

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, 217] 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 formulae 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 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 I 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.

M R A

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. F. Iander and Lalchand Pharamani (*Ind Jour Vet Sci and Anim Husb*, 7, 225). The author's abstract of the work is as follows—

Feeding trials carried out with cotton seed cake produced from 4 F American cotton seed without any preliminary dehulling and decortication 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 1.31 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 lay out of the plots it is concluded that a plot 20 × 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 *Nereid* formia, *Sabell* formia, *Terebell* formia, *Marphysa*, *Corallina* recorded from Madagascar and Cape of Good Hope also occurs in Karachi. New species like *Perinereis matthai* (Syllidæ), *Eunice manoræ* (Eunicidæ), *Dasychone graelyi* 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. granlandica* 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.