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Tribute to David M. Golden

If you need to know a rate constant (or a scouting report on a baseball player), Dave Golden will always have an answer and a patient explanation for you. As is evident from the numerous contributors to this Festschrift, the formal list of colleagues, and many other collaborations, Dave's collegiality, big picture approach, and mentoring abilities have helped advance the science and application of chemical kinetics and made it a more pleasurable pursuit. Dave can sort through an array of data to arrive at consistent values or estimates for rate constants and further their use to address real world problems such as atmospheric chemistry and combustion.

Dave learned research as a spectroscopist with Bryce Crawford, but when the Army interrupted his planned postdoc with Don Hornig he converted to chemical kinetics in Fred Kaufman's lab at the Ballistics Research Laboratory. Their careful determination of the OH(A-X) oscillator strength tellingly remains consistent with today's laser measurements. Dave then moved west to work with Sid Benson at SRI and add thermochemical kinetics and very low-pressure pyrolysis (VLPP) techniques to his repertoire.

The experimental work by Dave, Sid, and colleagues on decomposition and iodination VLPP kinetics, coupled with theoretical interpretation, formed a basis for determining many bond dissociation energies, a key parameter in radical thermodynamics and reaction kinetics. This work led to later interests in applying multiphoton laser kinetics and infrared laser pyrolysis methods to study decomposition kinetics and prompted Don McMillen and Dave to evaluate and document the database for their widely quoted bond energy review article. Of course, Dave has not neglected the other Arrhenius parameter, the *A*-factor, and is occasionally still required to remind others about what are and are not reasonable values for *A*-factors.

When Sid returned to USC, Dave assumed leadership of the Thermochemical Kinetics group at SRI and provided guidance for new research directions, valued mentoring to younger staff, and a founding first-base role on the softball team. This era saw the application of new lasers to chemical kinetics and the adaptation of VLPP methods to the study of gas−surface reactions. Fortunately, the group was better at chemistry than

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softball, even when Dave carefully perused prospective post-doctoral fellow resumes in search of athletic ringers.

Although Dave has always had a passion for fundamental chemical kinetics research, he also has a keen eye for the practical. Shortly after the discovery and announcement of the Antarctic ozone hole, it was proposed that chlorine activation on polar stratospheric clouds (PSCs) could be a key step in the ozone loss mechanism. Dave immediately realized that his group at SRI could make an important contribution by measuring the kinetics of chlorine nitrate reactions on ice surfaces representative of PSCs. Bringing together researchers from various laboratories at SRI, and with only internal SRI funding to keep things going, Dave coordinated an effort that showed that, indeed, chlorine nitrate reacted readily on ice surfaces under polar stratospheric conditions to form gaseous Cl_2 and condensed HNO_3. The gaseous Cl_2 was then poised for ozone destruction upon the return of sunlight in the Austral spring. This work represented an important link in unraveling the formation mechanism of the Antarctic ozone hole and was published in 1987 in *Science*. This paper was one of two selected for the AAAS Newcomb Cleveland Award for the best paper in *Science* for 1987/1988. In addition to this paper, several other important publications by Dave and co-workers followed over the years on various aspects of heterogeneous atmospheric chemistry. In 1990, Dave was recognized for his contributions in chemical kinetics as applied to the atmosphere by being awarded the ACS Award for Creative Advances in Environmental Science and Technology.

An important emphasis and approach in Dave's career is developing evaluated kinetic mechanisms. Since the inception of the NASA/JPL stratospheric chemistry review panel, he has been responsible for recommendations of rate constants of pressure-dependent recombination reactions, another long-term research interest, characterized by many examinations of nitric acid formation for example. Higher temperature applications include combustion, where Dave was a key member of the scientific consortium producing the widely used optimized GRI-Mech mechanisms describing natural gas combustion and pollutant formation. The information theory approach used to formulate GRI-Mech recognizes that rate constant uncertainties need to be constrained by utilizing the body of other systems' observations to improve predictability. Dave tirelessly advocated for this approach, posed rabbinical arguments to the skeptics, and is now involved in the successor PrIMe initiative with colleagues from UC Berkeley, MIT, and NIST.

Dave assumed higher science management duties at SRI in the 1990s and enjoyed that part of the job learning about and promoting a wider range of topics. But to maintain his perspective and interests, Dave wisely reserved one science day per week when financial and policy issues were off-limits. Thus, his colleagues could still benefit from his input, and Dave could later parachute back into the pleasures of research.

At the beginning of 1998, Dave left his management position at SRI and joined the faculty of the Mechanical Engineering Department at Stanford University as a Consulting Professor. This was not Dave's first affiliation with Stanford as he taught freshman chemistry for a number of years in the 1970s and 1980s. Dave also continued his ties with SRI as a Senior Staff Scientist in the Molecular Physics Laboratory. At Stanford, Dave has been working hard to convert mechanical engineers into physical chemists, while his colleagues work hard to turn Dave into an engineer. It is fair to say that both have benefited from this exercise. One of Dave's more important contributions to the Stanford shock tube kinetics program has been a deeper appreciation for and increased use of theory in this research. He is also an accessible and valuable mentor. The students in the kinetics program seek him out, and his door is always open. In addition to being a terrific research colleague, Dave participates in graduate teaching by leading the chemical kinetics course for mechanical engineers on an alternating basis. Here, again, he raised the level of theory in this course substantially so that even engineers feel comfortable with transition state theory and RRKM calculations. Ever open to new interests and collaborations, Dave has recently incorporated quantum calculations into his rate theory efforts. And, of course, you can always count on Dave for an interesting discussion of politics, as the resident "free radical" he takes great pleasure in giving conservatively inclined faculty members a hard time.

Dave Golden's approach to chemical, political, and sporting endeavors has always been characterized by both keen insight and great enthusiasm. In that spirit, we enthusiastically present this Festschrift in honor of Dave's 70th birthday and trust that it will provide valuable insight into the wide range of chemical kinetic and thermochemical topics that have benefited from his interest and attention.

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