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BY

G. L. MAGRUDER, M.D.

DEAN, MEDICAL DEPARTMENT, GEORGETOWN UNIVERSITY, WASHINGTON, D. C.

AND

C. W. STILES, PH.D.

PROFESSOR OF MEDICAL ZOOLOGY, MEDICAL DEPARTMENT, GEORGETOWN UNIVERSITY, WASHINGTON, D. C.

Reprinted from the MEDICAL RECORD, *March* 10, 1894

NEW YORK
TROW DIRECTORY, PRINTING AND BOOKBINDING CO.
201–213 EAST TWELFTH STREET
1894

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AN EXTREME CASE OF LEUCODERMA IN A NEGRO, WITH A COMPARISON OF SIMILAR CONDITIONS IN VARIOUS ANIMALS.

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THOMAS CLEVELAND, the subject of this sketch, has changed from a dark black negro to a uniform white color over his entire body, with the exception of a few spots almost symmetrically distributed over his cheeks and ears, and along the median line of the forehead. There is not a spot of discoloration on any other portion of the body; the soles of the feet, the armpits, and the entire scalp are equally free from pigment. The borders of the patches of pigment that remain are characterized by well-defined concave edges, thus making the edges of the changed skin convex. There is no loss of pigment in the eyes; they still are dark. The photograph gives an excellent representation of his present condition.

He is now over sixty years of age, and has recently come to this city from Georgia. He has affidavits from a number of citizens of that State that he was a black man twenty-five years ago. After careful and patient questioning the following history was obtained: He was born near Washington, and went to Georgia in infancy; his parents were "slick black;" there is no trace of similar loss of pigment in any branch of his family, either before or since his birth, although there is a large number of

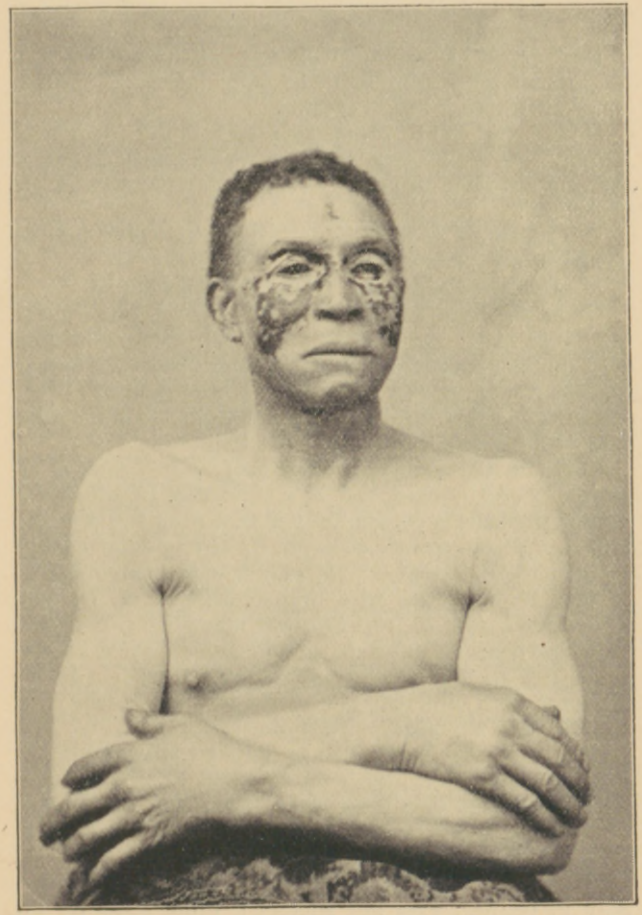
relatives, including brothers, sisters, nieces, and nephews; he is the father of two children, a daughter and a son; the daughter was born prematurely, about seven months, she was very dark, and died in the first year; the mother received an injury which seriously impaired her health; the son, about thirty years of age, is a stout, healthy man, "black as a crow," has been married twice, and has had black children by each wife.

Tom has always enjoyed exceptionally good health, and has only had some slight sickness in early childhood. At the age of thirteen he used to work in the field bareheaded, and then suffered from headaches, which disappeared as soon as he commenced to wear a straw hat; since then has always been healthy, never had syphilis, and has lived a very temperate life, neither smoking, chewing, nor drinking.

The first evidence of decoloration was a spot near the nipple, which appeared when he was about fifteen; he endeavored to remove it by the use of green walnut juice. The change was at first very slow and gradual. It had not reached his legs "before the war." Fifteen years ago the hands and face were still black, but since that time the progress has been much more rapid, especially the hands. Upon the body and the feet the process occurred in larger areas than on the face and hands, and the discoloration shaded from black to yellow, then to white. On the face and hands there was no shading. There was no difference as to the tactile sensibility of the two colors of skin. The white spots blistered more easily in the sun. The sweat-glands acted very freely, with the characteristic odor of the race.

The hair is still kinky, but has turned gray wherever present. There is a good growth upon the head, but sparse over the rest of the body. There is nothing in the history of this case that will give the slightest clew to the probable cause of this condition.

Upon consulting various works on dermatology and human pathology, it will be found that a certain number



of cases are included under the term "atrophic diseases." Although scarcely any two authors agree in their classification of these diseases, we need not enter into a discussion of their general arrangement here, as we are interested in the present paper only in those cases known as "albinism," "vitiligo," and "canities."

Under the term *leucopathia* (achromasia, pigment atrophy) we find cases cited in which the pigment of the skin atrophies or never develops, and these cases are classed as:

1. *Congenital leucopathia*, or albinism, which may be partial or complete; and,

2. *Acquired leucopathia*, vitiligo, or leucoderma.

Under the term *canities* we find included the whitening of the hair. As we wish to compare these conditions with similar conditions in other animals besides the human species, it may be well to give a very brief summary of the conditions as described in various text-books, at the same time citing some of the cases.

Albinism (congenital leucopathia). — 1. *Complete albinism* is usually described as a condition in which the normal pigment is congenitally absent from the skin and eyes, not accompanied, however, by any textural change of the parts in question. It may appear spontaneously, or may be hereditary to a limited degree; cf. Darwin, who cites a case of two brothers marrying two sisters, their first-cousins; no trace of albinism in their antecedents, but all seven children produced from this double marriage were albinos. Formerly it was claimed that albinos were necessarily weak in constitution, but this view is no longer held; hair is fine and silky, white, or slightly yellowish; eyes cannot stand a strong light. Earliest records of albinos came from the Portuguese, who found some "white negroes" (leucœthiopes) in West Africa. Cause unknown, no treatment.

2. *Partial albinism* differs from complete albinism only in degree; eyes not affected; white spots on the skin; hairs growing on these spots are colorless.

Leucoderma (vitiligo, acquired leucopathia) is described as a cutaneous disease in which the pigment of the skin atrophies to a greater or less degree after birth. The white spots generally appear between the ages of ten and thirty, although we find one case (Belcher, 1867) which commenced at five years of age; the patches are non-elevated and have a convex border, the concave border of the surrounding tissue generally being darker than the rest of the skin; in many cases (as in the one under discussion) there is a striking symmetry to be noticed in the appearance of the spots; in other cases the symmetry is more imaginary than real; while one case is recorded (A. Wood, 1871) in which the entire right side of the body turned white, while the left side remained brown. Leucoderma may be—

1. *Progressive*, the spots coalescing and extending slowly or rapidly over nearly the entire body: Bissell, 1817, case of an Indian of the Brotherton tribe, near Clinton, N. Y.; Hall, 1880, case of a negro; the present case, and many others. Or, after reaching a more or less advanced stage, it may remain

2. *Stationary*: a case of this kind is known to the writer. Or in some cases it may be

3. *Regressive*, cf. especially F. T. Wood, 1877, case of a negro, redeposit of pigment in same order in which it was absorbed. In cases of leucoderma the whitened portions of the skin seem to suffer more from intense heat than the darker portions, and Bissell records of his case that there was less perspiration from the white spots than from the dark skin, and that they healed with difficulty when cut.

Geographical and Racial Distribution.—Leucoderma is more common among the darker races than among the lighter ones. In America it is recorded from Canada to Panama, but is said to be much more common in Africa and India. According to Münch, the disease is endemic in Turkestan, where the natives call it Pjes, and believing it to be contagious, they isolate the patients

with the lepers. Probably, however, leucoderma in writings of the East is frequently confounded with *lepra maculosa* of the Jews (white Jewish leprosy).

Etiology.—It is quite generally admitted that leucoderma may be brought about in different ways, and T. F. Wood (1882) asks the very pertinent question, whether the cases recorded are examples of different diseases or different manifestations, varying degrees of a process which has a central origin elsewhere than in the skin. The cases thus far recorded may be classed as follows :

1. *Leucoderma syphiliticum*—(cf. Haslund, 1885, Raisz, 1884, Riehl, 1884, Szadek, 1885, Neisser, 1883, *et al.*). In these cases the condition has followed syphilis. A second class of cases may be included under the term :

2. *L. traumaticum.*—These cases, in which white spots follow burns, scalds, and other injuries, are well known to persons who live in districts where there are many negroes. The same condition is frequently found in horses, where the skin or hair may become white at places where pressure is exerted by the harness.

3. *L. parasiticum.*—Some authors state that leucoderma is parasitic in nature, and there would of course be nothing strange if we should find white spots following acariasis.

4. Leucoderma is also said to have followed convalescence from typhoid fever, there being an absorption and gradual redeposit of the pigment.

5. *L. nervosum.*—Cases of leucoderma are recorded as following a severe mental strain. The writer is acquainted with an exquisite case of this kind, in which the patches are small, symmetrical, and confined to the back of the hands.

5. *L. hereditarium.*—Cases are recorded in which heredity seems to have played something of a rôle, although in most cases there seems to be no trace of heredity. Brito (1885) cites the case of a lady in India in whom vitiligo manifested itself in early life, and the same condition appeared in her daughter, in whom it

spread much more rapidly. Brito, in writing on the subject of leucoderma in India, states that heredity appears to act as a strong factor, that the condition may be atavistic and may be found in collateral branches.

7. *L. spontaneum.* — Under this head we may include all those cases which appear spontaneously—by which we simply mean that we are unable to recognize the initial cause of the leucoderma. Authors generally dispose of these cases by saying that the change is dependent upon the nervous system, and in support of their view they quote the change of color in the chameleon and frog. Bissell (1817) remarks: "That it occurs in consequence of a deranged action in the vascular portion of the rete mucosum cannot be doubted." While Startin (1880) states that the cause of the disease seems to be due solely to deficiency of pigment matter in the skin, due to depressed innervation induced by intense cold or heat.

Canities is analogous to leucopathia, the only difference being that the situation of the former is in the hair, of the latter in the skin. It may occur with leucopathia, may be congenital or acquired, partial or complete, progressive or regressive, rapid or gradual in progress, frequently unilateral.

It might be well in this place to refer briefly to the physical phenomena concerned in the color of the skin and hair, and to the position and development of the substances with which this color is connected.

Absorption and Reflection of Rays of Light.—It is a generally accepted fact that the color of vertebrates, as well as invertebrates, is due for the most part to the presence of various quantities of definite pigments in the skin or its appendages. These pigments absorb certain rays of the white light and reflect the others, thus determining the color as it appears to us. If all the rays are absorbed so that none are reflected, the object appears black; if all the rays except the yellow are absorbed, the object appears yellow, etc. It has, however, been shown

that other matters besides the mere color of the pigment —such, for instance, as the structure of the feathers in birds—come into play in determining the color of an animal, so that the same pigment need not necessarily give to two different animals exactly the same color; and it is also known that when two animals have the same color, the latter may be produced by two different pigments. A most striking example of this kind is the green in the turacou and the green in the parrot. In the former animal this color is due to a pigment known as turacoverdin, while in the parrot "the actual pigment is yellow." Although Gaskell claims that a white pigment is found in the pineal eye of the lamprey and the same is claimed for certain butterflies (*Arge galathea*), it is quite generally denied that any white pigment exists in animals; and authors claim that the white appearance of an animal is due entirely to the irregular reflection of all the rays (none being absorbed) in different directions. In the same way that the whiteness of snow is explained by the presence, between the crystals, of minute globules of air which reflect the light irregularly in different directions, the whiteness of hair is explained by the presence of minute globules of gas in the hair.

We should also mention that the organs immediately below the skin play an important rôle in determining the color of an animal.

Position and Origin of the Pigment.—In the skin of mammals the pigment is situated in ectodermal tissue, for it is in the lowest layer of the epidermis, that is, in the cells of the basal layer of the stratum Malpighii. In the hair, which is also ectodermal, it is situated in the core. Although found in ectodermal tissue, it is quite generally admitted that it is of mesenchymal origin—Kodis (1891) alone opposing this view and claiming that the pigment is ectodermal in origin. In the last edition of Wiedersheim's "Grundriss" it is described as an excretory product, a degeneration product of the red blood-corpuscles carried by leucocytes from the corium into the

epidermis. As a matter of comparison, it is interesting to note that in fish the pigment-cells are in some cases in both the epidermis and cutis, in others only in one of these layers, while in amphibia the pigment is chiefly in the cutis, partially diffuse, partially in cells.

Variation in Color.—In passing now to conditions in animals, similar to those described above, we cannot hope to recite all the facts known about color and coloration, as that would take a number of volumes, but we will do well to cite some of the better known examples of variation in color. To begin with, a study of animals convinces us that there is scarcely any character which is so variable in species as that of color—a fact which is particularly true of the domesticated animals. In many cases it is absolutely impossible to establish a theoretical standard color for a species. Who would, for instance, try to establish a norm in color for the (conglomerate) species *Canis familiaris*, the domestic dog. Scarcely any two specimens, even of the same breed, agree exactly in color, and the same is true of cats, horses, cattle, pigeons, chickens, etc. In Man we find this same individual variation in color, not only when we compare an individual of one race with one of another, but when we compare individuals of the same race. Even among the brothers and sisters of one family, we may find an extreme blond and an extreme brunette. It is claimed that among the non-domesticated animals we do not find this same extent of variation, a claim which to a certain degree is supported, but in some respects is erroneous. In the adult of the Fall Web-worm (*Hyphantria cunea*) we find all possible gradations from a perfect white to a form whose wings are nearly half black; in the Gooseberry Geometrid (*Abraxas grossulariata*) every possible variation between a black and a white is found; enormous variation exists among the Mollusca; and among the higher animals, from fish to mammals, we find an individual variation in color. In many cases, more especially among mammals, the color of a species is apparently quite constant, but if a large

number of forms are examined from different localities, it is always possible to detect some individual variation in color or coloration.

Besides the individual variation in the shade of color, generally determined, as we have seen above, by the character and amount of pigment present, we find a variation in the color of the different parts of the body. For instance, the ventral surface of an animal, especially of a vertebrate, is almost always lighter than the dorsal surface. In some cases the ventral surface is even white, while the dorsal surface may be very dark, a fact which is explained differently by different authors—some claiming that the ventral surface is less exposed to light than the dorsal surface, and that the light, or absence of light, affects the color; while others hold that the dark color on the back of animals is of great service to them in extreme heat, and has hence been increased by natural selection. That light in some cases probably does influence pigmentation, is shown by the interesting experiments of Cunningham (1891), who placed some young flounders in a tank provided with a mirror on the bottom, and noticed after a time that the under surface, which is generally white, had in many cases become more or less pigmented. An interesting case in point is furnished by those insects whose pupal stage is concealed (under the ground, for instance), these being darker than those whose pupæ are exposed.

Animals generally undergo some change of color during their lifetime, and this change may be sudden and more or less frequent, as in the case of the chameleon, frogs, many fish, or it may be a gradual change as they grow older, or a change at certain periods of the year, a change during sexual activity, etc.

It is a well-known fact that chameleons, frogs, and many other animals become dark when on a dark background, and light when on a light background; in many of these cases it seems that the chromatophores, or pigment bearing cells, are under the influence of the ner-

vous system. It is believed that the color of the background stimulates the eye, and that the impulse acting through the nervous system causes the change of color. A dark light would stimulate the eye but slightly, and there would be no contraction of the chromatophores, so that the animal would remain dark; a bright light, however, would stimulate the eye more strongly, a stronger impulse would be transmitted to the chromatophores and would cause them to contract, so that the animal would become lighter in color. An interesting fact is that blind frogs and blind fish have lost their power of changing color, a fact which it is difficult to harmonize with Steinach's recent results, that in the case of amphibia the light does not affect the chromatophores through the eyes, but acts directly upon the cells and causes a contraction.

As examples of the changes of color during the development of the individual, numerous instances could be cited, but we will confine ourselves to the following, drawn from various sources:

The children of the Australians are a yellowish-brown directly after birth, and become dark at a later age. Those of the Guaranys, of Paraguay, are whitish-yellow, but they acquire the yellowish-brown tint of their parents in the course of a few weeks. The African babe is a reddish nut-brown, which soon becomes a slaty gray, the black color being fully developed within a year in the Soudan, and within three years in Egypt. Darwin, from whom we have taken these statements, also records that the Himalayans (a breed of rabbits) are quite white, and true albinoes, or more rarely a pale gray, when first born; in a few months, however, they gradually assume their dark ears, nose, feet, and tail. It will be noticed that in all these cases the animals are born light and turn dark (melanism in a greater or lesser degree!). In the silver-grays and chinchillas (two other breeds of rabbits) the young are born perfectly black, but soon assume their gray or silver tints (acquired leucopathia, *i.e.*, canities and leucoderma!). The same is true in

the case of gray horses, which are nearly black when foals, and become grayer and whiter as they grow older. Exceptions in the case of the rabbits cited above, are, however, not unknown, and to this we wish to draw especial attention; *i.e.*, the Himalayans sometimes produce a single black young in a litter, which, however, becomes perfectly white within two months' time, and silver-grays are sometimes born a cream-color, but they ultimately become black.

In the changes of color at certain seasons, the winter coat may be lighter or darker in color, according to the species; *Cervus mantchuricus* and *C. durancelli*, and the snow-bunting, are darker in the winter than in the summer. Seasonal changes have been noticed in grasshoppers and beetles. Among Arctic animals, the musk-ox, glutton, and raven undergo no change at the approach of winter; the reindeer becomes gray; the Hudson Bay lemming (*Cuniculus torquatus*), the American hare (*Lepus americanus*), the ermine, and many others become white at the approach of winter; the Arctic fox (*Canis lagopus*), generally becomes white in some localities, but in others it usually remains dark. The same remark applies to the Alpine hare.

This change from a dark to a light color has been brought about artificially by Sir J. Ross, who records that a Hudson Bay lemming (*Lepus torquatus*) had retained its summer color when kept during the winter in a warm cabin. One day, however, it was placed on deck, and within a day, when exposed to a temperature of — 30° F., "the fur on the cheeks and a patch on each shoulder had become perfectly white," and within a week the animal was almost entirely white. An exceedingly interesting fact in connection with this experiment is that the hairs which turned white grew rapidly in length, and that only the tips were involved in the change. In the case of *Lepus americanus*, F. H. Welch has shown that when the winter change takes place there is not only a change in the color of the autumnal hairs (in October), but a

new growth of white winter hairs (in November); and Poulton, from whom we have taken many of the examples here cited, in discussing this subject remarks that it is probable that the new winter hairs do not contain any pigment but that in the summer hairs which do contain pigment the latter does not have any effect in determining the color on account of the great amount of gas present. He also explains those cases of canities in man in which the hair has changed during some nervous attack but darkened afterward, by assuming a sudden evolution of gas in the hair and its subsequent absorption, thus leaving the hair its original color.

In the case of those animals which remain on the snow nearly the entire year, as the Arctic bear, the white color has become constant; but this must be an acquired condition for the races, for some of these animals at least (*Lepus glacialis*, for example), are born a darker color (gray, in this case), and change to white on the approach of the first winter.

It is interesting to note that while we find a tendency toward white in mammals and birds as we approach colder climates, in insects the tendency of color is toward a black or brown.

Many other cases of change in coloration might be referred to, but in order to avoid taking up too much space with examples of this kind, we will content ourselves with the cases already cited, and refer the reader who may desire to follow the matter further to Poulton's "The Color of Animals" (1890), Beddard's "Animal Coloration" (1892), Deane in "Bul. Nuttall Ornithological Club," 1876 and 1879 (eighty-seven cases of albinism and six cases of melanism among North American birds), and to Darwin's various works. In connection with albinism among birds, however, it should be remarked that this term is used in a very broad sense by ornithologists, referring not only to complete congenital achromatia, as reported in some white blackbirds, but also to partial congenital or acquired achromatia.

When we seek a cause for these differences and changes in color and coloration, we have no easy task before us. Some cases are evidently due to the nature of the food, others to temperature; some, it is claimed, are due to moisture, many to natural selection, and others to some more or less hypothetical influence of the nervous system; but whatever the cause may be, we always find an individual variation in the various specimens. The question, therefore, naturally arises as to whether we should include albinism, *all* cases of leucoderma and ascities among the diseases, or whether many of them cannot be looked upon as cases of extreme individual variation or, if one prefers the term, as freaks. The answer to this query depends entirely upon our definition of a "disease." If, with the ante-Darwinian idea of the fixity of the species before us, we look upon everything which does not correspond to our idea of the norm as pathological and diseased, then the question is easily answered in favor of looking upon all cases of achromatia as pathological. But if we take into consideration the utter impossibility of establishing a theoretical norm in man; if we recall that there is really no sharp line to be drawn between complete albinism, partial albinism, and leucoderma; if, further, we remember that all of these stages find their parallels as racial or specific characters in certain species and races of animals, we will certainly hesitate before pronouncing Uncle Tom Cleveland and similar cases, in which no trace of disease is found, as pathological specimens! If, however, we insist upon calling Tom a *diseased man*, and true albinoes *diseased beings*, must we not be consistent and call the albino rabbits, mice, rats, and ferrets, as well as the Himalayans, silver-grays, and chinchillas *diseased varieties*, and the exceptional congenitally black Himalayan and the cream-color silver gray as diseased individuals belonging to *diseased varieties?* How would it be with a cross between an albino rabbit and a gray rabbit which should happen to be partially white and partially gray? If we

carried our ante-Darwinian theory to its logical conclusion, we should discover that everyone of us—especially of the white race—is diseased! How would matters stand with the domesticated pigeon? Should we call every breed and every individual differing from its ancestor, the rock-pigeon (*Columba livia*), a pathological breed or specimen, or should we look upon these breeds as varieties resulting from individual variation, or shall we combine the two ideas in one and accept the inevitable conclusion that all individual variation is pathological? What shall we do with those cases in which the males and females are similar when young, but whose males take an entirely different character upon becoming mature? Are they pathological?

It is true that in many of the cases here cited, the change in color is racial as well as individual; but that the change began as an individual variation is made almost certain by the ontogeny of the animals, by the extreme individual variation in many of the cases, and by a comparison with allied forms; and on this account we have the right to bring the races in question into our discussion.

Having advanced these suggestions in connection with this case of leucoderma, and having cited a number of examples of color and coloration in the animal kingdom, we will, without carrying the discussion further, sum up our views upon this subject as follows:

1. It is exceedingly difficult to draw a sharp line between individual variation and pathological lesions.

2. Many cases ascribed to pathology—as albinism, partial or complete, and some of the cases of leucoderma and canities—can equally well (and probably better) be looked upon as cases of extreme variation of the species.

3. Man should be looked upon as an animal under domestication, and we must accordingly be prepared to find an immense variation among the races and individuals.

4. Albinism, both partial and complete, leucoderma,

and canities of man, all have their parallels among other domesticated and wild animals, in many of which they have become racial or even specific characters.

5. These characters must, however, have begun as individual variations, and there is no reason to doubt that if systematic breeding experiments were kept up for a sufficiently long period, with albinoes or leucoderms, or if these characters came into play in natural or sexual selection, races of albinoes or leucoderms in the human species could be established.