

## LETTERS TO THE EDITOR

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## What is "Anlage"?

THE necessity of finding an adequate translation of this indispensable German expression becomes more, rather than less, pressing as time goes on. To be obliged, on every occasion, to write "Anlage" in inverted commas, is a standing testimony to the deficiency of our scientific nomenclature, and a constant offence to our aesthetic susceptibilities. It is true that there are other terms which have been spasmodically employed to convey the conception contained in "Anlage." But these terms are either inadequate, unsightly or inaccurate. "Forecast" is inadequate, "fundament" is unsightly, while "rudiment" is inaccurate. I will not insist further upon the impropriety of the use of the words "forecast" and "fundament," but will proceed to explain why, in my opinion, "rudiment" is an inaccurate rendering of "Anlage." It is not so much that an "Anlage" of an organ is not a "rudiment" of that organ, as that the rudiment of an organ is generally something different from its "Anlage."

This point is best illustrated by considering a somewhat extreme case, or at least one which is a matter of common observation. The budding limbs of the embryo of a quadrupedal vertebrate are rudiments of the pentadactyle appendages which have their origin in the internal "Anlagen" of those structures. Thus the "Anlagen" are aggregations of embryonic cells which, by their growth and division, give rise to rudiments, and the latter, in their turn, give rise to the finished organs. So that, far from being identical with an "Anlage," a rudiment arises from an "Anlage," and is the middle stage in organogeny.

As the organs of the animal body are built up of tissues, and these of cells, so, in their development, they spring from rudiments, and these from "Anlagen."

This analogy may be represented as follows:—

<i>Anatomy.</i>	<i>Development.</i>
Organs—tissues—cells.	"Anlagen"—rudiments—organs.

In some cases, no doubt, it would not be necessary to make a fine distinction between "rudiment" and "Anlage," but in others it is undoubtedly necessary; and it is for such cases that one has to be prepared with a suitable technical term.

The essentials of a good term are that it should be new, precise and Latin.

The word that commends itself to me as being at once accurate and well-sounding is *primordium*, and I trust some of your readers will criticise it whether favourably or unfavourably.

The conception embodied in the word "Anlage" recurs so frequently in our science, that it seemed of sufficient importance to invite attention to the matter in the columns of NATURE.

New Museums, Cambridge,                      ARTHUR WILLEY.  
August 16.

## "Animal Intelligence."

IN a review of my monograph on "Animal Intelligence," in a recent number of NATURE, Mr. Lloyd Morgan credits me with upholding the theory that we have sensations caused by outgoing currents which innervate muscles, and with depending on that theory in some of my own statements about the nature of animals' consciousness. A careless and ambiguous sentence of mine was responsible for this. I believe with Mr. Morgan that the feelings which go with innervations of the muscles are due to currents coming back from the muscles or joints and tendons, and do not think that any of my conclusions in any way involve an acceptance of the other theory. Such sensations due to return currents (together with the images built up from them) were just what I meant by the phrase which he quotes, "the consciousness accompanying a muscular innervation apart from that feeling of the act which comes from seeing oneself move, &c." It was because I presupposed general agreement in accepting the return-current theory that I was so careless as to leave the obvious ambiguity.                      EDWARD L. THORNDIKE.

Cambridge, Mass., U.S.A., August 3.

NO. 1504, VOL. 58]

I NEED hardly say that I sincerely regret the unwitting misrepresentation of Mr. Thorndike's meaning. But I may be allowed to add, in self-defence, that the "careless and ambiguous sentence" forms part of the definition of "impulse," and that the exclusion of "feeling one's own body in a different position, &c.," is emphasised by italics. I am glad to find that Mr. Thorndike's interpretation and my own are thus yet more closely in accord than I supposed, and shall look forward to more experiments and further discussion in the field of "Animal Intelligence" from him.                      C. LLOYD MORGAN.

A Tooth of *Hybodus grossicornis* from the Inferior Oolite.

SOME time ago I found in one of the lowest strata of the Inferior Oolite, a tooth of the *Hybodus grossicornis*. The bed occurred at Haresfield Beacon, near Gloucester. The following section of this hill is given by Mr. E. Witchell, of Stroud:—

Freestone: Ferruginous concretionary marl, 1 foot 6 inches; ferruginous brown hard sandstone, 8 feet; oolitic ferruginous bed, 2 feet; Cephalopoda beds, 2 feet 6 inches.

Below these beds are the Cotteswold Sands, resting upon Upper Lias. The tooth was found in the freestone bed, the characteristic fossils of which are *Ostrea*, *Lima*, *Terebratula*, various small Gasteropoda and Crinoids.

The species of the fossil has been kindly determined by Prof. Newton.

THOS. BEACALL.

Quedgeley, Gloucester, August 19.

## Iridescent Clouds.

YOUR correspondent Mr. W. Larden, writing on the subject of solar halos (p. 344), referred also to rose-crimson and green colours on clouds. It is quite unnecessary to be at 6000 feet altitude to observe iridescent clouds, for we do so frequently here during the summer months, at about 350 feet above sea-level. They appear generally about an hour before sunset and cease at sunset, and we always look out for them when seeing the suitable kind of delicate cirrus cloud in fine wavy fleecy streaks in the sky near the sun at the right hour; and are generally rewarded by the sight of the exquisite rose and green ripples of nacreous brilliancy, affording a striking contrast to the ordinary sunset colouring.                      E. ARMITAGE.

Dadnor, Herefordshire, August 16.

## Distant Thunderstorms affecting Flowers.

AT Malvern we felt none of the thunderstorms of Thursday, August 18, and the following night; but some freshly-cut sweet peas shrivelled, and did not recover their beauty until the morning of the 19th. The nearest storms must have been at Cardiff and Bristol.                      ROSEMARY CRAWSHAW.

## INTERNATIONAL CONGRESS OF ZOOLOGISTS.

THE Fourth International Congress of Zoology, which opened at Cambridge on Tuesday morning, August 23, promises to be the most successful meeting yet held. This is the first occasion that the Congress has met in England, and the proportion of English members assembled to extend a welcome to the foreign zoologists is, as it should be, considerable. The Congress is a triennial one, and has already met at Paris, Moscow and Leyden. The increasing popularity with which the meetings are regarded by zoologists may be gauged by the progressive increase in the number of members attending. Only sixty members were present at the Paris Congress in 1889, 120 at Moscow, and 200 at Leyden; the number participating at the present meeting has already exceeded 280. Among the distinguished visitors present are Dr. Anton Dohrn (Naples), Prof. E. Ehlers (Göttingen), Prof. L. von Graff (Graz), Prof. Haeckel (Jena), Prof. E. L. Mark (Cambridge, Mass.), Prof. O. C. Marsh (New Haven), Prof. A. Milne-Edwards (Paris), Prof. K. Mitsukuri (Tokyo), Prof. Ramsay-Wright (Toronto), Prof. W. Salensky (St. Petersburg), Prof. F. E. Schulze (Berlin), and Prof. J. W. Spengel (Giessen). Much disappointment is felt at the absence through ill

health of Prof. Carus, Prof. Ray Lankester and Sir William Flower. Sir William Flower, it will be remembered, was, at the conclusion of the Leyden Congress in 1895, made President-Elect for this Cambridge meeting; but he relinquished the presidency in favour of Sir John Lubbock, in the early part of the present year, on account of failing health. Sir John Lubbock opened the Congress on Tuesday morning by a short address, which is here printed in full. The members of the Congress who arrived at Cambridge on Monday evening were received at the Guildhall by the Mayor of Cambridge and by the Vice-Chancellor of the University, who, in a short speech begun in English, continued in German, and concluded in French, welcomed the visitors and expressed the best wishes of the town and the University for the success of the meeting.

The following is the President's address:—

My first duty to-day is to welcome our foreign friends who have done us the honour to attend the Congress. I may do so, I know, on behalf of all English zoologists. They will, I hope, find much to reward them for their journey. It will have been to them, as it is to us, and to no one more than myself, a matter of profound regret that Sir W. Flower, who had been nominated as our President, found himself unable to accept the post. Our regret is the keener on account of the cause, but I am sure that we all hope that rest and change of air will secure him a renewal of health. I am painfully conscious how inadequately I can fulfil his place, but my shortcomings will be made up for by my colleagues, and no one could give our foreign friends a heartier or more cordial welcome than I do.

The first Congress was held at Paris in 1889, and was worthily presided over by Prof. Milne-Edwards, whom we have the pleasure of seeing here to-day. The second Congress was held at Moscow in 1892, under the Presidency of Count Kapnist, and under the special patronage of his Imperial Highness the Grand Duke Serge. The third Congress was at Leyden in 1895, under the Presidency of Dr. Jentink, Director of the Royal Museum, and under the patronage of the Queen Regent. We assemble here to-day under the patronage of H.R.H. the Prince of Wales, with the support of Her Majesty's Government, and under the auspices of the University of Cambridge.

Such meetings are of great importance in bringing together those interested in the same science. It is a great pleasure and a great advantage to us to meet our foreign colleagues. Moreover, it cannot be doubted that these gatherings do much to promote the progress of science.

What a blessing it would be for mankind if we could stop the enormous expenditure on engines for the destruction of life and property, and spend the tenth, the hundredth, even the thousandth part, on scientific progress. Few people seem to realise how much science has done for man, and still fewer how much more it would still do if permitted. More students would doubtless have devoted themselves to science if it were not so systematically neglected in our schools; if boys and girls were not given the impression that the field of discovery is well-nigh exhausted. We, gentlemen, know how far that is from being the case. Much of the land surface of the globe is still unexplored; the ocean is almost unknown; our collections contain thousands of new species waiting to be described; the life-histories of many of our commonest species remain to be investigated, or have only recently been discovered.

Take, for instance, the common eel. Until quite recently its life-history was absolutely unknown. Aristotle pointed out "that eels were neither male nor female," and that their eggs were unknown. This remained true until a year or two ago. No one had ever seen the egg of an eel, or a young eel less than 5 centimetres ( $1\frac{1}{4}$  inches) in length. We now know, thanks mainly to the researches of Grassi, that the parent eels go down to the sea and breed in the depths of the ocean, in water not less than 3000 feet below the surface. There they adopt a marriage dress of silver and their eyes considerably enlarge, so as to make the most of the dim light in the ocean depths. In the same regions several small species of fish had been regarded as a special family, known as *Leptocephali*; these also were never known to breed. It now appears that they are the larvæ of eels; the one known as *Leptocephalus brevirostris* being the young of our common fresh-water eel. When it gets to the length of about an inch, it changes into one of the tiny eels known as

elvers, which swarm in thousands up our rivers. Thus the habits of the eel reverse those of the salmon.

I will only take one other case, the fly of the King Charles oak apple so familiar to every schoolboy. In this case the females are very common; the eggs were known. But no one had ever seen a male. Hartig in 1843 knew twenty-eight species of *Cynips*, but in twenty-eight years' collecting had never seen a male of any of them. He and Frederick Smith between them examined over 15,000 specimens of *Cynips disticha* and *C. Kollari*, and every one was female. Adler, however, made the remarkable discovery that the galls produced by these females are quite unlike the galls from which they were themselves reared; that these galls produced flies which had been referred to a distinct genus, and of which both males and females were known. Thus the gall-flies from the King Charles oak apple (which are all females) creep down and produce galls on the root of the oak from which quite a dissimilar insect is produced, of which both sexes occur, and the female of which again produces the King Charles oak apple. This is not the opportunity to go into details, and I merely mention it as another illustration of the surprises which await us even in the life-history of our commonest species.

Many writers have attributed to animals a so-called sense of direction. Some species of ants and bees certainly have none. Pigeons are often quoted, but the annals of pigeon-flying seem to prove the opposite; they are "jumped," as it were, from one point to another. We know little about our own senses—how we see or hear, taste or smell; and naturally even less about those of other animals. Their senses are no doubt in some cases much acuter than ours, and have different limits. Animals certainly hear sounds which are beyond the range of our ears. I have shown that they perceive the ultra-violet rays, which are invisible to us. As white light consists of a combination of the primary colours, this suggests interesting colour-problems. Many animals possess organs apparently of sense, and richly supplied with nerves, which yet appear to have no relation to any sense known to us. They perceive sounds which are inaudible to us, they see sights which are not visible to us, they perhaps possess sensations of which we have no conceptions. The familiar world which surrounds us must be a totally different place to other animals. To them it may be full of music which we cannot hear, of colour which we cannot see, of sensations which we cannot conceive.

There is still much difference of opinion as to the mental condition of animals, and some high authorities regard them as mere exquisite automata—a view to which I have never been able to reconcile myself. The relations of different classes to one another, the origin of the great groups, the past history of our own ancestors, and a hundred other problems, many of extreme practical importance, remain unsolved. We are, in fact, only on the threshold of the temple of science. Ours is, therefore, a delightful and inspiring science.

We are fortunate in meeting in the ancient University of Cambridge, a visit to which is, under any circumstances, delightful in itself from its historic associations, the picturesque beauty of the buildings, and as the seat of a great zoological school under our distinguished colleague, Prof. M. Foster.

The University has given us a most hospitable reception, for which we are very grateful. This morning will be devoted to business and the receipt of reports. In the afternoon will be held the first meeting of Sections, and to-night the Vice-Chancellor has been good enough to invite us to Downing College. To-morrow morning will be devoted to a discussion of the position of sponges in the animal kingdom, and in the evening there will be a conversazione in the Fitzwilliam Museum. Thursday we are looking forward to a discussion on the origin of Mammals. For Friday we have a number of interesting papers. On Saturday morning we shall have to determine the time and place of the next meeting, and then we adjourn to London.

The President and Council of the Zoological Society have invited us to visit their gardens in the afternoon; and in the evening, by the kind permission of the Trustees, I am permitted to invite your presence to a party at the Natural History Museum.

The Central Hall only will be open that evening, but on the following day you will have the opportunity of visiting the whole Museum.

In the evening the President and Committee of the Royal

Societies' Club hope to have the pleasure of seeing you at their house in St. James'-street.

Monday the Museum of the College of Surgeons will be thrown open, and will be found well worth a visit. Mr. Rothschild has also kindly invited us to see his rich museum at Tring.

Tuesday the Duke of Bedford will show his collection of Cervidae at Woburn, and there will be excursions under the auspices of the Director of the Marine Biological Laboratory at Plymouth, and of Prof. Herdman at Port Erin.

I trust, therefore, that you will have a delightful and interesting week, and that our foreign friends will carry back with them pleasant recollections of their visit here, which may induce them to return again in some future year.

#### THE BRITISH ASSOCIATION.

THE preparations for the meeting in Bristol are well in hand, and by September 7 everything will be in order for the reception of visitors. It is, of course, impossible to say at present whether the meeting will be a big one, but it is expected to be, and the Executive Committee are prepared for any emergency which may arise on this score. It is not improbable, taking all things into consideration, that many will avail themselves of coming to Bristol. Owing to the distance that the meeting was held from London last year, some certainly could not spare the time for a visit to Canada, and so will take special pains to be present this year. There happen, too, to be several unusual attractions. The opening of the Cabot Tower, though not strictly speaking connected with the Association, has been fixed for Tuesday, September 6, and will no doubt influence many Canadians and other American visitors to come to Bristol. The Marquess of Dufferin will perform the ceremony, and be present at the dinner in the evening. The International Conference on Terrestrial Magnetism will also meet during the Association week, and there will also be a Biological Exhibition in the Clifton Zoological Gardens, which cannot fail to be of interest. Lastly, and by no means least, the high reputation Bristol and the neighbourhood has for objects of interest—geological, botanical, and archæological—together with the well-known beauty of the place and the hospitality of its citizens, will induce many to attend the 1898 meeting, combined with the additional attraction of a visit from part of the Channel Fleet.

The reception room will be at the Victoria Rooms in the large hall, and will contain the usual counters for obtaining tickets, &c., post office, and conveniences for writing; this latter being in the gallery, access to which is obtained by a wide staircase. The small hall will be devoted to the gentlemen's smoking room, where tea and coffee can be obtained. The room known as Alderman Daniel's, with two others, will be given over to the ladies, the rooms being suitably furnished. The local hon. treasurer and secretaries will also have their office in the Victoria Rooms.

The Directors of the Victoria Rooms Company have, in reply to a request, redecorated a large part of the building, so that the appearances are all that could be desired. Cloak room for gentlemen, typewriting rooms, telephone, and a newspaper stall are all provided.

Luncheons can be obtained at the Grammar School, hard by the Victoria Rooms, and at the premises of the late Salisbury Club, which latter building will also accommodate the press and General Committee at their meetings. Lunch can also be obtained at several restaurants near.

In the Drill Hall will be an exhibition of pictures, ancient armour, and Bristol china and other objects of interest; while the band of the Royal Horse Artillery will play there each afternoon from 4 to 6. In the event of wet weather this place will be very convenient; but wet or fine, it will form a comfortable lounge for those who do not wish to go to garden parties.

NO. 1504, VOL. 58]

The section rooms are well situated, and are mostly near the reception rooms, the furthest not being any considerable distance.

Section A will meet in the Lecture Theatre of the Museum, kindly lent by the Corporation; Section B in the British University College; Section C in the Hannah More Hall, Park Street; Section D in the Victoria Chapel Schoolroom; Section E in the Concert Room of the Blind Asylum; Sections F and G in the Merchant Venturers' Technical College; Section H in the Roman Catholic Schoolroom; Section K in the Fine Arts Academy.

All the Bristol and Clifton Clubs have thrown their doors open to visitors, and at the Clifton College and Corporation Baths members can have an early swim if they desire it.

The presidential address and evening lectures will be delivered in the Colston Hall; the working men's lecture in the hall of the Young Men's Christian Association, St. James Square.

Two conversaciones will be given: one by the Chairman of the Council (the Lord Bishop of Hereford), the head master of Clifton College, and Mrs. Glazebrook, at Clifton College, on September 8; the other by the local committee, in the Colston Hall on the 13th.

As well as the Cabot dinner two others will be given: the Chamber of Commerce on the 10th, the Master and Society of Merchant Venturers on the 13th; and a smoking concert will be given in honour of the President at the Merchant Venturers' Technical College on the 9th.

During the week, eight garden parties will be given to the members of the Association, several of the houses where they are to be held having most beautiful views of the Avon and Severn. As regards the usual literature that will be distributed, the handbook will not be of the bulky though excellent type of the 1875 one; it will be a more compact work, printed on thin but strong paper, and the articles, which are written by local authorities on the various subjects, as complete and full as space will permit. This work was completed more than a month ago.

The excursions guides are being framed on the lines laid down by the Manchester Committee a few years ago. Each of the eighteen excursions is printed as a separate booklet, but all are enclosed in a stout cloth cover and held by a band. The map, for only one will be given, is a new one, just published by Philip, of Liverpool, and will be coloured to show the geology of the district.

#### GLYPHIC AND GRAPHIC ART APPLIED TO PALEONTOLOGY.<sup>1</sup>

THE Trustees of the American Museum of Natural History have undertaken a most useful work, in providing casts of a number of vertebrate fossils, obtained during recent years, from the Tertiary and Secondary deposits of North America, many of which can only be represented by this means in foreign museums.

But they have done even more than this; for, possessing on their staff men of artistic talent, as well as anatomical knowledge, they have set to work and produced a series of models of some of the extinct monsters of the Permian, Cretaceous and Tertiary rocks of North America, restored by Mr. Charles Knight with suggestions and criticisms by the late Prof. E. D. Cope, and by Prof. Osborn and Dr. Wortman. These models (which are on a scale suitable for a small museum or lecture-table), have been executed in plaster by Mr. Jacob Gommel. Only five are at present ready for dis-

<sup>1</sup> "Casts, Models, Photographs, and Restorations of Fossil Vertebrates," Department of Vertebrate Palæontology, American Museum of Natural History; Central Park, New York, U.S.A. Henry F. Osborn, Curator; J. L. Wortman and W. D. Matthew, Assistant Curators. 8vo. Pp. 24 7 illustrations).