

**Fluorescence of Zinc Oxide.** An investigation by Beutel and Kutzelnigg (*Sitzungsber. Wien. Akad. Wiss.*, 141, 437; 1932) shows that the fluorescence of zinc oxide preparations is a specific property and is not due to traces of foreign metals as impurities. The effect is diminished by powdering the preparation, and the colour of the light is affected by the temperature to which the oxide has been heated. An intensive green fluorescence is obtained with preparations ignited in a reducing atmosphere, whilst the oxide obtained by decomposing the carbonate at 300° shows a dark brown fluorescence. A minimum of fluorescence strength was found with preparations heated at 600°, and the effect disappears when oxide obtained by heating the nitrate is strongly ignited. No definite relation between physical properties and fluorescence could be established.

**Copper Age in Ancient China.** Further analysis (cf. *NATURE*, 131, 243; 1933) of three ancient halberds similar to those found on the Yin site at Honan, made by Tsurumatsu Dono (*Bull. Chem. Soc. Japan*, April), showed that one was almost spectroscopically free from tin, another contained only 0.60 per cent of tin, whilst the third contained 2.19 per cent. In the first, 15 per cent of lead was present, in the second 0.58 per cent and in the third 5.85 per cent. Arsenic was either absent or present only as a trace. Since the three objects were almost identical in appearance, it is concluded that the introduction of bronze poor in tin occurred in a transitional period which came between the copper and bronze ages and that this period was very short. The paper contains complete chemical analyses and microphotographs of structure. The close similarity in composition between ancient Chinese and Sumerian bronzes is noteworthy.

### Astronomical Topics

**Radial Velocities of Variable Stars.** Dr. P. W. Merrill contributes an article on this subject to *Popular Astronomy* for April. He refers to the former idea that these were dwarf stars approaching extinction; a study of their proper motions showed that the variables are in most cases remote, so that they are now reckoned as giants, not as dwarfs. The radial velocities are important for giving an estimate of their true speeds, since the thwart velocities are generally too small to determine accurately. It has been observed in many cases that the bright lines visible at maximum show a velocity of approach of about 15 km./sec. relatively to the dark lines. It is concluded in the article that the latter give the true speed of the star, and that the difference arises from an outward motion of heated gases. A strong argument for this is afforded by the close double star X Ophiuchi; one component is variable, the other of constant light; at maximum the spectrum of the former is observable, at minimum that of the latter; the dark lines in both stars give the same radial velocity,  $-70\frac{1}{2}$  km./sec., while the bright lines in the variable give  $-83\frac{1}{2}$ . A similar argument is drawn from R Aquarii and its companion nebula. In some faint variables the bright lines only are measurable. A correction is applied to these to deduce the true velocity of the star. A statistical study then shows that the variables, as a whole, have a mean speed of 37 km./sec. relatively to the other stars, this speed being towards a point in the southern hemisphere nearly opposite the solar apex.

halves being afterwards developed together. The spectrograms were then examined with the Cambridge microphotometer. The tables give the multiplet identification, the central intensity and equivalent breadth of the lines in the part of the spectrum examined. In the third part, Dr. Woolley gives a full discussion of multiplet intensities, the calibration of Rowland's scale of intensities and the classification of solar lines according to contour.

Publications of the U.S. Naval Observatory (Washington). Vol. 13, of 365 pages, of these Publications, contains the observed positions of sun, moon, planets and stars, obtained from observations with the 9-in. transit-circle. The observations of the sun extend from 1918 until 1925, those of the moon from 1913 until 1925. The results are compared with the predictions of the American Ephemeris; in the case of the moon there is a further comparison with an improved ephemeris, in which some corrections to Brown's tables have been applied. In the case of Mars, Ross's corrections to Newcomb were introduced into the ephemeris in 1922, but their effects have been carried back to 1913.

The next item in the volume is a catalogue of 9,989 standard and intermediary stars, between the north pole and declination  $-36^\circ$ ; they were observed in the years 1913-1926; the positions are reduced without proper motion to 1920. Proper motions have been determined for all the stars. They are given to three or four decimals of a second of time, and to two or three of a second of arc. There follows a catalogue of 2,438 standard stars, and a comparison of the observed positions with those of Greenwich, Boss and Eichelberger.

Full details are given of the methods of observation. The transits were recorded by hand-tapping the passage over fixed wires. Meridian marks were used as a check of the azimuth of the instrument. A diagram shows an interesting correlation between the changes of azimuth of the marks and the motion of the pole determined from the observations for latitude variation. A printing chronograph was used for recording the transits, the times for each wire being read to 0.02 sec.

**Microphotometry of the Solar Spectrum from 4040 to 4390 Å.** In the first part of a recent paper (*Annals Solar Physics Observ., Camb.*, 3, Part 2), Dr. R. v. d. R. Woolley develops the mathematical theory, following Eddington's earlier investigations, of the occurrence and the relative intensities of the dark lines in the solar spectrum, on the hypothesis of selective scattering in the sun's atmosphere. The modification of the scattering coefficient due to the Doppler effect is also considered. The observations described in the second part are based on plates recently taken by Evershed at Ewhurst. A plate was cut in two; one half was exposed by Evershed, the other half was standardised photometrically at Cambridge, the two