Angewandte Author Profile

Angewandte Chemie International Edition

A. Hirsch

The author presented on this page has published more than ***25 articles*** *since 2000 in Angewandte Chemie, most recently:*
"The Graphene Flagship—A Giant European Research Project": A. Hirsch, *Angew. Chem. Int. Ed.* **2015**, *54*, 9132; *Angew. Chem.* **2015**, *127*, 9262.

Andreas Hirsch

Date of birth:	November 26, 1960
Position:	Professor for Organic Chemistry, Friedrich-Alexander-Universität Erlangen-Nürnberg
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Education:	1986 Diploma in chemistry, University of Tübingen 1990 PhD with Prof. Michael Hanack, University of Tübingen 1991 Postdoc with Prof. Fred Wudl, University of California, Santa Barbara
Awards:	**1994** Research award, Otto Röhm Memorial Foundation; **1994** ADUC Prize; **2006** Elhuyar–Goldschmidt Award, Gesellschaft Deutscher Chemiker and Real Sociedad Española de Química; **2012** Max Grundig Memorial Award, Max Grundig Foundation
Current research interests:	Chemistry of synthetic carbon allotropes (SCAs) such as 0D fullerenes, 1D carbon nanotubes and carbyne, and 2D graphene; synthesis of molecular, macromolecular, and supramolecular architectures with new structural, electronic, photophysical, and biomedical properties; regiochemistry of multiple addition reactions to SCAs; spherical aromaticity
Hobbies:	Playing the saxophone in a big band, piano, biking, skiing, tennis

My favorite place on earth is Erlangen.

My favorite author (fiction) is Edgar Allan Poe.

The most amusing chemistry adventure in my career was when, as a child, I set our basement (serving as coal storage) on fire while working on an experiment with my spirit burner.

My top three films of all time are *The Lord of the Rings*, *The Godfather* (Parts 1 and 2), *Zorba the Greek*.

My favorite food is lentils and "Spätzle" Swabian style, together with a good Franconian beer.

My favorite piece of music changes once in a while. In the moment I am swaying between *So What* by Miles Davis (very cool) and *Some Skunk Funk* by Randy Brecker (very hot).

I like refereeing because I like to render a service to the chemical community, and because I am very interested to learn about new developments from other laboratories.

What I look for first in a publication is the essence of its novelty.

When I'm frustrated, I set myself a new target.

The most important thing I learned from my parents is to be considerate.

If I could have dinner with three famous scientists from history, they would be Lise Meitner, Marie Curie, and Emmy Noether.

I chose chemistry as a career because the creation of new forms of matter fascinates me.

My best investment was my mountain bike that I bought 20 years ago and which I am still using every day to go to the laboratory (even in winter when it is snowing).

My not-so-secret passion is jazz, funk, and fusion.

If I were not a scientist, I would be a professional musician playing jazz, funk, and fusion.

My most exciting discovery to date has been the explanation of spherical aromaticity: the $2(N+1)^2$ rule.

My greatest achievement has been the chemical functionalization of synthetic carbon allotropes.

I lose track of time when I am working on a manuscript describing an exciting discovery.

The best advice I have ever been given is check everything and keep only the best.

The worst advice I have ever been given was that which I have already forgotten.

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

Not really. Both in former times and also today, I am inspired by two main motivations for working on a chemical subject. The first is my interest in deciphering the chemical reactivity of new forms of matter such as the synthetic carbon allotropes. In this regard, I am excited to recognize fundamental principles and to interpret them in the right way. The second main motivation is the synthesis of hitherto unknown target structures, which can be very large and complex. Examples are molecules with a highly integrated functionality (e.g., amphiphilic and redox-active) or macromolecular and supramolecular systems that are characterized by a special aesthetic beauty. During the design of such architectures, we frequently take advantage of reactivity patterns that we have discovered for the constituent building blocks.

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

I like to recommend to young colleagues to not stay too long in already established research fields but take daring journeys into unknown territory. For the establishment of an independent career, this, on one hand, is a risk, however, on the other hand, it is a big chance. I think we should provide our newcomers with sufficient freedom for such a phase of exploration. At the same time, we should support and advise them, especially in the case of initial setbacks. This is the very nature of good mentoring. I am very lucky to be able to observe the development of some very talented young chemists in Erlangen who take this path very successfully.

My 5 top papers:

1. "Covalent bulk functionalization of graphene": J. M. Englert, C. Dotzer, G. Yang, M. Schmid, C. Papp, J. M. Gottfried, H.-P. Steinrück, E. Spiecker, F. Hauke, A. Hirsch, *Nature Chem.* **2011**, *3*, 279.
   Covalent wet chemistry with graphene on a macroscopic scale is indeed possible. This was demonstrated with the example of arylations. The initial activation of graphite with alkali metals is key, and leads to easy-to-exfoliate intercalation compounds comprising negatively charged graphene layers. These can easily react with electrophiles such as diazonium compounds by electron transfer and subsequent radical addition.
2. "Spherical Aromaticity in I_h Symmetrical Fullerenes: The $2(N+1)^2$ Rule": A. Hirsch, Z. Chen, H. Jiao, *Angew. Chem. Int. Ed.* **2000**, *39*, 3915; *Angew. Chem.* **2000**, *112*, 4079.
   Shortly after the discovery of the fullerenes, the question came up as to whether this compound class is characterized by aromaticity or even "superaromaticity". However, it turned out that all conventional considerations that are applied to two-dimensional conjugated macrocycles (Hückel aromaticity) failed for the description of the electronic properties. We discovered that the analysis of the aromaticity of fullerenes and other spherical molecules requires a three-dimensional approach. The fullerenes can be considered as molecular atoms. If all valence shells with high degeneracy are completely filled with electrons, the diatropic ring currents reach a maximum and spherical aromaticity is present. This is the case when $2(N+1)^2$ π electrons are present.
3. "Reversible Template-Directed Activation of Equatorial Double Bonds of the Fullerene Framework: Regioselective Direct Synthesis, Crystal Structure, and Aromatic Properties of T_h-$C_{66}(COOEt)_{12}$": I. Lamparth, C. Maichle–Mössmer, A. Hirsch, *Angew. Chem. Int. Ed.* **1995**, *34*, 1607; *Angew. Chem.* **1995**, *107*, 1755.
   The fullerene C_{60} is the only organic molecule that can be converted to a hexakis adduct by addition to double bonds located at the poles and the equator. The corresponding octahedral addition pattern exhibits T_h symmetry. This unprecedented compound class has structural analogies with inorganic Werner-type coordination compounds with octahedral symmetry. We have discovered a method to access this compound class with high yields and regioselectivities. By the systematic variation and combination of the organic addends, spherical functional molecules that exhibit interesting properties can be synthesized.
4. "The First Account of a Structurally Persistent Micelle": M. Kellermann, W. Bauer, A. Hirsch, B. Schade, K. Ludwig, C. Böttcher, *Angew. Chem. Int. Ed.* **2004**, *43*, 2959; *Angew. Chem.* **2004**, *116*, 3019.
   The synthesis of unconventional amphiphiles involving a relatively rigid structure has enabled us to generate micelles that have stable and defined structures. This discovery allowed the first investigation of the molecular structure of a micelle with cryo-electron microscopy, in collaboration with the group of Christoph Böttcher in Berlin. This is possible with amphiphiles which contain, for example, a calixarene or a fullerene core as a platform for the attachment of hydrophilic and hydrophobic building blocks.
5. "On the Way to Graphane—Pronounced Fluorescence of Polyhydrogenated Graphene": R. A. Schäfer, J. M. Englert, P. Wehrfritz, W. Bauer, F. Hauke, T. Seyller, A. Hirsch, *Angew. Chem. Int. Ed.* **2013**, *52*, 754; *Angew. Chem.* **2013**, *125*, 782.
   Completely hydrogenated graphene (graphane) in the chair conformation is a so far unknown fundamental compound. It should be thermodynamically very stable according to calculations. In order to explore the synthetic accessibility of this system, we investigated the wet-chemical hydrogenation of graphene. We obtained a material that contains intact and partially isolated islands of conjugated π systems. This stable partially hydrogenated graphene is yellow and exhibits intense fluorescence, even in the solid state.

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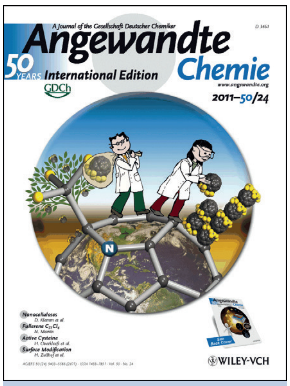

The work of A. Hirsch has been featured on the cover of Angewandte Chemie: "Nitrogen Directs Multiple Radical Additions to the 9,9′-Bi-1-aza(C_{60}-I_h)-[5,6]fullerene: X-ray Structure of 6,9,12,15,18-$C_{59}N(CF_3)_5$": N. B. Shustova, I. V. Kuvychko, A. A. Popov, M. von Delius, L. Dunsch, O. P. Anderson, A. Hirsch, S. H. Strauss, O. V. Boltalina, *Angew. Chem. Int. Ed.* **2011**, *50*, 5537; *Angew. Chem.* **2011**, *123*, 5651.