jumps strongly upwards at the beginning of the disturbance (the impetus stage), and then slowly becomes less again during the further course of the disturbance (the main oscillation stage) and its after-effects. This agreement must be more than accidental, and permits the conclusion, made with all due reservation, that increase of ionising ultra-radiation makes reception conditions worse, and conversely. The known deterioration of reception during the daylight hours, when there is an increase in ionisation in the upper layers of the atmosphere due to the ultra-violet radiation from the sun, also affords evidence for this inverse proportionality between reception strength and ionising radiation.

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¹ W. Kolhörster, *Naturwiss.*, **15**, 126; 1927.

² K. Stoye, *Funk-Beobachter*, **38**, 593; 1928: **39**, 617; 1931.

³ A. Corlin, *Lund Observatory Circular*, **1**, 3; Mar. 31, 1931.

Rhythmic Breaking of Ship-waves.

ON a recent voyage from Australia, I observed a phenomenon in connexion with ship-waves to which no reference is made in the literature on waves with which I am acquainted. Dr. Vaughan Cornish's book on "Waves of the Sea", etc., makes no mention of it.

The diverging waves produced by the motion of the ship increase in height and steepness on the near-side as they move outwards from the ship and then

Fig. 1.

break towards the ship. The fact to which I wish to direct attention is that this breaking is, under favourable conditions, regularly periodic.

Prof. Hartung of Melbourne, who was a fellow-passenger, was kind enough to take some photographs of this effect (Fig. 1). Two parallel bands of foam are very definitely shown, a third not quite so definitely. Occasionally as many as half a dozen such parallel breaks in the wave-crest could be seen, though more frequently these are broken by transverse bands of turbulence.

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Oct. 8.

Constitution of the White Dwarf Stars.

It is generally held that the white dwarf is in the degenerate state in the sense of the statistics of Fermi and Dirac. This assumption leads to another consequence bearing on the relative abundance of elements in the same star. Assuming further that (i) all atoms of various elements in the white dwarf are stripped of their extranuclear electrons, and (ii) all kinds of nuclei

of atoms are formed entirely from protons and electrons, the thermo-equilibrium among them is determined from Milne's equations.¹ The simplified form is

$$\frac{1}{m_E} \left(\frac{c_E}{q_E} \right)^{\frac{2}{3}} = \frac{\mu}{m_P} \left(\frac{c_P}{q_P} \right)^{\frac{2}{3}} + \frac{\nu}{m_e} \left(\frac{c_e}{q_e} \right)^{\frac{2}{3}} + \frac{2}{h^2} \left(\frac{4\pi}{3} \right)^{\frac{2}{3}} U \quad (1)$$

with the equation of nuclear formation of an element E from μ protons (P) and ν electrons (e),

where m , c , and U denote respectively the mass of an atom, the concentration and the heat of formation. μ and ν are expressed by Z (the atomic number), and the mass of an atom as follows:

$$\mu = \frac{m_E}{m_P}, \quad \nu = \frac{m_E}{m_P} - Z_E. \quad (2)$$

Usually the first term of the right-hand side of (1) is negligibly small.

U is calculated from the mass-defect, with the result that U increases monotonically with the mass number of the element. As all terms of the right-hand side of (1) are positive, it is quite clear that the nuclear concentration of an element increases with its atomic weight (almost proportional to its square). Therefore it may be concluded that the heavy radio-elements exist abundantly in the white dwarfs.

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¹ *Mon. Not. Roy. Ast. Soc.*, **90**, 769; 1930.

Dehydration of Salts.

IN the course of some investigations it was found advantageous to have a uniform and general method of dehydration. Such a method was found in the extension of the drying process applied originally to 2-nitro-*p*-cresol.¹ In general, dehydration was carried out by distilling a neutral liquid of high vapour tension containing the hydrated salt or its aqueous solution.

As an example, crystals of copper sulphate were placed in toluol and the latter distilled off until no further water could be detected in the distillate. The anhydrous copper sulphate so obtained, though lacking in cohesion, frequently retained its original crystalline form. Dried over solid paraffin in a desiccator, the copper sulphate was found as whitish fragile crystals free from water.

In a similar manner the dehydration of magnesium chloride and various salts of iron, nickel, and cobalt was carried out. This method practically eliminates decomposition of the product and side reactions, such as oxidation and reduction. Owing to its elasticity as regards medium, temperature, and pressure, the process may be of general application.

An attempt to extend Stephen's acetic anhydride dehydration of stannous chloride² to other salts met with but partial success.

Although dehydration was in most cases achieved, (1) the process was limited to solids in a finely divided condition; (2) in most cases the reaction was sluggish and required heating; (3) the dehydrated salts were found to retain tenaciously some acetic acid and its anhydride, a feature apparently general in the case of salt-acid mixtures.

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Manchester, S.W., Oct. 8.

¹ Copisarow, *Jour. Chem. Soc.*, 251; 1929.

² *Jour. Chem. Soc.*, 2786; 1930.