tunnels for themselves, when still more disastrous results may accrue. The abrasion and destruction of surfaces and cells and the opening up of abnormal communications are not, it is urged, of such serious importance of themselves; it is rather the secondary results from such lesions that are to be feared, such, for example, as the admission of bacteria from the alimentary canal into the blood and tissues. For it is held by many that the normal mucous surface is impenetrable by bacteria, and the germs of cholera and typhoid depend to some extent upon diminished resistance, functional or structural, for their entrance into the tissues.

No one, for instance, doubts that Eberth's bacillus is the active agent of typhoid, but there is strong reason to believe that before it can give rise to the disease there must be lesion of the intestinal mucous membrane. The very fact that out of numbers who drink contaminated water but comparatively few are infected is strong confirmation of this.

Parasites are likewise the inducing cause of changes which lead to multiplication, or proliferation, of cells and tissue, this being the case with both protozoa and bacteria.

The most common morphological change in the host is, perhaps, the development of a cyst round the parasite. An example of this is afforded in the case of pearls. In the Ceylon pearl-oyster the production of the best pearls is due to one particular cestode larva which passes part of its existence in the mollusc itself.

On the other hand, the attempt to attribute cancerous and other abnormal growths to the action of parasites does not appear to be supported by the available facts.

As regards such proliferation of tissues as is undoubtedly due to parasitic action, Prof. Ward advances the hypothesis that this may be largely owing to poison generated by the intruder. An inert body, like a grain of sand, will not give rise to the formation of a cyst, or at all events to the proliferation of tissue, and it is probable that pearls cannot be produced by such means. Parasitic bodies, on the other hand, feed and excrete, and nothing is more probable than that the excreta are toxic.

This, however, is not all, for the supply of nutriment to the parasites—nutriment frequently consumed in a wasteful manner—inflicts a severe strain on the host in a large number of instances. The drain on the resources of the latter is, indeed, practically three-fold, owing to the rapid growth of the parasite itself, the production by the latter of a large amount of reserve material (glycogen), and the great reproductive activity of the unbidden guest.

A curious phase of parasitic infection is the frequent loss of reproductive power in the host, due in some instances to destruction of the genital organs themselves, but in others to secondary influences. The tendency for one sex to acquire the sexual characteristics of the other is a marked feature in this parasitic castration.

The destruction of tissue by parasites, as in the case of that of the liver by the liver-fluke, although in one sense a mechanical injury, is really more than this. As the substance removed by the liver-fluke is replaced by connective tissue, a most important organ of the body becomes to a greater or less degree degenerate.

Among the physiological effects of parasitic infection, none is more remarkable than the power possessed by species living upon blood of secreting a substance which prevents the coagulation of that fluid. In regard to what has been stated above as to the development of toxic elements by parasites, the hæmosporidia of malaria undergo development in the red blood-corpuscles, and when they break up into spores the corpuscles are destroyed, with the probable discharge of poison into the blood. As many corpuscles break up at once, the effects are serious. The trypanosomes of sleeping sickness probably have a very similar physiological effect. The existence of a toxic principle affords also the most satisfactory explanation of the phenomena of the progressive, pernicious anæmia present in some cases of bothriocephalid infection. Anæmic conditions are also produced by direct blood-suckers, such as leeches and fish-lice. There remain, however, other forms of anæmia, such as that due to infection by the fish-tapeworm *Dibothriocephalus latus*, the physiology of which cannot at present be satisfactorily explained.

THE BELGIAN INTERNATIONAL BALLOON SERVICE.

THE investigation of the higher regions of the atmosphere by means of unmanned balloons, which has been carried on by some countries for several years, generally on the first Thursday in each month, has already revealed some important facts, among which may be mentioned the inversion of temperature at various heights and the determination of the direction of the flow of the upper air-currents over land and sea. The success hitherto attained well repays the expenditure of time and money incurred, and gives good reason for hoping that the study of aggregate results may lead to the ultimate solution of the problem of the general circulation of the atmosphere.

At the instigation of the aëronautical conference held in St. Petersburg in August, 1904, the Belgian Meteorological Service has taken part in this important work since the end of March, 1906, and M. Lancaster has sent us preliminary notes of the results of the monthly ascents from Uccle between April, 1906, and February, 1907, published in *Ciel et Terre*, and in a note to the Belgian Academy in November, 1906. We have previously referred to the ascents in April and May, but include the data in the following general summary.

The balloons are of india-rubber, coupled in tandem, having generally diameters of 1900 mm. and 1350 mm. respectively, and are inflated with hydrogen gas. The meteorograph is made by Bosch, of Strassburg, and consists of barometer (Bourdon tube), two metallic thermometers (Hergesell and Teisserenc de Bort's models), and hair hygrometer. A full description of the apparatus is given in *Ciel et Terre* for May, 1906. In this paper the values quoted are from Dr. Hergesell's thermometer. The starting place of the balloons at Uccle is 100 metres above sea-level, and the ascents were made from about 7h. to 7h. 30m. a.m. Greenwich time.

General Results of the Ascents.

Date	Wind	Temperature at starting	Lowest temperature recorded	Height	Direction in which balloons fell
1906		° C.	° C.	metres	
April 5...	S.	1·9	−57·2	13,500	S.S.E.
May 3...	S.S.W.	12·1	−62·6	10,160	E.N.E.
June 7...	N.E.	13·7	−65·7	11,460	S.S.W.
July 5...	N.E.	16·6	−58·0	9,829	S.
Aug. 2...	S.S.E.	22·0	−59·8	13,764	E.
Oct. 4...	Calm	11·9	−65·3	11,524	E.S.E.
Nov. 8...	N.N.E.	9·0	60·8	10,504	N.W.
Dec. 6...	S.S.W.	0·8	−51·6	9,168	S.S.W.
Jan. 14...	W.S.W.	5·2	−70·2	12,361	S.E.
Feb. 7...	E.S.E.	−6·7	62·0	15,346 and 17,073	S.S.E.

The following details, not included in the above table, are of interest:—

April.—An inversion occurred between 14,000 metres and 15,000 metres.

May.—A large inversion occurred above 10,160 metres; at the maximum height, 16,970 metres, the temperature had risen to −42°·0 C. Humidity fell to 18 per cent. at 10,330 metres, during the descent.

June.—Above 11,460 metres an inversion occurred up to the greatest height, 15,690 metres, where the thermometer read −54°·5 C. Humidity, 22 per cent., at 2520 metres.

July.—Inversion occurred between 9800 metres and the maximum height, 15,682 metres, where the thermometer read −50°·0 C.; humidity, 19 per cent.

August.—At the maximum height, 18,835 metres, the temperature was −50°·3 C.; between 13,800 metres and 18,000 metres there was an inversion in a layer about 4000 metres in depth.

September.—The meteorograph was broken by collision with buildings at starting.

October.—An isothermal zone occurred at about 11,500 metres, and an inversion between 1900 metres and 2000 metres. The minimum humidity was exceptionally low, being 9 per cent. at 4640 metres, and at the highest point (13,971 metres) 13 per cent.

November.—At 12,798 metres the temperature was −53°·0 C.; an inversion commenced at about 10,500 metres.

December.—At the maximum height, 11,935 metres, the thermometer read −51°·1 C. An isothermal zone commenced at about 6660 metres, and continued, with some fluctuations, until the bursting of the balloon.

January.—The greatest height reached was about 16,545 metres; temperature, −62°·3. An inversion commenced at about 12,360 metres. Humidity, 19 per cent. at about 13,000 metres during the descent.

February.—The minimum temperature (−62°·0 C.) was also recorded at 13,994 metres during the descent. An isothermal zone occurred between 15,346 metres and 17,073 metres (temperature, −62°·0 C.); an inversion then set in; at the maximum height (18,472 metres) the thermometer read −57°·5 C.

These isolated observations confirm the general existence of a stratum of air having a considerable increase of temperature, usually between 10,000 metres and 15,000 metres, referred to by Prof. Hergesell, M. Teisserenc de Bort and others, and the opinion that it constitutes a distinct current in the upper regions of the atmosphere.

TERRESTRIAL PHYSICS IN THE UNITED STATES.[1]

IN the first of the publications described in the footnote we have an investigation of the figure of the earth as determined by operations in the United States. The deflection of the vertical at each station, due to all known topography within 4126 kilometres of the station, has been computed. Least-square solutions, based on all the observations, were made (1) on the supposition that the earth is rigid; (2) solutions on the hypothesis of isostacy corresponding to three different assumed depths at which the isostacy is supposed complete; (3) a similar solution on the usual hypothesis, that there is no relation between the observed deflection and the topography.

The authors direct the attention to the "particular method of attack," first, of those whose chief interest is in the figure and size of the earth; secondly, of those who believe that the condition of isostacy exists; and, thirdly, of those who may, for any reason, have positive belief that cannot be reconciled with the existence of isostacy; inviting an investigation of the methods used.

Isostacy is thus defined:—"The excess of material represented by that portion of the continent which is above sea-level will be compensated for by a defect of density in the underlying material," the ocean being regarded as a defect of mass, and the corresponding compensation as effected by an excess of density in the underlying material.

The conclusions reached have been:—

(1) For the United States, the equatorial radius of the earth is 6,378,283 metres; the polar semi-diameter, 6,356,868 metres; the reciprocal of flattening, 297·8.

(2) Extreme rigidity is far from the truth. Isostacy is a comparatively close approximation. The States are in the main "buoyed up, floated, because of deficient density."

The isostatic adjustment made use of in the report is simply $\delta h = -\delta_1 h_1$, where h is the height of the surface above sea-level, δ its density, h_1 the depth of compensation below sea-level, and δ_1 the defect of density, h_1 being assumed a constant for each of the solutions in (2). This assumption is, of course, a crude one, though it facilitates the calculations; but it is sufficient to bear out the main contention that isostacy must be taken account of in determining the figure of the earth, and that the hypothesis of rigidity is untenable.

In the second of the above publications Mr. Hayford gives a general summary of the results of the survey as regards isostacy. He tells us that the evidence shows clearly and decisively that complete isostatic compensation within a depth of seventy-one miles is near the truth. The main impression which he endeavours to make upon his audience is that the earth is "a failing structure." The idea that the permanence of continents is due to elastic expansion of all the underlying material, as viewed in the light of geodetic evidence, he regards as extremely absurd, "whereas the earth is apparently inelastic to a high degree, even near the surface, and is apparently failing continuously," as shown by the ready adjustment of the figure to the effects of denudation. The author attributes the diminution of density beneath elevated regions to chemical changes, caused by increase of pressure, but there is no allusion in either of these publications to the theory due to Airy, and described in Clarke's "Geodesy," that elevated tracts are hydrostatically supported by a protuberance of the crust, dipping down into a denser medium below—a mode of isostatic compensation much in accordance with the compressed condition of most mountainous districts.

[1] (1) "Geodetic Operations in the United States, 1903–6. A Report to the Fifteenth General Conference of the International Geodetic Association." By G. H. Tittman and John F. Hayford. Pp. 45. (Washington: Government Printing Office, 1906.)

(2) "The Geodetic Evidence of Isostacy, with a Consideration of the Depth and Completeness of the Isostatic Compensation, and of the bearing of the Evidence upon Some of the Greater Problems of Geology." By John F. Hayford, C.E. (Proceedings of the Washington Academy of Sciences, May 18, 1906.) Pp. 40. (Washington, D.C.: Published by the Academy, 1906.)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

IT is reported from Ottawa that the engineering building of McGill University, Montreal, was completely destroyed by fire on April 5, the loss thus involved amounting to 150,000*l.*

THE Carnegie Institute at Pittsburg is to be dedicated this afternoon, and the ceremonies in connection with the event will continue until Saturday, when honorary degrees will be conferred by the University of Pennsylvania on a number of the foreign visitors. The *Times* correspondent at New York states that the gift of 1,200,000*l.* for an additional endowment and building fund for the institute, announced by Mr. Carnegie last week, makes the total sum given by him for the institute and for technical schools in Pittsburg more than 3,400,000*l.*, while the technical schools can draw on him for 1,400,000*l.* more as money is needed. Mr. Carnegie's total contributions to Pittsburg and Allegheny now amount to more than 6,400,000*l.* So far as is known, his total donations for public purposes in America and Europe amount to the stupendous sum of 33,300,000*l.* Of this total, 10,800,000*l.* have been given in the last four years.

THE *London University Gazette* announces several courses of lectures for advanced students of science by university teachers. Among these may be mentioned eight lectures on "The Ancestry of Angiosperms," by Miss Ethel Sargant, at University College, on Mondays, beginning on April 29. Nine lectures on "Psychological Research in Schools" will be given on Fridays, beginning on April 26; lectures i.–iii. and vii.–ix. will be given by Miss B. Edgell, lecture iv. by Dr. A. D. Waller, F.R.S., and lectures v. and vi. by Mrs. Reid. Four lectures on "The Pineal Sense Organs and Associated Structures in the Vertebrate Brain," by Prof. Arthur Dendy, on Tuesdays, beginning on May 7, in the physiology lecture theatre, King's College. Twenty lectures in protozoology at the Lister Institute, Chelsea, by Prof. E. A. Minchin, on Mondays, Wednesdays, and Fridays, beginning on Wednesday, May 1; each lecture will, when possible, be followed by exhibits of microscopic preparations illustrative of the subject of the lecture. Dr. W. N. Shaw will resume his lectures on dynamical meteorology on Monday, April 29, in the physics theatre, University College. The course will be continued on Fridays and Mondays until Friday, May 17, inclusive.