Minimuscle molecules for cell division

Movement and muscle, except in cases of dysfunction, are practically inseparable words when describing biological systems. Movement is the raison d'être for the complexly designed architectures of muscle tissues, smooth and striated.

Biology research has, in recent years, illuminated the basic interplay between muscle form and muscle function, and the light shines, not surprisingly, to the molecular level. The complex molecules responsible for muscle tissue construction, it has been well documented, are the globular protein actin and the fibrous protein myosin with its dense "heads," both of which are aggregated into separate types of filaments. These slide, rachetlike, past each other, when activated by the right chemical environment and carry with them the surrounding cellular material—an accumulation of the action of tiny fibers that together cause a great rippling contraction, and a smile is created or a step taken or a hand extended.

Actin and myosin, it seems, are also responsible for the contraction of other tissues and of organisms too small to have muscles. The power source for the mysterious ambling of amoebas has been traced to actin-myosin activity. The aggregation of individual slime mold cells into tiny tower colonies, too, and the movement and extension of blood platelets and growing nerve endings have been explained by the active shearing of actin and myosin molecules.

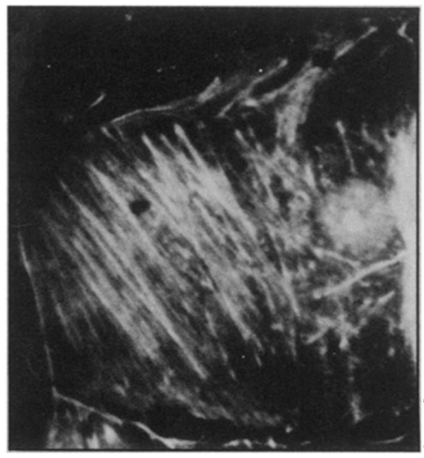
One of the most essential and universal biological movements—the movement of chromosomes during cell division—has now been linked to the actin-myocin system, in two reports in the May and the (just published) June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES by Joseph W. Sanger of the University of Pennsylvania School of Medicine.

In the first report he describes a technique for finding, then following, the patterns of actin in cells during mitotic division. By using a fluorescently labeled form of myosin called meromyosin, he was able to locate actin in embryonic chicken gizzard cells. The meromyosin attaches to the chick actin and fluoresces under the light microscope, making the actin filaments visible during cell division. The labeled mermyosin does not prevent the normal sheering action of the actin and myosin. Therefore, Sanger was able to observe the distribution of actin in the cell during all stages of cell division.

Using this fluorescence technique, Sanger has found that actin bundles are present on the chromosomal spindle fibers (particularly near the attachment of the chromosome to the spindle) of dividing kangaroo rat cells. These bundles provide the minimuscle power necessary to move the chromosomes along the spindles to the opposite poles before daughter cells are born.

The dense, round nucleoli also contain actin, Sanger found, and this may help explain the contributing role they play in spindle formation.

It would seem logical that, where there is actin and movement, there will be myosin, too. "We predict that myosin will also be found to be present in chromosomal spindle fibers," Sanger states, and this, of course, would be "compelling support for an actin-myosin role in chromosomal movement." Present fixation techniques, however, do not allow researchers to detect the small amounts of myosin present in nonmuscle cells. □



Sanger/PNAS

Spindle fibers and actin fluorescing.

'Streamlining' reorganization for NSF

Saying that the National Science Foundation wants to become more "streamlined" in its interaction with other Government agencies, Director H. Guyford Stever last week announced reorganization of the Foundation along more disciplinary lines. Stever said the move had been under consideration for more than a year and was "not aimed at the immediate problems we have"—an apparent reference to recent Congressional criticisms (SN: 6/28/75, p. 412).

Under the new plan, the old Directorate for Research would be replaced entirely, and such purely research-oriented projects as ocean exploration, various polar programs and the office of climate dynamics would be removed from the Directorate for National and International Programs. All research activities of NSF would then come under one of three new directorates, each led by an assistant director nominated by the President and confirmed by the Senate:

- The Directorate for Mathematical, Physical and Engineering Sciences (MPES), headed by assistant director Edward C. Creutz.
- The Directorate for Astronomical, Earth and Ocean Sciences (AEOS), headed by assistant director Robert E. Hughes.
- The Directorate for Biological and Social Sciences (BSS), headed by acting assistant director, Richard C. Atkinson, who will also be in charge of coordinating implementation of the reorganization under his other title of deputy director.

John H. Douglas

Stever: Reorganizing for future needs.

The law requires confirmation of four NSF assistant directors. Thus, when a permanent Biological and Social Sciences assistant director is nominated, he will have to appear before the Senate. Also, Lowell J. Paige, the present assistant director for Science Education, has just announced his resignation, effective Aug. 31, and his replacement will require confirmation. Otherwise, no further Congressional action is required for any of the proposed reorganization changes to take place. Final reshuffling of divisions within the directorates is expected to be completed by the end of October.

At his press conference announcing the reorganization, Stever was asked about mounting Congressional pressure on NSF and about prospects for the new Presidential science adviser. Stever would not speculate about whether he might be a candidate for the new post, saying he has enjoyed both his present position as head of NSF and as science adviser, but he allowed that handling both jobs simultaneously "was tough."

He called the Baumann amendment "an immediate, short-term response to a problem Congress has had," and said that while he opposed the measure to have NSF obtain prior approval from Congress of all its grants, "we could learn to live with it." Even if the amendment does not pass, however, Stever said NSF will begin sending Congress more detailed explanations of currently funded projects.

The reorganization will help NSF relate to the new White House science advisory apparatus, once it is established, Stever said. No changes in funding policy are implied, however, and individual grantees will not notice much difference. □