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Kamiya N. *Protoplasmic streaming*. Vienna, Austria: Springer-Verlag, 1959. 199 p.
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This monograph surveys what was known by the late 1950s about cytoplasmic streaming in plant cells and acellular slime mold including about 420 references to cited papers. Weight was given to new approaches to the study of motility in *Physarum* plasmodium and characean cells. [The *SCI*® indicates that this book has been cited in over 365 publications.]

Cytoplasmic Streaming—Motility in Plant and Fungal Cells

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I have been interested in protoplasmic streaming (now more often called cytoplasmic streaming) ever since my student days, but little was known then about its mechanism, there having been no proper methods to attack it. It was in the laboratory of William Seifriz at the University of Pennsylvania in 1939 that I met for the first time the gorgeous, golden yellow culture of a slime mold, *Physarum polycephalum*.[1] Seifriz directed his keen attention for the first time to *Physarum* plasmodium as an excellent material for the study of cytoplasmic streaming and biological rhythm. I was also to become absorbed in this attractive organism and to develop there the double-chamber method, which made it possible to measure the motive force responsible for streaming in this organism.[2] During the happy time I spent in Seifriz's laboratory, however, the Pacific War broke out in December 1941. Half a year later, I was on board a Swedish exchange boat that repatriated American and Japanese citizens to their home countries. After my repatriation I decided, at the University of Tokyo, to restart my research work on *Physarum* all over again and, further, to begin a new project on the mechanism of rotational cytoplasmic streaming in the characean alga *Nitella*. After I moved to Osaka University in 1949, we worked along the same lines. Among other things I attempted with K. Kuroda to determine the site of the motive force of rotational streaming in *Nitella* and to measure the value of the force.

The motive of writing a monograph on protoplasmic streaming was inspired by the invitation of L.V. Heilbrunn in the middle part of the 1950s. On this occasion I squeezed the time in between official duties to survey and discuss the reports on cytoplasmic streaming as far as was known and to introduce our own studies on the two main materials, *Physarum* and *Nitella*. It took about four years to complete the monograph. It was about the burgeoning stage of biochemical and ultrastructural study in cell biology.

In the last three decades since the book was published, our knowledge about cytoplasmic streaming and cytoskeleton has made great strides, taking advantage of progress in many experimental techniques. It has become possible now, if only in part, to consider the phenomenon on the molecular level and to reconstruct the phenomenon in model systems. There are several articles reviewing recent achievements in this field.[3-6] However, not a few passages in this monograph, I believe, still survive because they dealt mainly with history and description of experimental facts. One reason the above monograph was fairly well cited was that there had been no book surveying our knowledge on this subject since A.J. Ewart,[7] and the time was ripe for a new monograph. Another reason would probably be that description and application of new quantitative approaches might have aroused some interest in research workers in the field.

1. **Kamiya N.** My early career and the involvement of World War II. *Annu. Rev. Plant Physiol.* 40:1-18, 1989.
2. ————. The control of protoplasmic streaming. *Science* 92:462-3, 1940. (Cited 25 times since 1945.)
3. ————. Physical and chemical basis of cytoplasmic streaming. *Annu. Rev. Plant Physiol.* 32:205-36, 1981. (Cited 95 times.)
4. ————. Cytoplasmic streaming in giant algal cells: a historical survey of experimental approaches. *Bot. Mag.—Tokyo* 99:441-67, 1986. (Cited 5 times.)
5. **Tazawa M & Shimmen T.** Cell motility and ionic relations in characean cells as revealed by internal perfusion and other cell models. *Int. Rev. Cytol.* 109:259-312, 1987.
6. **Kuroda K.** Cytoplasmic streaming in plant cells. *Int. Rev. Cytol.* (In press.)
7. **Ewart A J.** *On the physics and physiology of protoplasmic streaming in plants*. Oxford, England: Clarendon Press, 1903. 131 p. (Cited 20 times since 1945.)

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