energy of nitrogen is less than, or about, 9·8 volts, and not 11·4 volts as was calculated by Sponer and Birge. The matter will be discussed in more detail in another place in connexion with a study of the photosensitised fluorescence of several other molecules.

E. GAVIOLA.

Johns Hopkins University,
Baltimore, July 12.

The Instability of a Single Vortex-Row.

DR. HAROLD JEFFREYS, in his letter appearing in NATURE of Aug. 11, p. 206, mentions some interesting practical effects for which the principle to which it refers is responsible. To those which he mentioned may be added a physiological consequence for the circulation of the blood. As the blood-stream races past the cusps of the valves at the orifices of the heart, some of the eddies, to quote his words, "enter the dead water, where they produce a circulation with a reverse current" behind each valve. This disposition prevents extreme eversion of the valve, and facilitates closure of the valve without delay or hindrance so soon as the diastolic check of the stream current ensues, at end of the active beat. The anatomical channel is actually bayed out (sinus of Valsalva) in the case of the two largest blood-vessels, in order to favour development of what in the letter is termed the second row of vortices.

C. S. SHERRINGTON.

Oxford, Aug. 19.

X-Ray Studies on the Nitrides of Iron.

IN the preliminary report under the above title, published in NATURE of May 26, p. 826, the conclusion is drawn that the cubic γ-phase is a solid solution of nitrogen in γ-Fe. A further study of the photograms, however, makes a correction of this assumption necessary, for there are in the photograms two very weak lines which indicate that the nitrogen atoms have definite places in the lattice.

As was said in the preliminary report, the lines of the γ-phase are fixed, showing that the phase probably has a very limited homogeneity range. As to its limits, it was pointed out that the upper limit was probably between 5·7 and 6·1 per cent nitrogen.

The iron atoms certainly still form a face-centred cubic lattice ($a = 3{\cdot}789$ A.) and nothing in the photograms indicates that the elementary dimensions must be increased. If the nitride contains about 6 per cent nitrogen, it is most likely that there is one nitrogen atom per one unit cell, that is, per 4 iron atoms. The formula of the nitride then becomes Fe_4N with 5·9 per cent nitrogen.

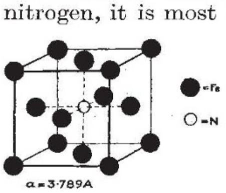

FIG. 1.

One possible position of the nitrogen atom is in the middle of the cell, as is shown in Fig. 1, that is, with the co-ordinates $\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$. Another possible position has the co-ordinates $\frac{1}{4}, \frac{1}{4}, \frac{1}{4}$. The positions and intensities of all lines calculated on these assumptions in both cases agree very well with the observed ones.

To judge between the two structures is hard, as they give almost the same intensities of the lines. It must, however, be pointed out that the iron atoms of the first structure are not equivalent.

GUNNAR HÄGG.

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Stockholm,
July 14.

The Crystal Structure of Solid Mercury.

As yet only two attempts[1] seem to have been made to determine the crystal structure of solid mercury with the aid of X-rays. The results of these investigations, however, were wholly contradictory.

I have tried to settle the question with the aid of a special spectrograph designed by Prof. Coster for crystal analysis at low or high temperatures. I have succeeded in obtaining with an exposure of one hour very good Debye-Scherrer diagrams by which the results of McKeehan and Cioffi, who found a simple rhombohedral structure, are fully confirmed. The main difficulty met with in my investigations was getting a preparation with sufficiently fine grain to be suitable for a Debye-Scherrer analysis. This was finally obtained by reducing mercuro-oxide by formic acid held in gelatine. The preparation contained very densely packed mercury globules of about 10 μ diameter.

These small globules showed the effect of undercooling in a very striking way. At the temperature of solid carbon dioxide ($-80°$), by far the greater part of them remained in the liquid state, as was clearly shown by the X-ray photograph obtained, in which the amorphous band of liquid mercury was predominant.[2] Only by hammering the preparation at a temperature below the freezing point of mercury was it possible to obtain mercury crystals in such abundance that very strong Debye-Scherrer lines were obtained. These conclusively support the views of McKeehan and Cioffi. As these authors worked at a temperature of $-115°$, no transition point seems to exist between $-115°$ and $-80°$.

A fuller account of method and results will be published elsewhere.

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Continued Self-Pollination in Cotton.

COTTON, though included among self-pollinated plants, is subject to crossing, and the extent of natural cross-pollination under favourable conditions is so great that it is regarded by some as obligatory for keeping up the health and vigour of cultivated races.

Kumpta cotton (*G. herbacium*) yielded in the year 1915 one pure strain, which has been continued since then by the use of selfed seed. The pure line has thus been subjected to continued selfing for twelve years. During the last season the strain was thoroughly examined in the following characters: 1, height of the plant; 2, total length of limbs; 3, sterility of the anthers; 4, shedding of flowers; 5, number of bolls per plant; 6, yield of seed cotton per plant; 7, ginning percentage; 8, staple length; and 9, seed weight.

The results clearly showed that there was no deterioration in any of the above characters. From this it appears that twelve years' selfing has no injurious effect in cotton.

Sometimes a variety yields more than its pure line which is selected for yield. The cause of this is to be found not in the deterioration of the selection due to selfing, but in the hybrid vigour of the F_1 plants appearing in the open pollinated seed of the variety.

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[1] L. W. McKeehan and P. P. Cioffi, *Physical Review*, **19**, 444; 1922. G. Aminoff and N. Alsén, *Geol. Fören. Förhandl.*, vol. 44, January 1922.
[2] J. A. Prins, *Physica*, **6**, 315; 1926.