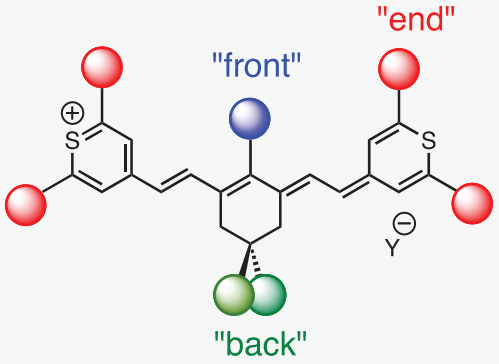
LECTURE ABSTRACT

Materials with high number densities of molecules that exhibit large real third-order optical nonlinearities and that also have low linear and nonlinear loss mechanisms may be of utility for a range of all optical signal processing applications. To date, most molecules and polymers that have large real third-order optical nonlinearities tend to have unacceptably large two-photon cross sections. Here we will report on our studies of cyanine molecules, to better understand both their two-photon-cross sections and their third-order susceptibilities. We have found that it is possible to identify systems at particular wavelengths with very small two-photon cross sections but large third-order susceptibilities. We will discuss recent advances in the design, synthesis, characterization and application of molecules with large real third-order optical nonlinearities, focusing on how variation in chemical structure relates to the observed nonlinearities and how substitution on the molecule as shown below can help to prevent undesirable aggregation.



Schematic showing some of the structural features of polymethine dyes that can be varied to inhibit aggregation

Questions and comments about the Dawson Lecture can be directed to Dr. John Anthony.
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College of Arts and Sciences
Department of Chemistry

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THE 20TH ANNUAL
LYLE RAMSAY DAWSON
LECTURE

Established in memory of Lyle Ramsay Dawson
Distinguished Professor and Former Head of
the Department of Chemistry

THE DESIGN OF THIRD-ORDER NONLINEAR OPTICAL MATERIALS

SETH R. MARDER
Georgia Power Chair of Energy Efficiency and Regents' Professor of Chemistry and Materials Science and Engineering, Georgia Institute of Technology

FRIDAY, OCTOBER 14, 2016 | 4:00 PM
ACADEMIC SCIENCE BUILDING, RM 321

**Reception to immediately follow.*

University of Kentucky

LYLE RAMSAY DAWSON

Lyle Ramsay Dawson was a native of Illinois and received his undergraduate degree from the University of Illinois in 1932. He received his Ph.D. degree in 1935 from the University of Iowa.

Dr. Dawson served in several academic positions in Illinois, Wisconsin, Nebraska and Louisiana and also worked on the Manhattan Project as a Research Chemist and Group Leader in the Metallurgical Laboratory at the University of Chicago. In 1946, he was awarded the War Department's Certificate of Merit and a U.S. Patent for his efforts on the Manhattan Project, which led to the discovery of a fundamental process for the extraction and purification of the elements plutonium and neptunium. He was a member of the committee that organized the Oak Ridge Institute of Nuclear Studies and was a council member of the Institute.

Professor Dawson came to the University of Kentucky in 1945 as Head of the Department of Chemistry. He provided key leadership in initiating and building the doctoral program in chemistry at the university. For example, in his first decade in the department, he individually obtained the major portion of extramural research support. During his twenty-five years with the department, he held contracts for fundamental chemical research with the U.S. Army, the National Science Foundation and the Atomic Energy Commission.

He directed or co-directed seventeen Ph.D. dissertations and nine M.S. theses. He was a talented research director and had a special ability to imbue his students with a concise, clear and complete scientific writing style. He published more than fifty research papers dealing with the chemistry of nonaqueous solutions and coauthored a reference book on the subject.

Dr. Dawson was a master teacher both in the classroom and in less formal conferences and discussions. His leadership and mentoring led many graduate teaching assistants and junior faculty members to become more effective teachers. His uncompromising devotion to high achievement standards in course-work, research, education and training set the tone for our department for years to come.

Another significant contribution to the department was Professor Dawson's indefatigable advocacy for a new chemistry building. His leadership in soliciting and designing a replacement for the former chemistry building, Kastle Hall, culminated in the opening of the current Chemistry-Physics Building in 1963.

He also served the campus community in other ways. Dr. Dawson was elected a Distinguished Professor in the College of Arts and Sciences in 1954—1955, and was appointed to the rank of Distinguished Professor in the field of Physical Chemistry by the University of Kentucky Board of Trustees in 1956. He served as Acting Dean of the Graduate School in 1954—1955, 1956 and 1960—1961.

Dr. Dawson's contributions outside the university were well recognized. He was a Fellow of both the American Institute of Chemists and the American Association for the Advancement of Science. He was a member of the American Chemical Society, Electrochemical Society, Sigma Xi, Omicron Delta Kappa, Alpha Chi Sigma and Kappa Delta Pi, serving leadership roles in each of these organizations. He served several times as a Tour Lecturer and Visiting Scientist under the sponsorship of the American Chemical Society. He was also active in a variety of other nonacademic organizations.

Dr. Dawson's twenty-five years in the department represent a truly outstanding combination and balance of administrative leadership, teaching, research and service. Although Dr. Dawson passed away in 1976, his impact on the department continues to this day as we continue our evolution into a top-twenty research institution. The endowment of the Lyle Ramsay Dawson Lecture Series by his beloved daughter, Venita Dawson Curry, permits us to rejoice in this legacy and to continue our tradition of world-class chemical research.

DR. SETH R. MARDER

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Seth Marder is the Georgia Power Chair of Energy Efficiency and Regents' Professor of Chemistry and Materials Science and Engineering, (courtesy) at the Georgia Institute of Technology. He has published over 450 peer reviewed papers with over 32,000 citations, and has edited several proceedings and books including two a volume set with Jean-Luc Bredas entitled The WSPC Reference on Organic Electronics: Organic Semiconductors. Among his recognitions and awards, Dr. Marder was a recipient of an NSF Special Creativity Award, the ACS Arthur C. Cope Scholar Award, Georgia Tech Outstanding Faculty Research Author, and the MRS Mid Career Award. He is a Fellow of the American Association for the Advancement of Science, the Optical Society of America, SPIE, the Royal Society of Chemistry the American Physical Society and the Materials Research Society.