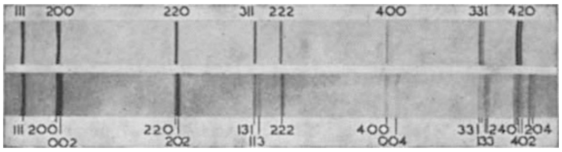

X-ray powder photographs (cobalt $K\alpha$ radiation, 19-cm. camera) of cobalt oxide: upper photograph, at 20° C.; lower, at −180° C.

There is a measurable structural deformation at −70° C., but the axial ratio of the tetragonal cell is only 0·995, thus differing from the 1·0 of a cubic cell by a smaller amount than at − 180° C. At 20° C. the face-centred cubic cell had a lattice parameter $a_0 = 4{\cdot}2495 \pm 0{\cdot}0005$ kX.

The X-ray examinations of ferrous oxide disclose a rhombohedral deformation of the face-centred cubic arrangement below − 70° C. The deformation thus takes a similar form to that found for nickel oxide, but the angle of the unit rhomb becomes less than 60° instead of greater.

Manganous oxide also shows below − 100° C. a transition from face-centred cubic to a symmetry approximating to rhombohedral; the deformation at − 180° C. is substantial.

It is hoped to describe this work in more detail elsewhere. Further investigations should yield some explanation of the changes in structure, which appear likely to be connected with the particular electronic configuration of the transition elements.

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[1] Rooksby, H. P., *Nature*, **152**, 304 (1943).
[2] Rooksby, H. P., *Acta Crystallographica*, **1**, 226 (1948).
[3] Lonsdale, K., and Smith, H., *J. Sci. Instr.*, **18**, 133 (1941).

Point Sources of Radio Noise

One of the unexplained phenomena of radio-astronomy is the existence of intense point sources of noise. These have been associated with the galaxy because they seem to be point sources within the accuracy of measurement, and because they have not shown pronounced parallax or proper motion. But the assumption of galactic or stellar origin fails to explain all the facts as understood now.

In the first place, although several point sources lie in the galactic plane, others are located at high galactic latitudes. Examples of these latter are the point sources in Hercules and in Coma Berenices. Furthermore, of the sources that lie approximately in the galactic plane, none has been definitely identified with optical objects, and none lies in the direction of the galactic centre.

Another major difficulty with the stellar or galactic hypothesis is the inverse-square decrease of intensity with distance from the source. For example, a source at the distance of the nearest star would have to radiate at a rate exceeding that of the sun by a factor of 10^{10} in order to produce the same noise intensity on the earth.

This last objection suggests that we should look within the solar system for the origin of these radio-noise sources. We must rule out the planets and asteroids as possible sources, if only because they are concentrated in the plane of the ecliptic and have huge proper motions and parallax angles. Giant comets, however, having distant aphelia, constitute a remotely possible explanation of the point sources. Their orbits may have almost any inclination to the plane of the ecliptic and hence to the plane of the galactic equator.

Recent solar studies indicate the existence of extreme ultra-violet and X-radiation, which would have an ionizing effect on gaseous media. A rough calculation shows that if the ionizing radiation from the sun were absorbed by a distant comet—at, say, 50 astronomical units—and re-radiated over a 1,000 Mc./sec. band, the resultant radio-noise intensity on the earth would be consistent with the observations. We very tentatively suggest that plasma-type oscillations of a gaseous ionized medium might be a mechanism for the conversion of the solar energy to the observed radio-frequency noise.

If comets are the point sources in question, only the very largest, long-period ones will fit the observations. Even so, it may be possible to observe an annual parallax of the order of 1°, and possibly also a small proper motion. We admit that this idea is highly speculative; but fortunately it is subject to direct experimental test. Detection of a measurable parallax would constitute a sufficient and necessary proof that the point sources of extra-terrestrial radio noise are part of the solar system.

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Induced Grid Noise and Noise Factor

It is easily shown that for any type of internal structure the power-frequency spectrum $s_g(f)$ of the current fluctuations appearing at the control grid of a triode valve is related to the spectrum $s_a(f)$ of the anode current fluctuations by

$$s_g(f) = \left|\frac{Y_g(f)}{g_m(f)}\right|^2 s_a(f), \qquad (1)$$

where $Y_g(f)$ is the increase, from the 'cut off' to the working conditions, of input admittance at the grid with the anode effectively earthed; g_m is the high-frequency mutual conductance of the triode. In the case of the 'induced' (transit-time) grid noise, and for moderate angles, the relevant component of grid admittance is largely susceptive, being

$$Y_{gt}(f) \doteqdot jB_t(f) = j.2\pi f.C_t,$$

where C_t is the value of the 'space-charge capacitance' measured on the valve. Thus, setting

$$s_a(f) = 2eI_a\Gamma^2$$

$$s_g(f) \doteqdot \left|\frac{j.2\pi f.C_t}{g_m}\right|^2 2eI_a\Gamma^2. \qquad (2)$$

The modifications to (2) introduced by distribution of electron velocities and trajectories are discussed elsewhere[1], and direct experimental verification is also described.