

RESEARCH ITEMS.

Failure of the Neutrino Theory of Light.—This theory, initiated by Jordan and developed by Kronig, Born, Nagendra Nath, Pryce and others, appears to have met its Waterloo on the question of relativistic invariance of the theory. In two recent papers, Pryce [*Proc. Roy. Soc.*, (A), 1938, 165, 247] and Madhava Rao [*Proc. Ind. Acad. Sci.*, (A), 1938, 7, 293] have established the non-invariance of Jordan's fundamental relation connecting neutrino and photon operators. Pryce has traced the failure of the theory to the fact that light waves are polarised transversely while neutrino "waves" are polarised longitudinally, and for "group-theoretical" reasons it is impossible to construct the former from the latter in an invariant manner. Unless some fundamental modification is made, Jordan's hypothesis has to be abandoned. It is to be hoped that the really beautiful mathematical theory which has been developed in the course of its three years, of life, may eventually find applications somewhere in physics.

Unification of Quantum Theory and Relativity.—Born [*Proc. Roy. Soc.*, (A), 1938, 165, 291] makes an attempt at this unification in a new and novel manner by introducing a kind of inverted relativity formalism in the p -space in which everywhere space-time and momentum-energy are interchanged. This attempt has been prompted by the author's strong feeling that attempts like those of Eddington to explain the ultimate particles by connecting them with the whole universe contradict physical intuition. Although the actual paper of Born is short, the number of conclusions drawn and the deviations that arise from the classical formulæ in several branches of physics are amazingly large. The chief consequences are (1) change of the expression for the number of quantum cells of a given phase element, (2) number of quantum states of radiation in the α -volume, the zero-energy of radiation in V , the self-energy of the electron all become finite (*cf.* with the old Born-Infeld field theory), (3) modification of Coulomb's law, change of Rutherford's law of scattering, (4) deviations from Planck's and Stephen-Boltzmann's laws, (5) change of Maxwell's equations, (6) Laws of kinetic energy are also altered. The application of the new principle which is called the *Principle of Reciprocity* to the structure of nuclei lead to results concordant with observation and leads to the hope that this new theory may not be a mere formalism after all.

A New Principle in Cosmology.—Dirac [*Proc. Roy. Soc.*, (A) 1938, 165, 199] has developed a new basis for cosmology and uses the principle that "any two of the large dimensionless numbers occurring in nature are connected by a simple mathematical relation, in which the coefficients are of the order of magnitude unity". Dirac considers this as superior to Milne's cosmological principle and Walker's Dimensional Hypothesis, and shows that a satisfactory theory of cosmology can be built up from it. Some

conclusions of interest may be noted here: (1) one would expect a clear connection between the atom and the cosmos to show itself with a deeper understanding of nature, (2) Flat t -space (space of zero-curvature at one epoch) is the only one consistent with the fundamental principle and with conservation of mass. This conclusion does not refer to the curvature of space-time as comes into general relativity, (3) There are two measures of distance and time of importance, one for atomic phenomena and the other for ordinary mechanical phenomena included under general relativity.

Interpretation of the Nebular Red-shift.—In view of the recent nebular counts by Hubble a lot of speculation has arisen as to correct interpretation of the red-shift, as to whether it means an expanding universe or demands some other as yet unspecified interpretation. Shapley [*Proc. Nat. Acad. Sci.*, 1938, 24, 148] subjects the nebular counts of Hubble to a close analysis and in particular the determination of the coefficient B given from $\Delta m = Bd\lambda/\lambda$. He comes to the conclusion that B cannot be accurately determined from the existing data and that there is no need as yet, from nebular counts, to question the interpretation which attributes red-shift to actual recession.

A New Theory of Surface Tension of Aqueous Solutions.—The recent experimental work of Jones and Ray has proved beyond doubt that the surface tension of salt solutions first decreases with the increase in concentration, passes through a minimum at a concentration of 0.001 c. and finally increases as the salt concentration is raised. This unexpected result is a direct contradiction to the theories of Langmuir, Wagner, Onsager, Belton and others, all of which predict an increase of surface tension with the increase of salt content even at the lowest of concentrations. Jones and Ray are of the opinion that at very low concentrations positive adsorption takes place due to the interaction between ions and the water dipoles and this positive adsorption decreases the surface tension. But this idea is shown to be untenable by Malcolm Dole (*J.A.C.S.*, April 1938). In his new theory Dole assumes that at the surface, the water molecules orient themselves so as to form 'active spots'. There might be about four active spots for every 100,000 water molecules. These active spots adsorb the negative ions even at very low concentrations of the salt and thus cause diminution of surface tension. At places other than the active spots both positive and negative ions are completely excluded. This simple theory explains why there should be a minimum in the surface tension at a particular concentration for a given liquid. The theory is further extended to explain the behaviour of solutions of sucrose and lower fatty acids.

Zinc and the Mottle-leaf of Citrus.—It is gratifying to record that the rôle of zinc in plant nutrition is being studied from more than one angle. A. D. Chapman and A. P. Vanselow have studied the relation of citrus mottle-leaf to the zinc content of nutrient solutions in which rooted cuttings of citrus are grown for the study. The important fact that spraying with zinc sulphate brings about an abatement if not cure of mottle-leaf, yellow leaf or the chlorosis—like affection in citrus trees having been now established, the authors attempted in their study to examine under controlled experimental conditions, the method by which such a result is brought about. From these studies (*Jour. Agric. Res.*, 55, No. 5), it was found that under the conditions of their experiments it was possible to produce mottle-leaf of citrus by omitting zinc from the nutrient solution and further by the addition of zinc to effect recovery of plants already affected with mottle-leaf. It is also stated that plants grown in the full light of the green house (intensity about 80 per cent. of that out-of-doors) become severely mottled whereas those subjected to a low intensity (of about 40 per cent.) were but slightly affected, and that this is in accordance with the field observation that the leaves on the south side of citrus trees are more affected than those on the north side. There were also indications that high nitrate developed more mottle-leaf than low nitrate content (not exclusion of nitrogen) and that further an increased phosphate content also produced more mottling. It is concluded that these results are more in conformity with the view that zinc is an indispensable plant food element, mottle-leaf being a manifestation of this deficiency, than that this element functions as an antiseptic or corrective. In actual orchard practice, however, the spraying will probably remain the more advantageous method of furnishing the zinc to the trees, irrespective of the rôle the element may play either as a nutrient absorbed through the leaves or as a corrective or antiseptic.

Digestibility Trials with Oil-cakes.—Work on the digestibility of cotton-seed cake as a cattle feed as compared with *Sarson* and *Toria* cakes and with whole cotton seed continues the series of digestibility trials of Indian feeding stuffs by P. E. Lander and Lalchand Dharmani (*Ind. Jour. Vet. Sci. and Anim. Husbandry*, 7, 225). The author's abstract of the work is as follows:—

“Feeding trials carried out with cotton-seed cake produced from 4F American cotton seed without any preliminary delinting and decorticating have shown this to be a highly nutritious and economic food, comparing more favourably than the whole cotton seed and showing a very satisfactory comparison with *Sarson* and *Toria* cakes.

The digestibility figures for all the ingredients were high; the albuminoid ratio was 1:3.1 and the cake possessed eighteen lbs. of digestible protein per cent. The price of the cake compared with *Sarson* and *Toria* cake, per starch equivalent, was two pies, as against 7.1 for each of *Sarson* and *Toria* cake. Expressed in terms of price per pound of digestible protein the cost of the cotton-seed cake based on current Lyallpur

prices is 6.7 pies as against 17.6 and 18.2 respectively, for *Sarson* cake and *Toria* cake.”

Experiments in Rice Cultivation.—Plot technique and the correlation of yield in rice to certain characters form the subject of work in the Rice Research Station (Berhampur, Madras) by M. B. V. Narasinga Rao (*Ind. J. Agric. Sci.*, 7, 733). As regards the size and layout of the plots, it is concluded that a plot 20' x 5' repeated six times with eight treatments to a block was adequate for differentiating between merits or treatments. The author continues that there were no significant differences in the standard errors between long, narrow and square or nearly square plots and that it is advantageous to elongate the plots along the fertility gradient and compound the blocks at right angles to it. Regarding correlation of characters to yield, three characters were studied, viz., number of tillers per plant, mean length of earhead and number of grains per earhead, and with reference to four important paddy varieties. Results show that the number of tillers bore the highest correlation with the yield, both total and partial. The number of grains per earhead and the length of the earhead follow next in order. Under no-manure conditions, it is stated that the number of the grains and the length of the ear exert a little higher influence than under manured conditions.

Fauna of Karachi.—Polychaetes.—Under the auspices of the Punjab University, the Department of Zoology is issuing memoirs from time to time on various zoological subjects. The present paper is by N. D. Aziz on Polychaetes (*Mem. Dept. of Zool. of Punjab Univ.*, 1938, 1) collected from Manora (Karachi) in 1927 and 1930. The paper is a systematic account of 11 families consisting of 23 genera and 34 species. There is a close comparison between the polychaete fauna of Krusadi Islands (S. India) and the one under discussion. The collection comprises of *Nereidiformia*, *Sabelliformia*, *Terebelliformia*. *Marpysa corallina*, recorded from Madagascar and Cape of Good Hope also occurs in Karachi. New species like *Perinereis matthai* (Syllidæ), *Eunice manora* (Eunicidæ) *Dasychone graveleyi* and *D. Kumari* (Sabellidæ) are reported.

The Mammals of Ireland.—This catalogue compiled by C. B. Moffat (*Proc. Roy. Irish. Acad.* (B), 1938, 44, No. 6) gives us a more comprehensive account of the mammals embodied in the IV Volume of W. Thompson's *Natural History of Ireland*. According to the list given, there are 55 species represented in and around Ireland, of which the visiting Cetacea form the strongest order (19 forms); similarly the seals like *Phoca hispida*, *P. groenlandica* and *Cystophora cristata* are also recorded. All these are not native to Ireland. If we set aside these aquatic mammals, of the remaining 33, 25 have already been described by Thompson. The additions are 3 species of Bats, the brown Hare, Grey Squirrel and Musk rat and two others, *Rattus frugivorus* and *Mus orientalis*, the latter two being of only a subspecific rank.

Development of Veterinary Work in India.*

IN his address to the Veterinary Research Section, Indian Science Congress, Calcutta, 1938, Col. Olver traces back the record of Veterinary work in India to the year 1799 when the East India Company drafted to this country Veterinary Surgeons trained in London for the purpose of organizing cattle and camel-breeding and the establishment of studs for the breeding of cavalry horses. The early Veterinary work in India is said to have been done by the veterinary officers of the British and Indian cavalry.

William Moorcroft was one of those early veterinarians who, while holding responsible posts under the East India Company, endeavoured to establish the value of veterinary knowledge in horse-breeding and the care and management of breeding studs. He wrote a small book on Shoeing and was the first to introduce machine-made shoes. In fact, his interests were so wide that among other things a mass of valuable information on veterinary matters was left by him through his records. Those worthy of mention are, his familiarity with the symptoms and progress of such conditions as *Navicular disease* and the operation of *Neurectomy* performed by him for that disease, the clinical features of *Glanders* and *Strangles* and the great frequency of generalised *Strangles* in India. He also recognised *Glanders* and *Farcy* as being caused by an "identical poison" and made a comprehensive record of a fatal disease of live-stock in the Punjab, which from the post-mortem appearances described by him, has since been identified as *Anthrax*.

Griffith Evans of the Army Veterinary Department, is another of the early pioneers deserving mention on account of his widely known scientific enthusiasm. In 1881, he demonstrated, for the first time, a large flagellated organism—now known as *Trypanosoma evansi*—in the blood of horses and camels affected with *Surra* and his findings have since proved to be an epoch-making advance in the knowledge of protozoan diseases.

The next important event in the advancement of veterinary work in India was the recommendation by Hallen of the formation of an Indian Civil Veterinary Department with schools for the training of students. He organized the Bombay Army Veterinary Service and established an Army Veterinary School at Poona. He also organized the horse-breeding operations in India and was made the President of the Commission appointed by the Government of India in 1869 in connection with cattle plague enquiry.

Col. Pease is the next outstanding personality who will be remembered for the valuable services rendered by him in disseminating veterinary knowledge in this country. He raised the Lahore School from very humble beginnings to the outstanding position it holds to-day, translated text-books into Urdu for the use of students, originated and edited the *Journal of*

Tropical Veterinary Science and conceived the formation of an Imperial Bacteriological Laboratory and appears to have been the first to diagnose the existence of *Dourine in India*. He has also published a valuable treatise on the 'Breeds of Indian Cattle'.

The obvious step for the advancement of Veterinary Science in India was the establishment of suitable colleges and schools for the training of veterinarians and the first Veterinary School to be opened is said to be that at Babugarh in 1874; a similar one being established at the same time at Rangoon. The Babugarh School was afterwards transferred to Lahore and formed the nucleus of the present College. Subsequently, Veterinary Colleges were established at Bombay, Calcutta, Madras, Ajmer (Merwara)—this was closed later—and at Patna.

As the value of veterinary work in India became established, suitable Provincial Veterinary Services were gradually organized by Officers transferred from the Army Veterinary Department. Men trained in the Indian Veterinary Colleges were entertained in the subordinate service. The superior veterinary services were, however, reserved for veterinarians with M.R.C.V.S. qualifications.

In spite of the rapid development recorded above, Col. Olver felt that there is still a dearth for fully qualified veterinarians in India. The Royal Commission on Agriculture in India recommended 300 officers and 6,000 subordinate staff for British India, but in 1936-37 the strength was only 109 and 1,646 respectively.

One of the most important steps ever taken for the development of Veterinary work in India was the appointment in 1891 of an Imperial Bacteriologist, whose headquarters were in the first instance at Poona but was transferred later to the Veterinary Research Laboratory at Muktesar. Lingard, a medical man, who was the first to hold this position discovered the specific affinity of arsenic for the *Trypanosoma* of *Surra*—a discovery, which proved to be of very great importance. From the day of its inception, the Muktesar Laboratory has indulged in research work of greatest value to the Indian live-stock owners, the most outstanding of which has been the control of *Rinderpest* through vaccination with goat-adapted virus. Advance has also been made in the study and control of other diseases such as *Hæmorrhagic septicæmia*, *Black quarter*, *Anthrax*, various forms of *Schistosomiasis* of which *Nasal granuloma* is an important and often fatal manifestation, *Cutaneous filariasis* and *Piroplasmoses*. Some research work is also carried on at the Indian Veterinary Colleges, notably at Lahore and Madras. Very good work is being turned out for the past five years by the Veterinary Investigation Officers provided by the Imperial Council of Agricultural Research in all Provinces and some big States and the systematic investigations undertaken by them have brought to light a number of disease conditions due to malnutrition and other causes not previously understood.

* Summary of the Presidential Address of Col. Sir Arthur Olver, Veterinary Research Section, Indian Science Congress, Calcutta, 1938.