

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Bioorganic & Medicinal Chemistry

journal homepage: www.elsevier.com/locate/bmc

Preface

2010 Tetrahedron Young Investigator Award for Medicinal and Bioorganic Chemistry

The major classes of biomacromolecules, oligonucleotides, proteins, carbohydrates and lipids are responsible for the recognition and signal transduction processes in living cells. This special issue demonstrates the power of synthetic chemistry to better understand the roles these molecules play in biological processes.

Following Richard Feynman's "I only understand what I can build" has prompted chemists to create the biomolecules—first typically to confirm structural assignments and to provide access to quantities of pure compounds that can be used in further studies. In a next step modified biomolecules serve as probes to understand interactions to identify key features that are responsible for activity and to create molecular tools. Finally, synthetic biomolecules constitute potentially powerful diagnostics and therapeutics.

The area of peptides and proteins is best understood as the synthesis of peptides was a key challenge during the 1950s and 1960s. The 1970s and 1980s saw a focus on oligonucleotides as automated methods for the synthesis of DNA and RNA resulted in dramatic advances in the area of molecular biology based on the availability of primers as well as modified oligonucleotides for use in antisense therapy. Both the chemical biology and medicinal chemistry of genomics and proteomics has prospered over time and is still presenting a host of challenges and opportunities.

Carbohydrates that can be further divided into the glycosaminoglycans, glycoproteins, glycolipids and glycosylphosphatidyl-

inositol (GPI) anchors have resisted longer to advances regarding their chemistry and biology. Intensifying efforts in the 1990s lasting until today have seen the development of fundamental technologies, including automated synthesis methods as a basis for biological and eventually medical advances. Recent years have seen increased activities in the exploration of the role of carbohydrates and their analogs for the use as therapeutics and diagnostics. The creation of molecular tools contributed greatly to that development.

The present special issue was put together on the occasion of the 2010 Tetrahedron Young Investigator Award and brings together chemists and biologists concerned with the role of peptides, oligonucleotides and carbohydrates in biology and their use to address medical challenges. Much has been achieved but still many challenges await chemists of future generations.

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