P. R. Schreiner

The author presented on this page has published more than ***25 articles*** *since 2000 in Angewandte Chemie, most recently:*
"Synthesis and Stereochemical Assignment of Crypto-Optically Active $^{2}H_6$-Neopentane": A. Masarwa, D. Gerbig, L. Oskar, A. Loewenstein, H. P. Reisenauer, P. Lesot, P. R. Schreiner, I. Marek, *Angew. Chem. Int. Ed.* **2015**, *54*, 13106; *Angew. Chem.* **2015**, *127*, 13298.

Peter R. Schreiner

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Position:	Professor of Organic Chemistry, Justus-Liebig-Universität Giessen
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Education:	1992 Diploma in Chemistry, Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg 1994 Dr. rer. nat. with Paul von Ragué Schleyer, FAU Erlangen-Nürnberg 1995 PhD with Henry F. Schaefer III, University of Georgia, Athens 1999 Habilitation with Armin de Meijere, University of Göttingen
Awards and Honors:	**1999** ADUC Prize; **2003** Dirac Medal; **2013** elected member of the German National Academy of Sciences Leopoldina; **2013** Science Award of the German Technion Society; **2014** Swiss Chemical Society Lectureship; **2015** elected Corresponding member of the NRW Academy of Sciences and Arts; **2015** Kurt Alder Lecture, University of Cologne
Current research interests:	My group tries to understand organic chemistry down to the atomic level in order to develop new practical methods and theoretical concepts. Focus areas include organocatalysis, nanodiamonds, reactive intermediates, and tunneling control of chemical reactions.
Hobbies:	Tennis and playing the electric guitar

If I could be anyone for a day, I would be Roger Federer at Wimbledon.

My favorite musicians are Joe Bonamassa, David Gilmour, and Victor Wooten.

If I could be a piece of lab equipment, I would be a precision balance as it is required for every experiment and has to be kept meticulously clean.

My favorite book is always a different one at different times. At the moment it is *The Pity of It All* by Amos Elon and *The Human Stain* by Philip Roth.

The natural talent I would like to be gifted with is to be a master of a musical instrument.

The greatest scientific advance of the last decade was, in my biased view, the explosive growth of highly useful organocatalytic methods.

I am waiting for the day when someone will discover the highly efficient, sustainable, industrial-scale CO_2 reduction with sunlight.

The biggest challenge scientists are facing is to convey to policy makers, administrators, and the general public that it is not only money but even more so uninterrupted time that leads to new scientific ideas and advances.

Chemistry is fun because it is the only discipline that routinely, reproducibly, and at will creates its own objects of study.

Looking back over my career, I am still amazed how I got to where I am.

The most significant historic event of the past 100 years was the end of World War II, the German reunification, and the end of the Cold War (they are all connected).

In a spare hour, I try to practice the guitar. If there were only more spare hours, I'd be much better at it.

My favorite time of day is early morning, when I go running with my dog through the woods.

I admire the dedication, resilience, and scientific prowess of many of my colleagues, especially in less privileged countries.

I get advice from my wife.

I advise my students to adopt a professional attitude that includes accountability, collegiality, thinking about chemistry all the time, striving to learn from others, and not talking themselves out of their next experiment.

My science "heroes" are Justus von Liebig (for defining and shaping the field of organic chemistry as its own discipline) and Erwin Schrödinger (for outlining how chemical reactions may one day become predictable through solving intricate mathematical equations).

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

Technological advances have been enormous over the last 20 years and this affects how research is done. We are now beginning to “see” molecules react in real time, both with spectroscopic and microscopic techniques. We are at the transition of inferring chemical behavior by induction and the direct observation of chemical reactions. The same is true for computations that have achieved an accuracy that rivals that of experiments, at least for small molecules. Both of these developments play an increasing role in the way my group conducts research because they offer deeper insight and set new quality standards. It also puts higher demands on co-workers, as they have to be well-versed in using expensive modern equipment and modern computational methods. The entire publishing “business” has changed in terms of a much faster pace and the fierce competition that arises from scientists and policy makers in developing countries. As a consequence, I am teaching a course on scientific writing to prepare young scientists so that they can better meet these challenges.

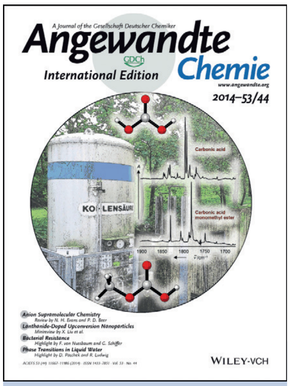
What advice would you give to up-and-coming scientists?

Don’t follow common threads, do your own thing! Think about long-term projects with scientific depth, not about something that is merely publishable quickly. For junior or assistant professors, a piece of good advice is also to keep working in the lab and not to rely only on the capacities of a (very) small research group because one is one’s own best co-worker, especially in the very beginning of scientific independence.

My 5 top papers:

1. “Gas-Phase Preparation of Carbonic Acid and Its Monomethyl Ester”: H. P. Reisenauer, J. P. Wagner, P. R. Schreiner, *Angew. Chem. Int. Ed.* **2014**, *53*, 11766; *Angew. Chem.* **2014**, *126*, 11960.
   This contribution sets the record straight regarding the previously reported identities of the so-called α- and β-phases of amorphous H_2CO_3. By way of an independent and novel preparation method and direct spectroscopic evidence, we were able to show that the α-phase rather is the monomethyl ester, while the β-phase indeed is H_2CO_3.
2. “Overcoming lability of extremely long alkane carbon–carbon bonds through dispersion forces”: P. R. Schreiner, L. V. Chernish, P. A. Gunchenko, E. Yu. Tikhonchuk, H. Hausmann, M. Serafin, S. Schlecht, J. E. P. Dahl, R. M. K. Carlson, A. A. Fokin, *Nature* **2011**, *477*, 308.
   Chemists often apply highly successfully empirical rules such as bond length–bond length correlations (shorter bonds are stronger and vice versa), even though there is no physical basis for such assumptions. Herein we reported a case where an alkane C−C bond between two diamondoid moieties was way off the correlation line because the breaking of the interfragment C−C bond was hampered by very large dispersion forces derived from the tightly fitting dispersion forces surrounding it. As a consequence, these types of molecules have the longest C−C bonds (up to 1.71 Å) ever observed in an alkane, yet they are thermally very stable with melting points well above 250 °C.
3. “Methylhydroxycarbene: Tunneling Control of a Chemical Reaction”: P. R. Schreiner, H. P. Reisenauer, D. Ley, D. Gerbig, C.-H. Wu, W. D. Allen, *Science* **2011**, *332*, 1300.
   Herein we show that next to thermodynamic and kinetic control of chemical reactions there is a third reactivity paradigm, namely tunneling control, which overrides these well-established reactivity principles. While tunneling effects were hitherto considered corrections to the rate of a reaction of a light particle (typically protons, hydrogen atoms, or hydrides) into the kinetic direction of a reaction, we were able to show that tunneling is also possible into the direction of the *thermodynamic* product. Hence, $H_3C{-}C{-}OH$ undergoes a tunneling [1,2]H-shift to the thermodynamically more stable product (acetaldehyde), undercutting the higher barrier. The kinetic product (vinyl alcohol) does not form despite a considerably lower barrier, which is, however, much wider: tunneling control ensues.
4. “H-Bonding Additives Act Like Lewis Acid Catalysts”: P. R. Schreiner, A. Wittkopp, *Org. Lett.* **2002**, *4*, 217.
   This is our landmark paper on the use of bis[3,5-di(trifluoromethyl)phenyl]thiourea as a robust catalyst for a broad variety of organocatalytic transformations. The 3,5-di(trifluoromethyl)phenyl motif has subsequently been highly successfully used in many new (thio)urea and also phosphoric acid, proline, and squareamide catalyst families.
5. “The First Efficient Iodination of Unactivated Aliphatic Hydrocarbons”: P. R. Schreiner, O. Lauenstein, E. D. Butova, A. A. Fokin, *Angew. Chem. Int. Ed.* **1999**, *38*, 2786; *Angew. Chem.* **1999**, *111*, 2956.
   This paper demonstrates the optimization of a “side reaction” in the well-known phase-transfer-catalyzed generation of dihalocarbenes. Diiodocarbene is very sluggish in olefin addition or C−H insertion with yields typically well below 30 %. In trying to improve these yields, we found that iodoalkanes were formed from alkanes. This was much more interesting as it meant that one may be able to iodinate alkanes by following a very simple protocol. Indeed, we were able to make this the main reaction with good yields and broad applicability.

International Edition: DOI: 10.1002/anie.201511431
German Edition: DOI: 10.1002/ange.201511431



The work of P. R. Schreiner has been featured on the cover of Angewandte Chemie: “Gas-Phase Preparation of Carbonic Acid and Its Monomethyl Ester”: H. P. Reisenauer, J. P. Wagner, P. R. Schreiner, *Angew. Chem. Int. Ed.* **2014**, *53*, 11766; *Angew. Chem.* **2014**, *126*, 11960.