Author Profile

K. C. Nicolaou

The author presented on this page has recently published his ***100th article*** *since 2000 in Angewandte Chemie:* "The True Structures of the Vannusals, Part 1: Initial Forays into Suspected Structures and Intelligence Gathering": *Angew. Chem.*, **2009**, *121*, 5752; *Angew. Chem. Int. Ed.*, **2009**, *48*, 5642.

K. C. Nicolaou

Date of birth:	July 5, 1946
Nationality:	Greek Cypriot (UK and USA citizenships)
Position:	Chairman, Department of Chemistry and Darlene Shiley Chair in Chemistry, The Scripps Research Institute, La Jolla, CA (USA) Distinguished Professor of Chemistry, University of California at San Diego, La Jolla, CA W. Aline and L. S. Skaggs Professor of Chemical Biology, The Skaggs Institute for Chemical Biology, The Scripps Research Institute, La Jolla, CA Program Director, Chemical Synthesis Laboratory@Biopolis, A*Star, Singapore
Education:	1967 High School Diploma, Pancyprian Gymnasium, Nicosia (Cyprus) 1969 BSc (Honors, First Class), Bedford College, University of London (UK) 1972 PhD, University College, University of London 1972–1973 Postdoc with T. J. Katz, Columbia University, NY (USA) 1973–1976 Postdoc with E. J. Corey, Harvard University, MA (USA)
Recent awards:	**2000** Paul Karrer Gold Medal (Switzerland); **2001** Royal Society of Chemistry Centenary Medal (UK); Ernst Schering Prize (Germany); Nagoya Gold Medal of Organic Chemistry (Japan); Foreign Member, Academy of Athens (Greece); **2002** Tetrahedron Prize for Creativity in Organic Chemistry; **2003** ACS Nobel Laureate Signature Award for Graduate Education in Chemistry (USA); **2004** Aristeio Bodossaki Prize (Greece); Honorary Fellowship, Chemical Research Society of India; **2005** ACS Arthur C. Cope Award (USA); **2006** Burkardt–Helferich Prize (Germany); **2007** Honorary Fellowship, Indian Academy of Sciences; ISHC Senior Award in Heterocyclic Chemistry (USA); **2008** August-Wilhelm-von-Hofmann-Denkmünze Award (Germany); Charles Chandler Medal, Columbia University (USA); **2009** Member, German Academy of Sciences Leopoldina
Current research interests:	Chemical synthesis; new synthetic technologies and strategies; cascade reactions and asymmetric catalysis; total synthesis of natural products and analogues thereof; chemical biology, molecular design, and medicinal chemistry; marine natural products; anticancer agents; antibiotics; enzyme inhibitors; protein ligands
Hobbies:	Geopolitics, history, cooking, and gardening

My favorite subject at school was … mathematics.

When I wake up I … take a walk in my garden to admire and enjoy nature and its fruits.

If I could be anyone for a day, I would be … Alexander the Great.

If I could have dinner with three famous scientists from history, they would be … Aristotle, Archimedes, and Friedrich Wöhler.

I chose chemistry as a career because … I was inspired by a teacher, I fell in love with it, and I was good at it.

My biggest inspiration is … nature.

If I wasn't a scientist, I would be … an astronomer.

The most exciting thing about my research is … the challenge and the feelings of discovery and accomplishment.

The worst advice I have ever been given was … to abandon my ambition to gain entry to a university because it was supposedly too hard.

My ultimate goal is to … make the world a better place.

The part of my job which I enjoy the most is … interacting with young students and sharing the joys of discovery and learning with them.

The most groundbreaking discovery in science in the past 100 years has been … the elucidation of the structure of the double helix and the enlightenment of the genetic code.

My favorite book is … *The Iliad*.

My top three films of all time are … The Godfather; The Good, the Bad, and the Ugly; and The 300 Spartans.

My worst habit is … pinching food from everyone else's plate when dining with friends.

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

Research in chemistry these days is much more interdisciplinary than it was then, and it is supported by powerful instrumentation and physical methods such as high-field NMR spectroscopy, mass spectrometry, and chromatographic techniques. For example, during my PhD studies we had only a 60 MHz NMR instrument at our disposal, whereas today my students have the luxury of a 600 MHz machine, making their pace of research much faster and more precise. On the other hand, it is interesting to note that the experimental techniques practiced in chemical synthesis laboratories today are more or less the same as those practiced then, with a few exceptions such as flash-column and HPLC chromatographies. This means that we need much more engineering and automation in our laboratories, technologies that are certain to increase the tempo and accuracy of our research.

Has your approach to chemistry research changed since the start of your career?

I certainly have a more global view of our science today than I had then, both from the historical perspective and what it encompasses and can achieve. And while I appreciate and enjoy following the various aspects of research in chemistry today, I, for the most part, remained loyal to my original aspirations, which were to advance the art and science of total synthesis for its own sake and to exploit its power for applications in biology and medicine.

Has your approach to publishing your results changed since the start of your career?

There was certainly an evolution in my philosophy of publishing over the years, which I suppose was related to my desire to combine research with education. At the beginning of my career, the main vehicles of publishing our discoveries were communications and full articles, a tradition that we continue to adhere to today. Later on, however, I recognized the importance of informative and educational review articles, as well as books that inspire young students into studying chemistry and inform the public about the virtues of our science. Such publications certainly serve a great purpose in placing discoveries and developments in science into perspective, and even stimulate new research. Personally, I feel fortunate to have had wonderful students who collaborated with me in such educational book endeavors as the *Classics in Total Synthesis* series and *Molecules That Changed the World*, which are widely used today to educate and inspire students around the world.

What do you think the future holds for your field of research?

I am very optimistic about the future of chemical synthesis, both as an art and as an enabling technology for a myriad of applications. Indeed, looking at the young generation of synthetic organic chemists around the world today gives me confidence that the field has a great future, with several new frontiers emerging and others gathering momentum. These include the rapidly advancing frontiers of cascade reactions, C–H activation, metal catalysis, organocatalysis, and biocatalysis, all at the disposal of total synthesis. With these continuously sharpening tools, the art of synthesis will continue to play an ever increasing role in the construction, through cleverly designed strategies, of almost any molecule, whether it is natural or designed. The latter might become more popular, whereas the former will remain indispensable in terms of their potential to inspire and teach us nature's modus operandi.

Have you changed the main focus of your research throughout your career and if so why?

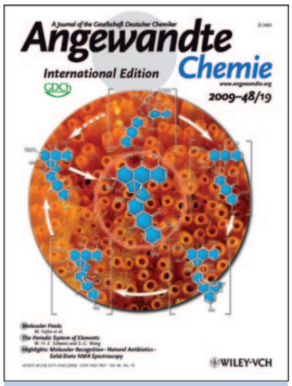
I would say not by much. Certainly, our focus has expanded to include more chemical biology studies with the molecules that we synthesize, but the primary goal of our research has been, and continues to be, the advancement of the art and science of chemical synthesis for its own sake, with particular emphasis on new synthetic technologies and strategies. Fortunately, nature has been very generous to synthetic chemists by providing precious new molecular architectures endowed with important biological activities to keep us busy. Such challenging synthetic targets provide opportunities to discover and develop new chemistry, and to contribute to biology and medicine. Needless to say, I find endeavors in total synthesis stimulating and rewarding, and so do my students who enjoy the benefits of the wonderful educational opportunities they provide.

What has been your biggest influence/motivation?

I was obviously influenced by my mentors but also by my students, without whom I would not be where I am today. My motivation is the challenge to solve long-standing and important problems and to explore the unknown along the way, thereby enriching scientific knowledge and benefiting society. Coming first is obviously a motivation in science, as it is in the Olympic Games!

What advice would you give to up-and-coming scientists?

Have a focused strategy for your career but keep things in perspective and have an open mind towards the big picture. Be methodical and patient and continue to learn and apply your knowledge to



K. C. Nicolaou has recently featured on the cover of Angewandte Chemie: "Total Synthesis and Absolute Configuration of the Bisanthraquinone Antibiotic BE-43472B": K. C. Nicolaou, Y. H. Lim, J. Becker, *Angew. Chem.* **2009**, *121*, 3496–3500; *Angew. Chem. Int. Ed.* **2009**, *48*, 3444–3448.

solve important and worthy problems. But do not pay too much attention to my advice, just go and do your own thing, create your own science, and establish your own niche and legacy!

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

There is no secret! I have the privilege of attracting talented students and I motivate them to work hard and intelligently. The rest just happens as a consequence of that simple recipe!

My 5 top papers:

1. "The Endiandric Acid Cascade. Electrocyclizations in Organic Synthesis. 3. 'Biomimetic' Approach to Endiandric Acids A–G. Total Synthesis and Thermal Studies": K. C. Nicolaou, N. A. Petasis, R. E. Zipkin, *J. Am. Chem. Soc.* **1982**, *104*, 5560 – 5562.
   This paper is important because the experimental demonstration of the endiandric acid cascade, first proposed by D. A. Black, paved the way for the emergence of electrocyclic cascade reactions in total synthesis in the same way that the biomimetic total synthesis of tropinone, by R. Robinson, and progesterone, by W. S. Johnson, did for the development of cationic cascade reactions.
2. "The Total Synthesis of Calicheamicin γ_1^I": K. C. Nicolaou, C. W. Hummel, E. N. Pitsinos, M. Nakada, A. L. Smith, K. Shibayama, H. Saimoto, *J. Am. Chem. Soc.* **1992**, *114*, 10082 – 10084.
   This paper demonstrated that the seemingly impossible, but beautiful structure of calicheamicin γ_1^I could be reached by total synthesis. Featuring a number of unprecedented strategies and tactics, this total synthesis reflected the power of chemical synthesis at the time and opened the way to the synthesis of other enediynes, natural or designed, the chemical and biological properties of which were investigated and defined. It was important because it served to admirably demonstrate the importance of total synthesis endeavors as opportunities to discover and invent new chemistry, and also to interweave within them aspects of chemical biology and medicinal chemistry. Furthermore, as the first total synthesis of a naturally occurring enediyne, it marked the beginning of what became a major field of investigation.
3. "Total Synthesis of Taxol": K. C. Nicolaou, Z. Yang, J. J. Liu, H. Ueno, P. G. Nantermet, R. K. Guy, C. F. Claiborne, J. B. Renaud, E. A. Couladouros, K. Paulvannan, E. J. Sorensen, *Nature* **1994**, *367*, 630 – 634.
   The total synthesis of Taxol in 1994 represented a solution to a long-standing and formidable synthetic problem that served as the quintessential symbol of the power of chemical synthesis as it stood in the 1990s.
4. "Total Synthesis of Brevetoxin B. 2: Completion": K. C. Nicolaou, F. P. J. T. Rutjes, E. Theodorakis, J. Tiebes, M. Sato, E. Untersteller, *J. Am. Chem. Soc.* **1995**, *117*, 1173 – 1174.
   As the result of a 12-year synthetic odyssey, the total synthesis of brevetoxin B was accompanied by a plethora of discoveries and developments in new synthetic methodology and strategy. Most importantly, it paved the way for the total synthesis of several other members of the polyether class of natural products and gave impetus to the important field of marine biotoxins.
5. "Total Synthesis of the CP Molecules CP-263,114 and CP-225,917—Part 2: Evolution of the Final Strategy": K. C. Nicolaou, P. S. Baran, Y.-L. Zhong, K. C. Fong, Y. He, W. H. Yoon, H.-S. Choi, *Angew. Chem.* **1999**, *111, 1781–1784; Angew. Chem. Int. Ed.* **1999**, *38*, 1676 – 1678.
   In this paper, the first total synthesis of the highly complex and architecturally complex CP molecules is described. Most significantly, the accomplishment was accompanied by a series of discoveries of new chemical reactivities, especially of hypervalent iodine reagents, and the development of new synthetic strategies based on novel cascade reactions.

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