It is my great privilege to present the opening lecture at this very exciting meeting. The organizer, Dr. Ledeen, suggested a historical outline of glycolipid research as an introduction, and I hope you will allow me to talk freely as I outline some of the thoughts and questions that have occurred to me during my 30 years of research in this field.

The first naturally occurring glycolipid that was found was cerebroside, or galactosyl ceramide (Fig. 1). It was isolated by Thudichum about 100 years ago and described in his textbook. Because of the infamous "protagon" controversy, his finding was only accepted after his death. At that time, galactose was also called cerebrose because of its presence in cerebroside. The monohexosyl ceramide most commonly found in various animal tissues is glucosyl ceramide. Galactosyl ceramide occurs abundantly in white matter of brain, and is also present in considerable amount in kidney along with glucosyl ceramide.

We may ask the question, why is the distribution of galactosyl ceramide and glucosyl ceramide so specific? The localization of galactosyl ceramide in brain and kidney cells was visualized by Nagai and his co-workers in 1981 by means of the immunofluorescence technique. Oligodendrocytes, myelin sheath and choroid plexus were definitely stained. Furthermore, they showed positive staining at the microtubule-like cytoskeleton structure in cultured monkey kidney cells with anti-galactosyl ceramide. The localization of galactosyl ceramide in renal tissue raises an interesting question, and may be a clue to solving the differing roles of glucosyl ceramide and galactosyl ceramide. For the biosynthesis of more complex oligoglycosylceramides, glucosyl ceramide seems to be convenient for elongation of carbohydrate chains, but this is not
the case for galactosyl ceramide. Abrahamsson⁴ pointed out that in oligoglycosylceramides the oxygen at position 4 of hexose is usually involved in glycosidic linkage to the next sugar. The conformation of galactose in cerebroside would not allow addition of another sugar residue. It is therefore of interest to note that almost all known oligoglycosylceramides have glucose instead of galactose in proximal linkage to ceramide. So, a possible explanation may be that a membrane site which requires restriction to a monohexosyl ceramide, for example in the myelin sheath, selects galactosyl ceramide.

The second glycolipid which appeared was sulfatide or cerebroside sulfuric ester. The presence of sulfate in brain lipids had been suggested by Thudichum. Koch subsequently separated a substance in which cerebroside and phosphatide seemed to be esterified with sulfuric acid⁵ (Fig. 2). When Blix isolated sulfatide in 1933, he arbitrarily suggested the formula of cerebroside-6'-sulfate as its probable structure.⁶ In 1951, Nakayama presented