Popper, Daniel M. *The strange case of RS Canum Venaticorum.*

New spectrographic observations of the eclipsing binary, RS CVn show that the radii are 8 per cent and the masses 22 per cent smaller than previous evaluations. The K type subgiant is slightly more massive than the smaller F type star and does not appear to fill the critical zero-velocity surface. In these respects this system differs from most of those of similar kind.

The light curve has long been known to show persistent, but not constant, asymmetries, both within and outside of eclipse. Comparison of photoelectric observations made in 1956 and in 1959 shows the light of the K star at primary minimum to have increased by 0.3 mag. with no or only a slight change of color. There was no corresponding increase in the light outside of minimum. The light of the K star apparently varies intrinsically both with time and over its surface. The asymmetry outside of minimum is found by color measurements also to be caused by the K subgiant. This persistent asymmetry could be caused by a slight pulsation with the same period as the orbital motion. This system also undergoes changes of period of a unique character. Nearly continuous photometric observations of high precision are needed to determine the behavior of the star.

The spectrograms outside of eclipse show no evident peculiarities except for variable $H\alpha$ emission associated with the K star. The lines of the F star are sharp, hence the designation "n" of Joy's classification is not suitable.

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Rabe, Eugene. *The orbit of (1011) Laodamia and the mass of Mars.*

The recently improved orbit of the minor planet (1011) Laodamia (Rabe 1956) reveals a remarkable relationship to the orbit of Mars. The trajectories interlock near to the ascending node of Laodamia on Mars, and to the aphelion of Mars. The orbits approach to 0.04 a.u., yet the approach is so asymptotic that the distance between the two curves is of the order of 0.1 a.u. for orbital arcs of nearly 90°, between the approximate heliocentric longitudes of 96° and 181°. The orbits deviate by less than 0.05 a.u. between the longitudes 158° and 169°. The closeness of actual approaches depends on the difference of the longitudes. In consequence of the near commensurability of the mean motions of Mars and Laodamia in the ratio 1.97:1, any close approaches occur in series of successive passages. The subsequent approaches of September 1957 and March 1961 amount to 0.10 a.u. each. They are preceded by an approach to 0.36 a.u. in January 1954, and followed by approaches to 0.14 and 0.36 a.u. in September 1964 and June 1968, respectively.

If the Mars perturbations of Laodamia are integrated from a zero epoch in 1959, between the two closest approaches to 0.10 a.u., then in the backward integration the longitude perturbations exceed $-1000''$ already in 1941 (the discovery opposition is 1924). The perturbations will increase even more rapidly in the forward integration, through the three approaches to 0.10, 0.14 and 0.36 a.u. In perihelion oppositions these perturbations can be observed at geocentric distances of roughly 0.6 a.u. The planet has been observed in 5 oppositions 1924–57, mostly near perihelion. Observers with powerful instruments are urged especially to observe this relatively faint object as extensively as possible, because undoubtedly the mass of Mars can be determined from the motion of (1011) Laodamia to a very considerable degree of accuracy.

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Roman, Nancy Grace. *Planets of other suns.*

As seen from the distance of Alpha Centauri, Jupiter, at its maximum apparent separation from the sun, $3''.94$, would be a star of $23^m.4$ (assuming that its phase function is that of Venus); it would brighten to a maximum of $22^m.0$ at exterior conjunction. For Venus, Earth, Saturn, the maximum brightnesses and separations are, respectively: $22^m.5$ and $0''.55$, $23^m.4$ and $0''.76$, and $22^m.7$ and $7''.23$ (with the rings at moderate inclination).

Thus, a similar planetary system around Alpha Centauri would be within the reach of our largest telescopes and our current photoelectric techniques if our terrestrial atmosphere did not limit our resolution. At a separation of more than $2''$, it does not seem to be a serious problem to get rid of the light of the primary in the absence of an atmosphere.

The following instrumental set up is a possible solution: Let a 20″ diaphragm, at the focal plane of a large telescope, be bisected by a highly polished razor. Let a 45° mirror on one side reflect the light into a photomultiplier and let the light on the other side go into a light trap. Any departure from a constant signal as the position angle of the multiplier is varied would be due to either a planetary companion or a distant star. A repetition of the experiment several months later should decide this question.

Other stars from which a member of our solar system would be at least as bright as $25^{m}.0$ and as far as $0''.75$ from the primary include: β Hyi, Sirius, Procyon, Altair, Fomalhaut, Vega, β Gem, and Arcturus.

A telescope on an artificial earth satellite can probably not provide either the size of instrument or the necessary guidance accuracy for the long periods of observing time required for this experiment but an observatory on the moon would be ideally situated.

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Sandage, Allan and Wallerstein, George. *The color-magnitude diagram of the nuclear globular cluster NGC 6356 compared with halo clusters.*

NGC 6356 is representative of a group of globular clusters located in the vicinity of the galactic center which have strong spectral lines. A color-magnitude diagram of the cluster has been determined to $V = 19.4$ and $B = 20.3$ from plates and a photoelectric sequence obtained at the 200-inch telescope.

The diagram shows a strong giant branch extending from $V = 15.3$, $B\text{-}V = 2.2$ to $V = 17.5$, $B\text{-}V = 1.2$; but the slope of this giant branch is considerably less than that of a normal globular cluster. There appears to be a short horizontal branch and a poorly defined sub-giant branch. The horizontal branch extends to $B\text{-}V = 0.8$; but no bluer stars are present. The magnitude difference between the horizontal branch and the giant branch is only 2.4 mag. as compared with the usual value of about 3 mag.

From colors and spectra of foreground B and A stars the reddening is at least $E_{B-V} = 0.5$ and may be greater. The reddening estimate is uncertain because there are no RR Lyrae stars in the cluster.

Comparison of the color-magnitude diagram of NGC 6356 with other clusters has been made by fitting the horizontal branches. This comparison shows that the giant branch of NGC 6356 is fainter than the giant branches of typical globular clusters such as M13 and M92, but is brighter than the giant branch of the old galactic cluster M67. Thus NGC 6356 is intermediate between M13 (which shows a metal deficiency of a factor of about 20) and M67 whose stars seem to have normal metallic lines.

This result, combined with the number of stars on the giant branch, is consistent with Morgan's description of the spectrum as being giant K with *CN* present in absorption.

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Searle, Leonard. *A spectrophotometric study of R Coronae Borealis.*

High-dispersion spectra of the hydrogen-poor, carbon-rich supergiant variable R Coronae Borealis, obtained at maximum light, have been quantitatively compared with similar spectra of the standard supergiant δ Canis Majoris. The equivalent widths of 200 unblended lines in the wave length region $\lambda\lambda$4000–4700 have been measured and a curve of growth abundance comparison carried through.

The carbon to iron ratio is found to be 25 times greater in R CrB than in δ CMa. The carbon to hydrogen ratio in R CrB is found to be about 40. Lines of nitrogen and oxygen do not fall in the region studied. Among the metals there is no clear evidence for abundance anomalies exceeding a factor of two. In particular the abundance of the rare-earth elements relative to iron is the same in R CrB and the standard star.

Quantitative agreement between predicted and measured equivalent widths of the carbon lines is obtained with the hypothesis that the predominant opacity source in R CrB is the photoionization of neutral carbon.

Precise measures of the blended molecular bands in R CrB are not possible, but rough intensity estimates give reason for believing that the ratio of carbon to nitrogen must be greater in R CrB than in stars of solar composition.

If it is true that the composition of the atmospheric material of R CrB differs from solar composition only in the abundances of carbon, hydrogen and helium then the composition parameters of R CrB are $X = 0.00014$, $Y = 0.92$, $Z_c = 0.07$. If on the other hand nitrogen and