Abstract Submitted
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Toward molecular switches and biochemical detectors employing adaptive femtosecond-scale laser pulses ROLAND ALLEN, PETRA SAUER, Texas A&M University — The following topics will be discussed: (1) Cis to trans and trans to cis photoisomerization of azobenzene, with nuclear motion allowing extra electronic transitions for pulse durations > about 50 fs. (2) Photoinduced ring-opening and ring-closing in a model dithienylethene. (3) Response of dipicolinic acid to femtosecond-scale laser pulses, including excited states and nuclear motion (with Yuri Rostovtsev). Our technique is semiclassical electron-radiation-ion dynamics (SERID, in which the radiation field and nuclear motion are both treated classically, and the ion cores are regarded as inert (with only the valence electrons included in the dynamics). Recall, however, that one still observes "n photon" and "n-phonon" processes in a semiclassical treatment. Also, the nuclear motion is treated correctly on reasonably short time scales (e.g., picoseconds). Although real applications (such as molecular switches and biochemical detectors) will involve adaptive techniques – with femtosecond-scale laser pulses whose durations, photon energies, fluences, shapes, etc. are tailored for specific applications – as well as larger systems, one needs an understanding of the rich interplay of electronic and nuclear dynamics to guide more empirical approaches. This understanding can be obtained through detailed studies of the kind reported here. This work was supported by the Robert A. Welch Foundation.

Roland Allen
Texas A&M University

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