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The Significance of Anomalies.

BY

THOMAS DWIGHT, M. D., LL. D.

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THE SIGNIFICANCE OF ANOMALIES.[1]

By Thomas Dwight, M. D., LL. D.[2]

This subject, which after consultation has been chosen for our discussion this year, is one which for a long time has interested and puzzled me extremely. I look forward with great pleasure to the light which I hope will be thrown upon it by distinguished members of this Association. For my part I propose merely to state some of the difficulties which it seems to present and suggest one or two general conclusions which seem to me to be justified.

Probably no biological phenomena have been more confidently explained by heredity and atavism than rudimentary organs and anomalies. The former, of constant occurrence, though perhaps of transitory existence, have been happily compared by Darwin to letters in words which are no longer sounded, but which were pronounced at an earlier stage of the language.

Anomalies are the occasional appearance of structures normal in other animals. That these are found very commonly in man everyone knows. Whether they are found equally commonly in animals is a matter of uncertainty. Mr. Dobson believes that man as the type of a domesticated animal is particularly liable to them and that in wild animals they are extremely uncommon. To this may be opposed the great frequency of anomalies in negroes. If I am not mistaken, other rebutting evidence is furnished by comparative anatomy. The same explanation has held for these; but as their gradually increasing numbers have brought more accurate study, serious difficulties have arisen. It is clear that if an anomaly in man is to be called a reversion, either the species in which it is normal must have been in the direct line of ancestry, or there must have been a common progenitor. Evident as this

[1]Read at the meeting of the Association in New York on December 29th, 1894, to open the discussion.

[2]President of the Association of American Anatomists.

is it has been grossly disregarded, not only by popular scientists, but by some from whom better might be expected. To point out the animal in which a certain anomaly is normal has been too often offered as an explanation. Critical study makes many difficulties apparent. These are vastly increased when we consider that a satisfactory explanation must account not only for certain anomalies, but for all. At the very least there must be no case clearly at variance with the explanation.

All anomalies have not the same significance. Certain ones represent structures widespread throughout mammals, some of them even in other classes of vertebrates. Three of these may be mentioned: the supra-condyloid process, the third trochanter, the para-mastoid process. Of the first there is usually no trace in man. The second is represented at most by a roughness of doubtful interpretation, in my opinion it is usually wholly absent. The third is wanting, or a mere point. The occurrence in man of a third trochanter is very common, that of the supra-condyloid process uncommon and a really large para-mastoid process is a great rarity. None of them occur normally in the Simiidæ (the anthropoid apes). Of these structures the most general is the supra-condyloid foramen. In the primates it is practically universal among the Lemuroidæ, but among the Anthropoidæ it occurs only among some of the smaller monkeys,—some of the Cebidæ.

The third trochanter also is almost universal among the Lemuroids as a rudiment, and in some species reaches a moderate development. There are traces of it in some of the smaller monkeys, and it is occasionally seen in the gibbons and the chimpanzee. I have tried to maintain that the true third trochanter in man, occurring very often on delicate bones, is different from the rough line for the insertion of the glutæus maximus.[3]

The para-mastoid process is, if I am not much mistaken, rudimentary or wanting throughout the primates.

When therefore, we find a supra-condyloid process which with the completing ligament, represents the supra-condyloid foramen, to account for it atavistically the shortest leap is to

[3]Journal of Anat. and Phys. Vol. XXIV.

the Cebidæ. In the case of the third trochanter we can hardly stop short of the lemuroidæ in spite of the probability that they and the anthropoidæ came from a common stem. For a really large para-mastoid process we must go beyond the primates altogether. There would be some comfort to be gained from the insectivora were we in the least justified in putting them among the ancestors of the primates, for several genera have a well-developed para-mastoid process, the supra-condyloid process is general, and the third trochanter is frequently represented, still it is neither general nor very prominent. For its greatest development we must turn to the odd-toed ungulata, and now descent is out of the question.

It may be opposed to this that we have no right to assume that a certain well developed anomalous process in man must necessarily be accounted for by inheritance from a form possessing an equal large one; that it is enough to show the existence of a clearly marked process in a common ancestor and to assume that its great development in the anomaly is an accident of no significance. I am quite willing to grant that this objection has weight. Still when we account by atavism for the supra-condyloid process we must admit that the gulf between the structure of man's body and that of one of the Cebidæ is so great that this explanation would hardly serve were it not absolutely necessary for a theory.

Another class of anomalies are those, which far from being general features, are found in certain highly specialized animals which can be included in no possible scheme of descent. An instance is the fossa praenasalis, not to be confounded with the rounding of the border of the nares which is practically universal. It occurs in human skulls of a low order and presents a development which is seen in no animal. It is usually more or less distinctly marked in the seal tribe. I have seen it poorly marked in the gorilla. Here atavism is wholly at fault. The Pronator Quadratus muscle in man very rarely sends a prolongation downwards to one or more carpal bones on the radial side of the wrist. I am not aware that this is normal in any mammal. Whence then does it come? Testut would have it the homologue of a muscle which Humphry

describes as pronator manus is Cryptobranchus Japonicus and of one described by Meckel in chelonians. It is curious that Macalister has found this arrangement in a tiger and I have found it in both arms of a chimpanzee, which I believe is an unique observation. This shows a tendency in the carnivora and primates to similar variation which is not inherited.

Some of these anomalies present a likeness that is very probably accidental, possessing no significance whatever. Such is the peculiar union of the different pieces of the sternum by which the manubrium fuses with what should be the first piece of the meso-sternum. Is the fact that this frequently occurs in the gibbons to be looked upon as anything but a coincidence? Does the occasional perforation of the thyroid cartilage by the superior laryngeal nerve in man derive any significance from the fact that this is found in the seal? Again, when we find in man some anomaly of the aortic arch or of the great arteries springing from it, we know that the usual course of development of the branchial arches has been disturbed. Need we look further than to some accident in the individual? Has the fact that the abnormal arrangement is normal in some animal any significance? These are questions which admit of no certain answer.

The second class of anomalies are those of most difficult explanation. They naturally suggest an analogy with the cases of the occurrence of similar structures in widely separated animals, such as the bill of a duck and of the Ornithorhyncus, the paddle of the cetacean and of the ichthyosaurus. The obvious retort is that these resemblances are superficial; but they are none the less true. Indeed, similar arrangements for a similar purpose are found which can in no way be called superficial. A very good example is furnished by Mr. Dobson.[4]

The Pyrenean water mole (Myogale) of the Insectivora, which has very elongated digits, has an enormously developed fibular flexor and a rudimentary tibial flexor. On the true moles the tibial flexor is larger, but the arrangement is

[4]On the Comparative Variability of Bones and Muscles, etc. Journal of Anat. and Phys. Vol. XIX. p. 20.

the same. Now the Bathyergus martimus of South America which has the habits of moles, but is really a rodent, has a precisely similar disposition of the parts. "Here the larger fibular flexor, as in Myogale, has forced the tibial flexor inwards, so that the latter is attached to the head of the tibia internal to the attachment of the popliteus; and its tendon being separated in the foot from that of the fibular flexor, is attached, precisely as in the true insectivorous moles, to the tibial margin of the basil phalanx of the hallox, developing, as it crosses the ento-cuneiform articulation, a broad sesamoid ossicle." Mr. Dobson then asks: "How happens it that in certain widely separated species, in no way connected by descent from a common ancestor having similar peculiarities, separation of this tendon from that of the fibular flexor and attachment to a different part of the foot has occurred in a perfectly similar manner?" He finds this very difficult to answer and can only suggest that the arrangement in question being the best, it has been reached independently in both species by natural selection.

Those of us who look upon natural selection pure and simple as quite inadequate to what is already required of it, will not be disposed to call upon it to do double duty. Those who like myself, believe in design and in a limited evolution founded on law, while they may explain by teleology such instances as the last mentioned, can by no means apply that doctrine to anom alies.

The mechanical theory that the action of certain muscles should account for certain processes, such as the third trochanter, is not admissable. I have shown that this anomaly occurs in savage races in which presumably all live pretty much the same life, and that further it occurs at too early an age to be caused by any strain in the individual.[5] Even were this not so there are many anomalies which obviously can have no connection with mechanics.

It is easier to destroy than to build. I can offer no substitute for the theories I reject which would itself stand criticism. I will merely offer the following as justifiable conclusions.

[5]Loc. cit.

First, similarity of structure, either in the ordinary animal or in the one showing variations, is not necessarily a proof of descent. Second, those very irregularities, which we call abnormal, point to a law in accordance with which very diverse animals have a tendency to develop according to a common plan. This be it noted, in no way denies the possible influence of surroundings.

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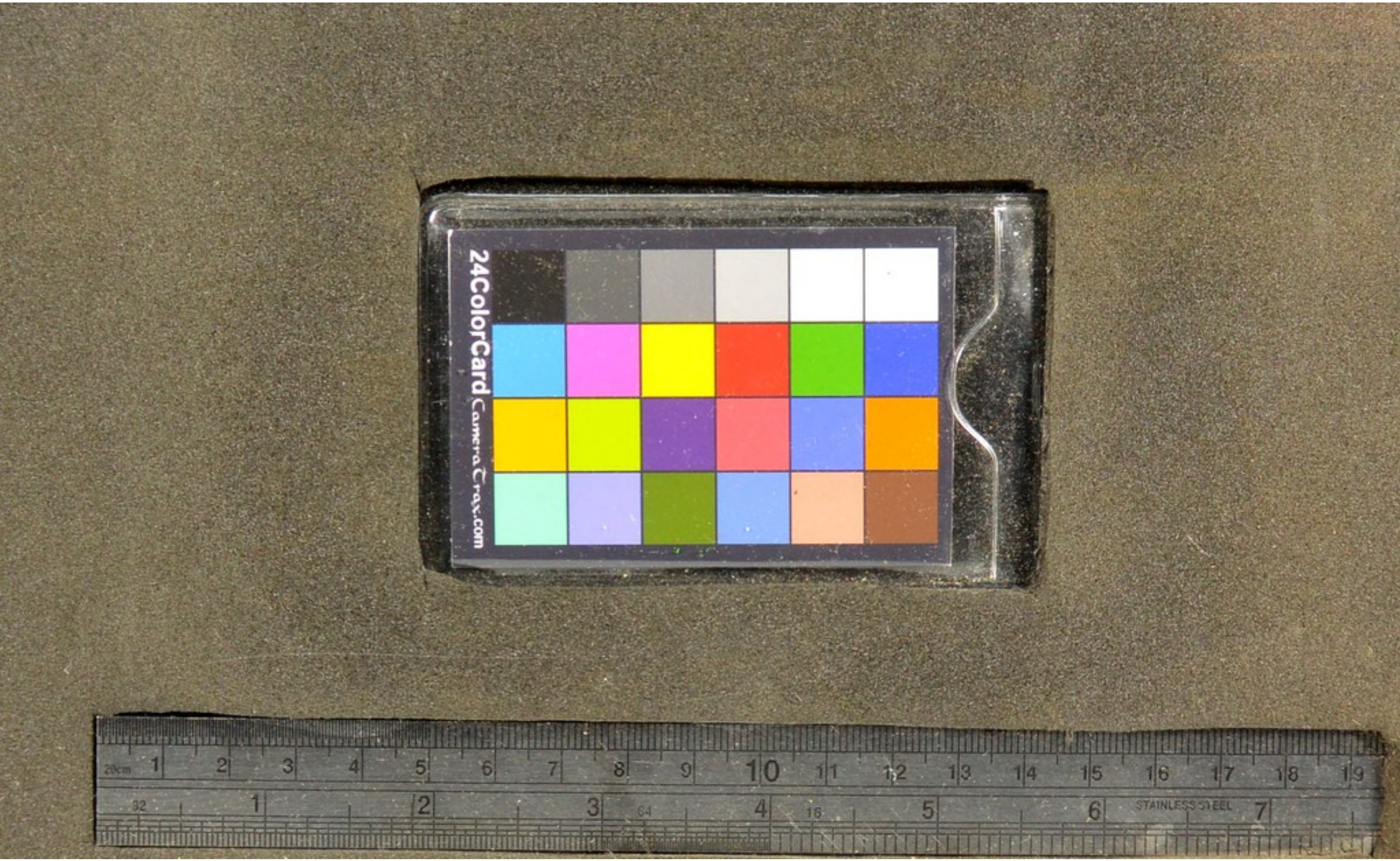
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