



Fig. 6.15 ELECTRICAL CIRCUIT FOR A MYELINATED AXON Geometrical and electrical layout of the myelinated axon from the frog sciatic nerve (Frankenhaeuser and Huxley, 1964; Rogart and Ritchie, 1977). The diameter of the axon and its myelin sheath is $15 \mu\text{m}$, the diameter of the axon itself $10.5 \mu\text{m}$, the difference being made up by 250 wrappings of myelin. The myelin is interrupted every 1.38 mm by a *node of Ranvier* that is $2.5 \mu\text{m}$ wide. The total distributed capacitance for the internode (2.2 pF) is only slightly larger than the capacitance of the much smaller node (1.6 pF). The same is also true of the distributed resistance. At each node, the spike is reamplified by a fast sodium current and is repolarized by a potassium current. Little or no potassium current is found at the nodes of Ranvier in mammalian myelinated axons. There, repolarization is accomplished by rapid sodium inactivation in conjunction with a large effective "leak" current.