



# San Joaquin Geological Society

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## Geologic Evolution of the Southwestern Sierra Nevada-San Joaquin Basin Transition-An Excursion to Some Critical Exposures

by

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### ABSTRACT (Field Trip)

The goal of this one day field trip is to bring to light a number of critical relationships that we have discovered in regard to the Neogene-Quaternary history of the eastern San Joaquin Basin by the tracking of relationships into the Basin margin that we have discovered during multi-decadal structure mapping and petrologic-geochemical studies of the southern Sierra Nevada-Tehachapi Mountains basement uplift. In published papers and in manuscripts that are in preparation we show that the Neogene-lower Quaternary section of the Basin margin extended nonconformably eastwards across recently re-exhumed Sierran basement for a considerable distance, and that strata of the Basin margin were in continuity with strata of a significant Miocene basin (termed the Walker graben) that covered most of the southern Sierra Nevada until medial Pliocene time. Neogene basin development, reorganization of principal depocenters, and partial exhumation phases are recognized to have been forced by three distinct tectonic regimes: 1) Early and Middle Miocene opening of the Pacific-Farallon slab window; 2) Late Miocene initiation of the eastern Sierra escarpment system, and derivative westward tilting of the Sierra-Great Valley basement surface; and 3) Late Pliocene-Quaternary delamination of mantle lithosphere from beneath the southern Sierra and Great Valley region. Some of the specific features that we will focus on in the field include: 1) the Neogene-Quaternary southern Sierra fault system, which consists of numerous topographically and bathymetrically significant high-angle normal and transfer faults that cut across the entire southern Sierra, and extended as growth structures into the eastern San Joaquin Basin; 2) Early and Middle Miocene chronostratigraphic markers that extend from the Walker graben into the eastern San Joaquin Basin; 3) evidence for Early to Middle Miocene rapid normal fault growth along eastern Basin exposures; 4) multiple phases of profound sediment re--dispersal from the Walker graben into the southern San Joaquin Basin, and then from uplifts along part of the Basin margin into the Maricopa and Tulare sub-basins; and 5) the development of the lower Kern River gorge and the Kern gorge fault scarp.

### BIOGRAPHY

*Born: October 24, 1948*

### EDUCATION AND EXPERIENCE:

- 1972 - Bachelor of Science(Geology) *summa cum laude*, California State University at Northridge
- 1975 - Doctor of Philosophy(Geology), University of California at Santa Barbara
- 1972 - Instructor, Geoscience Department, California State University at Northridge
- 1974 - Instructor, Department of Geological Sciences, University of Southern California
- 1974-1975 - W.A.E., U.S. Geological Survey, Alaskan Branch
- 1974-1978 - Assistant Professor of Geology, University of California at Berkeley
- 1978-1987 - Associate Professor of Geology, California Institute of Technology, Pasadena
- 1979-present - W.A.E., U.S. Geological Survey, Alaskan Branch
- 1987-present - Professor of Geology, California Institute of Technology, Pasadena

*Ph.D. DISSERTATION: "Structure, Petrology and Geochronology of the Kings-Kaweah Mafic-Ultramafic*

*Belt, Southwest Sierra Nevada Foothills, California," 271 pp., (1) plate. Thesis advisors: C.A. Hopson, G.R. Tilton and A.G. Sylvester.*

*TEACHING ACTIVITIES: Introductory and advanced geological field mapping, structural geology, physical geology, Cordilleran regional geology and tectonics, global mountain building and plate tectonics, application of petrogenetic and geochemical studies to regional and global tectonics. Volunteer educational outreach includes classroom and field instruction of middle and high school level Environmental Sciences and Arts, and Director of Island Outpost, a public charity designed toward environmental education field excursions and the disseminating of scientific information to the general public.*

*RESEARCH INTERESTS: Regional field, petrologic, radiogenic isotopic and geochronologic studies applied to the interactions of oceanic and continental plates, tectonic and magmatic accretion of continental crust, dynamics of continent edge batholithic belts and the paleogeographic development of western North America; petrogenesis and geodynamics of the upper mantle beneath the southwest United States region based on studies of Cenozoic volcanic hosted xenoliths integrated with regional geophysical studies integrated with geomorphology and basin analysis; tectonic and petrogenetic development of the Greater Caucasus Mountain Range, southern U.S.S.R. , and the Dinaric Alps, Croatia, and their relationships with the paleogeographic evolution of the northern Tethys ocean basin.*

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*Born July 13, 1957, Zagreb, Croatia*

*MS degree in Geology and Paleontology from University of Zagreb, Croatia (established in 1669, one of the oldest universities in Europe, and home university of "MOHO" seismologist - Andrija Mohorovicic*

*MS degree in geology from Indiana University in Bloomington >BR>Both in Croatia and Indiana, research focused on carbonate sedimentology and petrology*

*Worked four years as teaching assistant (Zagreb and Indiana Universities)*

*1990-1997 Senior geological engineer Shell Oil Company Bakersfield, Ca*

*1998-1999 Special Education Instructor, Bakersfield CA*

*2000-present, Caltech Tectonics Observatory, Staff Geologist with Caltech, research focusing on stratigraphy, sedimentology and tectonics of SE San Joaquin basin, CA and stratigraphy and structure of Dinaric Alps, Croatia*