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## SHORT BIO:

My research focuses on understanding the mechanisms of unimolecular and bimolecular chemical reactions. To obtain the greatest level of detail, we study these reactions in the gas phase using powerful tools such as time-resolved infrared spectroscopy (TR-FTIR) and multiplexed photoionization mass spectrometry (MPIMS). Much of this work uses tunable vacuum ultraviolet radiation produced by synchrotron light sources. These techniques probe a wide range of reactants, intermediates, and products simultaneously, providing a global view of a chemical reaction.

The rate coefficients and product branching ratios from kinetics work, or the quantum state product distributions from dynamics experiments, provide insight into the shape and energetics of the potential energy surface that ultimately controls a chemical reaction. By defining and constraining the mechanisms of chemical reactions, we provide both specific reaction data for predictive chemical

models, and general tests of theoretical approaches that can be applied to reactions where experiments are too difficult to perform.

Accurate, predictive models of combustion and atmospheric chemistry are critical to our national and international interests, impacting, for example, tools to lower pollutant emissions from automobiles and policies to promote a more sustainable environment.

## RESEARCH INTERESTS

Gas phase chemical dynamics and kinetics, photodissociation dynamics, time-resolved photoionization mass spectrometry, combustion chemistry, atmospheric chemistry, science education

## EDUCATION & APPOINTMENTS

2013 - Distinguished Member of Technical Staff, Combustion Research Facility

2004 – 2013 Principal Member of Technical Staff, Combustion Research Facility

1999 – 2004 Senior Member of Technical Staff, Combustion Research Facility

1997 – 1998 Post-doctoral research, JILA, University of Colorado, Boulder
Advisor: Prof. Stephen R. Leone

1991 - 1996 Ph.D. Physical Chemistry, University of California, Berkeley
Supervisor: Prof. Daniel M. Neumark
Thesis: Photodissociation Dynamics and Spectroscopy of Free Radical Combustion Intermediates

1987 - 1991 S. B. Chemistry, University of Chicago
Advisor: Prof. Donald H. Levy

## AWARDS, HONORS AND MEMBERSHIPS

David Shirley Award for Outstanding Science at the ALS, 2012
JILA Visiting Fellowship, April – September, 2010.
O. W. Adams Award for Outstanding Achievement in Combustion Science, 2010.
National Research Council Postdoctoral Fellowship (NIST/JILA), 1997 - 1999.
National Defense Science and Engineering Graduate (NDSEG) Fellowship, 1991-1994.

## SELECTED PUBLICATIONS & PATENTS

Direct measurements of conformer-dependent reactivity of the Criegee intermediate $CH_3CHOO$
C. A. Taatjes, O. Welz, A. J. Eskola, J. D. Savee, A. M. Scheer, D. E. Shallcross, B. Rotavera, E. P. F. Lee, J. M. Dyke, D. K. W. Mol, D. L. Osborn, and C. J. Percival, Science 340, 177 (2013).

Phototautomerization of Acetaldehyde to Vinyl Alcohol: A Primary Process in UV-Irradiated Acetaldehyde from 295 to 335 nm

A. E. Clubb, M. J. T. Jordan, S. H. Kable, and D. L. Osborn, Journal of Physical Chemistry Letters **3**, 3522 (2012).

New mechanistic insights to the $O(^3P)$ + propene reaction from multiplexed photoionization mass spectrometry

J. D. Savee, O. Welz, C. A. Taatjes, and D. L. Osborn, Physical Chemistry Chemical Physics **14**, 10410 (2012).

Direct kinetic measurements of the Criegee intermediate ($CH_2OO$) formed by reaction of $CH_2I$ with $O_2$

O. Welz, J. D. Savee, D. L. Osborn, S. S. Vasu, C. J. Percival, D. E. Shallcross, and C. A. Taatjes, Science **335**, 204 (2012).

Near-threshold H/D exchange in $CD_3CHO$ photodissociation

B. R. Heazlewood, A. T. Maccarone, D. U. Andrews, D. L. Osborn, L. B. Harding, S. J. Klippenstein, M. J. T. Jordan, and S. H. Kable, Nature Chemistry **3**, 443 (2011).

Roaming is the dominant mechanism for molecular products in acetaldehyde photodissociation

B.R. Heazlewood, M.J.T. Jordan, S.H. Kable, T.M. Selby, D.L. Osborn, B. C. Shepler, B.J. Braams, and J.M. Bowman, Proceedings of the National Academy of Sciences 105, 12719 (2008).

Imaging combustion chemistry via multiplexed synchrotron-photoionization mass spectrometry

C. A. Taatjes, N. Hansen, D. L. Osborn, K. Koehse-Hoinghaus, T. A. Cool, P. R. Westmoreland, Physical Chemistry Chemical Physics 10, 20 (2008).

The multiplexed chemical kinetic photoionization mass spectrometer: a new approach to isomer-resolved chemical kinetics

D. L. Osborn, P. Zou, H. Johnsen, C. C. Hayden, C. A. Taatjes, V. D. Knyazev, S. W. North, D. S. Peterka, M. Ahmed, and S. R. Leone, Review of Scientific Instruments **79**, 104103 (2008).

Measurement of the sixth overtone band of nitric oxide, and its dipole moment function, using cavity-enhanced frequency modulation spectroscopy

J. Bood, A. McIlroy, and D. L. Osborn, Journal of Chemical Physics **124**, 084311 (2006).

On the mechanism of the HCCO + $O_2$ reaction: Probing multiple pathways to a single product channel

P. Zou and D. L. Osborn, Physical Chemistry Chemical Physics **6**, 1697 (2004).

Photodissociation spectroscopy and dynamics of $CH_3O$ and $CD_3O$

D. L. Osborn, D. J. Leahy, and D. M. Neumark, Journal of Physical Chemistry *A* **101**, 6583 (1997).

Photodissociation spectroscopy and dynamics of the HCCO free radical

D. L. Osborn, H. Choi, D. H. Mordaunt, R. T. Bise, D. M. Neumark, and C. M. Rohlfing, Journal of Chemical Physics **106**, 10087 (1997).

Fast beam photodissociation spectroscopy and dynamics of the vinoxy radical

D. L. Osborn, H. Choi, D. H. Mordaunt, R. T. Bise, D. M. Neumark, and C. M. Rohlfing, Journal of Chemical Physics **106**, 3049 (1997).

Vibrational predissociation and intramolecular vibrational relaxation in dimethyl-*s*-tetrazine–argon complexes

D. L. Osborn, J. C. Alfano, N. van Dantzig, and D. H. Levy, Journal of Chemical Physics **97**, 2276 (1992).