one whose contributions to science have been so large and brilliant. It is the suggestion regarding the companion to Algol that needs comment. Vogel's contributions to the art of measuring radial velocities put him in the first rank, but they do not include the discovery of the first spectroscopic binary. As this is an error that has often been repeated it may be well to set down the facts.

In his third annual report on the Henry Draper Memorial, published early in 1889 (our copy reached New Haven on April 16), E. C. Pickering states: "One photograph of Zeta Ursæ Majoris shows the K line distinctly double, and others show it single." In the January, 1890, number of the *American Journal of Science*, Pickering has an article dated November 12, 1889, in which he states that the K line in this star occasionally appears double, and he goes on to give what we now know to be the correct explanation, namely, that we are dealing with a binary, both components of which are bright.

At the meeting of the Prussian Academy of Science held on November 28, 1889, Vogel communicated six observations of Algol which show it to be a spectroscopic binary. These observations were first printed in *Astronomische Nachrichten* 2947 (dated January 11, 1890), in an article by Vogel dated December, 1889. Vogel's first observation of this object is dated December 4, 1888, while the duplicity of the lines in the spectrum of Zeta Ursæ Majoris was noted on a plate secured at Harvard on March 29, 1887. We see, therefore, that no matter what criterion is used to fix the epoch of the discovery of the first spectroscopic binary, we must conclude that the first of these objects to be detected was Zeta Ursæ Majoris by Pickering.

The above illustrates a difficulty which will be constantly met if Sir Oliver's suggestion is followed out; we should often be involved in matters of priority if these names are assigned during the lifetimes of the investigators concerned or too soon after their deaths.

FRANK SCHLESINGER.

Yale University Observatory,
June 4.

Energy Levels of the Carbon Monoxide Molecule.

IN their communication under this title in *NATURE* of July 3, p. 12, Messrs. Duffendack and Fox make a suggestion in connexion with the scheme of electronic energy levels of neutral carbon monoxide which I recorded in a recent letter. It is briefly, that there are two sets of levels involved corresponding to triplet and singlet terms in the corresponding atom. I would like to say that this and other suggestions were made to me by Prof. Birge and Dr. Mulliken in private communications some three months ago, but too late for publication in my letter. It is clear that the whole scheme of levels can be interpreted on Birge's views, which are outlined in his important letter on "The Structure of Molecules" (*NATURE*, Feb. 27, 1926). The common ground level is $1S$. The initial levels of the 4th positive and the Ångström bands are respectively $1P$ and $2S$. The initial level of the Cameron bands is the triplet $1P_{123}$, and of the third positive bands is $1S$, while the new level which Duffendack and Fox postulate is probably $2P_{123}$. All the above levels have their counterpart in the corresponding magnesium atom, and the inferences which may be drawn therefrom account for all the facts.

The 3A positive bands of Duffendack and Fox are clearly the bands which I interpreted as an $n'=4$ sequence. The interpretation as arising from a $2P_{123}$ level is, however, preferable for two reasons: it avoids

the anomalous intensity distribution in which the states $n'=2$ and 3 are absent, and secondly, the existence only of the states $n'=0$ and 1 is in harmony with recent work of Birge and Sponer on the heat of dissociation of the molecule. It may perhaps be added that not only are s to s transitions possible in band spectra but so also are p to p transitions (e.g. the 3A bands of carbon monoxide).

R. C. JOHNSON.

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The Physical Basis of Insect Drift.

THE letter of Dr. E. P. Felt (*NATURE*, May 29, p. 755) illustrates how difficult it is in these days for the student of one science to keep in touch with developments in other sciences, developments which may have a considerable bearing on his own subject. We know all too little about the conditions in the upper air, but we know more than "the extremely few observations made by airmen in balloons, dirigibles, or aeroplanes." If Dr. Felt were to get in touch with the Weather Bureau at Washington, or with the Blue Hill Observatory, he would probably be able to obtain data which would be of great value in connexion with the question of insect drift. Observations of wind in the upper air are made as a matter of routine in many places in the northern hemisphere, and in some in the southern, so that there should be plenty of material to work on.

No doubt winds in the upper air have a great deal to do with the dispersal of insects, and convection currents occur at times up to much greater heights than those mentioned by Dr. Felt. At the same time there may be other factors besides wind; it is not easy to see how the extraordinary migrations of *Vanessa cardui* in Europe can be explained on purely meteorological lines unless other insects are similarly affected, which, so far as I know, is not the case. No doubt the appearance of *Colias edusa* in England from time to time might be explained by meteorological considerations, but if so a "clouded yellow year" should be a year when other continental forms appear here. There is evidently scope for a considerable amount of team work between meteorologists and entomologists.

C. J. P. CAVE.

Stoner Hill, Petersfield,
June 17.

Abnormal Venous Circulation in a Frog.

ONE of our senior boys here, Alan Cadbury, when dissecting a frog, directed my attention to the fact that the right anterior vena cava appeared to be completely missing. Closer examination proved this to be actually the case. In order to return the blood from the right anterior region of the body to the heart, a commissural vessel had been established connecting the bases of the external jugular vein of the two sides, the venous blood from the entire anterior region of the body thus finding its way back to the sinus venosus through the left anterior vena cava. The specimen was a well-grown male.

In a communication to *NATURE* of April 25, 1925, Dr. N. B. Eales has directed attention to variations occurring in the distribution of the anterior abdominal vein of the frog and remarked on their evolutionary significance. No such significance can be plausibly attached to the present case, but the anomaly seems rare enough to be worth recording. The anterior abdominal vein opened into the liver as usual.

F. W. FLATTELY.

Leighton Park School,
Reading, June 10.