

complex these structures, the more convincing the evidence they furnish, since it then becomes so much the less probable that the same anatomical device should have been produced twice than that it should have been acquired once only. In the Artiodactyla, for example, "a definite case of an anatomical peculiarity, so well marked and complex as to be a safe guide to affinity," is seen in the elongation and spiral coiling of the proximal portion of the colon. The Perissodactyla and rodents supply other examples of evolution along a definite radius from the ancestral centre. From his investigations the author deduces inferences of importance for the general theory of evolution, especially as regards the limitation of the possible range of variation of organs in any set of animals which have once come to occupy a particular radius. Further changes and elaborations are then restricted by the past history, that is to say, by the limited material which it has furnished for further specialisation. In this way a simple explanation is given for the definite grooves, recognised by many writers, along which the specialisation of organisms must necessarily move, without having recourse to the assumption of any mysterious directive forces. E. A. M.

SCIENTIFIC REPORTS OF THE LOCAL GOVERNMENT BOARD.¹

THE first half of the volume under notice is devoted to the medical officer's report, statistical data, and details of various inspections and inquiries by the Board's inspectors. The second half contains reports of the auxiliary scientific investigations carried out for the Board. The first of these is a memorandum by Dr. Theodore Thomson on rats and ship-borne plague. The conclusion arrived at is that "the part played by the rat in transmission of plague to man, although real, falls far short of the importance which has generally been attributed to it." This may be true, but in view of the predominant part played by the rat in the dissemination of plague in the various Sydney epidemics, it is to be hoped that the campaign against this rodent will in no way be relaxed.

Bearing on the same subject, Drs. Haldane and Wade report on methods of rat destruction and disinfection on ship-board. In this especial attention is directed to the Clayton process, in which sulphur is burned at a high temperature, and air charged with the products of its combustion is pumped into the ship's hold. The gas is rapidly fatal to rats and other vermin, and is germicidal to non-sporing microbes, but it does not penetrate a loaded hold well, and has a deleterious action on certain articles. On the whole, however, it seems to be the best method to employ for rat destruction. Dr. Klein details further experiments on the two types, virulent human and less virulent rat, of the plague bacillus differentiated by him and described in a previous report. Dr. Klein also records some interesting observations on the influence of symbiosis on the virulence of microbes.

An important paper on the differentiation of various streptococci and staphylococci is contributed by Dr. M. H. Gordon. Hitherto the differences exhibited by the members of these classes of micro-organisms, particularly the streptococci, have been slight and indefinite, but by making use of culture media containing various mono-, di-, tri-, and poly-saccharides and glucosides, important differential characters are obtainable. Dr. Sidney Martin has continued his studies on the toxic action of microbes, dealing in the present volume with that of the *Proteus vulgaris*. The results, however, in this case are somewhat indefinite, the toxic reaction being mainly evinced by the development of agglutinin in the blood. Dr. Houston gives a detailed report of the bacteriological examination of normal human dejecta, and of the intestinal contents of sea-fowl and of fish. All gulls contained typical *B. coli* in their excrement in enormous numbers, but guillemots did not contain *B. coli* of any sort. As regards fish, those obtained "from a source seemingly above all suspicion of objectionable contamination, may contain sometimes apparently typical *B. coli* in their interior; in the great majority of

cases the results were either wholly negative or the microbes that were isolated proved to be atypical in character."

Dr. Alan Green contributes further observations on chloroformed calf vaccine which prove that the quality of the lymph prepared by this method is of a high order.

The above brief review shows that this report contains matter of the greatest interest and importance which should be studied by all bacteriologists and by those to whom the care of the public health is entrusted.

R. T. HEWLETT.

INFRA-RED SPECTRA.¹

THE record of an enormous amount of work on the absorption spectra of organic compounds and emission spectra of various metals and gases in the infra-red region is given in the volume under notice. The investigations were commenced whilst the author was a graduate student at Cornell University, and completed under the auspices of the Carnegie Institution of Washington.

Even to summarise the mass of valuable information contained would exceed the limits of our present space, but it may be said at once that, to workers along similar and related lines, these results, and the descriptions of the apparatus and methods whereby they were obtained, are indispensable.

Part i. occupies nearly seven-eighths of the whole volume, and deals with the absorption spectra of 131 organic compounds up to 15 μ . As is pointed out in the very complete historical review, all previous workers in this subject have abandoned the investigation at 7 μ for the alcohols and 10 μ for some few other compounds.

The description of the apparatus and methods is exhaustive and invaluable. From 0.8 μ to 2.5 μ a quartz prism was employed, beyond that, and up to 15 μ , one made of rock-salt. The source of the radiations was a Nernst lamp "heater," which gives a spectrum of which the energy curve is smooth and continuous. A reflecting spectrometer of 35 cm. focal length was employed for the explorations of the spectrum up to 15 μ , and a considerable portion of the work up to 7.5 μ was repeated with a spectrometer of 1 m. focal length.

The distribution of the energy in each spectrum was determined by means of a radiometer similar to that devised by Nicholls, but with some modifications.

The principal reasons for this investigation were the determination of the influence of molecular weight upon absorption spectra, and also the effect of molecular structure. The results show that in different compounds each of these causes in turn acts separately, whilst in other compounds the absorption is produced by the combined effect.

In recording the quartz-prism results the author deals separately with each absorption band in the nineteen compounds investigated, whilst in the other results the compounds are treated separately, notes being made of the chemical structure and properties of each substance where necessary.

Numerous tables set out the numerical results in various forms, whilst 140 full-page *transmission* curves show them graphically. In addition to these the author has written seven brief appendices dealing with side-issues in connection with the apparatus and the investigation and its results.

In part ii. Mr. Coblenz deals with the infra-red emission spectra of various metals, metallic chlorides (alkalies), and gases. The metals were employed as the poles for the arc producing the radiations, whilst the chlorides were volatilised on carbon arcs. The apparatus was very similar to that described in part i., except for a few modifications rendered necessary by the greater intensity and unsteadiness of the radiations.

With the metals, a black-body spectrum due to the oxides, and sufficiently strong to obliterate any emission lines which might be present, was found, and in the alkali chloride spectra no lines were discovered beyond 2 μ . Of the gases investigated—in vacuum tubes—N was found to be the only one having strong emission lines in its infra-red spectrum. CO₂, CO, and the vapour of C₂H₅HO were

¹ "Thirty-third Annual Report of the Local Government Board, 1903-4." Supplement containing the Report of the Medical Officer for 1903-4.

¹ "Investigations of Infra-Red Spectra." By William W. Coblenz. Pp. vi+331. (Washington, D.C.: The Carnegie Institution, 1905.)