have also a relatively high amount of organic carbon in their subsoils, *i.e.*, even down to two feet depth.

Podsol soils have been identified as such in Brome County, near the Vermont border of Quebec, in Jacques Cartier County on the Island of Montreal, and in Hull County near the confluence of the Ottawa and Gatineau Rivers. In each of these cases small areas of non-podsolized soils of limestone origin occur near the larger podsol areas.

Some of the characteristics of the Quebec podsols so far studied in this laboratory are shown in Table I:

TABLE I

CHARACTERISTICS OF QUEBEC PODSOL SOILS STUDIED

	Surface 8″ of Soil	Subsoil—Taken between 12 and 24″ deep
Carbon	High—3.42–4.72 per cent.	Low—0.79–1.72 per cent.
Nitrogen	High—0.25–0.45 per cent.	Low—0.08–0.15 per cent.
Color	Medium to light brown	Light brown to gray
Lime requirement	Very high—5721–11,378 lbs. $CaCO_3$ per acre	High, but lower than surface—3784–6557 lbs. $CaCO_3$ per acre
Hydrogen ion concentration	High—pH 4.97–5.71	High—pH 4.94–5.76
Water-retaining capacity	Very great	Much less than surface
Percolation rate	Very low	Higher than surface
Total Ca and Mg	Low — each below 0.5 per cent. of air-dried soil	Low—but slightly more than surface soil
Water soluble Ca and Mg	Low—23–33 ppm. Ca; 13–18 ppm. Mg in air-dried soil	Lower than surface—9–16 ppm. Ca; 3–5 ppm. Mg in air-dried subsoil
Concentration of NO_3^-, K^+, $PO_4^{\equiv}$, & $SO_4^{\equiv}$ in water percolates	Low	Much lower than surface
Loss on ignition	High—10.52–14.58 per cent. of oven-dried soil	Low—2.67–5.55 per cent. of oven-dried subsoil
Hygroscopic moisture	High—2.66–3.24 per cent. of air-dried soil	Low—0.89–1.96 per cent. of air-dried subsoil
Apparent specific gravity of fraction of air-dried soil passing 2 mm mesh sieve	Low—0.899–0.969	1.158–1.338

Further work on this question is in progress.

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THE NATIONAL ACADEMY OF SCIENCES

AT the annual meeting of the National Academy of Sciences, held in Washington on April 22, 23 and 24, the following papers were presented:

The regeneration of minute sectors cut from the bodies of nemertean worms: W. R. COE (introduced by Lorande L. Woodruff). When an individual of *Lineus socialis*, a nemertean found abundantly on our Atlantic coast, is cut into numerous transverse sections, each of these, with the exception of pieces cut through or anterior to the brain, quickly restores the missing organs and regenerates into a miniature of the original worm. If the transverse sections are split longitudinally along any plane, regeneration likewise occurs. Furthermore, if a section is split into four quadrants or even into six sectors, each piece may produce a minute worm of normal proportions. If, however, the sectors are incompletely separated posteriorly curious types of multiple individuals are sometimes formed. These may eventually lead to the production of normal worms either by a process of regulation whereby the less active partial individual is absorbed into the body of a more dominant individual or, more frequently, two or more of the partial individuals separate from the multiple group to develop into normal, but extremely minute, replicas of the original worm. Sectors incompletely separated at the anterior end may likewise produce multiple groups, but in this case the partial individuals are joined anteriorly and only a single head is usually formed. Eventually the single head forms a new body and separates from the multiple group as a complete individual, and the process may be repeated until all the partial individuals separate or disintegrate. Because of the high specialization of their tissues and the stability of their polarity the nemerteans are particularly favorable subjects for detailed analyses of the processes which are concerned in the dedifferentiation and redifferentiation of the cellular elements participating in the regenerative phenomena.

The physiology of sympathectomized animals: WALTER B. CANNON. Bilaterally sympathectomized animals have lived in the laboratory in good health, performing normally all the routine functions, for many months. The claims that the superior cervical sympathetic ganglia or the mesenteric nerves are essential for life are thus disproved. Additional removal of one adrenal and demedullation of the other demonstrates that the chromophil tissue is not of vital importance. Unilateral sympathectomy of young kittens has not resulted, as they have grown to adult size, in any demonstrable difference in bilaterally symmetrical organs. Sympathectomy does not prevent the female from performing the functions of reproduction. After bilateral sympathectomy emotional excitement causes no erection of hairs, no consistent increase of blood sugar, no polycythemia, no relative increase in mononuclear cells and, as shown by a few

observations, no marked rise of arterial blood pressure. Sympathectomized animals are very sensitive to cold; having lost the means of conserving heat they seek warm places, and when placed in a frigid environment they lose heat more rapidly than normal animals. The basal metabolism usually falls somewhat after sympathectomy, especially after the cervical portion is excised, but as a rule removal of the sympathetic chains does not reduce the basal metabolic rate more than 10 per cent. The slight effect resulting from sympathectomy raises the question as to the function of the sympathetic. This question is considered with regard to the natural conditions which excite the sympathico-adrenal system, and the conclusion is drawn that this system, dispensable in the protected conditions of the laboratory, finds its great service at times of critical emergencies when it adjusts the internal organs of the body for use of the mechanisms responding to external exigencies.

Chemical bacterial analysis and the coordination of chemical and biological investigations in the study of the tubercle bacillus cell: TREAT B. JOHNSON.

Chemical investigations of biologically active lipoids of tubercle bacilli (illustrated): RUDOLPH J. ANDERSON (introduced by Treat B. Johnson).

The reaction of the lipoid fractions from the tubercle bacillus, human strain H 37, when introduced into the tissues (illustrated): FLORENCE R. SABIN, C. A. DOAN and C. E. FORKNER.

An experimental method for determining the activity of convalescent poliomyelitus serum: SIMON FLEXNER and CORNELIUS P. RHOADS.

The relief of experimental pneumonia: YANDELL HENDERSON, P. N. CORYLLOS, H. W. HAGGARD, G. L. BIRNBAUM, and E. M. RADLOFF. In patients after surgical operations the development of the so-called massive collapse, or atelectasis, of the lung is an essential factor or stage in the development of pneumonia. It has been found (Scott and Cutler) that deep breathing induced by inhalation of carbon dioxide dilates the lung again and thus overcomes atelectasis and prevents the development of pneumonia. In medical pneumonia also the development of atelectasis (Coryllos and Birnbaum) plays an important part by closing the air tubes and thus obstructing the normal channels of drainage. The purpose of the experiments to be reported was to determine whether the deep breathing induced by inhalation of carbon dioxide will open up closed areas of the lungs in pneumonia. In its essentials this treatment is like that introduced by Henderson and Haggard and now widely used by the rescue crews in cities for the treatment of carbon monoxide asphyxia. In the experiments dogs were narcotized and a virulent culture of pneumococci type II was introduced through a bronchoscope into the right lung. Pneumonia generally developed, and in nearly all such cases, if not treated with inhalation of carbon dioxide, the animals died in from one to three days. If, however, soon after the development of pneumonia the animals were placed in an atmosphere of 5 to 7 per cent. carbon dioxide, the collapsed and pneumonic areas of the lung cleared up to a large extent and many of the cases made a complete recovery. X-ray pictures will be shown illustrating the collapse of the lung induced when an obstruction is placed in a bronchus and the rapid redistention of the lung when the animal is placed in a chamber containing 5 to 7 per cent. carbon dioxide in air. Similar pictures will be shown of atelectasis in dogs infected with pneumonia, together with the X-ray pictures showing the redistention of the lung resulting in such cases from the deep breathing induced by inhalation of carbon dioxide. These results are not to be interpreted as promising similar relief in clinical pneumonia; they merely open interesting possibilities. But, with other evidence, they do prove that atelectasis is a factor in pneumonia, and that inhalation of carbon dioxide is an effective means of counteracting atelectasis and reinflating the pneumonic lung.

Measurements of 100 members of the academy and what they show: ALEŠ HRDLIČKA. For five years now an effort has been made to obtain reliable physical, and some physiological, data on the members of the National Academy of Sciences. The membership of the academy is limited to 250; the mean actual membership has been by about twenty smaller. These men have been rigidly selected from among the foremost representatives of the different sciences. They are, therefore, a selected group of high-class brain workers. The problem was whether and how these men differed in physique, in strength, and above all in the development of their head, from the general population. The old idea of an eminent man of science was largely that of one-sidedness of mind with a rather frail or neglected body. Approximately one half of the members were examined, without any choice. The most striking fact brought out through this work is that these men, barring rare exceptions, are in no way inferiors, but rather superiors in physique, strength, health and longevity, as compared to the American and even the Old American population at large. It is decisively not a case of strong minds in weak bodies, but strong minds with strong constitutions. This is a fact of much significance and that not merely to anthropology. Another important fact is that these brain workers show a high average size of the head. The head (and hence presumably also the brain) of the members of the academy exceeds in size not only that of the population at large, but even that of the well-educated and professional Old Americans. There are many additional interesting details, but it is clear that outside of prevalence of above-the-average physique and above-the-average size of head, the highly talented men of science conform in their traits with the racial groups to which they belong. The essential results of the study here dealt with are, therefore, the apparently conclusive proofs that, in science at least, the strongest and ablest healthy minds go generally with strong healthy bodies; that intensive, prolonged mental work is concomitant with larger-than-average head and brain, and, finally, that such intensive mental work evidently does not tend towards a shortening of the life of the workers.

The reality of the great star streams: JAN SCHILT (introduced by Dr. Frank Schlesinger). In 1904 Kapteyn showed that the proper motions of the stars were directed towards two definite points in the sky. Although the more conspicuous motions seemed to be in either direction along a certain axis in space, it was realized that many stars deviated considerably from this main direction. Schwarzschild showed that Kapteyn's discovery could equally well be interpreted by the introduction of an ellipsoidal distribution of velocities as by Kapteyn's assumption of two separate streams. Kapteyn's interpretation has been illustrated by a comparison with two swarms of bees flying through each other, while the ellipsoidal theory is comparable with ships sailing on a wide river. In the former case each bee belongs to one definite swarm, although the direction and velocity of motion for an individual may deviate considerably from its swarm. In the second case we can not assign each ship to a definite stream. Slow craft will be found especially plying across, whereas the faster ships will show a tendency to sail either up or downstream. The controversy between the idea of the separate streams and the unitarian preferential motion theory has not been settled hitherto by observations. The tendency has been to favor the preferential motion rather than the streams, because it can much more easily be put into mathematical formulas. Kapteyn had the proper motions of about 3,000 of the brighter stars at his disposal. Nowadays more than ten times as many are known, and we have, moreover, the radial velocities for several thousands of stars. The discussion of parts of this enormous material has revealed the fact that the stars in a certain portion of space have, in general, a systematic velocity with respect to the stars in a distant portion of space. Several astronomers have tried to explain these systematic motions on the basis of the ellipsoidal theory. The recent results obtained from the discussion of proper motions and radial velocities at Yale Observatory confirm the existence of two great star streams which, however, are not the same as Kapteyn's. The stars in general to the tenth visual magnitude appear to be divided into two streams. The points of convergence are in Orion and Canis Major, at about 10° North declination and 40° South, respectively. The velocity of the sun is 8 km per second with respect to the northern stream, and 22 km per second relative to the southern. The proportion of stars belonging to stream N and to stream S varies with the region of the sky. But as a whole, about equal numbers belong to the two. Relatively to each other the streams move to and from a point in the galaxy at galactic longitude 58°, situated in Cygnus, with a velocity of 19 km per second.

The use of time-corrected films in hydraulic experimentation (illustrated): TH. REHBOCK (by invitation).

Comets and terrestrial magnetic storms: E. O. HULBURT and H. B. MARIS (introduced by Joseph S. Ames). A recent theory of the authors attributed terrestrial magnetic storms and auroral displays to the effect of unusual flares of ultra-violet light from the sun falling upon the terrestrial atmosphere. Such flares would be expected to cause changes in comets, and therefore comet changes should be closely connected with magnetic storms. This connection is supported by the evidence brought out in the present paper in a discussion of the behavior of thirty-one comets scattered through the years 1848 to 1927. A general statistical result was that in the month preceding each comet's activity there occurred on the average 6, 4, 2.9 and 1.5 times as many magnetic storms of strength 4, 3, 2 and 1, respectively, as there should have occurred according to chance. Outstanding comet changes, twenty-eight in number, followed on the average five days after strong magnetic storms. The positions of the comet, sun and earth at the epochs of the comet changes indicated that the solar flare was in a wide angle, contrary to the narrow beam hypothesis of Maunder.

Elements in the sun (illustrated): CHARLES E. ST. JOHN.

Further observations of stellar energy spectra: C. G. ABBOT. Author explained his attempts to improve the sensitiveness of the Nichols radiometer in order to prepare the way towards observing the distribution of energy in the spectra of the fainter stars. He employs vanes of house-flies' wings, cut approximately 1/25 inch tall by 1/75 inch broad as the ray-receiving surfaces. To prevent transfer of heat from front to rear, the vanes are in two groups of three each, placed parallel, with intervening gas-spaces of 1/250 inch. The front member of each group is blackened so as to be warmed by absorbing the spectral rays. Being suspended by excessively fine fibers of rock-crystal, the system, shaped like an inverted T, responds to the reception of rays by turning until the torsion of the fiber equals the kick of the gas molecules on the warmed surface. Rotations were measured by the deflections of a ray of light reflected from a tiny platinized mirror of very thin microscope cover-glass. The observing scale was at nearly twenty feet distance, and deflections thereon could be read almost to one second of arc of rotation of the mirror. The suspended system weighed but 0.9 milligram (3/100,000 ounce). The system was suspended within an optically worked tube of fused quartz, and surrounded by hydrogen gas at 1/5,000 atmospheric pressure. Experiments had shown that this gas, while giving nearly equal radiometer effects to air, was so much less viscous as to avoid excessive damping of the free swing of the suspension. Air at atmospheric pressure behaved like molasses to the vanes, so that the upper end of the quartz fiber could be rotated over forty complete turns before the suspension itself began to rotate. With this apparatus, author was able to make satisfactory observations of the energy spectra of eighteen stars and the planets Mars and Jupiter. Several stars fainter than second magnitude were observed, and the faintest was of 3.8 magnitude. From the results it is possible to estimate the diameters of the stars observed. Mars and Jupiter, as expected, indicated the solar type of spectrum.

(To be continued)