muscle. In this preliminary note we wish to describe briefly the most prominent features of these photographs and their probable interpretation in terms of nerve structure. A detailed report will appear in another place.

For this work the Kα radiation of copper was used, the average exposure time being ten minutes. While the patterns are not as sharp as those from more perfectly oriented structures, such as hair and tendon, the spacings are clear enough to permit fairly satisfactory measurement. In fresh sciatics the following spacings are distinguishable: an equatorial point at 40–45 Å and another at 14–17 Å, a ring at 4.6–4.8 Å, with clearly defined meridianal sickles, and an outer ill-defined ring at 2.8–3.1 Å. The inner equatorial point very close to the central spot can be observed only by careful centering of the primary beam and by using very small pinholes and beads. This pattern seems to be typical for fresh medullated nerve, since it has been obtained from the sciatic, motor and sensory roots and spinal cord of the frog and cat. The smaller equatorial spacing decreases with drying to 11–12 Å. Tension tends to sharpen the picture somewhat, but, as in the case of muscle, produces no new pattern.

Because of its similarity to the diagram of α-keratin it seems likely that the molecular configuration producing the diagram in nerve corresponds to a system of oriented protein primary valence chains lying parallel to the fiber axis. The equatorial spacing of 17 Å corresponds to the direction of the side chain rungs (0, 0, 1 spacing of Astbury and Street[1]) and the meridianal spacing probably corresponds to the reflection from double amino-acids residues along the fiber axis. A large equatorial spacing has been observed in keratin diagrams, but its significance is uncertain.[1] We have entertained the view that this spacing in nerve and perhaps also in other animal fibers may correspond to the lateral distance between micelles. Since it is almost completely absent in pictures from nerves subjected to long soaking in alcohol, it is conceivable that this lateral distance is maintained by lipid or other fatty molecules acting as lateral spacers and oriented perpendicularly to the long axis of the micelles. Since the 4.6 Å spacing shows relatively imperfect fibering and the side chain spacing tends to appear as elongated points there must be considerable random orientation of primary valence chains. Intermicellar protein chains are also evidenced by the diffuse ring at 3.1 Å.

Boehm,[2] who also observed the 17 Å equatorial and the 4.8 Å meridianal spacings, attributed the former to connective tissue micelles and the latter to radially oriented fluid crystals of the myelin sheath. Axis cylinder, according to him, produces no pattern. However, we find no correlation between the presence of connective tissue and the 17 Å spacing; this spacing has been observed not only in sciatic nerve but also in corpus callosum, spinal cord, motor and sensory roots, and also in lobster and crab nerves. We have, moreover, observed a spacing of 4.8–5.0 Å in lobster nerve, and in a few instances, meridianal sickles at 2.5 Å, which are presumably second order reflections. There can be no doubt that the primary valence chains in lobster and crab claw nerves are very highly solvated and exist for the greater part, in the fresh tissues, as unoriented chains. The fresh nerve usually shows only one or two very diffuse rings. But by careful drying under tension, or better by very slow dehydration with increasing concentrations of alcohol up to absolute, a very clear equatorial spacing appears at 11–14 Å, and second order meridianal sickles are often visible at 2.4–2.5 A. From these considerations it seems more reasonable to believe that the pattern observed with nerve is essentially that of a single system of partially oriented primary valence chains probably admixed with unoriented intermicellar protein chains. Histological evidence seems fairly conclusive that the site of this fibrous structure is the axis cylinder. This explanation fits well with data of thermal shortening and on solvation and desolvation of nerve.[3] Since the radiation required to produce these patterns has no appreciable effect on the irritability of the nerves and if further analysis of the pictures confirms the view given above this constitutes the first evidence for the existence of a typically fibrous condition in the axis cylinder of a "normal" nerve. Moreover, a means is now available for a direct attack upon the problem of the rôle of the axis cylinder proteins in nerve phenomena.

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