# Muscle-like Arrays in a Fibroblast Line

SEVERAL investigators have speculated that the basis for all cellular contractile activity resides in a common molecular mechanism involving an interaction between actin and myosin[1–4]. Thin filaments resembling the actin filaments of muscle have indeed been widely observed[3,5] and the recent demonstrations of heavy meromyosin binding to thin filaments[4–6] suggest that these ubiquitous filaments are, in fact, actin. Although muscle-like thick filaments have not been observed in non-muscle cells, myosin thick filaments have been reconstituted from blood platelet preparations[1]. To our knowledge, however, no one has presented evidence for the natural occurrence of ordered arrays of thick and thin filaments in non-muscle cells.

In this laboratory, a line of BHK-21 fibroblasts (C13–404) has been maintained by serial stationary culture of stock originally obtained from Dr H. V. Aposhian. The cell line is maintained in Eagle's MEM supplemented with 5% tryptose phosphate broth and 10% calf serum (GIBCO) under an atmosphere of 5% $CO_2$ in air at 37° C[7]. Electron microscopic techniques have been described previously[8].

The ultrastructure of the cells conformed closely to a previously published[9] description, although in five cells from four different cultures (examined over a one year period) numerous 150–180 Å filaments with periodic lateral projections were observed interdigitating with 60 Å thin filaments (Fig. 1*a–d*). On one occasion, dense material was associated with the thin filaments (Fig. 1*a* and *b*) and the ordered thick and thin filament "Z-like" array closely resembled the first stages of myofibril assembly in embryonic skeletal and cardiac muscle (compare ref. 8, Figs. 1 and 3; ref. 10, Figs. 2 and 6). Although a recent report[11] notes "a muscle-like configuration of microfilaments (50–80 Å diameter)" in BHK–21 fibroblasts treated with cytochalasin B, the presence of thick filaments was attributed to an effect of the drug.

We believe that this evidence is the first demonstration of ordered arrays of muscle-like filaments and Z-like material in a cultured cell line of non-muscle origin.

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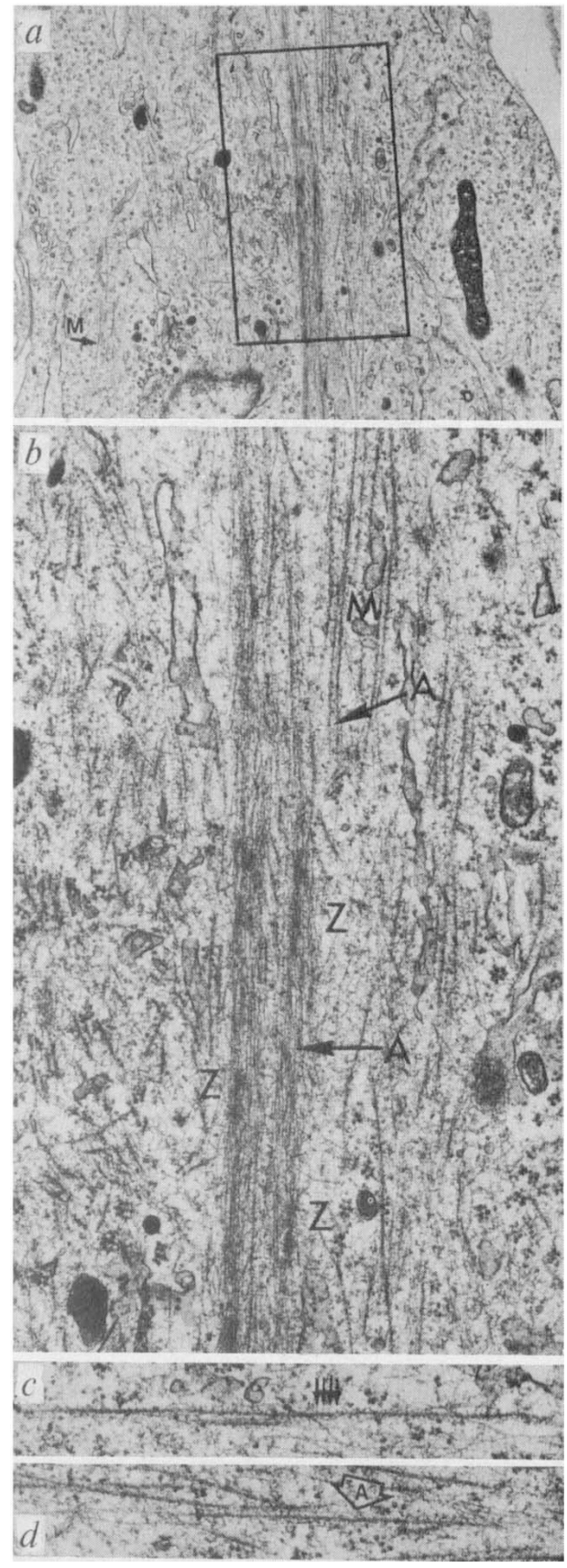


**Fig. 1** *a*, Orientation electron micrograph of BHK-21 fibroblast containing a bundle of thick (M) and thin (A) filaments and Z-like densities (Z). Additional filaments randomly oriented in cytoplasm. ×9,600. *b*, Higher magnification revealing Z-like density with attached thin filaments and associated thick filaments. ×32,000. *c*, Cytoplasmic thick filaments with periodic lateral projections (arrows); *d*, thin filament (arrow) associated with thick filaments via cross-bridges. ×40,000.