H. Mayr

The author presented on this page has published more than ***25 articles*** *since 2000 in Angewandte Chemie, most recently:*
"Generation of α,β-Unsaturated Iminium Ions by Laser Flash Photolysis": S. Lakhdar, J. Ammer, H. Mayr, *Angew. Chem.* **2011**, *123*, 10127–10130; *Angew. Chem. Int. Ed.* **2011**, *50*, 9953–9956.

Herbert Mayr

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Education: 1966–1971 Undergraduate studies of Chemistry, LMU München
1971–1974 Doctoral studies with R. Huisgen, LMU München
1975–1976 Postdoctoral studies with G. A. Olah, Case Western Reserve University, Cleveland, Ohio (USA)
1976–1980 Habilitation with P. von R. Schleyer, University of Erlangen-Nürnberg (Germany)
Awards after 2000: **2001** Robert W. Taft Memorial Lecture at the University of California, Irvine; **2002** Lady Davis Fellowship of the Technion—Israel Institute of Technology, Haifa; **2003** Elected Member of the Bavarian Academy of Sciences; **2004** Alexander von Humboldt Honorary Research Fellowship by the Foundation for Polish Science; **2005** "Deutschland in Japan" Lectureship Award by the Chemical Society of Japan; **2006** Elected Member of the German National Academy of Sciences Leopoldina; **2006** Liebig Denkmünze of the German Chemical Society
Current research interests: We are trying to develop a kinetic model for polar organic reactions, in which the positions of reagents in comprehensive reactivity scales indicate the relative reactivities of competing reactive sites and provide an estimate, whether certain reactions are likely to take place. While the systematic extension of our nucleophilicity and electrophilicity scales (and, in collaboration with the Kronja group, of nucleofugality and electrofugality scales) is ongoing, we are also applying them to specific problems in organocatalysis and basic questions of organic reactivity (reactivity–selectivity relationships, ambident reactivity, intrinsic barriers, mechanisms of nucleophilic aliphatic substitutions). We hope that in the future, chemists will increasingly use these reactivity scales (http://www.cup.lmu.de/oc/mayr/DBintro.html) as easily applicable tools for the plausibility check of mechanistic hypotheses and the design of polar organic reactions.
Hobbies: Hiking and swimming

The greatest scientific advance of the last decade … can only be recognized after another 50 years.

The biggest challenge facing scientists is … storage of energy.

Young people should study chemistry because … it is fun and at the same time helps to solve the most challenging problems of mankind.

Looking back over my career, I … had the privilege to work with three world-class teachers, who each had completely different styles of working, hence demonstrating that there is not a single way to success.

The most significant historic event of the past 100 years was … the integration of European nations.

The most important future application of my research … is the simple prediction of potential reaction pathways.

If I could be any age I … would be 40, with the knowledge I have now.

I admire … Loriot (German humorist) for his non-aggressive humor.

The secret of being a successful scientist is … having a goal and finding the right co-workers and colleagues.

My favorite principle is … the Curtin–Hammett principle, because its application put an end to the 12-months frustration period at the beginning of my habilitation (see publication #1 on the next page).

The most important thing I learned from my students is … that they can do many things better than their boss.

My favorite author (science) is … Sir Christopher Ingold.

What I appreciate most about my friends is … modesty.

My motto is … based on a quote by R. Niebuhr: Striving for serenity to accept the things I cannot change, the courage to change the things I can, and the wisdom to know the difference.

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

Definitely! The seven papers that reported the results of my doctoral work were published the year after my graduation (1975–1976). Thus I received a postdoctoral fellowship of the Deutsche Forschungsgemeinschaft (DFG) with "zero" publications. Unthinkable nowadays! In the interest of students, today we have to publish faster. In the first years of independent publishing, I followed Huisgen's rule, communications in English and full papers in German, which allowed me to use my mother tongue for faster and more accurate writing. As Supporting Information was not common, the communications I wrote at that time were preliminary reports without experimental details, which were followed by full papers. Nowadays, double publication is no longer needed, because full experimental details are also reported in the Supporting Information of Communications. Impact factors were not known to me at the beginning of my career. Nowadays, young chemists are so fixated on "impact" that I often have big arguments with my students when they think that the journal I am suggesting for publication of their work has a too low "IF".

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

Most mechanistic concepts taught in common organic chemistry text books are based on experimental work published before the 1970s. Since then, the progress in electronics and measurement techniques has provided fascinating new tools for investigating dynamics and intermediates of molecular transformations, which are waiting to be more widely used by organic chemists. Their application on modern synthetic reactions will lead to a renaissance of physical organic chemistry and will replace the presently dominating empirical approach for the development of synthetic methods by a more rational process.

My 5 top papers:

1. "Lewis Acid Catalyzed Alkylations of CC-Multiple Bonds; Rules for Selective Enlargements of Carbon Skeletons": H. Mayr, *Angew. Chem.* **1981**, *93*, 202–204; *Angew. Chem. Int. Ed. Engl.* **1981**, *20*, 184–186.
   Haloalkylations, that is, Lewis-acid-catalyzed additions of alkyl halides to CC-double bonds often do not stop at the [1:1]-product stage and give oligomers and polymers. Here, I presented simple mechanistic considerations, which showed that for properly adjusted combinations of alkyl halides, alkenes, and Lewis acids, the selective formation of [1:1]-products can be achieved. Though these rules did not become popular, they proved to be valuable guidelines for our own synthetic investigations and were the basis for the later development of a reactivity scale for π systems.
2. "Addition Reactions of Diarylcarbenium Ions to 2-Methyl-1-pentene: Kinetic Method and Reaction Mechanism": H. Mayr, R. Schneider, C. Schade, J. Bartl, R. Bederke, *J. Am. Chem. Soc.* **1990**, *112*, 4446–4454.
   With the exception of a single paper on radiolytically generated carbocations, rates of the attack of carbocations at alkenes were unknown prior to our work. In this article we described an efficient method for investigating the kinetics of the reactions of carbocations with alkenes, which thus became one of the mechanistically best investigated types of reaction.
3. "Scales of Nucleophilicity and Electrophilicity: A System for Ordering Polar Organic and Organometallic Reactions": H. Mayr, M. Patz, *Angew. Chem.* **1994**, *106*, 990–1010; *Angew. Chem. Int. Ed. Engl.* **1994**, *33*, 938–957.
   In this article, we first launched the equation $\lg k\,(20\,^{\circ}\mathrm{C}) = s_\mathrm{N}(E+N)$, where electrophiles are characterized by one parameter (E) and nucleophiles are characterized by two parameters (N, s_N). This equation has become the basis for the most comprehensive nucleophilicity scale presently available, which allows the direct comparison of π-, σ-, and n-nucleophiles. With the rule of thumb that reactions of electrophiles with nucleophiles can only be expected to take place at room temperature if $E+N>-5$, a simple tool for a rational design of polar organic reactions has been created.
4. "Reference Scales for the Characterization of Cationic Electrophiles and Neutral Nucleophiles": H. Mayr, T. Bug, M. F. Gotta, N. Hering, B. Irrgang, B. Janker, B. Kempf, R. Loos, A. R. Ofial, G. Remennikov, H. Schimmel, *J. Am. Chem. Soc.* **2001**, *123*, 9500–9512.
   The great success of the reactivity scales based on the approach described in reference 3 requested a systematic method for extending the scales by further nucleophiles and electrophiles. The reactivity parameters derived in this paper turned out to be most useful for characterizing nucleophiles of large structural variety and have now been used for more than ten years without any need for reparameterization.
5. "Farewell to the HSAB Treatment of Ambident Reactivity": H. Mayr, M. Breugst, A. R. Ofial, *Angew. Chem.* **2011**, *123*, 6598–6634; *Angew. Chem. Int. Ed.* **2011**, *50*, 6470–6505.
   For decades I have been using the Salem–Klopman concept of "Charge and Frontier Orbital Controlled Reactions" when teaching ambident reactivity, though I consistently failed to illustrate the general validity of the concept by unequivocal examples from the original literature. When applying our kinetic methods to characterize ambident nucleophiles, the general deficiency of this concept became obvious to us; we realized that many authors before us had already noted the deficits of this concept but found little attention, because it would have implied abandoning a tenet of organic reactivity.

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