coma and the other an equally typical carcinoma. Polymorphs are numerous, and I think I have made out bacteria in places, but these often occur in rat-tumor transplants. As I have said, the hypothesis that they are pure accidents appears to me untenable and the Dresden work reduces me to one of two alternatives. Either the rat tumors are due to the bacterial culture *PM* or else to some invisible virus attached to the culture and carried along with it. In either event it suggests parasitism. Just as I left Berlin I saw a third rat tumor (good primary, size of the end of my finger, with liver metastasis) produced from a third human breast carcinoma. This is *Beta*. It was just being transplanted, and I have not heard whether the transplants have grown. I showed the rat slides to Jensen in Copenhagen. He said he had never seen any tumor like it. One he pronounced a sarcoma, another from the same rat "possibly an endothelioma."

I found general scepticism in Berlin and in other parts of Europe as to the value of Dr. Blumenthal's work, but it is well to remember that the attitude of medicine toward any startling new discovery has been always one of rank scepticism, which in many cases is only another name for mental inertia. I have learned, therefore, to discount all criticisms which are not based on good opposing work. There are also many jealousies and much misinformation. The cancer laboratory at the Charity Hospital is poor and has urgent need of money for assistants and for additional animals and animal houses. Just now it would be a good place to put money, hoping for interesting definite returns. A few thousand dollars would be of great service and many a rich man who will die of cancer would not miss it in the least and might render a real service to humanity, just as he might also by giving money to the American Association for Cancer Research.

It is the more interesting that Dr. Blumenthal should have reached the conclusion that the crowngall organism is the type of a whole group of cancer parasites, since originally he shared and expressed the opinion of all German pathologists that the American crowngall studies were of no importance whatever to cancer research and only changed his opinion after studying and experimenting with the plant tumor for half a dozen years.

Professor Gosset, the great surgeon of the Salpêtrière in Paris, has also established a laboratory for the study of crowngall and has put Dr. Magrou, a Pasteur Institute man, in charge of it. Dr. Borrel, in Strasbourg, is also now studying it and a great variety of other tumors very actively and has a superb collection of cancer slides. There also a large amount of research is going on upon tuberculosis, syphilis, vaccine virus and all sorts of human and animal diseases. Dr. Borrel has found the cornea of rabbits an excellent place for the propagation of vaccine virus and here by staining methods he had demonstrated the presence of great numbers of cocci, sharply stained (I saw them under the microscope) and closely resembling the bodies he has found in *Molluscum contagiosum*, but from neither disease can they be cultivated. I was much impressed by what I saw in the Strasbourg Medical School. There I was received very courteously and invited to give two lectures to the fourth-year medical students on plant tumors.

Personally, I never thought the crowngall organism could be the cause of cancer in man, but only that cancer might be due to some parasite endowed with similar chemical activities. My reason for disbelief was that, in those strains of the organism which I tested in the thermostat, growth ceased a little under human blood temperature, but always in the back of my thought was the idea that there might be strains of the organism able to grow at 38° C. and for this reason I generally handled the tumors carefully and often sterilized my hands afterward. It was on my mind also to try to educate our strains of the organism to grow at higher temperatures than 36.5° C., but I never found time to try it. I will now try to discover strains able to grow at 38° C.

Looking over the whole field of cancer research I can not resist the feeling that great progress is being made and that the time is not far distant, and perhaps within our own generation, when we shall not only know the cause of human sarcoma and carcinoma, but shall have much better methods of treatment and especially of prevention than any now available. A vaccine is what I hope for and a carrier that may be destroyed, possibly also, a bacterial antagonist. As Pasteur said very often, "The essential thing is to repeat our experiments and not to be discouraged."

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DINOSAUR FEED

THE idea that dicotyls arose suddenly about the time smaller mammals appeared and the plant-eating dinosaurs reached maximum size and widest distribution, has led to some quite unimaginative speculation as to ancient reptilian food habits. With Jurassic hillsides so dominantly clothed in araucarians, pines, ginkgos, cycads and ferns, and lowlands beset by scouring rushes and stoneworts, the food of the great browsing animals seemed limited. Zoopaleontologists suggested, for instance, that terrestrial ortho-

poda, such as Iguanodon and Camptosaurus, ate the cycads and ferns which grew in such profusion during their day as to provide an "ample nourishment"!

Trachodon of the duck-like bill and fine dental battery, was as well equipped for chewing as the Tertiary and later Pachyderms, and was thought perchance to have lived on plenteously associated equisetes, including of course the rhizomes. "The abundant silica of the cuticle would have necessitated just such a formidable apparatus as the Trachodonts possessed for its proper mastication."

Now, in one of the Trachodont "mummies" various twigs of conifers and dicots, needles of *Cunninghamites elegans* and numerous seeds or fruits, all in macerated form, have been found by the German paleobotanist Kraeusel. Hence it is likely that some of the dinosaurs of drier habitats pastured on a severer forage than their relatives of the ox-bows, lakes, meadows and edges of moist warm woodlands with a more varied vegetation.

But the actual ecologic conditions of Jurassic and later time and the greater plant alignments presented a different grazing scene. Soil and climate were as varied as now. From the viewpoint of food as made up of root, stem, leaf and fruit, soils sustained as varied growth of nutrient substances as now. Thus, large edible seeds are abundant from the Carboniferous down, while the specialized vegetation, usually first preserved in the fossil form, rarely indicates the exact food source of contemporary life. In considering the meaning even of Jurassic pines as food it is observed that the pine group was then varied, lush of foliage, numerous in species, perhaps five times as numerous as now, and must have included types quite free from the harsher turpentines characteristic of the specialized limited remnant now seen.

Liliaceous plants abounded in the streams and about the lakes of the Trachodon landscapes, and perhaps added to the reptilian dietary. Tangled masses of water hyacinths, like those that at night in the late winter when in bloom simulate ice floes along the upper St. John's River, may feature the plants on which Como dinosaurs fed. No great animals live on pine twigs, on cycads, on ferns, or on scouring rushes to-day, and it is safe to assert that rarely have any fed to any extent on such arrested, aplastic plants in the past. On the contrary, throughout all Triassic and Jurassic time, the land and water plants closely antecedent to the dicots and monocots of to-day, afforded the varied and abundant food on which the dinosaurs lived and often reached gigantism. Climate was only somewhat warmer, in the geographic temperate zones, with stem structure simpler, and foliage less net-veined. As the dinosauria lived throughout the period of development, of modern stem types and persisted into that of the later dicotyl forests, their disappearance is but indirectly traceable to local loss of food supply due to geologic change. The contemporary plant life as a whole, though not as numerous in species as now, may long have afforded a rather more succulent or more digestible forage than that on which the Indian and African elephant and the rhinocerus thrive.

In all considerations of the food habit of the dinosauria the three factors, climate, habitat, and the prevailing cast of vegetation for the successive periods, must outweigh surmise as to what were precisely the plants on which the particular genus or species lived. Were the hippopotamus only known as a fossil, the habit of feeding on seaweed would scarcely be suspected as one of his aquatic acquirements. While on the other hand the occasional cropping of conifer twigs by the musk ox, and winter season feeding of reindeer on algae are habits of the arctics which have no bearing here, unless showing how far necessity may drive animal life.

Citation of the cycads, particularly those of former desert regions, as a source of dinosaur diet, suggests a further risk of error. Chamberlain, who has seen most of the existing cycads in their habitats, says of the great *Macrozamia Moorei* of East Australia (23° S. L.), so like *Cycadeoidea* in both vegetative habit and the free subapical growth of cones:

> Unfortunately the leaves of cycads contain a poison which has a disastrous effect upon cattle, and in such a place anything green is likely to prove attractive. The cattle eat the leaves, especially the young leaves, and soon show a kind of paralysis which the cattlemen call "rickets." The hind legs begin to drag, giving the animal a peculiar gait, and when it can no longer move about it dies of starvation rather than from the direct effect of the poison. The government is trying to exterminate the plant by poisoning it with arsenic. A notch is cut in the side of the stem, and the arsenic is inserted. The plant soon dies, its leaves droop, and the stem becomes so brittle that the first strong wind completes its ruin. . . . Steps were being taken to create a reservation and thus prevent a plant of such scientific importance from becoming extinct. It seemed nothing short of vandalism to destroy such splendid plants.

If then the dinosaurs toward the close of their long dominance, turned to a cycadeous forage, the cycads could have been one of the causes of their undoing. The gradual development of poisonous principles in the foliage would then have been one of those fortuitous counter-adjustments sometimes seen in nature, tending to survival of the cycadean stock.

Undoubtedly poisonous plants have endangered grazing animals as long as there have been such. Poisonous or deleterious plants must have abounded

always and in all climates, in desert, arid, and wooded regions or plain alike. An enumeration of the more or less poisonous plants of Michigan by Woodcock (*Amer. Jour. Botany,* Feb., 1925) extends to 156 species above the algae and fungi. Most are angiospermous; but as the case may be, either horses, cattle, sheep, goats or people need to avoid three species of ferns, the field horsetail, two junipers, and the American yew. Leaves of all species of oak are poisonous, when forming the sole food of animals. Many of the various species listed yield prussic acid, and the flowers of the "lily of the valley" and the "meadow saffron" toxic honey.

The dinosaur range was more than once narrowed by geologic events; but Africa and South America, half the land area of the globe, always remained tropic. Dinosaurian life having shown no visible sign of failure to adjust itself to relatively modern environments, loss of either food or habitat does not satisfactorily explain the extinction of the entire race; although it is thinkable that time being long, with waning appearance of new species the ordinary course of geologic change would tend to localize and thin out the older numbers.

Nor is it certain that the dinosaurs were as dependent on warmth as is usually assumed. As Lucas suggested, the lungs may have been more bird-like, the blood warmer than in existent reptiles. Moreover the growth rings of the conifers of the Como in any case indicate sharp seasonal change, and there is no known feature of the vegetation in the Freeze Out Hills or of that further north in the Como dinosaurian range, precluding heavy frosts. Whence one must imagine the Como sauropods retreating into the waters of the protected bayous in the colder season, and stretching their long necks to crop the masses of shore vegetation in the springtime; while as the hot dry summer advanced these animals would venture landward into different herbage for egglaying and any care of the young. Other types of medium size like the orthopoda would perhaps hibernate like tortoises about the edges of the low wooded lands.

The really important phase of dinosaurian dietetics must therefore be the comparative odontography measured in terms of present day life and food,—at least with rare exceptions. Plant fossils record only a small percentage of the floras of dinosaur times; while the dinosauria were so varied of structure that they could live in all the terranes of their day from the rivers and lakes to the borders of the plains, and through the shady forests to the edge of the dry desert. Until a greater floral record is revealed in the course of the years, the *menu* of the dinosaur must remain somewhat in the same category as that of Thomas Hood's Mylodon, which was generous, abundant, and only lacked preparation by a modern *chef!* Neither harsh "abrasive" foods, nor thyroid-reactive iodine need be looked upon as elements of dinosaurian diet to any extent. Dinosaurs trampling the earth till the grasses grew is only fair evolutionary phantasy. The grasses may be as old as any larger reptiles.

Not to close this suggestion too hastily it is connoted that the lacertilia afford near views of dinosaur-like food habits. Their habits are most varied, and aside from the many insectivores, larger forms like the Algerian Agamids eat, besides dates, berries, grass and various flowers.

Then amongst the Varanids, the monitors are exceedingly rapacious, at times becoming scavengers. They prey on all animals they can master, and are very active; from which it appears that certain fossil Varanids vieing in size with present day crocodilians, were formidable reptiles which may easily have accounted for some of the past extinction of water fowl and mammals.

More aquatic than any of the monitors, the Galapagos Island Iguanoid, *Amblyrhynchus cristatus,* is semi-marine, feeding on sea weeds below tide. This animal is an expert swimmer. The teeth are trilobate; the head is covered by low conical scales. And herein lies a further suggestion. The famous Maidstone Iguanodon of the lower Greensand might just as readily have led an aquatic life, feeding on sea weeds, as the turtles or an Iguanoid. A few of the armored dinosaurs also suggest algal pasturage. Such are Hierosaurus of the Niobrara chalk and certain allied European types. The marine occurrence of the dinosaurs has never been closely considered. Though of course, such occasional occurrences as that of the Hadrosaurs in the New Jersey Greensand, in the Niobrara chalk, and again in the upper Pierre, may be without bearing on food habits.

G. R. WIELAND

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SCIENTIFIC EVENTS

ROBERT SIMPSON WOODWARD

THE following resolution was adopted at the annual meeting of the American Geophysical Union, May 1, 1925:

WHEREAS, We, the members of the American Geophysical Union, have learned with deep regret of the death of our associate, Robert Simpson Woodward, who, after a lingering illness of 18 months, peacefully passed away on June 29, 1924, in the seventy-fifth year of his age, therefore, be it

Resolved, That we express our deep sorrow in this loss of one who took a prominent part in the formulation of the initial plans which led to the ultimate establishment