system of fault valleys and the fault bisecting Alphonsus. Some of these minor rills passing near the black areas end in deep valleys cutting through the rim of Alphonsus both in the north and south. All the major valleys seem to pre-date the craters as they are in most cases either obliterated by craters or fainter valleys appear where they pass through the craters than where they pass through continental areas.

An elongation on the north side of the large, beautifully symmetrical mountain almost filling Alpetragius seems to be connected with the easternmost valley. There is thus indication that Alpetragius, which postdates Alphonsus, was affected by the fault when its central peak was formed. If these craters were produced by impact, the gas released during and after rebound as a result of activity along these faults, triggered by hypervelocity shock, strongly affected the shapes of the central peaks in both Alphonsus and Alpetragius. Since gas is still being released along these faults in Alphonsus then it is probably also emanating from the northern side of Alpetragius.

There is a possibility that the gas was injected into brecciated shock-faulted areas in these craters during their creation if produced by impact of cometary matter and it is slowly outgassing. However, it is more probable that Kozyrev observed outgassing from the major fault bisecting Alphonsus and that the gas has its source deep within the Moon's surface where it is slowly being ejected as a result of radioactive heating. If one accepts this conclusion then a source is needed to account for C_2 issuing from deep below the lunar surface. I can think of no sources other than those suggested earlier by Urey[3]. Recent observations[5,6] indicate that gas evolution from the lunar surface may be a more common phenomenon than was earlier suspected. It is rather startling that the only positive evidence for a specific molecule present on the Moon is one that is probably there in such a small quantity. It is also interesting that a major source of gas is where a possible rebound is located on a deep lunar fault.

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[1] Kozyrev, N. A., *Physics and Astronomy of the Moon*, 361 (Academic Press, New York and London, 1961).
[2] Kozyrev, N. A., *The Moon*, 263 (Academic Press, New York and London, 1962).
[3] Urey, H. C., *Astrophys. J.*, **134**, 268 (1961).
[4] Baldwin, R. B., *The Measure of the Moon*, 418 (Univ. Chicago Press, 1963).
[5] Kozyrev, N. A., *Nature*, **198**, 979 (1963).
[6] Greenacre, J. A., *Sky and Telescope*, **26**, 316 (1963).

RADIOPHYSICS

Oscillatory Model for Radio Source 3C273

THE radio source 3C273 has recently been identified with a star-like, superluminous object of thirteenth apparent magnitude[1,2]. Doppler shift measurements of identifiable line features indicate a strong red shift corresponding to radial velocity of 4×10^9 cm/sec, while the observed spectral characteristics of the continuum suggests synchrotron radiation as the dominant emission mechanism[3].

Smith and Hoffleit[4] have examined the luminosity history of the object and found that its brightness underwent rather drastic changes during the past eighty years. The light curve exhibits fluctuations of a time-scale of the order ten years, on which occasional light flashes are superimposed. Colgate and Cameron[5] suggested chains of type II supernova explosions as an explanation for the light flashes.

It is the purpose of this communication to present a simple, qualitative argument that suggests radial oscillations of a self-gravitating body as an explanation for the observed fluctuations of the average luminosity. Consider the equation of motion of a gaseous body undergoing oscillations of period $P = 2\pi/\sigma$:

$$\sigma^2 \rho \vec{\xi} = -\rho \delta \vec{g} - \vec{g} \delta \rho \qquad (1)$$

Here, ρ is the density, $\vec{\xi}$ the Lagrangian displacement vector, g the gravitational acceleration. δ-quantities represent the fluctuations. The equation of continuity reads:

$$\delta\rho + \nabla \cdot (\rho \vec{\xi}) = 0 \qquad (2)$$

Introducing a scale-length l for the oscillation, and taking the second term of equation (1) to be dominant, we find from equation (2):

$$\delta\rho \sim -\rho\xi l^{-1} \qquad (3)$$

whereupon equation (1) results in:

$$\sigma^2 \sim g l^{-1} = GMR^{-2} l^{-1} \qquad (4)$$

G is the constant of gravitation, M the mass, and R the radius of the body. In writing down the second proportionality, g is identified with the surface gravity.

Identifying the scale length with $R/100$ and taking[6,7]:

$$R \sim 3 \times 10^{16} \text{ cm, and } M = 10^6 M_\odot \qquad (5)$$

we find from (4)

$$\sigma^2 = \frac{GM}{R^2 l}$$

or

$$P \sim 9{\cdot}2 \text{ years} \qquad (6)$$

We can verify this estimate against Milne's luminosity-period relation for an oscillating spherical gas mass which reads[8]:

$$L = \frac{v}{3(\gamma - 1)R}\left[\sigma^2 MR^2 - \frac{GM^2}{R}\right] \qquad (7)$$

where v is the pulsation velocity and γ the adiabatic coefficient. Inserting P from (6) we have to dominant order:

$$L \sim 1{\cdot}5 \times 10^{47} \text{ ergs/sec} \qquad (8)$$

with the plausible value of 10^7 cm/sec for v. The estimate in equation (8), too, agrees closely with observational evidence[1].

It appears improbable that the close agreement with observational data, exhibited by the estimates in equations (6) and (9), which are completely independent of each other, is purely fortuitous.

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[1] Hazard, C., *et al.*, *Nature*, **197**, 1037 (1963).
[2] Schmidt, M., *Nature*, **197**, 1040 (1963).
[3] Oke, J. B., *Nature*, **197**, 1042 (1963).
[4] Smith, H. J., and Hoffleit, D., *Nature*, **198**, 650 (1963).
[5] Colgate, S. A., and Cameron, A. G. W., *Nature*, **200**, 870 (1963).
[6] Greenstein, J. L., Reported at Intern. Symp. Relativistic Astrophysics, Dallas (1963).
[7] Minkowski, R., reported at Internat. Symp. Relativistic Astrophysics, Dallas (1963).
[8] Milne, E. A., *Mon. Not. Roy. Astro. Soc.*, **109**, 517 (1949).

Interfering Radio Signals on 18 kc/s received in New Zealand

ON three occasions in April 1963, an interfering signal on 18 kc/s with a frequency deviation from nominal of 6 ± 1 parts in 10^7 and received at approximately the same signal strength as *NBA* (Panama Canal Zone) was observed at the Dominion Physical Laboratory, Lower Hutt, New Zealand. The times of occurrence to the nearest 5 min were:

		G.M.T.
April 12–13, 1963.	Intermittently from	23.35–01.00
April 14, 1963	,, ,,	14.20–14.25
April 16, 1963	,, ,,	12.10–12.20