the world of man, we are always before personal beings, before intangible facts, before individuals who, for their part, are bound by inflexible moral standards when exercising their aptitude to procreate. Thus, the Creator Himself has established in the moral realm barriers that no human power can surpass.

I hope your science can find in public morality and social order a firm support when it comes to the marriage of healthy and normal men and married life to be able in general to develop easily and freely according to the laws that the Creator himself has written in the heart of man and which He has confirmed by his Revelation. No doubt you will find in it the most precious help for your efforts, in behalf of which and on which we desire and invoke the most abundant blessings of God.

* AAS 45 (1953) 596-607.

[1] November 30, AAS 33 (1941) 506.

[2] AAS 42 (1950) 575 s.