Nierensystems und Zusammenfließen der segmentalen Leibeshöhlen in eine einheitliche übernehmen gewisse Nephrostomenpaare die Beförderung der Genitalproducte; so bei den Cyclostomen und den Weibchen der Aale, Salmoniden, Ganoiden, Selachier, Amphibien und Amnioten. Bei den übrigen Teleosteern, Männchen und Weibchen, und *Lepidosteus* (Weibchen) wird jederseits der Theil der Leibeshöhle, in welche das die Geschlechtsproducte ausleitende Nephrostom mündet, in oben geschilderter Weise zur Ovarial- resp. Hodenhöhle. Bei den Männchen der Ganoiden[2], Selachier, Amphibien und Amnioten verschwinden die ursprünglichen Vasa def., die den Oviducten homolog waren, und die Urniere übernimmt die Ausfuhr der Spermatozoen. Vielleicht ist der Centralcanal des Hodens dieser Thiere ein Rest der Hodenhöhle der Teleosteer, die übrigens nach meinen Praeparaten keine Verbindung mit der Urniere besitzt. — Zum Schluß muß ich bemerken, daß ich trotz der neuerdings von den Herren Jungersen[3] und McBride[4] für einige Amphibien festgestellten »complete independence of the oviduct from the Wolffian duct« und ähnlicher Befunde an Amnioten doch bei meiner Ansicht bleiben muß, die Müller'schen Gänge seien nur besonders entwickelte Nierentrichter. Daß in allen Fällen dasselbe Nephrostom zum Oviduct wird, glaube ich nicht. denn bei den Selachiern z. B. spaltet sich nach Balfour und Sedgwick[5] der Oviduct in seiner ganzen Länge vom Urnierengange ab und mündet in den vordersten Theil der Leibeshöhle, während er bei den Teleosteern ganz kurz ist und erst am hintersten Ende den Urnierengang berührt.

5. Preliminary Note on a new Theory of the Phylogeny of the Chordata.

By Walter Garstang, M.A., Fellow and Lecturer of Lincoln College, Oxford, and Naturalist to the Marine Biological Association.

eingeg. 4. Februar 1894.

The appearance in the last number of this Anzeiger of a note[1], in which is recorded the discovery of an endostyle in *Tornaria*, induces me to communicate a preliminary announcement of certain

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[2] R. Semon, Notizen über den Zusammenhang der Harn- und Geschlechtsorgane bei den Ganoiden. Morph. Jahrbuch. Bd. 17. 1891.

[3] Om Udviklingen af den Müllerske Gang (Aeggelederen) hos Padderne. Vidensk. Meddel. f. d. naturhist. Foren. Kjöbenhavn. P. 4. 1892.

[4] The development of the oviduct in the Frog. Quart. Journ. Micr. Science, Vol. 33. 1892.

[5] Handbuch der vergl. Embryologie von F. Balfour. Bd. 2.

[1] Ritter, On a new *Balanoglossus* larva from the coast of California, and its possession of an Endostyle. Zool. Anz. XVII. No. 438. p. 24—30.

general results at which I have arrived in regard to the morphology of the endostyle and other organs in the Chordata. The results upon all the points which I have studied have proved so harmonious with one another that I have been able to synthesise them into a consistent theory of chordate phylogeny of which I here briefly sketch the outlines. The complete evidence for this view will shortly be published in the Quarterly Journal of Microscopical Science.

Stated shortly, my theory postulates a common ancestor for the Echinoderma, the Enteropneusta and the Chordata. This ancestor was bilaterally symmetrical and had the external appearance of a young *Auricularia* larva, in which the blastopore (anus) is posterior and terminal, and the sides of the body are margined by a complete circumoral ciliated ridge. At the apical or prae-oral pole was situated a pair of pigmented ectodermal pits, resembling the eye-spots of *Tornaria*. These pits, together with the blastopore, lay within the dorsal or aboral area circumscribed by the circumoral band. An adoral ciliated band was also present and had the relations of the adoral band of modern *Auricularia* larvae; that is to say, it bounded the dorsal and lateral margins of the mouth, and was prolonged ventrally into a loop which penetrated some distance along the ventral wall of the oesophagus. The *Auricularia*-like ancestor possessed at least two pairs of bilaterally symmetrical enterocoeles, of which the first pair communicated with the exterior by water-pores. The central nervous System of the pelagic ancestor consisted of an elongated nerve-ring which lay exactly underneath the circumoral ciliated ring, and, therefore, like the latter, enclosed both the apical plate and the blastopore.

The *Echinoderma* were derived from this hypothetical ancestor by a series of changes mainly correlated with the secondary assumption of a radial symmetry. The right anterior enterocoele atrophied, in the way recently described by Brooks and Field in certain *Bipinnaria* larvae, the left anterior enterocoele persisted and retained its pore as the definitive »dorsal pore«. The nerve-ring segregated itself from the circumoral ciliated band, as described by Semon in the development of Holothurians, and moved ventrally so as to constitute the circumoesophageal nerve-ring of the adult. The sense organs of the prae-oral pole atrophied.

The Chordata retained the primitive bilateral symmetry. The circumoral ciliated ridges of the two sides approximated dorsally, and fused along their entire length in the mid-dorsal line, enclosing both the prae-oral sense-organs and the blastopore, in this way constituting a canal, ciliated internally, and communicating with the gut by means of the blastopore (neurenteric canal). The ciliated ridges, upon this

theory are practically homologous with the medullary folds of the Vertebrata, which, it will at once be recognised, have precisely similar relations to the blastopore and the central nervous system. The prae-oral pigmented pits, which were shut off from the exterior by the fusion of the ciliated folds, enlarged, and represent the optic vesicles of Vertebrate embryos. The elongated nerve-ring, underlying the ciliated band, represents the lateral components of the brain and spinal cord of the Vertebrata. The adoral ciliated band I regard as the homologue and predecessor of the peripharyngeal bands and of the marginal ciliated bands of the endostyle in Tunicata, for I show in my larger paper that these two bands — the one transverse, and the other longitudinal — are directly continuous with one another, and jointly take a course which is identical with that of the adoral band in Echinoderm larvae. The primitively V-shaped condition of the endostyle in *Amphioxus*, as described by Willey, is probably to be explained in a similar way, for its limbs are continuous anteriorly with the ventral ends of the peripharyngeal bands. The number of enterocoeles became greatly increased with the evolution of the Chordate type; the anterior pair of the ancestor is represented in *Amphioxus* by the lateral halves into which the anterior enterocoeles, according to Hatschek, becomes divided in ontogeny, the left component acquiring a communication with the exterior (ciliated pit), the right component undergoing degeneration, as in the case of the Echinoderma.

The *Enteropneusta* are to be derived from the hypothetical Auricularian ancestor by a rather more complicated series of changes. The lateral halves of the circumoral ciliated band did not approximate along their whole extent, but, as is clearly indicated by *Tornaria*, became divided at the apical pole into two portions, a prae-oral and a post-oral band, each of which assumed a highly sinuous course over the sides of the body. Nevertheless portions of the post-oral band approximated dorsally in the middle region of the body, which eventually becomes the collar-region of the adult. To this region the neural canal of the adult is also confined, from which fact I infer that the ciliated bands of the ancestor fused in this region, and in this region only, — a conclusion corroborated by the course of the ciliated bands in *Tornaria*. This limitation of the area of fusion also explains the curious fact that the prae-oral sense-organs of the metamorphosing *Tornaria* are not enclosed in a medullary tube, as they are in the Vertebrata, but remain on the external surface of the body (at the apex of the proboscis); and also that there is no neurenteric canal in *Balanoglossus*, the blastopore persisting as the anus. The origin of the nervous system proper is discussed in my larger paper, but is too

difficult to be entered upon in a brief communication. The enterocoeles present no difficulty. The right anterior enterocoele has disappeared as such, but its pore persists in *Cephalodiscus* and in *Balanoglossus Kupfferi*. The left anterior enterocoele is the proboscis cavity, which retains its pore.

I may now revert to the question of the endostyle. The considerations here advanced render it probable that an adoral ciliated band, comparable to that of *Auricularia*, persists in some forms of *Tornaria*. Mr. Ritter's note on the discovery of a ventral ciliated (?) tract in the oesophagus of a *Tornaria* from the Pacific suggests to me that he has very probably come across the desired homologue of this adoral band. His preliminary description is, however, so incomplete that it is impossible to be certain upon the point at present. The general truth of the homologies which I have suggested seems to me to be so well substantiated that I should be far from surprised if Mr. Ritter should find, upon further examination, that the ciliated tract which he has discovered possesses the loop-like arrangement characteristic of the adoral band of *Auricularia*, of the corresponding structures in the Tunicata, and of the endostyle of the larval *Amphioxus*. I publish this note in the hope that he may be led to direct his attention towards the possible existence of such an arrangement; and also to the important theoretical point whether the approximated portions of the ciliated bands do actually in ontogeny contribute to the formation of the medullary plate which he describes. I am well aware that Morgan does not attribute any direct share in this formation to the ciliated bands; but his description is most significant and suggestive. It is possible that in *Tornaria*, as in *Auricularia*, the ciliated ridges are secondary concentrations of primitively broader ciliated bands, and that Morgan's »collar-folds« are the ontogenetic expression of these hypothetical tracts.

Plymouth, Febr. 2nd 1894.

6. Cambarids from Florida, a new blind species.

By Dr. Einar Lönnberg, Upsala.

eingeg. 14. Februar 1894.

During my sojourn in Florida 1892—93 I had opportunity to collect three species of *Cambarus*. Two of them are well known and described forms: *Cambarus fallax* Hagen and *Cambarus Alleni* Faxon both of which I procured from several different places. But the third is quite different. It is a blind species from a subterranean water. Digging a well in Orange County a man at a depth of about 30 feet