Angewandte International Edition Chemie

C.-H. Wong

The author presented on this page has recently published his **35th article** since 2000 in Angewandte Chemie: "Synthesis of *Neisseria meningitidis* Serogroup W135 Capsular Oligosaccharides for Immunogenicity Comparison and Vaccine Development": C.-H. Wang, S.-T. Li, T.-L. Lin, Y.-Y. Cheng, T.-H. Sun, J.-T. Wang, T.-J. R. Cheng, K. K. T. Mong, C.-H. Wong, C.-Y. Wu, *Angew. Chem.* **2013**, *125*, 9327–9331; *Angew. Chem. Int. Ed.* **2013**, *52*, 9157–9161.

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Position:	President, Academia Sinica and Professor of Chemistry, The Scripps Research Institute, La Jolla
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Education:	1970 BS, National Taiwan University 1977 MS, National Taiwan University 1982 PhD with George M. Whitesides, Massachusetts Institute of Technology 1982–1983 Postdoctoral Fellow with George M. Whitesides, Harvard University
Awards:	**2000** The Presidential Green Chemistry Challenge Award; **2002** Member of the US National Academy of Sciences; **2005** The American Chemical Society (ACS) Award for Creative Work in Synthetic Organic Chemistry; **2012** ACS Arthur C. Cope Award; Nikkei Asia Prize for Science, Technology and Innovation
Current research interests:	Bioorganic and synthetic chemistry and biocatalysis, including synthesis of complex carbohydrates, glycoproteins, and small-molecule probes for the study of carbohydrate-mediated biological recognition, posttranslational glycosylation, and drug discovery
Hobbies:	Reading, music

I admire … people with strong determination and persistence.

My favorite musician is … the violinist Jascha Heifetz.

In a spare hour, I … read articles related to new discoveries in different areas.

My biggest inspiration is … to use chemistry to improve our lives.

I advise my students to … pursue their interests and learn from failure.

My favorite way to spend a holiday is … reading and listening to classical music.

The secret of being a successful scientist is … to identify an important subject of interest and pursue it persistently.

My favorite reaction is … glycosylation in biology (and understanding its role).

The most important thing I learned from my students is … the value of their unexpected discoveries.

The principal aspect of my personality is … I pursue science with passion.

What I appreciate most about my friends is … their support and advice when I encounter difficulties.

My favorite painter is … Leonardo da Vinci.

The greatest scientific advance of the last decade was … stem cell research.

When I was eighteen I wanted to be … a chemistry professor.

I am waiting for the day when someone will discover … the way to prevent Alzheimer's disease.

The biggest challenge facing scientists is … to understand the origin of life.

Young people should study chemistry because … it provides you with tools to understand and solve problems in science.

Looking back over my career, I … am happy with my choice.

The most significant historic event of the past 100 years was … discovery of the double helix structure.

The most important future applications of my research are … the development of cancer vaccines and preparation of single glycoforms.

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How is chemistry research different now than at the beginning of your career?

I think in addition to its own standing as a major branch of science, chemistry is also the discipline that can be used to create compounds or tools to tackle important problems in life and materials sciences. Chemists create molecules for new reactions, as probes to study reaction mechanisms, and as medicines. Chemists develop methods and tools or reagents to measure and detect matter and to alter various pathways to optimize production processes. Since I started my career, these capabilities have been further refined and exploited, and in combination with new instruments and tools developed from other fields, many unsolved or untouched problems have been addressed. I believe this trend will continue, and chemistry will continue to play a very important role in tackling new problems, especially at the interface of physical and life sciences.

What is the secret to publishing so many high-quality papers?

I think development of new methods, or new principles or strategies that are far-reaching and appreciated by the community is the secret. When I started my career more than 30 years ago, it was the beginning of recombinant DNA technology and site-directed mutagenesis, and the application of physical organic chemistry to mechanistic enzymology. I became interested in and curious about many reactions that occur in nature, and decided to pursue my career in a unconventional way, i.e., to develop natural or nonnatural enzymes for organic synthesis, especially for the synthesis of complex molecules that are vital to biology and medicine and are impossible to prepare by chemical means. It was this desire and the desire to solve the problem of many incurable diseases that I became interested in complex carbohydrates and glycoproteins. Throughout the years, I have been focusing my effort in development of new synthetic methods and new tools to make these molecules, to understand their structures and functions, and to develop new detection methods or therapeutics. This approach is relatively new and quite different from the way organic chemists approach synthesis, made my research quite productive and soon became a new field in chemistry. The methods and strategies developed in my research were used to address many important problems and create new opportunities in carbohydrate-mediated biological recognitions and synthetic organic chemistry, including, for example, synthesis of oligosaccharides and homogeneous glycoproteins on large scales for fundamental and translational studies, development of glycan arrays for analysis of protein–carbohydrate interaction, and development of carbohydrate-based vaccines, therapeutics, and devices.

My 5 top papers:

1. "Chemical-Enzymatic Synthesis and Conformational Study of Sialyl Lewis x and Derivatives": Y. Ichikawa, Y.-C. Lin, D. P. Dumas, G.-J. Shen, E. Garcia-Junceda, M. A. Williams, R. Bayer, C. Ketcham, L. Walker, J. C. Paulson, C.-H. Wong, *J. Am. Chem. Soc.* **1992**, *114*, 9283 – 9297.
   This paper describes the synthesis of sialyl Lewis X (Le^X) on large scales using glycosyltransferases coupled with regeneration of sugar nucleotide cofactors. This enabling technology provides enough quantities of oligosaccharides for clinical study and conformational analysis, representing the most practical process for oligosaccharide synthesis.
2. "Enzymatic Glycoprotein Synthesis: Preparation of Ribonuclease Glycoforms via Enzymatic Glycopeptide Condensation and Glycosylation": K. Witte, P. Sears, R. Martin, C.-H. Wong, *J. Am. Chem. Soc.* **1997**, *119*, 2114 – 2118.
   This paper is about the strategy for the preparation of homogeneous glycoproteins with well-defined glycan structures. This strategy has been used in the synthesis of antibodies and other glycoproteins.
3. "Programmable One-Pot Oligosaccharide Synthesis": Z. Zhang, I. R. Ollmann, X.-S. Ye, R. Wischnat, T. Baasov, C.-H. Wong, *J. Am. Chem. Soc.* **1999**, *121*, 734 – 753.
   An automated approach to oligosaccharide synthesis using building blocks with defined reactivity in a programmable and one-pot manner. The method has been used in the synthesis of many oligosaccharides for functional study and array development.
4. "Synthesis of Sugar Arrays in Microtiter Plates": F. Fazio, M. C. Bryan, O. Blixt, J. C. Paulson, C.-H. Wong, *J. Am. Chem. Soc.* **2002**, *124*, 14397 – 14402.
   One of the first reported glycan arrays developed for the study of protein – sugar interactions. The work has been further extended to glass slides and other surfaces.
5. "The core trisaccharide of an N-linked glycoprotein intrinsically accelerates folding and enhances stability": S. R. Hanson, E. K. Culyba, T. L. Hsu, C.-H. Wong, J. W. Kelly, E. T. Powers, *Proc. Natl. Acad. Sci. U.S.A.* **2009**, *106*, 3131 – 3136.
   The glycosylation effect on protein folding and stabilization was studied in a systematic way and it was found that the first monosaccharide attached to the protein is the most important to keep the protein intact. Further study on the subject to understand the origin of the glycosylation effect was later reported.

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