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I. Wissenschaftliche Mittheilungen.

1. The Terms of Bioplastology.

By Professor A. Hyatt, Boston, Mass., U.S.A.

(Schluß.)

Ontogeny.

Messrs. Buckman and Bather have proposed to substitute a set of improved terms for those previously used by myself and both are given in the following table:

Ontogenic Table of Terms (I).

Hyatt 1888.		Buckman and Bather 1892.
1) Embryologic	1) Embryonic	1) Embryonic
2) Naepionic	2) Brephic	2) Infantile or Larval
3) Nealogic	3) Neanic	3) Adolescent
4) Ephebolic	4) Ephebic	4) Adult or mature
5) Geratologic	5) Gerontic	5) Senile
a) Clinologic	a) Catabatic	a) Declining
b) Nostologic	b) Hypostrophic	b) Atavic

It would be a waste of time, even if I felt so disposed, to attempt to defend the nomenclature of the first column in this table. The use of terminations derived from λογος in this way is not defensible and was due to the careless habits of the early history of terminology, still extant in the use of »morphological« instead of »morphic« and in the obligatory use of »physiological« and »geological« etc.

The nomenclature of 1888 is inadequate not only on account of etymological faults, which do not however trouble me as much as they

do those who regard linguistic purity with higher respect, but because the system is insufficient and unsymmetrical.

This last objection applies with equal force to some of the terms proposed by Buckman and Bather. These gentlemen were hampered by the desire to perpetuate the older terms now in use in this country and for which I alone am unluckily responsible. This is also my own condition, and although I would willingly now suggest an entirely new method, I find after having framed and tested a new one, that it is better not to interfere any farther than is absolutely necessary with the nomenclature of 1888.

The table printed below, Table II, therefore, is made up of a set of terms which are substantially the same as those suggested by Buckman and Bather, except in the use of Nepionic, and in it I have also followed a suggestion kindly sent me in a letter by Mr. Buckman in adopting the prefixes »ana«, »meta« and »para« for the designation of the substages of development. This has the great advantage of adding to the means of expressing observations accurately, quite as well as the use of an entirely distinct word and at the same time preserving in each term a direct reference to the period to which it belongs. Thus one can speak of the metanepionic or ananeanic substage without referring to the stage in which they occur, and yet the reader will at once recognize to what stage the substage mentioned is to be referred.

Recent researches have in my opinion clearly demonstrated that all stages of development from 2—4 inclusive like the embryonic stage, 1), and the senile stage, 5), will have to be subdivided in studying many groups. These subdivisions are also relatively important and their differences are often well defined.

I now propose the following nomenclature which does, it is hoped, fuller justice to every stage[7].

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[7] It is my grateful duty to add that I have had the unremitting help of Dr. C. E. Beecher of New Haven, and have consulted with Dr. Jackson of Cambridge and Mr. Clarke of Albany and also with Mr. Buckman, and I wish to express to these gentlemen my indebtedness for suggestions and advice of essential importance. Except in the retention of one term »Nepionic« the nomenclature is more theirs than mine. I also desire to thank Prof. Reynolds of New Haven and Prof. William Goodwin of Cambridge for the earnest help they contributed to the formation of a table of terms which for reasons given above was not used, as well as for advice which influenced the framing of the one finally adopted.

Ontogenic Table of Terms (II).

Structural Conditions	Stages	Stages	Substages	Substages
	Embryonic	Embryonic	Several[8]	No popular Names.
Anaplasis (Haeckel)	Larval or young	Nepionic	ananepionic metanepionic paranepionic	
	Immature or adolescent	Neanic	ananeanic metaneanic paraneanic	
Metaplasis (Haeckel)	Mature or adult	Ephebic	anephebic metephebic parephebic	
Paraplasis	Senile or old	Gerontic	anagerontic metagerontic paragerontic	

The necessity of subdividing the embryonic stage is admitted and in all probability this really includes several stages with their respective substages but the discussion of this problem must be left to the future. The former subdivision of the gerontic stage into two substages seems to have met with general acceptance, but the terms remain to be settled. Buckman and Bather have proposed Catabatic to replace my old term Clinologic, which is an improvement, but their term proposed, Hypostrophic, from Ὑποστροφή meaning a turning around and back, is not equally good. While this is better than the term formerly employed, »nostologic« it is longer and not preferable to »Nostic« from Νοστός[9] signifying a return in the sense of a journey

[8] These stages were enumerated and more or less described under the names of protembryo, mesembryo, metembryo, neoembryo, typembryo in my paper on »Values in Classification of stages of Growth and Decline« and to these Jackson added phylembryo in his »Phylogeny of the Pelecypoda«, p. 289. — See »Values of Classification of the Stages of Growth and Decline«. Am. Nat. Oct. 1888 and »Genesis of the Arietidae«, Smithsonian Contributions, No. 673, 1889, also Mem. Mus. Comp. Zoology, XVI, No. 3.

[9] Neither of these words have any authority for the termination »ic« but unless one can make some such »corruptions« it is often impracticable to manufacture a consistent set of terms according to the method here adopted. It is obvious that scientific convenience occasionally requires such heroic methods and this seems to be a case in which it is justifiable.

If the new set of terms here proposed is adopted there will be no need of employing either »catabatic« or »nostic«. These will then be superseded by »anagerontic« and »paragerontic« or by all three terms used for the stages in the table if the characteristics justify their application. It was necessary, however, to discuss these terms because two distinct sets of names have been employed for the subdivision of the senile period.

back to one's home. This parageröntic substage is not in my opinion »atavistic« or »reversionary« as it is defined by Buckman and Bather. Reversions are the returns or recurrence of ancestral characteristics in genetically connected organisms which have been for a time latent in intermediate forms. I do not think that we can include in this category purely morphic characteristics which habitually recur in the same individual as the result of paraplasis or which occur in the paracme of a type more or less invariably. In the individual the smooth round shell of the whorl of the parageröntic substage after it has lost the progressive characteristic of the ephebic stage cannot be considered as reversions. They are simply analogies in form, not structurally similar characteristics. A better known and more easily understood case is the resemblance of the lower jaw of the infant before it has acquired teeth and that of the extremely old human subject in which these parts have been lost and the alveoli and the upper parts of the bony mandible have disappeared through resorption. The forms are similar but no one would venture to consider the infant's cartilaginous jaw and that of the old man as similar in structure.

The best examples of similar phenomena in the phylum known to me is the close resemblance of form between the straight *Baculites* of the Cretaceous or Jura and *Orthoceras* of the Paleozoic. These two are often confounded by those ignorant of the essential differences existing in their structure. One is a mesozoic straight form derived by degenerative processes of evolution from the highly ornamented progressive *Ammonitinae* of the Mesozoic and the other is a near relative of the primitive ancestral forms of the *Nautiloids* in the Paleozoic. One occurs in the paracme and the other in the early epacme of the group of chambered shells. They are widely distinct in their structural characteristics and these differences are greater in the young than at any subsequent stage of their ontogeny. *Baculites* has a close coiled shell in the nepionic period as has been lately demonstrated by Amos P. Brown of Philadelphia and *Orthoceras* is straight from the earliest stage. The return of a similar form in *Baculites* in the later periods of development in obedience to the law of the cycle does not carry the structure back with it to a repetition of the orthoceran siphuncle and sutures.

The term used by Buckman and Bather, »Brephic« derived from Βρεφικὸς is perhaps etymologically preferable to nepionic but unluckily it was not used in 1888. Nepionic[10] has been used by authors on this side of the Atlantic in several essays and is found in the Cen-

[10] Originally taken from Νήπιος, but there is a form Το νήπιον.

tury Dictionary and therefore, consistently with the principles adopted by Buckman and Bather and myself to depart from established terms as little as practicable, it should be perpetuated. It has not deserved the sharp criticism of these authorities, since it is not an »impossible corruption of the Greek«. It is a convenient term and not worse etymologically than one those authors themselves adopted and another which they proposed. Embryonic has a precisely parallel history, there being in Greek no authority for the use of the termination »ic«, but this is adopted by them without comment. Hypostrophic derived from ὑποστροφή, also having no authority for its termination in »ic« was one of the terms proposed by them. So far as the purity of the language is concerned I see no reason why they should not do this since there is no Greek word to which »hypostrophic« could be referred that would make confusion.

The Phylum.

Buckman and Bather propose to use the prefix »phil« for forms occuring in the Phylum which represent in their adult development the stages in the evolution of the phylum which correspond with those of the Ontogeny and give an instructive table in which Haeckel's physiologic terms are placed side by side with those proposed for the morphic phenomena. In following out the same ideas the following table has been constructed which differs from theirs only in the use of nepionic as stated above, and in the interpolation of phylanaplasis etc. as correspondents of anaplasis in ontogeny.

Summary Table (III).

Ontogeny or Ontogenetic Development		Phylogeny or Evolution of the Phylum		
Structural-Conditions	Stages	Structural-Conditions	Stages	Dynamical
Anaplasis	Embryonic Nepionic Neanic	Phylanaplasis	Phylembryonic Phylonepionic Phyloneanic	Epacme
Metaplasis	Ephebic	Phylometaplasis	Phylephebic	Acme
Paraplasis	Gerontic	Phyloparaplasis	Phylogerontic	Paracme

The Cycle.

Phylum expresses genetic connection, cycle the totality of the phenomena whether morphic or physiologic which is exhibited by ontogeny, phylogeny, or the physiological phenomena alone. Thus one can describe the cycle of the phylum in its rise and decline, the epacme, acme and paracme as purely dynamical phenomena exhibited

by the increase in numbers of forms etc., or the cycle of the ontogeny as shown by the increasing complexity of the development and its decline, the anaplasis, metaplasis and paraplasis of the individual, or one may describe the cycle as exhibited by the embryonic, nepionic, neanic, ephebic and gerontic stages, or the cycle of the phylogeny as exhibited by the corresponding stages of evolution designated by their appropriate prefix »phyl«.

There appears to be real need of two terms under the head of cycle, one for ontogeny and the other for phylogeny. It is proposed to use in this way ontocycle or ontocyclon for the ontogeny, meaning the cycle of the individual, and phylocycle or phylocyclon for that of the phylum. This will make it practicable to use the terms monocyclon or monocyclic, polycyclon or polycyclic etc. to describe the number of cycles observed. Thus the *Ammonoids* are polycyclic, the *Arietidae* are decacyclic, the genus *Coroniceras* is an incomplete monocycle.

It is not necessary to defend these terms before students of Bioplastology, they will be tested and if convenient adopted. For the benefit of others it may be mentioned that the cycle is of all degrees of development in ontogeny. Thus insecta are apt to stop at the ephebic period and in many other animals there is a similar limitation.

Those who try to find a complete cycle of metamorphoses in their own special lines of research will be often disappointed and probably question that it exists at all. Thus for several years I could not find any evidence of its existence among certain Cephalopods, those having a primitive organization like *Endoceras* and *Orthoceras*, but I have since seen well marked senile stages in these shells.

Stages of Morphogenesis.

As remarked by Buckman and Bather »it is possible to trace the evolution of one character from its first appearence to its final loss right through the history of a long line of individuals«. They also say »the various characters that go to the formation of an individual or a race, at any period of its development, may themselves differ greatly from one another in the degree of their own development«, and further, »for the designation of the successive stages in the history of a character, the ontogenic terms might be used with the addition of the prefix morpho- e. g. morpho-brephic (here nepionic) »morphephebic«. These suggestions are useful, but they appear to me to cover both Ontogeny and Phylogeny, while according to the title used by these gentlemen »Stages of individual Morphogenesis« they were meant to apply only to Ontogeny.

If one traces the history of any one character, something which every student of Bioplastology must habitually do in actual practice, throughout a chain of individuals, whether these are members of one variety or of one species, or whether they lead into distinct species, as they are apt to do, he is studying the phylogeny of that characteristic. It would seem therefore that the prefix »phyl« would be applicable in such cases whereas the use of a single term for both the phylum and the individual, especially the prefix »morpho«, would be likely to be confusing.

2. Über den Werth der mimetischen Verkleidung im Kampf um's Dasein.

Von Dir. Seitz, Frankfurt a./M.

eingeg. 15. Juni 1893.

Von den Gegnern der Mimicrytheorie, d. h. jener Auslegung der Erscheinung gegenseitiger Nachahmung im Thierreich, wo auf einen direct aus dem Besitz erborgter Kleider resultierenden Vortheil im Kampf um's Dasein geschlossen wird, hört man vielfach den Einwurf, daß das mimetische Kleid wohl den Menschen, nicht aber die scharfen Sinne der Thiere täuschen könne, daß also das für den Menschen schreckende Aussehen, gegen die wahrhaft gefährlichen Feinde der Mimiker nutzlos sei.

Die ausgiebigen Versuche Butler's mit gefangenen Vögeln aller Familien, denen er Schmetterlinge aus »geschützten« und »ungeschützten« Gattungen vorwarf, führten zu dem Resultat, daß gewisse Schmetterlinge, die von fast allen gemieden wurden, immer einen Feind fanden, der sie annahm. Eine *Zeuzera pyrina*, vor der alle Vögel deutliche Furcht verriethen und flohen, wenn das Insect die Flügel rührte, wurde schließlich von einer Drossel zerhackt und verspeist u. s. f.

Butler sowohl, wie fast alle Forscher, die sich mit dieser Frage beschäftigt haben, gehen dabei von der Idee aus, daß die Vögel die gefährlichsten Feinde der Schmetterlinge seien, und daß ihnen gegenüber die Mimicry, wenn sie überhaupt von Vortheil wäre, wirken müßte.

Schon die Thatsache aber, daß die Mimicry ihre meisten Fälle in der Unterordnung der Tagschmetterlinge hat, und daß deren Angehörige fast ausnahmslos von den Vögeln verschont werden, auch ohne daß sie gefährliche Thiere nachahmen, muß uns auf die Idee führen, daß die Mimicry eben nicht in Rücksicht auf die Vögel besteht. Skertchly, den der directe Augenschein zur Überzeugung brachte, daß die Tagfalter (Borneo's), unter denen er zahlreiche mimetische