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CH. S. MYERS

SOME PSYCHOLOGICAL ASPECTS OF HEREDITY

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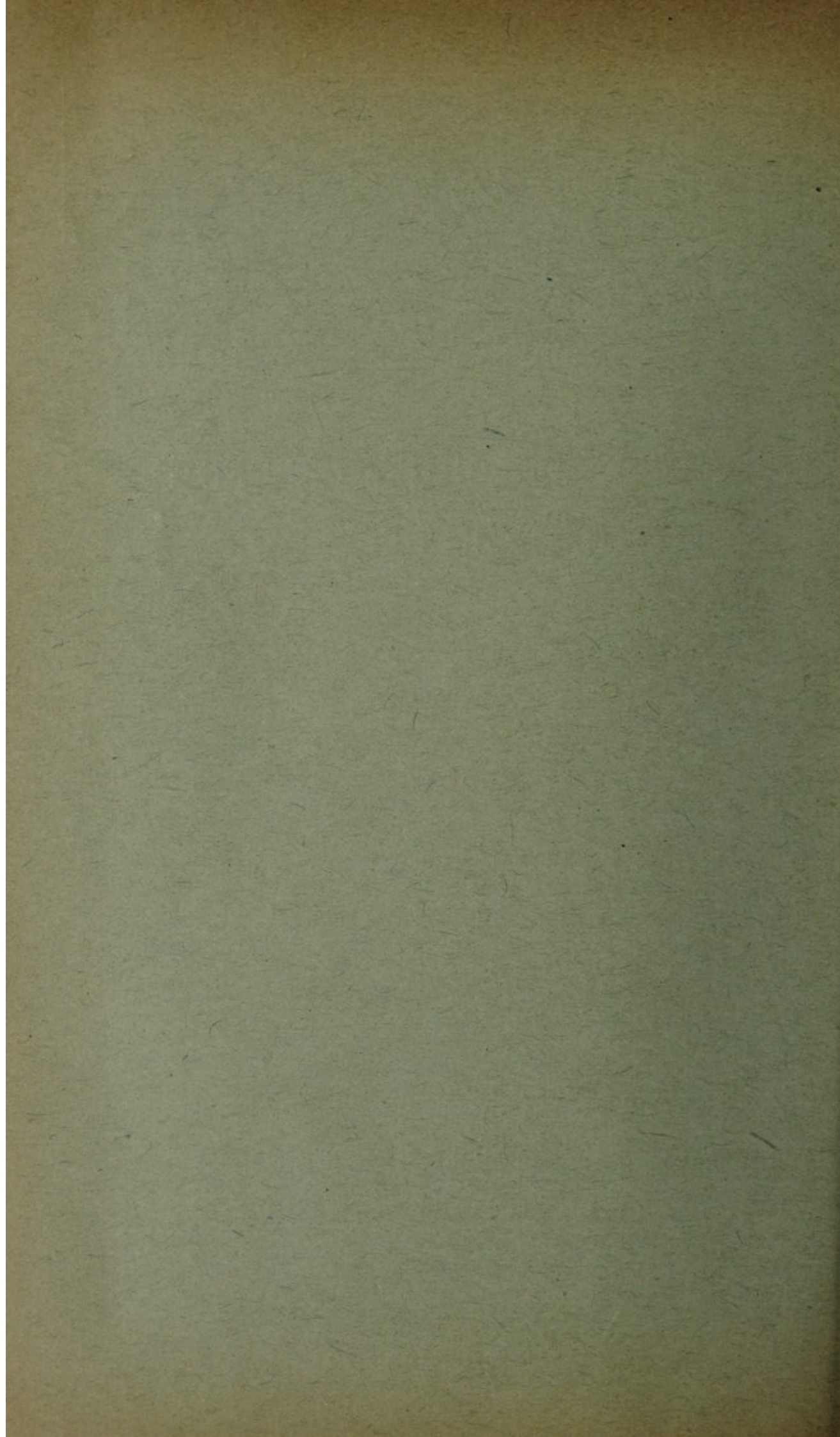
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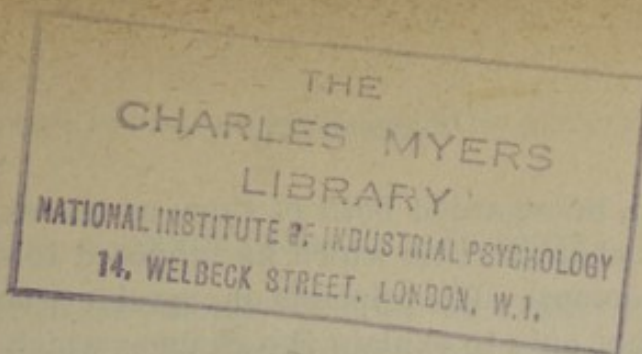
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SOME PSYCHOLOGICAL ASPECTS OF HEREDITY

Probably every science can gain by taking into consideration the guiding principles and the standpoints of other sciences. Genetics, the young science of heredity, has regarded its subject alternatively from two theoretical aspects, — the «physical» and the «psychological».

According to the «physical» view, as developed by Mendel and more especially by his successors, definite units of inheritance exist which correspond to definite units of structures or function; these units being separately localisable in different regions (in different chromosomes, even in specified positions within one and the same chromosome) within the germ cells. Such localisation seems analogous to the manner in which certain conscious processes have commonly (but, as I shall later indicate, erroneously) been supposed to be definitely localisable in different parts of the cerebral hemispheres.

From quite another point of view, evolution of the species has been likened to the various systems and schemata of purposive experience and behaviour within the organism (regarded as an undivided individual), and to the superposition and reciprocal modification of these systems and schemata, one level above another. The adoption of some such «psychological» standpoint as this has resulted in vague analogies being drawn (by Hering, Semon and others) between heredity and memory, — as if we knew a great deal about memory which would throw light on the nature of heredity.

In this connexion Rignano's attitude was distinctive.¹ For he did not seek to explain heredity in precise terms of me-

¹ Cfr. his *Inheritance of Acquired Characters*, Eng. trans., Chicago, 1911, pp. 316-400; and his «Biological Memory», Eng. trans., chap. IV.

mory. Instead, he regarded both of them as the expression of a more general characteristic which he supposed to underlie all biological phenomena. His principle of « specific accumulation » was employed not only to explain the changes which take place in nervous matter when an experience occurs and passes away and which form the basis of its revival in memory; according to Rignano, the same principle is also concerned in the evolution of species.

Nevertheless the fact must be faced that, however valuable such a principle may be, it is a pure hypothesis. For we have no actual knowledge of the nature of memory or of « specific accumulation ». Neither the microscope nor the galvanometer is able to inform us what changes in the central nervous system take place when an experience comes and goes, leaving behind it some trace which is responsible for its revival as a memory. In ignorance of their nature, we can usefully speak of these traces as « dispositions », and we may term them « mental » or « neural », according as we are considering them from the psychological or from the physiological point of view.

Memories are often spoken of as *acquired* habits. In this connexion, inherited functions and structures are generally considered as if they were *congenital* habits, by those who seek to explain heredity in terms of memory. This analogy between memory and heredity favours the Lamarckian teaching that acquired dispositions may be inherited. Rignano's hypothesis of « specific accumulation » (coupled with his hypothesis of ontogenesis as a « centro-epigenetic » process) likewise favours the Lamarckian view. Yet the actual evidence in favour of the inheritance of acquired characters, suggestive and attractive though it is, cannot be accepted without reserve. Again then, we tread uncertain ground when we liken heredity to memory and attempt to draw deductions from the supposed analogy.

My contention is that other, more valuable, considerations may be brought to bear upon the problems of genetics from the psychological standpoint; and that the final solution of the nature of heredity lies in a combination of *both* standpoints, the physical and the psychological, — the former concerned with the formation and kaleidoscopic mechanism of a mosaic of specialised units, the latter expressing the more general purposive activities of the individual organism.

MECHANISM AND PURPOSE.

The physical standpoint must naturally be confined to a purely mechanistic explanation. But this can only be *one* aspect of the entire truth. What is found in mind must also occur throughout life. Where blind mechanism occurs in mind, it is only a part of the whole, — an abstraction from the whole. Even reflex action is coming to be regarded as a lower-level mechanism whose originally purposive characters have been « distilled », as it were, into the higher controlling levels of the central nervous system. The mechanical is overwatched by orderly, purposive direction not only in the perpetuation, but also in the creation of the new. We cannot explain the appearance of instincts, we cannot imagine how the unconsciously inspired flights of genius can prove effective, without involving the guidance of some purposeful *quasi*-intelligent activity. The origin of the new, — whether it occurs unconsciously or consciously in the mental life of the individual or in the bodily or mental evolution of its species, — is not comparable to the acts of a lunatic firing off purely haphazard shots until he hits his mark.

We may accept this notion of « purpose » without professing any clear knowledge as to its nature. In regard to its biological applications, — its applications to the problem of heredity as we see it under natural, not merely under experimental, conditions, — we seem justified in assuming some such attitude as this. We may admit the inadequacy of the notion of « chance variations »; but we are not bound therefore to accept the Lamarckian view that in its struggle for existence the organism expressly strives to bring about certain changes in its structure or functions, which, after generations of such striving, are ultimately transmitted by heredity. In other words, we conclude that, in some or other form, purposive direction, as well as blind mechanism, is operative in the living world, influencing the phenomena of heredity.

LOCALISATION.

Because a certain area of the cerebral hemispheres must be intact in order that a certain kind of consciousness may occur, it does not follow that that area is the *seat* of that kind of consciousness. We are only justified in concluding that a neces-

sary *condition* for a special kind of consciousness to appear is that the corresponding nervous processes must pass through a special area of the cortex. The localisation in chromosomes of inherited qualities may have merely a similar implication.

In view of the juxtaposition and the crossing over of different chromosomes which various biologists claim to have observed, there is of course a strong temptation to localise various «genes», or inherited units, in different chromosomes, or in different places or loci within one and the same chromosome. But the temptation may not be justified; the *condition* for the appearance of any given phenomenon is not necessarily equivalent to its *seat*. Alike in genetic and in mental behaviour, the influence of the whole may need to be taken into account. The basis of heredity may be more akin to what we know of mind than to matter; in the functioning of the whole and the interrelation between parts, general orderliness and direction seem at least as important as a narrow material localisation. It may be in the persistence of these powers, rather than in the literal persistence of identical molecules of substance, that the so-called «immortality» of germ plasm consists.

THE PART AND THE WHOLE.

Here enters an important difference of attitude between the physicist and the psychologist. The physicist has been too often content with the analysis of a complex body into elementary ones. The psychologist, more frequently and more explicitly than the physicist, realises that identical elements, e. g. the same notes of a melody, may be differently combined to yield quite a different whole, or melody; he also realises that the same whole, or melody, may be evoked from a set of quite different elements, or notes, by transposing it into another key. But the psychologist goes even beyond the conception (now becoming more generally recognised by the physicist) that the properties of a whole depend on the *kind* of combination of the parts. The psychologist insists that in the living mind the parts are themselves altered by separation from the whole, and that within it they depend for their characters on *inter-relation* between the parts of the system to which they belong, and even more generally on the *configuration* of systems of wider and wider complexity. Thus «formal», as well as «material», bases of here-

dity must be — as indeed they are being — taken into consideration. The « dominance » of an inherited character, for instance, is becoming recognised as a feature not absolute, but dependent on the other characters with which it is associated; under appropriate conditions that character may become « recessive ».

THE ORIGIN OF THE SIMPLE.

The complex may be derived from a synthesis of elements. But still more important in organic evolution is the derivation of clearly-cut elements from analysis of a pre-existent, vaguer, more generalised, « complex ». Modern psychology insists that the first fruits of experience are not sensations, but the awareness of situations and the perception of objects; and that from these vague, generalised « complexes » arise, by the increasing differentiations of later experience, the « pure sensations » of light, colour, sound, touch, etc. It is interesting to note that precisely the same standpoint was adopted by the famous geneticist, William Bateson. He suggested¹ that the simpler units of heredity may have been differentiated from earlier, more lowly, more generalised, more complex units.

CONGRUITY.

Wherever there would otherwise occur incompatible, antagonistic mental processes, inhibition steps in and tends to repress one of them. For example, the appearance in consciousness of any idea depends largely on its congruity with the total mental « attitude » of the moment. Again, the revival of a forgotten idea may be impossible owing to the unfavourable « constellation » which obtains at the moment. Such lack of congruity between different systems, or between any given process and the whole of which it forms a part, is a notion employable in the problems of heredity.²

NATURE OF INHIBITION.

The study of mental processes combats the view that inhibition is merely equivalent to diminution or absence of excita-

¹ In his Presidential Address to the « British Association for the Advancement of Science », Australia, 1914. See *Report*, pp. 17-18.

² Cfr. also RIGNANO, *op. cit.*, pp. 98 et seq.

tion, or that it arises from the excessive drainage of available « energy » into other channels. Inhibition in a given area or of a given act is as active a process as its opposite, — facilitation. The former is not the mere negation of the latter. It is not a matter of absence or presence of one and the same process, x . It is not a matter of *zero* or x , but of y or x , — the presence of one process or state, or the presence of another process or state antagonistic to it.

This standpoint is closely related to a hypothesis proposed by the two geneticists, Correns and Bateson, to account for the phenomena observed in certain experiments, in heredity, e. g. the relations between the inheritance of the walnut-comb, rose-comb, pea-comb and single-comb in the domestic fowl, when rose-comb is crossed with pea-comb.¹ Their explanation of the facts is that here we have to deal with two different states of one and the same factor. They believe that all combs are fundamentally single-combs, that one state of the rose-comb factor transforms the single-comb into a rose-comb, while in the other state of the same factor such change is prevented. So, too, they believe that single-combs become pea-combs or remain as single-combs according to the one or other state of the pea-comb factor. When both pea-comb factor and rose-comb factor concur, the result is a walnut-comb. In their absence this comb is single.

In other words, we have here to deal with a « presence » state and an « absence » state, — each of which behaves as a separate genetic unit. It is of no little interest to find the trend of psychological considerations so clearly reflected in quite another biological field, — that of genetics.

INHERITANCE VERSUS MANIFESTATION OF INHERITANCE.

During the development, and indeed throughout the life, of the individual, well-marked changes may occur in its personality or in one or more of the mental characters which go to compose that personality.

A well-known case, described by Binet, is on record. — The experiments which he conducted on his two daughters, aged 14½ and 13, established striking mental differences between

¹ A full description of the facts is given in *Animal Genetics* by F. A. E. CREW, Edinburgh and London, 1925, pp. 45-48.

them. When somewhat later he re-examined one of them, he obtained results quite different from those which were revealed by his original examination. The whole mental make-up of the child had changed; when confronted with her previous results, she observed — « Maintenant je n'aime pas mettre des choses comme ça, ça me paraît bête! ». ¹

No one who has closely observed the mental development of children will be surprised at this result. Some persons reveal certain adult characters even in infancy, but this is by no means true for all persons or for all characteristics. A reversal or change in mental characters is by no means uncommon in the course of development.

Under psycho-pathological conditions, sometimes the entire mental make-up of the adult individual suddenly undergoes a complete change, as in cases of multiple personality.

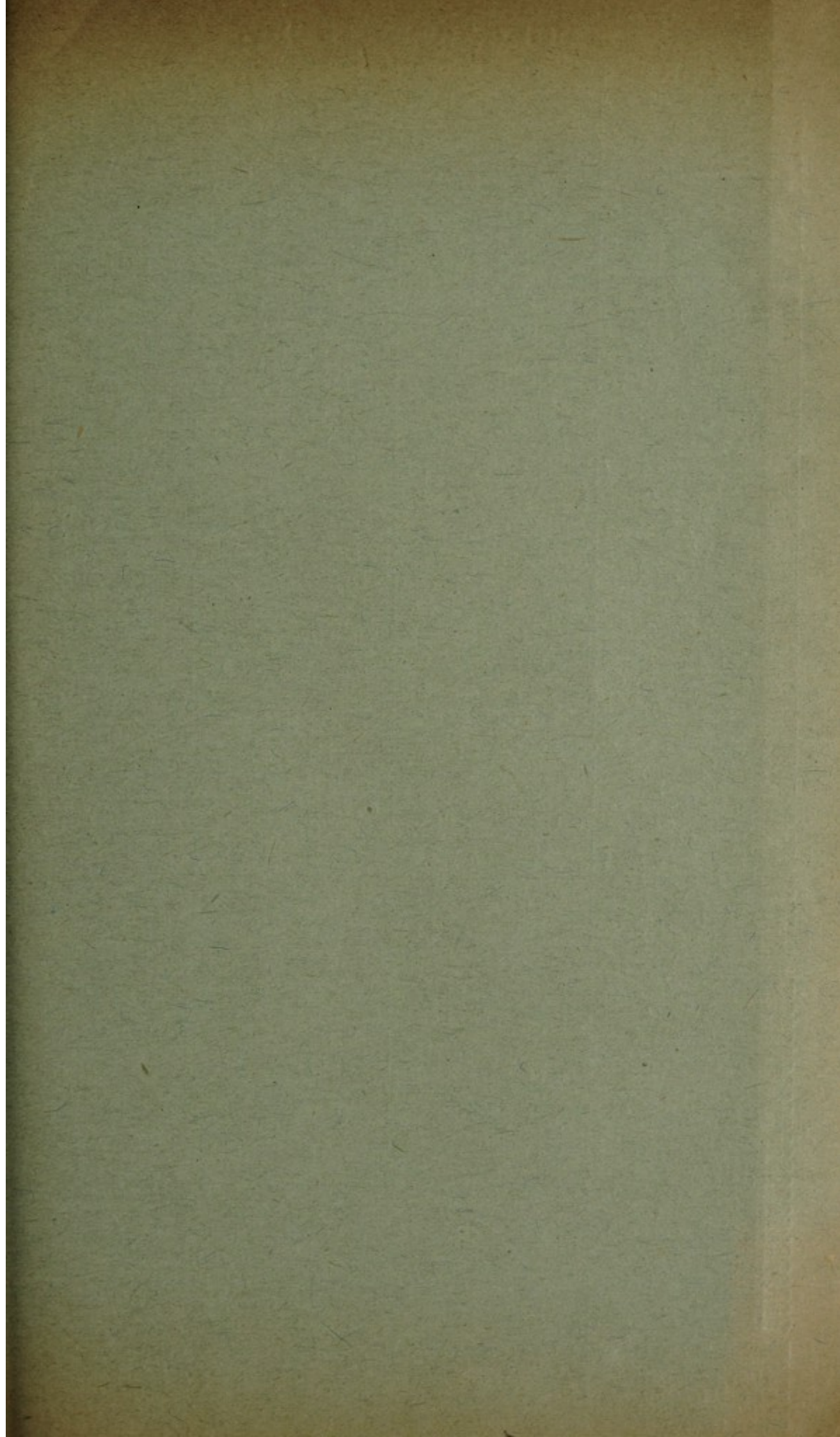
These phenomena, when considered from the standpoint of heredity, suggest that the individual may inherit a vast number of mutually antagonistic potentialities or *possible* characters, much vaster than is generally supposed, and that the characters which *actually* appear in the course of the life of the individual depend on what I have in this paper termed « internal configuration » or « constellation », as well as, of course, on such external influences as education and harmonic and other environment.

I am unaware how far these and other notions which I have advanced in this article may be acceptable to the geneticist. But I believe that the suggestions and analogies which they offer are at least deserving of consideration.

London, National Institute of Industrial Psychology.

CHARLES S. MYERS

¹ *L'étude expérimentale de l'intelligence*, Paris, 1903.



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