The ductless glands as a factor in the production of racial differences / by Antonio M. Crispin.

[Reprinted from
MONTHLY CYCLOPEDIA AND MEDICAL BULLETIN
October 1912.]

7.

THE DUCTLESS GLANDS AS A FACTOR IN THE PRODUCTION OF RACIAL DIFFERENCES.

BY ANTONIO M. CRISPIN, M.D.,
NEW YORK, N. Y.

THE rôle which environment, especially climatic and geological influences, has played in the production and differentiation of races must be admitted by all, but the *modus operandi* is still a question for speculation.

There is no doubt that geographical and geological conditions are potent factors in this connection, and that there is an interplay of forces forming the basis of selection, such as climate, soil, warmth and cold, quantity of sunlight, altitude and latitude, abundance or scarcity of food, degree of civilization, etc., all of which have exerted a decided influence in differentiating one people from another, or in emphasizing their ethnic differences. Yet, profound as these influences are, they are only secondary causes. The mutations which a race undergoes are essentially of a physiological nature. Thus, when the Aryans descended to the enervating lowlands of tropical India, and in that debilitating climate lost the qualities which first gave them supremacy, the change which they underwent was principally a physiological one.

This naturally raises the question of man's adaptability to his environment, and the mechanism by which it is accomplished. To understand this action fully it is necessary to take a glimpse at present biological teachings, which obviously lead us to the closely allied question, the origin of species. Especially is this necessary today, when much confusion has been wrought through the widespread influences of the fashionable theories of Weismann, as a consequence of which the Lamarck-Darwinian doctrine has fallen into undeserved discredit.

It has become a debated point whether evolution comes from within or from without, and this through a misinterpretation of the teachings of Lamarck and Darwin. It appears to me that these two pioneers agree in the essential points advanced. Darwin accepts the Lamarckian principle in its widest sense, stating that variations which are transmitted to the offspring are probably produced by the environment. This principle regards all reactions of the body to environmental factors as variations. Lamarck taught that changes in the environment were the direct cause of variation, and, in the formulation of his second law, lays particular stress on the production of new organs in the animal body by the supervention of a new want (besoin), *i.e.*,

through changes in the habits of the animal due to appetence or longing, there occurred a tendency to variation and the formation of new organs.

Darwin believed that within the great process of evolution there are two distinct changes, one the *transformation of species,* that is, the change of one existing form of life into *one* other one, and the other, the *differentiation of species,* that is, the division of one existing form into *two or more* other ones. For the first process, the transformation of species, three factors are necessary: variation, inheritance, and natural selection. In the second process the new species originate "if they are enabled to seize on many and widely diversified places in the polity of nature"; "if they become fitted for . . . different habits of life or conditions."

From this it will be observed that Darwin is in complete accord with Lamarck, and that the new school, which owes its existence to Weismann and the experimental researches of Roux in morphology and physiology, has taken sides without warrant in producing the "vitalism" of von Hartmann, a theory which denies that the vital phenomena can be described or explained in "merely mechanistic terms." After asserting that the mechanistic explanation of life is untenable, the adherents of this view endeavor to describe the nature of the process in two ways, some sustaining a psychological vitalism (or biological animism) and the others a non-psychological vitalism.

Psychological vitalism has, nevertheless, intensified the Lamarckian doctrine, finding in the phenomena of consciousness, especially in the immediately felt inner nature of simple awareness, desire and aversion, some clue to the sort of causal process which must be assumed to account for the peculiar form and adaptiveness of living things, as well as their functioning.

But this is an objectionable separation. The Darwinian principle accepts both sides, recognizing mechanism on one side, and, on the other, sensation, feeling, memory, and volition. Lamarck, to account for the phenomena of adaptation, invokes use and disuse, effort and habit, and considers their effect as directly adaptive and hereditary, thus explaining the evolution of organs necessary for life in certain surroundings and the regression of those that are useless under the particular environmental conditions existing. Whichever doctrine is accepted, one thing is certain, viz., that the mutations observable in man can only be explained by changes in the germ through the influence of the environment, taken together, not singly, and accomplished by slow variation. To effect this adaptability is necessary, and adaptability is that induction of biology by which organisms fit themselves to their surroundings, and is the deciding factor in the origin of species. It is the necessary consequence of the surviving ability of the species, and the species which does not adapt itself to the environment perishes. The first requirement is that the species must become *fitted* for the different habits of life and conditions.

How do species become so fitted?

The key to the solution of this problem, I think, will be found in the rôle played by the ductless glands, which by virtue of their internal secretions are at the foundation of the phenomena of adaptability and development.

It is almost certain that climatic conditions, such as warmth, moisture, elevation, etc., exert a specific action on the activity of one or other of these glands. Owing to the accelerative functions of these organs, they constitute the most important factor in fitting the individual for different habits of life and conditions and thereby in the production of the different races. We know today, thanks to surgical and experimental methods and the labors of Sajous, that the thyroids, suprarenal capsules, and hypophysis are organs of immense importance to the organism, and that they play an important part in the regulation and maintenance of life.

Thus we find that absence of the thyroid in children causes arrest of growth and cretinism, and absence of the same organ in the adult, either as a result of surgical intervention or through lesion of the gland, produces the disease known as myxedema. In animals complete removal of the thyroid results in death. While removal of the parathyroid causes tetanic symptoms, there seems to be a functional antagonism between the thyroids and parathyroids.

The pituitary body seems to be in some way connected with the growth of the body, and to perform an important function in the organism. In 1886 P. Marie found that tumors of the hypophysis were associated with certain striking symptoms, such as overgrowth of certain parts of the skeleton, especially the extremities and jaws, and unusual stature or gigantism, the whole constituting a condition which he called "acromegaly."

Certain glands of internal secretion supply the organism with a peculiar substance which, upon gaining access to the blood, neutralizes certain poisons or specific substances which accumulate therein. A fact of no less importance is the correlation existing between them; they interact, and thus profoundly affect metabolism in its various phases.

The environment, by virtue of its action on these glands, would tend either to accelerate or retard their functions. It is probable that in certain localities the conditions are such that the thyroids, adrenals, and hypophysis are excited to greater activity, the metabolism of proteins being thereby increased, as has been demonstrated experimentally by injecting extracts of these organs or interfering with their functions. The hypophysis exerts the most marked effects in this respect, while the adrenals mobilize the carbohydrates and the thyroids increase the destruction of fats.

The influence of other localities would, on the contrary, be inhibitive, the conditions being such as to fail to stimulate the glands referred to or stimulate other glands the functions of which are known to be retardative, *e.g.*, the pancreas and parathyroids. It is an established fact, we may add, that the pancreas retards protein destruction and decreases fat consumption, while the parathyroids restrain the mobilization of carbohydrates.

The influence of these glands on mineral metabolism is equally remarkable. It has been shown that thyroid feeding increases the output of phosphates through the intestines, while hypophysis feeding leads to a decrease of phosphates.

It is also a well-established fact that these glands exert a powerful influence on the nervous system, especially the thyroids and parathyroids, although their actions are different. Removal of the parathyroids increases galvanic irritability. This may be explained by the loss of calcium, as calcium decreases the irritability of the cerebrospinal axis.

Other glands and organs possess the power of influencing the body through the agency of an internal secretion, *e.g.*, the testicles and ovaries. The dependence of the secondary sexual characters on the internal secretions of these organs is a well-established fact.

Another interesting point, but little understood, is the mutual relation of these various internal secretions, *e.g.*, the relation of the hypophysis to the secretion of the thyroids or to that of the essential sexual organs, or the mutual relation of the internal secretions of the pancreas, adrenals, and thyroids, which constitutes an unsolved problem.

These ductless glands discharge into the circulation specific hormones, and probably play an important rôle in the production of immunity.

Caution is, of course, needed in interpreting these interesting phenomena, but when we consider the functions of these glands, and their vital importance to the organism, we cannot but be impressed by their apparent value in the determination of adaptability and consequently in the production of the different races of mankind.

Excessive pigmentation may be due to altered activity of the adrenal glands; of this we have sufficient evidence in the pathology of Addison's disease. May it not be that an excess of sunlight, combined with the well-known effect of altitude, has exerted a decided modifying action on the adrenal glands of the negroes? As regards the chemical power of light, advanced by von Schmaedel in 1895, it is held that the black pigment renders the skin of negroes insensitive to the luminous or actinic effects of solar radiation, which are far more destructive to living protoplasm than the mere calorific effects. Light tends to destroy any substance that absorbs it; man and animals develop therefore, when needed, a protective armor of pigment.

Altitude has operated in differentiating the inland people from those inhabiting the coast, and has exaggerated the ethnic peculiarities of given nations. The pigment of the skin tends, as a rule, to be lighter in the higher altitudes as well as in the higher latitudes. The influence of these two factors on the suprarenal bodies would appear to be the same.

In the case of the excessive pigmentation of the negro, we are told that his dark skin is associated with a dense cuticle, diminished perspiration, smaller chest volume, and less respiratory power, together with a lower temperature and more rapid pulse. Compare this with the symptoms observed in Addison's disease or when extracts of the adrenal gland have been administered medicinally or experimentally, and the similarity of action will be evident.

The effect of temperature is very marked not only on the body in general, but on the growth of the hair in particular. A low temperature is apt to result in the formation of a good protective coating, while a high temperature acts in the opposite way. High temperatures reflexly stimulate the adrenal

glands to produce an excess of pigment, while diminishing the capillary covering. Low temperatures have opposite effects. A glance at the distribution of races shows that the greater amount of pigment obtains in the tropics, and that as one advances northward the complexion gradually lightens, being dark brown in Egypt, light brown in north Africa, deep olive in the Mediterranean, olive in south Europe, brunette in central Europe—until one comes to what has been called the faded brunette, or blonde, of the north of Europe. Similar effects have been produced on the original inhabitants of our continent, the Indians, in whom different shades of coloring obtain according to the latitude.

Abundance or scarcity of food is a most prolific cause of variability through acceleration or retardation of the function of the glands in question. Certain kinds of food have in all probability a decided influence on their function; thus, oatmeal is said to be stimulating to the thyroid gland. In the light of this view, the production of a certain kind of food, characteristic of or more easily obtained than others in a given locality, is likely to influence the internal secretions of the inhabitants thereof, and, accordingly, to affect their development. The influence of food on the temperament of man occupied the attention of the earlier physiologists, who came to believe thoroughly in the different effects of various foods and condiments on the human organism. Liebig maintained that excess of meat eating made man more violent and even ferocious. At present physiologists are more concerned with the nutritive value of food, as measured by the number of calories yielded, than with its effect on any particular system of the body. Still, there is here an uncultivated field, a virgin soil, capable of generously repaying the investigator.

In reviewing literature we are confronted with the great diversity of opinion existing among the masters, and, although they all admit—Darwin, Nagelis, De Vries, Klebs, Bailey, and especially Ratzel—that environment exerts a marked effect upon the vegetable and animal organism, they do not make clear how these effects are produced. This has been due, in part, to the inherent difficulties of explaining the phenomena presenting themselves and the multifarious factors entering into the problem.

The question stands thus: How does the organism react to the environment? How does it adapt itself to new conditions? In this apparently mysterious process, it seems to me that the internal secretions play a preponderant rôle in that they permit the organism to adjust itself to external influences. The reaction of the ductless glands to these influences tends to produce variations, which are likely to be transmitted to succeeding generations. Such advantages as the organism may have acquired through the continued readjustment of the ductless glands result in the survival of the individuals best fitted. The influences exerted being dissimilar in different localities, differentiation occurs, and this is the explanation of the existing variety in races.