RECENT DEATHS

Arturo E. Burkart, 69; director, Botanical Institute Darwinion, Argentinian Academy of Sciences; 25 April.

Robert G. Bingham, 36; former professor of astronomy, University of Washington; 13 April.

Leigh E. Chadwick, 70; retired head, entomology department, University of Illinois; 4 February.

William G. Hackler, 52; professor of engineering, Virginia Polytechnic Institute and State University; 8 April.

Howard L. Hunter, 70; professor emeritus of chemistry, Clemson University; 27 March.

Percy L. Julian, 76; former professor of chemistry, Howard University; 19 April.

John S. Kieffer, 70; former president, St. John's College; 29 March.

Joseph N. Knull, 83; professor emeritus of entomology, Ohio State University; 24 April.

Dorothy D. Lee, 69; former professor of anthropology, Vassar College; 18 April.

Samuel H. Lee, 56; professor of chemistry, Texas Tech University; 3 April.

Stuart Mudd, 81; former professor of microbiology, University of Pennsylvania; 6 May.

Charles M. Nevin, 82; professor emeritus of geology, Cornell University; 24 March.

Timothy J. O'Leary, 66; professor emeritus of chemistry, Gonzaga University; 3 May.

William A. Pearl, 81; former professor of engineering, Washington State University; 5 April.

Lyman B. Porter, 81; former professor of chemistry, University of Arkansas; 24 March.

Henry A. Schroeder, 68; professor emeritus of physiology, Dartmouth College; 20 April.

Joseph Solomon, 71; clinical professor of psychiatry, University of California, San Francisco; 29 March.

RESEARCH NEWS

Actin and Myosin: Role in Nonmuscle Cells

Actin and myosin, contractile proteins once considered characteristic of muscle, are now known to occur in numerous cell types ranging from amoebas and cellular slime molds to mammalian fibroblasts, nerve cells, and platelets. Actin, at least, is probably ubiquitous. With the wide distribution of these proteins firmly established, investigators are concentrating on developing a better understanding of their functions. The evidence acquired thus far indicates that cell motility and mitosis may depend on the activities of these contractile proteins.

In striated muscle, actin and myosin are arranged in a highly ordered manner. A muscle fiber consists of a series of contractile subunits called sarcomeres. Two structures called Z-lines constitute the boundaries of each sarcomere. The ends of thin filaments of actin are attached to the Z-lines. Interspersed between the thin filaments are thick filaments composed of myosin. Driven by the energy supplied by hydrolysis of adenosine triphosphate (ATP), the thin and thick filaments interact and slide over one another, thus drawing the Z-lines closer together and producing contraction.

Many investigators think that an analogous interaction occurs between nonmuscle or cytoplasmic actin and myosin, and that the interaction is involved in such processes as amoeboid motion, development of the cleavage furrow during mitosis, cytoplasmic streaming, blood clot retraction, and certain changes in cell shape that occur during embryo development. Studying the postulated interaction between contractile proteins in nonmuscle cells is difficult because in these cells they are not arranged in such neat patterns as they are in striated muscle.

More is known about the localization of cytoplasmic actin in cells than about that of myosin. This is because there is a convenient label for actin. A fragment of myosin called heavy meromyosin (HMM) retains both the adenosine triphosphatase (an enzyme that catalyzes the hydrolysis of ATP) activity and the actin-binding capacity found in the intact molecule. When HMM is added to cells that have been treated with glycerin to increase their permeability, HMM will bind to actin filaments in a distinctive arrowhead pattern. Harunori Ishikawa, now at the University of Tokyo, and Howard Holtzer of the University of Pennsylvania used this technique to show that microfilaments consist of actin.

Fig. 1. Pattern of fluorescent HMM in chick fibroblast during interphase (× 1950). [Source: Joseph Sanger, University of Pennsylvania]

Microfilaments are a distinct class of filaments with a diameter of about 50 Å that can be found in most types of cells. In resting cells in culture they often form bundles (also called stress fibers) that are more or less parallel to one another. They exist in another form, as a network of filaments, in the ruffled or moving edges of motile cells. There appears to be a correlation between the location of these filaments and cell movements. Moreover, several investigators have found that the ends of actin filaments are attached to, or perhaps embedded in, the cell membrane. This is important because generation of contractile force and movement requires anchorage of the actin filaments just as those in muscle are attached to the Z-line.

The cells containing actin "decorated" with HMM must be examined with the electron microscope in order to observe the arrowhead patterns formed. This complicates the determination of the three-dimensional actin patterns in a cell because only thin sections of the cell can be examined.

Two new techniques, both of which permit visualization of entire cells with the light microscope, do not suffer from this handicap. One, used by Joseph Sanger of the University of Pennsylvania School of