Twins and Science

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That personage on horseback dominating the piazza of the Capitol, were he alive and not a bronze statue, would I think be very happy about this Symposium now opening.

I may even imagine that Marcus Aurelius would leave his role of sceptical emperor-philosopher to assume that of *paterfamilias*, smiling benignly upon us all, as he was the father of twins: Commodus, emperor after him, and Antonius Geminus.

He had a special medal struck, when these twins were born to him by Faustina, bearing her image and that of Juno Lucina, goddess of fertility. He then had six children, and Faustina was to bear him seven more — quite a large family, as is often the case when there are twins.

Yes, I am sure that Marcus Aurelius would rejoice at the opening today in Rome of this first Symposium of twin researchers, their object being not only to know twin better, but also to assist them, and because the Symposium is the first, the beginning, we hope, of a series of many more most fruitful ones.

We are honoured and happy, my lord Mayor, that Rome should welcome us in these historic precincts, auguring so much. I therefore wish to express our sincere gratitude to you, and also to the Minister of Education for his presence here.

And as president of the Organizing Committee of this Symposium I now ask leave to offer for your consideration, and in the official scientific language, some thoughts and reflections which I trust may bring home to all our guests something of the significance of this place, and of this occasion.

In such a place, and on such an occasion, you might be expecting me to say something about Romulus and Remus, Rome's twin founders, or about the three Horatii twins, or the Alban Curiatii, to whom a hall here in the Capitol is dedicated.

But no, it is Faustulus I want to say a word about — Faustulus the shepherd, who took and saved from death the twins Romulus and Remus whom he found being suckled by a she-wolf on the banks of the Tiber where they had been exposed by order of the King (because born of the Vestal Rea Silvia), somewhat as Moses had been laid on the brink of the Nile, to escape death from the Egyptian King, and was saved by Pharaoh's daughter.

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Moses was not a twin, as Romulus and Remus. We, then, whose job is with twins, could not claim Pharaoh's daughter for our representative — just as well, perhaps, in days of democratic welfare planning — but we might claim the simple shepherd Faustulus.

Faustulus was not a Roman — Rome had not yet been founded. Let us say he was a kind of universal person who could well represent those caring for twins all over the world...

In expressing my gratitude to each of you for your presence here, I give you my most cordial greetings, in the name of the Mendel Institute of Medical Genetics and Twin Science.

The Tiber still flows today. But it is not to this tawny river flowing through Rome that I refer. I mean another river impetuously coursing through the modern city and conditioning it so much that our very lives depend, in many ways, on it: I mean the river of Science.

And today it happens that, on the banks of this river, too, twins are found. They are not abandoned as were Moses, Romulus and Remus, except in the sense that modern society does not consider them as messengers of scientific knowledge, and treats them without understanding their twin state. At the most, it considers them with benevolence, as a curiosity which makes news with public opinion.

It is up to us, then, to point out the message twins can bring to scientists, to establish its full value and usefulness.

It seems to me that the way in which twins are linked to science is above all by drawing genetics nearer to other sciences concerning man. In a few decades, genetics has made giant strides and today has become the pylon carrying every line of knowledge concerning life.

But genetics has not forgotten that it was born of Mendel's precise hybridations which not only served to establish certain laws, but also to stress the experimental crossing method.

I wish to emphasize that, from then until today, hybridation has been the high road for every geneticist, the arithmetical proof of nine for every genetical idea, the method which is essential and sure.

But, with man, crossing is far from corresponding to the conditions which make experimental crossing unexceptionable, beginning with the conditions of " pure lines ".

Furthermore, with the human species, crossing bears its fruit with extreme slowness and little frequency.

Genealogical study of families, as far as it can, takes the place of experimental crossing, but it is directed to the interpretation of what happens by chance and serves, above all, clinical ends.

The utility of crossing between cosmonauts has been spoken of today. It is sufficient to advance such a project to discover the extreme difficulties now presented by human crossing, owing to ethical properties honouring the human species, and because of experimental difficulties based on the scarcity of observable cases.

Thus we see today a notable gap between genetics and medicine — gap which medical genetics is trying to bridge, but with scant success, insofar as the training and practice of modern physicians are concerned.

It is logical, and interesting, that genetics should know all, or almost all, about *Pisum sativum*, *Drosophila melanogaster*, *Escherichia coli* and *Fagus* λ, but sad that genetics knows little about human immunity, tumours, sensitivity to drugs, human intelligence and so on. Well, twins can span the experimental scientific distance between the two banks of modern science: genetics and medicine.

If we have progressed in the fields of plant and animal genetics, whilst not knowing how to map out all forty-six human chromosomes, the reason is that we cannot there make use of experimental crossing as we are able to, on the other hand, with plants and animals.

Livy recounts how the survivor of the Horatii twin brothers, knowing that he could not conquer the Curiatii together, had recourse to the stratagem of separating them by means of a race. The ruse succeeded, and he won.

Analogously, human genetics can overcome the obstacle of experimental crossing through a stratagem: twin method.

All the problems of fundamental genetics can be experimentally tackled and resolved, apart from experimental crossing, by using the twin test.

The problems of population genetics can actually be tackled with greater advantage by twin method, since increasing exogamy and the impact of physico-chemical influences of life today augment normal and morbous variability, and diminish the value of the census of singletons.

At the 1966 Geneva meeting, the World Health Organization dealt with twin method. Also at this Rome Symposium several researchers will be dealing with problems of this method, a very important one in view of submitting man to experimental genetics.

The bridge which twin science builds between genetics and medicine is not only solid, but also an attractive one. In twin pathology there is a paradoxical aspect inviting knowledge of genetics. This paradox consists in the fact that twins seem to contradict a fundamental dictum of medical teaching enunciated about four hundred years ago by Ambroise Paré: « *Il n'y a pas des maladies, mais des malades* ». The good doctor repeats this aphorism today.

But when the physician finds himself confronted with a concordant disease of monozygotic cotwins, presenting symptoms identical as to quality, quantity and chronology, he is induced to think that in this case the disease is no abstraction. Then the physician asks how this total and minute concordance comes about, and the answer connot but lead him to genetics; which makes him realize the determining part played by heredity in pathology. What two hundred and thirty-nine cases of a disease have not been able to do, because similar but not identical, the two hundred and fortieth can, this being the statistical frequency of a hereditary disease striking a monozygotic couple.

This phenomenon of the most minute repetition of the genotype in monozygotic

twins concerns each gene, that is, it happens about sixty thousand times in each cell. In the adult it is therefore repeated a milliard milliard milliard times.

This number increases enormously if we reflect that the perennial cells are few, whilst all the rest are in a potential state of *clone*, which can indefinitely repeat the miracle of gene concordance.

If then we consider that the concordance is not only structural but also functional, because it concerns the gene silent or acting, we realize how inconceivably great the phenomenon of monozygotic isogenism is, and how distant from the casual event. The monozygotic couple is truly a marvellous gem which we have in our hands once in every two hundred and forty births. Science must realize this with greater attention and expectancy than in the past.

There is another way in which twins can engage science, representing, as they do, a human society of an altogether exceptional nature — a society in which there are only two; but it is not only a question of number, for psychology has knowledge of another such society, that of husband and wife. The exceptionality of the twin society consists in the absolute parity based also on the equivalence of the hereditary factors controlling the psyche. What these factors are, and how they act, genetics does not know and psychiatry ignores. It is what the Germans call a *Zwischenland.*

But until now any meeting-point on this land has been rare, for, impeded by the limits of their own scientific competence, neither geneticists nor psychologists have gone to the bottom of this question, in which the contribution of twin material would be of exceptional value.

There are some such strong concordant facts as to make one think that heredity, that is, the nonfree component, may perhaps be the determining one in cases of suicide. For example, the case of the sixty-five-year-old twin brothers, who last year in Florence committed suicide in exactly the same way and at exactly the same moment by throwing themselves into the Arno.

Another case is the one recently made known of a pregnant female twin and of her twin sister, not pregnant, feeling the pains of pregnancy; and of female twins in different places having the same dreams. Or, vice versa, the choice of different ways of life made by monozygotic twin brothers; for example, one a priest, the other an engineer with wife and children.

Cases such as these would suggest that psychology ought to be revised making use of the resolvent of the twin test. A study seems opportune of the subconscious hierarchy of tasks of the cotwin society, that is, the distribution of the functions of Twin-leader, Twin-Foreign Affairs Minister, Twin-conscience (suggester of moral decisions). These different tasks in isogenic subjects are indicators whereby the free and responsible component of the human psyche may be sought.

Finally, science can and must see to it that justice be rendered to twin man. It is rather strange that the present-day law-maker has not yet realized two incontrovertible facts: first, that the twin is born with an average weight less than one third that of the single-born; second, that the birth of twins is, as a rule, characteristic of the large

family, occurring often with women of a certain age having already given birth to a number of children.

In terms of social welfare, this means a greater need for regard and care on the part of the community. It therefore seems the duty of the demographic and medical experts to require the legislative and executive powers to recognize special assistance for twins during their first years, and for their families.

Again, owing to the difficulties often encountered by twin families on account of choice of clothing, schooling, medical treatment, recreation, occupation and so on, help should be afforded them through the setting up of appropriate consulting-rooms and surgeries. Such a work of social welfare has been part of the life of the Mendel Institute for the last 15 years and has formed around it a large family that today comprises 13 000 Italian twin couples and their families. Our experience has shown that twins are not only most sympathetic persons, but that they also have, as a rule, higher social standards than the single-born, and show themselves less egoistic, being from babyhood not alone, but two.

I cannot avoid a further observation, documented by means of an enquiry of ours, and that is, that treatment of sterility with *gonadotropins*, and control of fertility with *progestins*, may be a cause of inducing twin birth, nonexistent up to a little time ago.

In conclusion, let me emphasize that our task is not only one of studying twins, but also of helping them. And there are some 70 millions in the world.

Here in Rome, the monuments to the mythological twins Castor and Pollux record the twins of all the world and of all time.

There is a monument to these twins here in the Capitol; but the finest statues, of pure Greek art, the work of Phidias, stand before the Quirinal. At the foot of an obelisk, Castor and Pollux are driving the horses of the sun towards the future—auguring a finer civilization that is worthier of a better and nobler mankind.