UC Berkeley
GeoSystems Engineering Program

FACULTY

Norm
Abrahamson

Adda
Athanasopoulos-Zekkos

Jonathan
Bray

Steve
Glaser
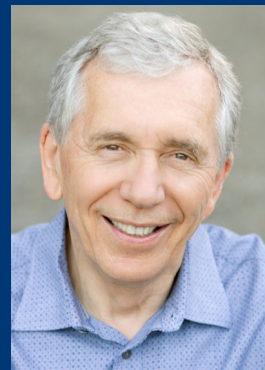
Rob
Kayen

James
Rector

Michael
Riemer

Yoram
Rubin

Nick
Sitar

Kenichi
Soga

Dimitrios
Zekkos

UC Berkeley
GeoSystems Engineering Program

GRADUATE STUDENTS

UC Berkeley GeoSystems Engineering
Graduate Student Fellowships

CORPORATE SPONSORS

GOLD LEVEL

BLUE LEVEL

MS Degree

- MS is a 9-month course-focused program
  - to prepare students to enter professional practice and to pursue research as a PhD student

- Most students complete MS Plan II.
  - Plan II requires each student to submit **one** of the following:
  - A satisfactory, individually written, capstone report in CE 273 Advanced GeoSystems Testing and Design *(most common).*
  - A written report on at least 3 units of individual study or research (CE 299).

- Geosystems degree requirements may be found here: https://www.ce.berkeley.edu/programs/geo/graduate-requirements

MS Degree Requirements

Plan II

- 24 units
  - One course is typically 3 units. So 4 courses in Fall and 4 courses in Spring
  - 12 units in approved graduate courses (3 units of these 12 units can be CE 299 Individual study)
  - The remaining 12 units from approved upper-division and graduate courses (3 units of these 12 units can be CE 299 Individual study).

- Report
  - a satisfactory written capstone report in CE 273 Adv. Geo-Testing & Design, or
  - a satisfactory written report on at least 3 units of individual study or research

Plan I

- Thesis
- 20 units
  - 9 in approved graduate courses (3 of these can be CE 299)
  - The remaining 11 units from approved upper-division and graduate courses.
- You must be enrolled for a minimum of 12 units per semester to be considered a full-time student.

Fall Semester

- CE 173 - Groundwater and Seepage

- CE 270 - Advanced Geomechanics

- CE 281 - Engineering Geology

- *And ONE more 3-unit course, such as:*
  - CE 275 - Geotechnical Earthquake Engineering
  - CE 170 - Infrastructure sensing and modeling
  - CE 178 - Applied Geophysics
  - CE 193 - Engineering Risk Analysis
  - CE 225 - Dynamics of Structures
  - CE 231 - Mechanics of Solids
  - CE 299 - Independent Research

Spring Semester

- CE 272 - Numerical Methods in Geomechanics
- CE 273 - Advanced Geotechnical Engineering and Design
- CE 277 - Advanced Foundation Engineering
- *And ONE more 3-unit course, such as:*
  - CE 171 - Rock Mechanics
  - CE 176 - Environmental Geotechnics
  - CE 202A - Vadose Zone Hydrology
  - CE 222 - Finite Element Methods
  - CE 276 - Seismic Hazard Analysis and Design Ground Motions
  - CE 286 - Digital Data Processing
  - CE 299 - Independent Research

Other Information

- Geosystems Weekly Seminar: Wednesday 12-1 pm
  - CE298 (1 non-degree unit)

- GSIs are required to take CE301 (Workshop for Future Civil and Environmental Engineering Teachers) in the Fall.

- PhD/Post-doc Research Seminar

- Career Fairs (one in Fall and one in Spring)

- Distinguished Spring Lecture Series & Fall Research Symposium

PhD Requirements

Consists of selected courses and independent research culminating in a thesis:

- BS or MS degree is required. If only BS, earn MS while progressing towards PhD.

- Superior level of academic achievement in graduate studies & support of a faculty research adviser are required.

- Graduate adviser provides general academic guidance, and Research adviser supervises dissertation research. The research adviser and the student need to identify funding for at least 3 years prior to enrollment of the PhD program.

- A major field and two minors, one from outside CEE, *with at least 30 units after earning the BS.*

- Minimum GPA of 3.5 in the major field and 3.0 in the minor fields.

- Two examinations:
  - Written Preliminary Examination to test student's ability to apply fundamentals, perform research, synthesize information, and think creatively to solve complex Geosystems problems.
  - Three-hour Oral Qualifying Examination administrated by a committee of 4 faculty members, 2 *of whom* represent the minor fields. The thesis adviser may be a member of the committee but not the committee chair. Testing the student's mastery of the field is an essential part of the examination.

What are the funding sources?

- Financing Graduate Education in the Civil and Environmental Engineering department discussed here: https://www.ce.berkeley.edu/grad/finances

- Financial aid https://grad.berkeley.edu/financial/aid/

How do I find housing? What is the cost of living?

- UC Berkeley housing resources for graduate students may be found http://www.housing.berkeley.edu/graduate

- The estimates of living expenses:

- http://financialaid.berkeley.edu/cost-attendance

COVID-19 Issue

- New decision due date – May 15, 2020

- We may be forced to go for simultaneous on-line and in-class teaching for Fall 2020. For example,
  - Domestic students – in-class (maybe on-line)
  - International students – on-line

- International students are likely to have visa issue this summer and hence may need to go on-line or to defer.

- The deferral option to Fall 2021 is very likely to be available but the details are currently in discussion within the university. We will update you as soon as possible.

The top 5 results for reasons you chose Berkeley?

1) Program Prestige/Reputation (listed on 58% of responses)

2) Professors, Faculty, and their Lectures (46%)

3) Location (42%)

4) Length of Program (31%)

5-tie) Received Funding and Financial Aid (9%)

5-tie) Research Topics (9%)

Please have a look at the following website

https://ce.berkeley.edu/about/openhouse

- 10:00 - 11:00a   Introduction to the GeoSystems Program (Prof. **Soga**) &
  meet the faculty (Profs. **Athanasopoulos-Zekkos**, **Bray** & **Rieme**r)
  https://berkeley.zoom.us/j/252266794
- 11:00 - 12:00p   PhD student panel Q&A
  https://berkeley.zoom.us/j/5107102043
- 12:00 - 1:00p   Masters student panel Q&A
  https://berkeley.zoom.us/j/732798059
- 1:00 - 2:00p   Office hours with Prof Soga
  https://berkeley.zoom.us/j/785472654

Geosystems will run another virtual visit in the **evening of Monday, April 6**:
- 5:00 - 6:00p   Introduction to the GeoSystems Program (Prof. **Soga**)
  & meet the faculty (Profs. **Kayen**, **Sitar** and **Zekkos**)
  https://berkeley.zoom.us/j/709257503
- 6:00 - 7:00p   Masters student panel Q&A
  https://berkeley.zoom.us/j/853287382
- 7:00 - 8:00p   PhD student panel Q&A
  https://berkeley.zoom.us/j/5107102043
- 8:00 - 9:00p   Office hours with Prof. **Soga**
  https://berkeley.zoom.us/j/527065979

If you want to talk to our faculty, please let me know.

Summary

1) Program Length – 9 months - course focused

2) Courses
- 4 courses (Fall) + 4 courses (Spring)
- Geosystem core courses (6) + others

3) Most students go for MS Plan II
- A satisfactory, individually written, capstone report
  - CE 273 Advanced GeoSystems Testing and Design *(most common)*.
  - A written report on at least 3 units of individual study or research
- If you are interested in MS Plan I (thesis option), please let me know.

4) Research
- 10 Professors in Geosystems group
- Many post-docs and PhDs
- Diverse research topics from fundamentals to applied.

5) Funding Sources
- MSc – GSI, Reader, Financial Aid
- PhD – Fully funded

6) COVID-19
- Decision deadline extended to May 15
- Hybrid in-class and online teaching is likely for Fall 2020

Adda Athanasopoulos-Zekkos, Ph.D.

Assistant Professor, UC Berkeley

TEACHING
Advanced Geomechanics, Geotechnical Earthquake Engineering

RESEARCH

### Assessment of Present & Future Infrastructure Systems
- Seismic Vulnerability of Levees-NSF
- Characterization of Liquefaction Assessment of Gravelly Soils – NSF
- Seismic Response of Port Facilities -NSF
- UAV enabled health monitoring of levees

Soil-Structure Interaction and Risk Assessment
- Characterization of Pile-Driving Induced Vibrations-MDOT
- Risk Framework for Asset Management of Retaining Walls-MDOT
- Centrifuge Testing of Retaining Walls under Dynamic Loading-EUMEPS

New Materials
- Engineered Cementitious Composites in Slurry Walls-NSF
- EPS Geofoam for Seismic Earth Pressure Reduction in Retaining Systems-EUMEPS

More information at: http://addazekkos.geoengineer.org
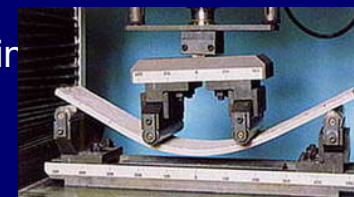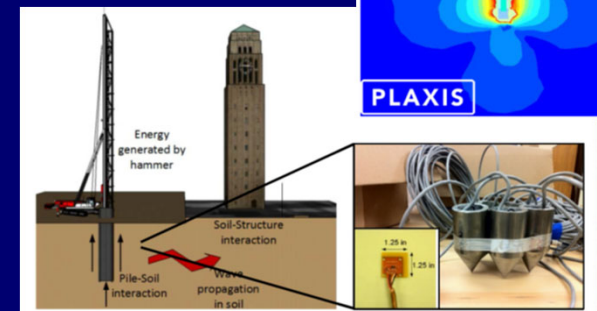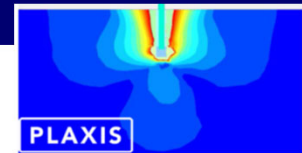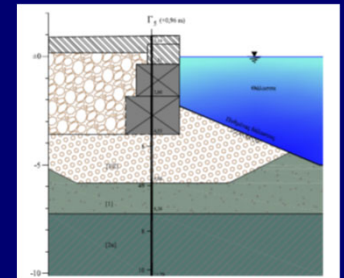
Cassandra Champagne, UM student

Jonathan D. Bray, Ph.D., P.E., NAE

Faculty Chair in Earthquake Engineering Excellence, UC Berkeley
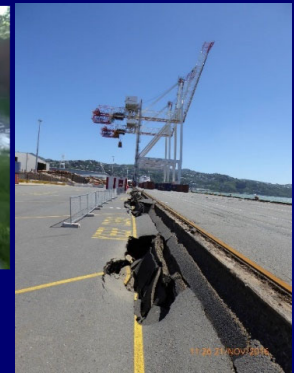
TEACHING

Geotechnical Earthquake Engineering & Advanced Foundation Engineering
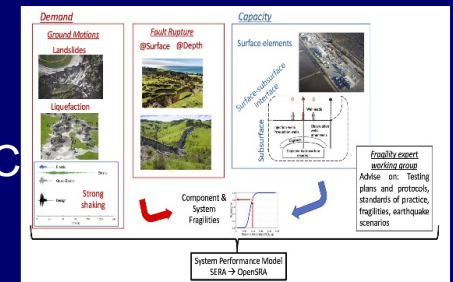
RESEARCH

Liquefaction

- Seismic Performance of Facilities at Wellington Port - NSF
- Evaluation of Liquefaction Ejecta Case Histories - USGS
- Liquefaction Consequences of Stratified Deposits of Silty Soil - NSF
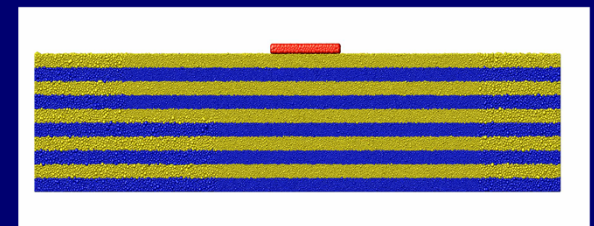
youtu.be/rRVK5NJE2qE

Infrastructure

- Risk Assessment Tool for Gas Storage & Transmission System - CEC
- Characterization & Evaluation of Mine Tailings - UCB

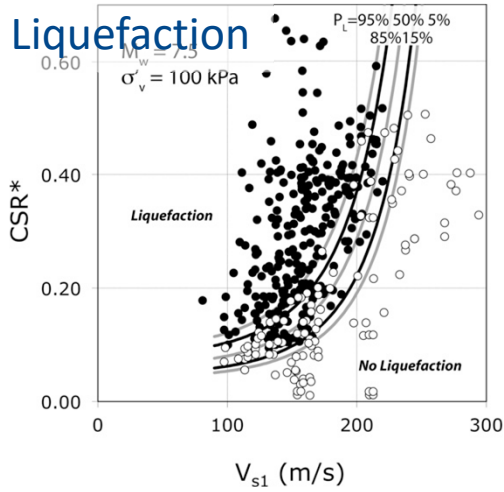### Particulate Media

- Discrete Element Analysis of Sand Response - UCB

Liquefaction

P_L=95% 50% 5%
85%15%
M_w = 7.5
σ'_v = 100 kPa
CSR*
Liquefaction
No Liquefaction
V_{s1} (m/s)

TLS

USGS
RIEGL
LMS-Z420

Marine studies

Berkeley
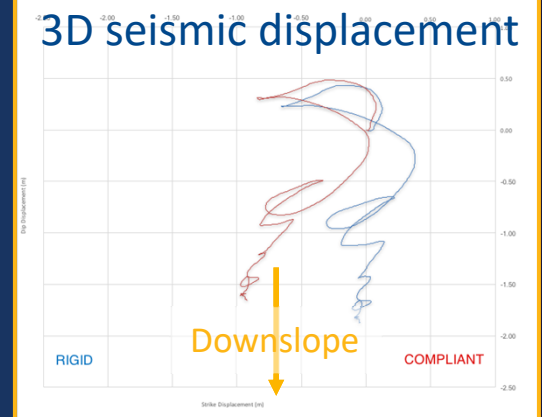UNIVERSITY OF CALIFORNIA

Robert Kayen

- **Current Research Areas:**
  - Shear wave velocity & seismic liquefaction triggering
  - Surface wave methods in earthquake geotechnical engineering
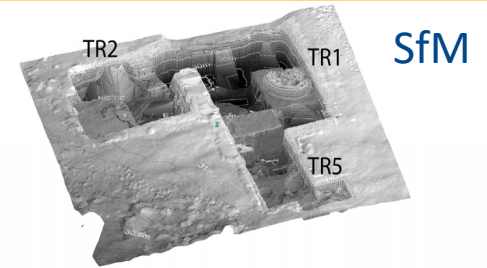 - Terrestrial Laser Scanning (TLS), Structure-from-Motion (SfM), Marine acoustics, and UAV studies
  - Permanent 3D seismic displacement modeling

- **Courses in 2020/2021:**
  - FALL, 2020:
    - CE281 Engineering Geology
  - FALL, 2020:
    - CE170 Infrastructure Sensing and Modeling (w/ KS, DZ)
  - Spring, 2021:
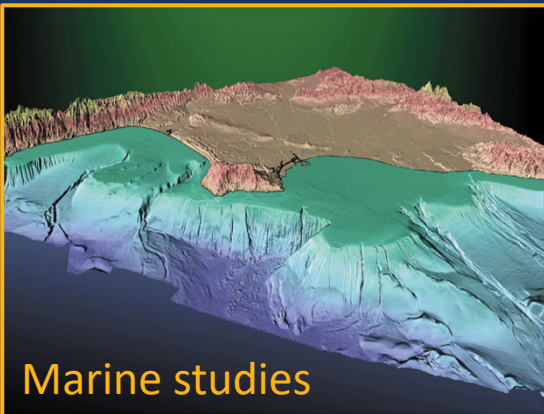   - L&S70c Living on the Edge
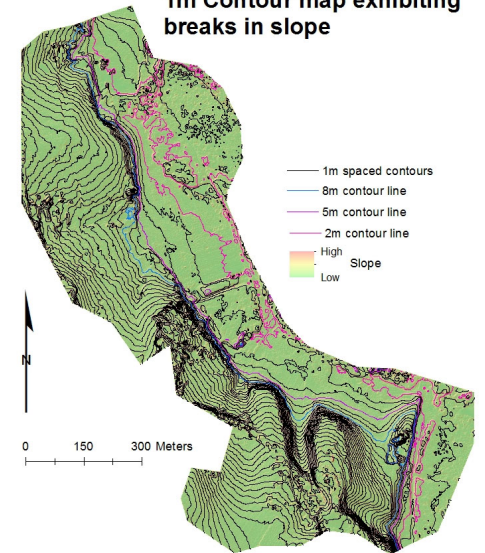
3D seismic displacement

RIGID   Downslope   COMPLIANT

SfM

TR2   TR1
TR5

1m Contour map exhibiting breaks in slope

1m spaced contours
8m contour line
5m contour line
2m contour line
High   Slope
Low

0   150   300 Meters

TLS & SfM

Michael Riemer, Ph.D.

Adjunct Professor and Laboratory Manager, UC Berkeley

Newly Designed Simple Shear Device
- Vertical load applied by 2nd piston, through a load frame designed to be stiff against rotation.
- 3 LVDTs will monitor the displacements
- Designed for a range of sizes, and membranes.

TEACHING
- Advanced GeoEngineering Testing and Design
- Training researchers on project-specific experimental methods

EQUIPMENT DEVELOPMENT
- Design & Development of Direct Simple Shear (DSS) Systems
- Incorporation of Vs measurements in large-scale Triaxial testing

RESEARCH AREAS
- Compressibility of deep, cohesive clays in SF Bay Area
- Characterizing Foundation materials for Transbay Transit Center
- Liquefaction susceptibility of mine tailings
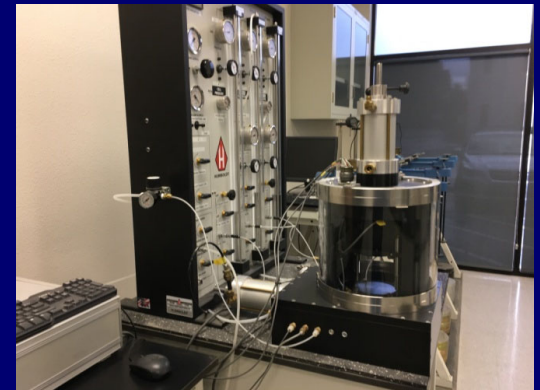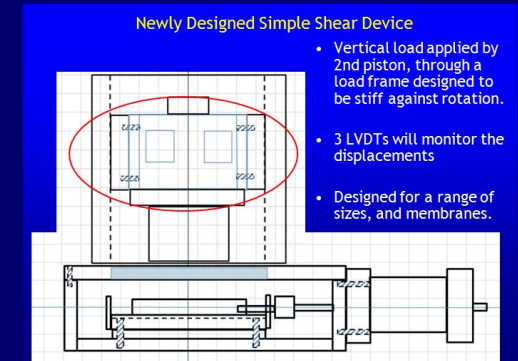
Nicholas Sitar, Ph.D., P. Eng.

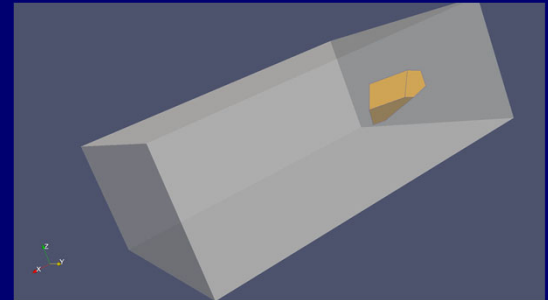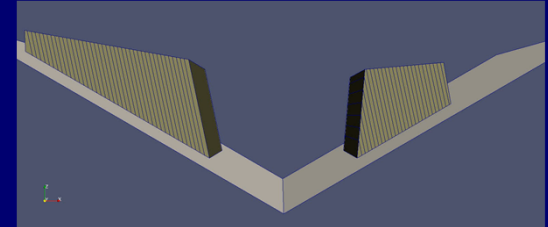## Edward G. and John R. Cahill Professor, UC Berkeley

TEACHING

Engineering Geology, Groundwater and Seepage, Environmental Geotechnics
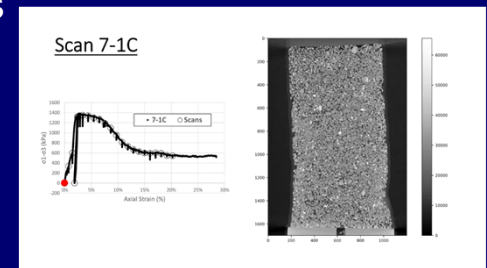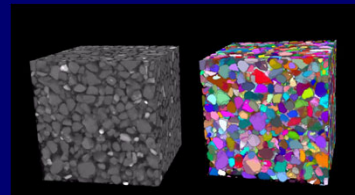
RESEARCH

Natural Hazards and Earthquake Engineering

- Seismic Slope Stability
- Kinematics of Rock Failures
- DEM Modeling of Rock Mass Stability and Rock Avalanches
- Seismic Performance of Retaining Structures

Engineering Geology

- 3-D Xray Tomography and DEM Modeling of Granular Sediments
- Hydraulics of Rock Scour
- Modeling of Debris Flow Mechanics

Kenichi Soga

The Donald H. McLaughlin Chair of Mineral Engineering
Chancellor's Professor, Bakar Fellow
Faculty Scientist, Lawrence Berkeley National Laboratory

FUNDAMENTALS OF SOIL BEHAVIOR
THIRD EDITION
James K. Mitchell and Kenichi Soga

TEACHING

Numerical Methods in Geomechanics, (Advanced Geomechanics),
Infrastructure Sensing and Modeling
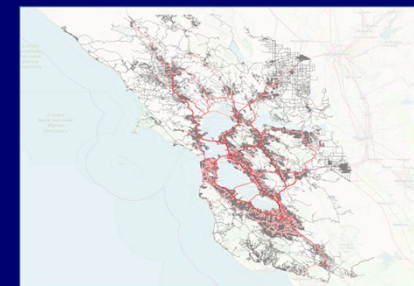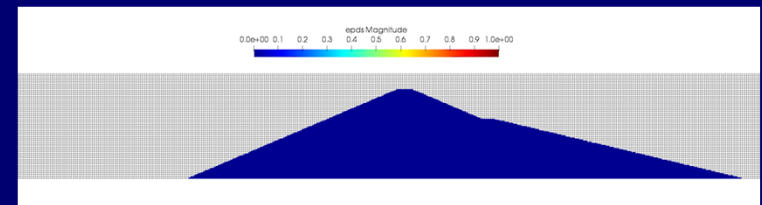
RESEARCH

(i)   Geomechanics
- Large deformation characterization and modeling (MPM) (Industry)
- Soil fracturing and localization (NSF)
- Sand production, erosion, water injection (USACE, Industry)
- Fluid-geomaterial interaction (LEM and LBM-DEM)
- Geothermal THM engineering (DOE, NSF)
- Methane hydrates (Industry)

(ii)   Infrastructure Sensing
- Distributed fiber optic sensing (NSF, DOE, CEC, Caltrans, EBMUD, PG&E, USACE, Industry)
- In-ground wireless sensor network (NSF)
- Computer vision – tunnel construction (Industry)
- The value of sensing for gas facilities (CEC)

(iii) Infrastructure Modeling
- Water pipeline network resilience (EBMUD)
- Traffic network after earthquake (PEER, Caltrans)
- Wildfire evacuation (ITS, CITRIS)
- Machine learning of tunnel excavation (Industry)

More information at: http://geomechanics.berkeley.edu/

Dimitrios Zekkos, Ph.D., P.E.

Associate Professor, UC Berkeley

TEACHING (AY 2020-2021)

Geosystems Engineering Design, Infrastructure Sensing and Monitoring (1/3), Geoenvironmental Engineering

RESEARCH

Natural Disasters

- Characterization of Landslides following natural disasters using
- drones and satellites- NASA & USGS
- 1D-2D-3D Regional Stability Assessment Frameworks- NASA
- Liquefaction Assessment of Gravelly Soils – NSF
- Seismic Response of Port Facilities -NSF
- Physico-Chemical & Mechanical Characterization of rock masses & weathering zone - NSF

Robotics and Informatics

- Surface and subsurface characterization using
- robot-enabled multi-sensing - NSF
- Data analytics for post-disaster reconnaissance – NASA

Sustainability

- Stationary and Mobile Sensing of Methane Emissions from Landfills – NSF
- Bio-Chemico-Physical Characterization of Solid Waste Degradation for Energy Optimization - NSF

More information at: http://dimitrioszekkos.org