objectives in from $\frac{1}{25}$ to $\frac{1}{5}$ of a second. Resolution approaching the theoretical maximum has been reached in pictures of living cells made under these conditions. We have furthermore observed that many kinds of cells if carefully shielded from all extraneous radiation are seemingly unhurt by the amount of ultra-violet light necessary to photograph them. Consequently it has been possible to prepare serial photographs which show many single cells and simple organisms passing through successive stages in their life histories. As would be expected from the conspicuous absorption of formed chromatin, this "motion picture" procedure has proved especially instructive in studies of cell division.

The microscope used is a Barnard instrument adapted to take Zeiss optics and modified in various minor details of its construction. Reduced exposure and irradiation times have been achieved (1) by employing as source a sufficiently powerful condensed spark discharge (between cadmium electrodes), (2) by refining mechanical features so that the correct focal plane for the ultra-violet light can *always* be reached after applying an empirical correction to the setting for green light and (3) by photographing on fine grained motion picture film at moderate initial magnifications and enlarging from the negatives. It should be remarked that after these modifications ultra-violet photographs can be made with practically the same ease and certainty that attend ordinary photomicrography with visible light.

This apparatus and the "slow motion picture" technique which it makes possible are being applied to the study of a number of biological problems. With A. H. Ebeling photographs[3] have been made of various tissue cells in mitosis. We have also photographed the growth of yeast, several steps in the reduction divisions leading to the production of grasshopper sperm and some stages in the life cycles of typical protozoa. These will be published at a later date, together with a detailed description of the microscope itself.

RALPH W. G. WYCKOFF
ADRIAN L. TER LOUW

ROCKEFELLER INSTITUTE FOR
MEDICAL RESEARCH,
NEW YORK, N. Y.

ELEMENT 87

THE isolation of element 87, reported in the press on October 15, 1931, offers another opportunity to test the validity of the periodic classification. The accompanying curves indicate certain properties of the alkali elements, and have been extended to cover the properties of element 87 by extrapolation. The values so obtained are subject to the usual objections common to extrapolated figures, but it will be interesting to see how closely they will conform to the observed properties of element 87 when the element has been completely studied.

Figs. 1, 2, 3 and 4 represent, respectively, the

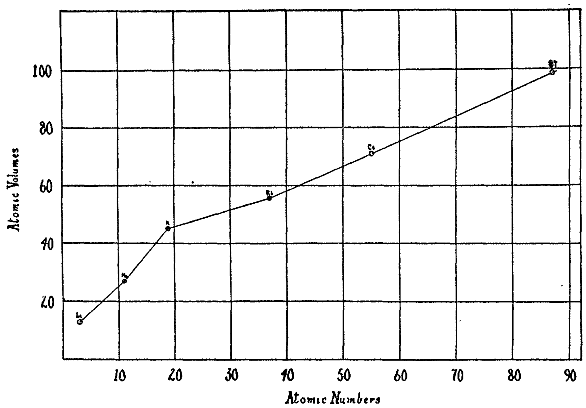

FIG. 1. Atomic volumes of the alkali elements plotted against their atomic numbers, with the value for element 87 extrapolated.

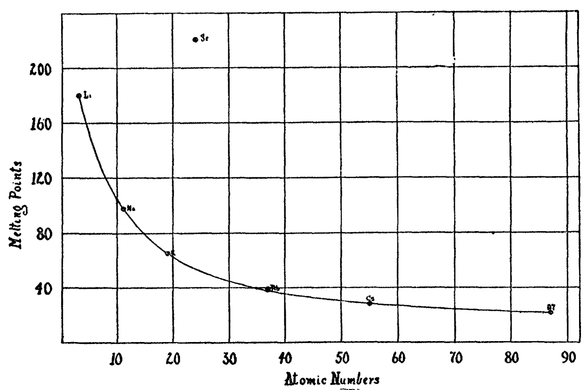

FIG. 2. Melting points of the alkali elements plotted against their atomic numbers, with the value for elements 87 extrapolated.

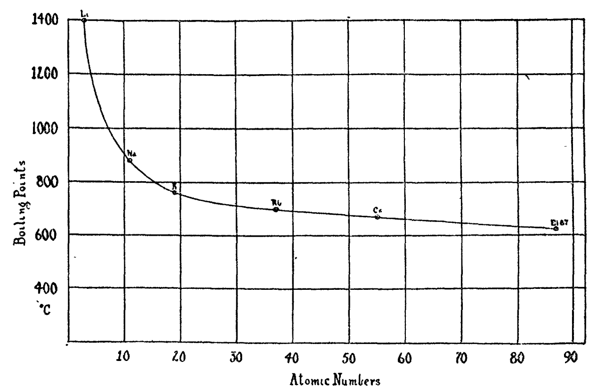

FIG. 3. Boiling points of the alkali elements plotted against atomic numbers, with the value for element 87 extrapolated.

[3] A few of our earliest photographs will appear in a forthcoming number of the *Journal of Morphology*.

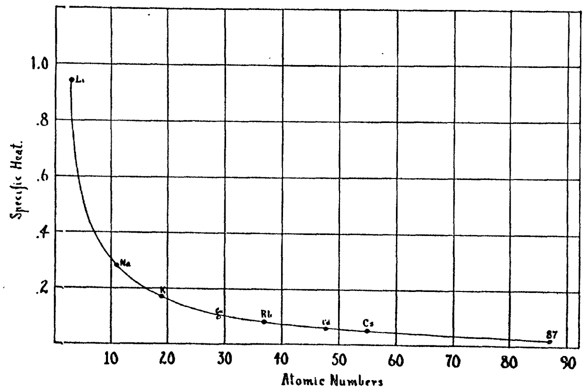

FIG. 4. Specific heats of the alkali elements plotted against their atomic numbers, with the value for element 87 extrapolated.

atomic volumes, melting points, boiling points and specific heats of the alkali elements, when plotted against their atomic numbers, with the value for element 87 extrapolated in each instance.

Fig. 5, representing the wave-lengths of maximum photoelectric sensitiveness of the alkali elements in

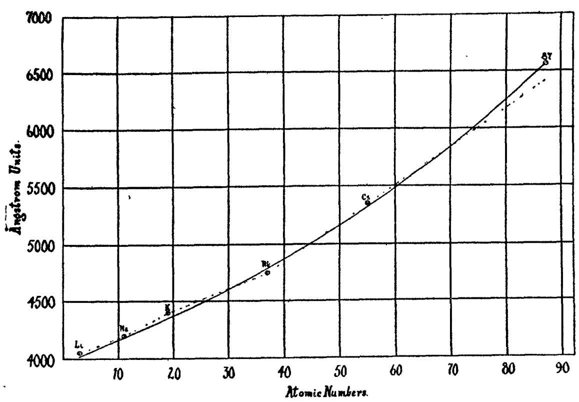

FIG. 5. Wave-lengths of maximum specific photoelectric sensitiveness of the alkali elements in contact with argon, plotted against their atomic numbers, with the value for element 87 extrapolated.

contact with argon, has been plotted from the values given by Miss E. F. Seiler in the *Astrophysical Journal,* Vol. 52, 1920, and is for the metals in comparatively thick layer.

Fig. 6 is a composite curve from two curves showing the sensitivity curve of the caesium on caesium oxide photocell (solid line) and the analogy curve for a similar cell made with element 87, assuming that the same wave-length difference between caesium and element 87 would occur in cell and in maximum photoelectric sensitiveness of curve 5. The curves from which the composite was drawn are from Koller (*J. O. S. A.* and *R. S. I.*) and Zworykin and Wilson ("Photocells and Their Application"). Since the sensitivity peaks broaden and flatten with increasing

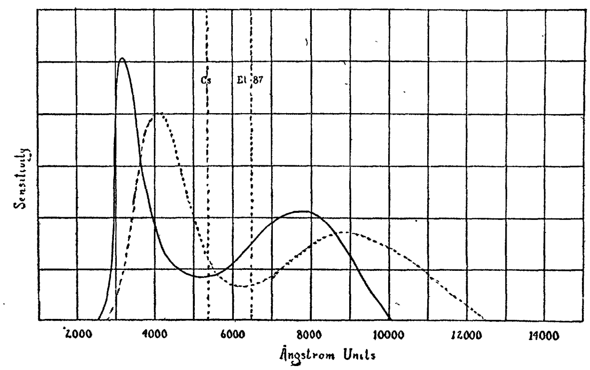

FIG. 6. Photoelectric sensitivity curve of caesium in monatomic layer on caesium oxide; solid line. Analogy curve for element 87; dotted line. The vertical dotted lines represent the wave-lengths of maximum specific photoelectric sensitiveness shown in Fig. 5 for Cs and El 87.

atomic number, a photocell utilizing element 87 might have a considerable sensitivity well into the infra-red.

From the atomic volume, the specific gravity of element 87 may be calculated as approximately 2.2. Its large atomic number makes it probable that several isotopes exist. Since the radioactive degeneration series does not pass through the element, there is no reason to expect that it will be radioactive to any greater degree than the other alkali elements. It should be possible to separate the element from admixture with caesium by differential light ionization in an electrostatic field, since presumably the vapors of the two elements would be ionized at different light frequencies.

C. F. GRAHAM

ALBANY, N. Y.
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