

Foreword

The element fluorine manifests many important differences from the other halogens to the extent that its chemistry has to be considered separately from many of the generalizations that may be applied to chlorine, bromine, and iodine. This element, the most electronegative in the Periodic Table, has an atomic radius little larger than hydrogen, attracts protic hydrogen, and forms an exceptionally strong, while highly polarized, bond to carbon. Natural fluorine is uniquely the ^{19}F isotope, which has a nuclear spin of $1/2$, and it constitutes a most valuable NMR probe for structure and conformation. The radioisotope ^{18}F decays by emission of a positron with a half-life of 109.8 min and thereby constitutes a sensitive, albeit fleeting, tracer for fluorine-containing molecules in living systems.

These manifold features of the element have presented a multitude of opportunities for researchers working with carbohydrates to explore precise aspects of molecular structure, to develop valuable synthetic and degradative methodologies, to throw light on enzyme–substrate binding mechanisms involved in glycosyl transfer and glycoside hydrolysis and the inhibition of these processes, to use fluorine-containing probes to study complex biological sequences *in vivo*, to develop new therapeutic agents effective against microorganisms, viruses, tumors, and other disease states, and to introduce sensitive imaging techniques of important clinical value.

Although seventy years have passed since the first glycosyl fluoride was described, the general synthesis of carbohydrates containing fluorine still presents significant challenges, and most of the published research on fluorinated sugars has appeared during the past three decades following the advent of NMR spectroscopy and the introduction of effective fluorinating agents that can be handled with less hazard than earlier reagents. The current pace of research in all aspects concerning fluorinated carbohydrates is high and a recent survey of the area [T. Tsuchiya, *Adv. Carbohydr. Chem. Biochem.*, 48 (1990) 91–277] records over 800 articles published during a ten-year period. It was judged timely, therefore, to invite workers in this field to join together in presenting aspects of their current research in this Thematic Issue of *Carbohydrate Research* devoted to Fluoro Sugars.

One of us (TT) worked with the Editors in inviting the contributors, and the 21 articles presented here by authors in North America, Europe, and Japan reflect developments in a broad variety of areas where fluorinated sugars address important questions in research on carbohydrates.