growth-promoting necrotic tissue from an osteomyelitis wound by means of the macerating activities of the powerful mouth-hooks and predigestion, or liquefaction, by the tryptase present in the excreta, as shown by Hobson[1,2,3] and Mackerras and Freney[4] in experiments with maggots upon carrion. The action of this excreted tryptase, which arises in the mid-gut, is dependent upon an alkaline reaction which is imparted to the wound by ammonia in the feces and by calcium carbonate, which is continually exuded in small quantities through the body wall.[5] The removal of the necrotic tissue and the alkalization of the wound result in a reduction of the swelling of the soft tissue, with consequent increased drainage and decreased bone destruction, in protection to the tissue cells from autolysis stimulated by an acid condition and in retardation of bacterial growth. The calcium ions liberated from the exuded calcium carbonate stimulate phagocytosis.

The characteristic healthy granulation of wounds treated with blowfly larvae is, from experimental evidence,[5] apparently due to the alkalization of the wounds.

The increased rate of growth of larvae placed in wounds in which these organisms have been employed for some time and the occasionally high mortality of young larvae placed in such wounds are both due to ammoniation of the wounds by larval activity.

Bacteriological tests of the mid- and hind-guts of maggots previously fed upon *Staphylococcus aureus*, the most common etiologic agent of osteomyelitis, are consistently negative, but histological examinations of similar guts show undissoluted bacteria to be as numerous in the rectum as in the proventriculus. Hobson[1,3] has shown that the middle segment of the mid-gut of *L. sericata* larvae has a pH value of from 3.0 to 3.5. Exposure at 30° C., the apparent minimum temperature of an osteomyelitis wound, of growths of *S. aureus* to McIlvaine's Buffer Solutions ranging through pH values of 3.0, 3.2 and 3.5 demonstrated that marked mortality occurs at the highest pH and at a pH of 3.2 complete killing was effected well within the time limit during which the food is retained in the acid region of the mid-gut. Thus are many of the pathogenic organisms removed from the wound; however, not enough of them are ingested to make this the chief factor in securing propitious results.

It is believed that a considerable portion of the destructive leucocidin liberated by the bacteria is ingested by the maggots and probably rendered inert in the acid region of the intestines by means of the direct action of the acid or by virtue of its possession of an isoelectric point close to, or at, the point of concentration of the acid.

The writer succeeded in readily developing extensive myiases in guinea pigs and in one human with *L. sericata* larvae. It was demonstrated that these maggots will readily attack normal, healthy tissue if necrotic tissue is not present, and even if it is present but not immediately accessible. It was further demonstrated, however, that these organisms do prefer necrotic tissue, provided it is exposed to their action at the time of implantation into the wound. From these findings it becomes apparent that blowfly larvae are potentially dangerous in human wounds and must, therefore, be employed with care and skill.

Brumpt[6] has suggested that the larvae of the French and Chinese strains of this fly will attack normal tissue but the American strain will not. The writer has demonstrated such not to be the case by easily and repeatedly causing experimental myiases in guinea pigs, with no necrotic tissue present, with two different American strains.

Furthermore, the author caged seven sterile *L. sericata* larvae upon perfectly intact, healthy epidermis of his fore-arm which penetrated the skin and subcutaneous tissue to a depth of 3 mm in less than forty-eight hours.

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The unification of relativity theory and quantum theory: SIR ARTHUR STANLEY EDDINGTON. The basis of unification is that *a priori* probability in quantum theory furnishes the metric in relativity theory, the metrical tensor $g_{\mu\nu}$ being identified with the energy tensor of the *a priori* probability distribution of the N particles of the system. The wave equation for a particle refers to a system in which one particle has a modified momentum distribution and the remaining N–1 particles (which are averaged) have the *a priori* distribution. The double wave function of this system is in practise replaced by a simple wave function, the physical system of N–1 particles being replaced by an ideal comparison frame which is treated as definitely known instead of as a probability distribution. The condition that this substitution is valid gives a quadratic equation for the mass associated with the simple wave function, and the two roots are the masses of the proton and electron, respectively.

[1] Hobson, *Jour. Exp. Biol.*, 8: 109, 1931.
[2] Hobson, *Biochem. Jour.*, 25: 1458, 1931.
[3] Hobson, *Jour. Exp. Biol.*, 9: 359, 1932.
[4] Mackerras and Freney, *Jour. Exp. Biol.*, 10: 237, 1933.
[5] Stewart, *Surg. Gynec. and Obst.*, 58: 155, 1934.
[6] Brumpt, *Ann. de Parasit. Hum. et Comp.*, 11: 403, 1933.

The energies of the atomic linkages in the normal paraffin hydrocarbons: FREDERICK D. ROSSINI (introduced by W. W. Coblentz). The energy of dissociation at 0°K of gaseous normal C_nH_{2n+2} into gaseous carbon and hydrogen atoms is shown to be a linear function of n above, but not linear below, n = 6. The deviations from linearity for the latter are: methane, 4.81 ± 0.08; ethane, 1.59 ± 0.14; propane, 0.83 ± 0.19; normal butane, 0.46 ± 0.27; normal pentane, 0.13 ± 0.37, kilocalories per mole. The deviations can be explained by distinguishing different kinds of C–H and of C–C linkages in normal C_nH_{2n+2}. For the normal paraffin hydrocarbons, and for carbon and hydrogen atoms in the normal state, the energy evolved in the reaction $C\ (gas) + 2H\ (gas) + C_nH_{2n+2}\ (gas) = C_{n+1}H_{2n+4}\ (gas)$, for $n > 5$, is $-\Delta H^\circ_0 = (20.8 \pm 0.9) + D_{CO}$ kilocalories per mole; and any assignment of values for the energy of dissociation of CO, for the energy of excitation of the carbon atom to the ^5S state, and for the energies of the one C–C and two C–H linkages formed in the reaction must satisfy this relation.

A new conception of metallic oxide hydrosols: ARTHUR W. THOMAS (introduced by H. C. Sherman). It is proposed to regard the micelles in hydrosols of the metallic oxides as polynuclear complexes arising through the process of olation (Pfeiffer, Werner) of basic salts in solution. Such a conception of polyolated complexes accounts for the properties and behavior of these hydrosols, such as decrease in acidity upon treatment with neutral salts and the order of effectiveness of neutral salt anions in this respect, the presence of anionic radicals in the cationic micelle, increase in acidity of the hydrosol upon aging and the concomitant increase in the refractory nature of the micelle upon aging. It also provides for the application of the knowledge of crystalloid complex ions to colloidal complexes.

Thio sugars: P. A. LEVENE and ALBERT L. RAYMOND. The methylthio pentose which occurs as a nucleoside in yeast has not been extensively studied because of the scarcity of the material. An attempt has therefore been made to prepare synthetic thio sugars, with the immediate object of studying their properties and the hope, ultimately, of synthesizing the natural sugar. The methods that have been evolved for this purpose and the products which have been prepared are presented.

Neglected factors in the development of thermal springs: E. T. ALLEN. Hot springs due to the same fundamental causes develop, under the influence of secondary factors, into distinctive types. Limestone is such a factor. Springs associated with it deposit travertine. Without it they would develop into a different type. Thermal waters of almost identical character may, or may not, deposit travertine, according as they stand in still pools, flow over rough outlet beds, escape by smooth channels or by very short runs. Springs of two radically different types arise in basins where the water supply is of different magnitude, and the supply depends in turn on the topography. In hot areas small water-supplies develop into shallow bodies of hot ground water, where leaching of rock by sulfuric acid is the dominant alteration process. Large water-supplies descend to much greater depths, reaching and dissolving the less volatile magmatic emanations and chemical products formed at deeper levels, thus generating hot spring waters which leach the adjacent rock in quite a different way.

Supposed meteorite scars of South Carolina: DOUGLAS JOHNSON. Typical oval "bays" of the South Carolina coast have recently been examined to test the validity of the meteorite-scar and other theories of their origin. Evidence will be presented which seems definitely to negative the theory that they are meteorite scars, and to support the conclusion that they represent former lake basins surrounded by rims of wind-blown sand. The sand was derived from the sandy borders of the former lakes, and characteristic effects of wave erosion are still traceable in places, although the lakes are now for the most part filled with bog deposits, thickly overgrown with vegetation. The remarkable parallelism of the oval "bays," as well as the varying breadths of the surrounding rims, is believed to be controlled by the winds. The rims themselves do not appear to be the product of waves or water currents, nor does any change in the level of land or sea seem necessary to account for the phenomena observed.

Geomorphic researches in the Yellowstone Park and Big Horn Basins, Wyoming: DOUGLAS JOHNSON, ARTHUR HOWARD and J. H. MACKIN. In connection with the Yellowstone-Beartooth-Big Horn research project, supported by a grant, in part, from the Geological Society of America, geomorphic researches along two major lines were prosecuted during the past summer. With a view to unraveling the physical history of the Grand Canyon of the Yellowstone, Howard, with the collaboration of Field and Johnson, has investigated the partially consolidated sediments (early described by Holmes and later discussed by Field and Jones) found adhering to the canyon walls in places, and has sought to determine the conditions under which they may have accumulated. Damming of the canyon by lava flows, landslides and ice, with consequent temporary laking of the Yellowstone River, are among the hypotheses tested. It has been found (a) that much of the high-level basalt represented as "recent" on earlier geologic maps of the region, and appealed to as a possible source of damming, is older than the supposed Pliocene basalt found partially blocking the canyon in places; (b) that this supposedly recent basalt at one place underlies a rhyolite flow, which latter has been dissected by streams, and the stream channels subsequently filled by more recent basalt; (c) that the great age of the high-level basalts makes it doubtful whether they can be appealed to as a means of damming the river, to cause deposition of the sediments in question; (d) that more than one period of damming is suggested, in which the more recent basalt flows, landslides and glacial ice may all have played a rôle, the presence of all being indicated, but the fact of damming by each not yet being demonstrated. In the Big Horn region,

Mackin, with the collaboration of Johnson and aided by Lucke and others, and Bogert, aided by Wiringa, have made extended studies of the behavior of streams entering the arid basin from the bordering ranges. The evidence indicates (a) that the heavily laden streams have swung widely over the basin floor, carving rock fans and pediments by the process of lateral planation; (b) that partially completed pediments constitute a series of smoothly planed rock terraces, each terrace being covered with a veneer of gravel laid down by the laterally shifting stream which carved it; (c) that remnants of pediments largely destroyed by subsequent erosion constitute high-level mesas or table-lands, each similarly capped by gravels; (d) that study of the gravels enables one to determine what stream was responsible for the carving of each terrace or mesa; and (e) to trace a former course of the Shoshone River across a mesa top and through a gap in Pryor Mountains long since abandoned by that stream; (f) that the terraces and mesas are not to be regarded as peneplanes or partial peneplanes, and that they do not necessarily indicate either successive changes in the relative position of general base level, or successive local uplifts of the adjacent mountain ranges; but may record variations in the graded condition of streams due to climatic or other causes; and (g) that long-range correlations of these erosion surface remnants are of doubtful validity. New topographic maps of some of the forms studied have been prepared and will be placed on exhibition, together with other products of the investigation.

Time measurements of an ice readvance at Littleton, N. H.: RICHARD J. LOUGEE (introduced by Charles P. Berkey). The lower dam at fifteen-mile Falls on the Connecticut River in Littleton, N. H., lies within the belt of the Littleton-Bethlehem moraine. Near the site of the dam in 1921 Antevs measured two varved clay sections a mile apart. The bottom varves of each rested on till, but the lowest varve of the section nearest the dam was about 280 years younger than the bottom varve of the other exposure. Antevs concluded that the ice had readvanced over the dam site and finally retreated some 280 years after the first uncovering. During construction on the dam site in 1930 Mr. I. B. Crosby noted two till sheets, each 30 to 80 feet thick, separated by a 30-foot bed of lacustrine sand. No varved clay was exposed between the sheets, but several hundred varves overlaid the upper sheet. In the summer of 1933 excavations were made near the diversion channel of the dam, and the writer observed 119 slightly contorted varves resting on 15 feet of till, which in turn lay on bed rock. Since the bottom varve is some 270 years older than the lowest varve on the upper till sheet, this clay must lie beneath the upper till. These observations confirm Antevs' conclusions and show that: (1) lake waters covered the dam site for 119 or more years after the first withdrawal of the ice; (2) readvancing ice overlay the site of the dam for 151 years and deposited the upper till sheet; and (3) some 270 years after the first retreat the ice finally withdrew and lacustrine conditions ensued for several hundred years.

The fauna of the White River Oligocene: W. B. SCOTT. Work on the great assemblage of mammals and reptiles which have been found in the Bad Lands of South Dakota, Nebraska and the adjoining states, must begin with Dr. Joseph Leidy's great monograph of 1869. Dr. Leidy was not himself a collector, but was dependent for his material upon the fossils sent him by others, especially by Dr. Hayden, who enjoyed the fortunate reputation among the Indians of being mad and therefore inviolable. Leidy's warning to paleontologists not to expect "novelties" for half a century to come has been rendered nugatory by the great advance in the art of collecting, an art which was developed by the men who worked for Professor Cope and Professor Marsh, above all by the late Messrs. Hatcher and Wortman, not to mention living men. In Leidy's time collecting consisted of picking up such fossils as had weathered out of the matrix and were lying on the surface, and erosion in those arid regions is very slow. Twenty or more museums have undertaken the work of collecting in the White River area, for in none of the American Tertiary formations is there such a wealth of beautifully preserved material; and in the list prepared for me by my colleague, Professor W. J. Sinclair, there are 94 genera and 339 species of mammals already named, to say nothing of the many tortoises and lizards. No doubt, the number of species must be largely reduced, but the genera will probably remain as numerous as at present.

The seeds of Supaia, a Permian Pteridosperm: DAVID WHITE. Several seeds apparently attached at the bases of as many pinnules of a fern-like plant, from the Permian Hermit shale in the Grand Canyon, Arizona, described by the author as a new genus, *Supaia,* could not be proved beyond question to be in organic union with the fronds on account of the gritty nature of the matrix and the complete absence of the plant substance, due to oxidation in the arid climate of the region and time. A fragment similarly oxidized, of *Supaia,* recently found in the Supai formation of the Apache Indian Reservation, Arizona, reveals the impressons of small cordiform platyspermic, winged seeds, completely agreeing with those from the Grand Canyon, each attached by a pedicel, about 4 millimeters long, to the rachis at the base of a pinnule. Not only is *Supaia* thus conclusively proved to belong to the Pteridosperms, of which it is the seventh form-genus in the Permo-Carboniferous to yield definitely correlated seeds, but it becomes most probable that the *Cyclocarpon*-like seed described as apparently attached pedicellately to a frond from the Grand Canyon tentatively referred to *Brongniartites,* a genus very close to *Supaia* and regarded as Pteridospermic, is in place of growth and a Pteridosperm.

(To be concluded)

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