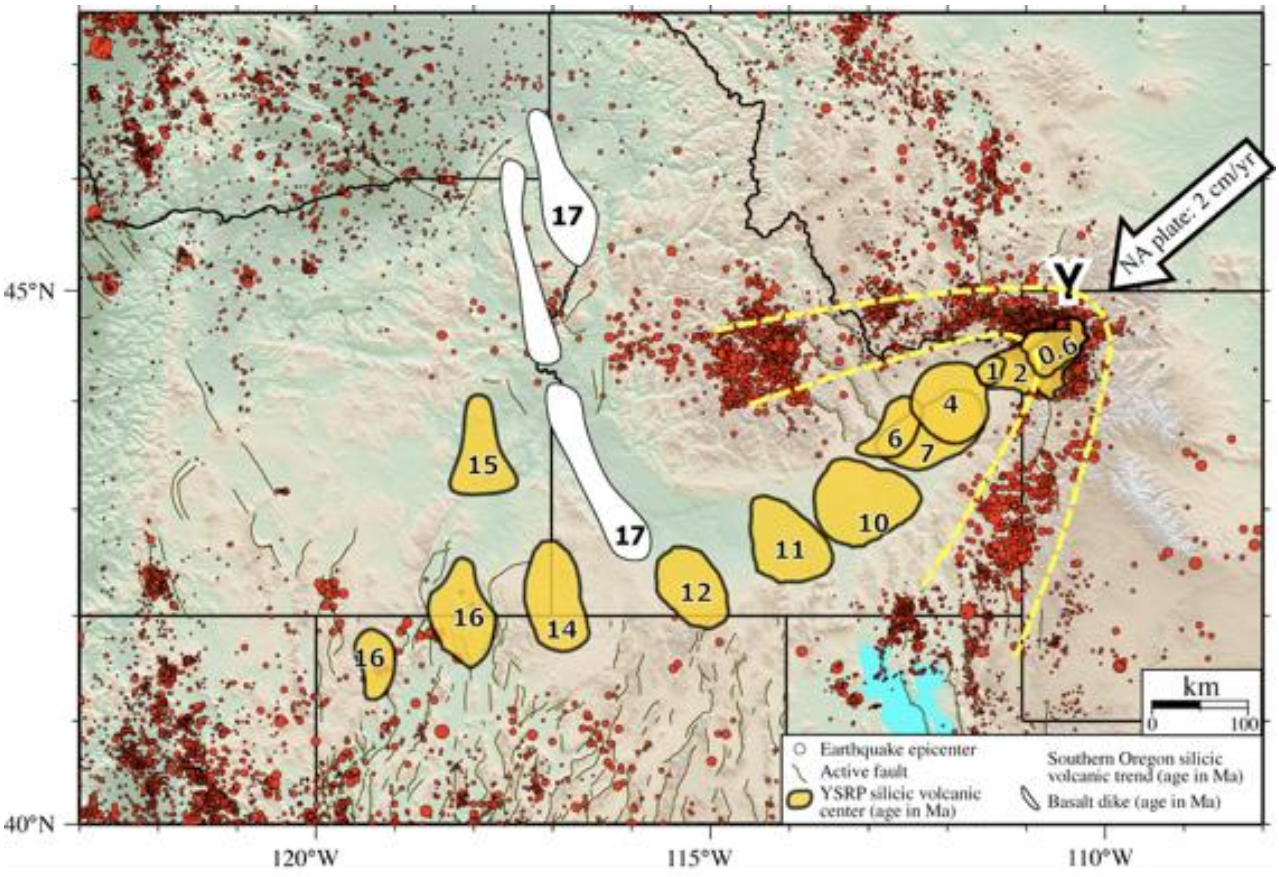
Abstract and Information for Bob Smith's Presentation for U.C. Berkeley Feb 25-26

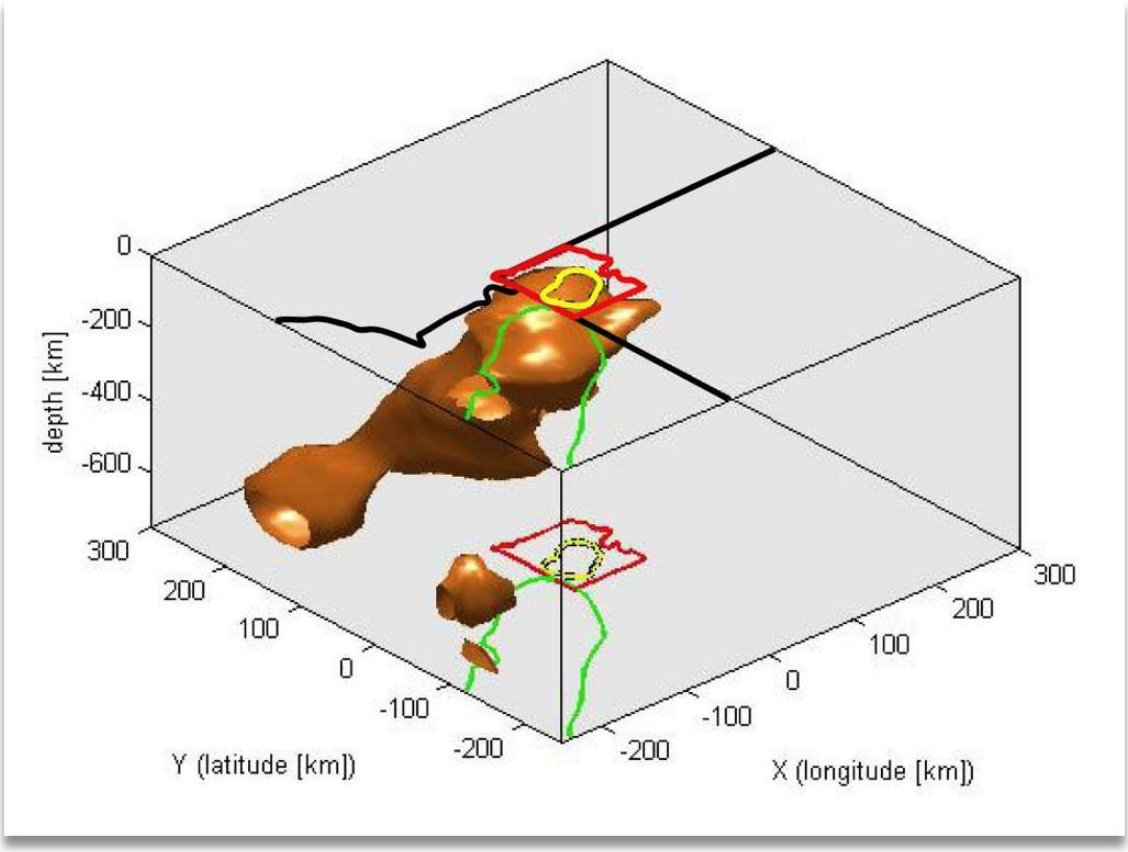
Name:
Robert B. Smith (Bob Smith)
Distinguished Professor of Geology and Geophysics
University of Utah

Abstract:
Old Faithful Anatomy And Magma from Earth's Core Fueling Yellowstone's Volcano and Earthquakes.

Bob Smith's began his Yellowstone research in 1956 and his University of Utah research group has monitored Yellowstone since 1983. The project continues conducting earthquake, crustal structure and GPS R as well as continuous real-time monitoring of the world's largest volcano and its tallest geyser, Steamboat. Moreover, we have conducted detailed seismic, GPS and geologic studies of the anatomy of Old Faithful the world renown Yellowstone geyser to determine its 4D structure, plumbing dynamics and eruption properties. These studies reveal that Old Faithful is located at the top of a large hydrothermal reservoir only 10 to 60 m deep that is composed of highly fractured rock, hot water and steam located west of the geyser. He discovered that Old Faithful eruptions do not have a notable seismic signal but experience large precursory harmonic tremors every 95 minutes just prior to the eruption and from which we can now predict within seconds. I will also show the results from seismic monitoring and imaging of Steamboat Geyser, the world's tallest geyser and of the northern Yellowstone Lake hydrothermal system. Moreover, I will show how Yellowstone's immense volcanic system is part of a giant, mantle-convection cell originating 1800 miles deep at the core-mantle boundary creating a plume of partly molten rock rising in a conduit upward to 50 miles deep beneath the North American continent which then intrudes the lithosphere and fuels magma into two crustal magma reservoirs as shallow as 2-3 miles. Overall, these studies demonstrate the geodynamics of the entire 300-mile-wide Yellowstone Plateau was created by magma-plume buoyancy and that has had a profound impact on the tectonic evolution of entire western U.S.

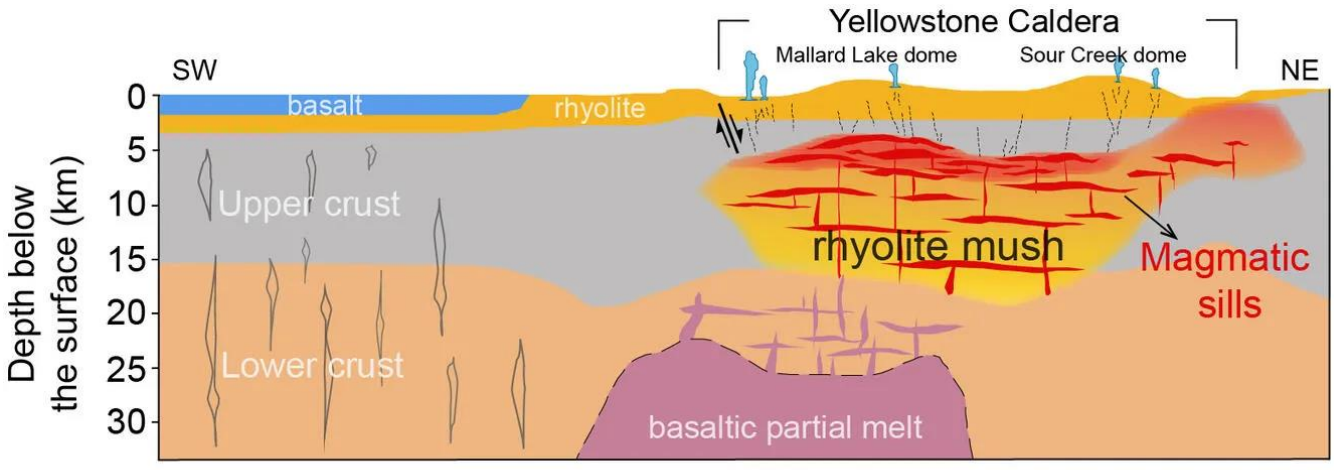


The Yellowstone Hotspot Track Across the N. American Continent



Upper lithosphere noerhqweast dipping Yellowstone plume image. Image outlines a 1-3% melt. Outline of Yellowstone National Park location for reference

Email: robert.b.smith@utah.edu Homepage: uusatrg.utah.edu



Results of joint local and tomography of the Yellowstone magmatic system

Short Biography (hard to do a short bio after six decades of research);
Bob Smith has been working in Yellowstone for 65 years, beginning in 1956 even before college. He has been a Geophysics Professor at the University of Utah for 58 years leading a research group of scientists and students working on the dynamics of earthquake and volcano and dynamics of the western American Plate.

Bob has supervised 69 graduate students and dozens of Post Docs and Visiting Professors.

Bob's Academic Combination: 40-50-60-70-97-100-200-1,000-30,000

- 40 – Actually 44[1] years since assisting the founding of Teton Science Schools in 1972
- 50 - Bob has been a faculty member at the University of Utah for 58 years, now as a Distinguished Professor
- 60 – Bob has conducted research and worked in Yellowstone for 67 years beginning in 1956 before he went to college
- 70 – I have been the major advisor of 69 graduate students, rounded to 70, a record among his colleagues
- 97- Bob has supervised 16 PhD students, 53 MS students, 7 undergraduate student honors theses, 14 Post Docs and hosted 7 visiting professors.
- 100 – Authored ~100+ papers and a book, alone, on Yellowstone-Teton geology
- 200 – Bob has published over 220 papers in major scientific journals.
- 1000+ -Bob has given thousands of abstracted presentations in national and international scientific venues
- 30,000+ Bob along with co-author Lee Siegel published the most popular geology book on the Yellowstone-Teton parks, has sold some 30,000+ copies, "Windows Into The Earth, The Geologic Story of Yellowstone and Grand Teton National Parks", Oxford University Press, 2002.

Recipient of International and National Awards and Accolades including:

- Recipient, United States Antarctic Medal, 1964, for leadership and expeditionary exploration and research of Antarctica while serving as the U. S. Exchange Scientist to the British Antarctic Survey 1962-63.

- Recipient, United Kingdom, Gold Medallion award from the British Antarctic Survey, 1965, for outstanding research and service in Antarctica.
- Recipient of the University of Utah Department of Geology and Geophysics Research Award, 1983.
- Recipient of the University of Utah Distinguished Research Award, 1985.
- Hamilton Scholar Award, Southern Methodist University, for career of geophysical research in studies of hydrothermal systems of the Rocky Mtns, Basin-Range and Yellowstone.
- Career Research Award, Department of Interior, National Park Service, 2006.
- Yellowstone National Park, National Park Service, Award for scientific research in pursuit of understanding the Yellowstone volcano and unconditionally sharing that knowledge for the benefit of future generations, 2008.
- National Park Service Directors Award for Natural Resource Research, 2009.
- John Wesley Powell Award, 2011, the U.S. Department of Interior's, National Park Service highest award.
- George P. Woollard Award, 2012, the Geological Society of America highest award and given in recognition of Bob's outstanding contributions to the field of geophysics.
- U. S. Geological Survey, Recipient, Career Award, 2015 honoring Bob for his outstanding scientific career and his legacy of pioneering research and discoveries in the Yellowstone-Teton volcano-tectonic system. This award was celebrated by holding a symposium in his name at the GSA Rocky Mountain meetings.
- Recipient, Paul G. Silver Award, 2015, American Geophysical Union, for contributions in earth science research, mentoring careers of junior scientists and leadership and founding of major national Earth Science programs: IRIS, UNAVCO and EarthScope.
- Bob's long-time research was recognized by the University of Utah, 1996 by naming the new Department of Geology and Geophysics Computational Laboratory in his and his wife Janet's name.
- Bob is the leader of the pioneering Yellowstone earthquake monitoring in 1983 developing the 35-station seismic network of the University of Utah Seismograph Stations with 260 channels of real-time data.

- Bob also led the development of the Yellowstone Global Positioning, GPS, monitoring network in the late 80s that now has 40 stations of real-time precise positioning data.
- Beginning in 1983 was Principal Investigator of the Old Faithful seismic imaging project, deploying hundreds of the new NODAL portable seismographs. This is the first time this iconic geyser has been imaged in 3- and 4-dimensions to depths of kilometers

Special Publication on Bob Smith's Antarctic Expedition to the U.S. State Department:
Smith, Robert B., 1963, Report of the U.S. Representative To The British Antarctic Survey Expedition, 1963, 1st Lieutenant. Air Force, U.S. Antarctic Survey Program, Washington, D.C., Secretary of State Dean Rusk.

Special Publication On Bob Smith's Career Research:
Bob along with coauthor Lee Siegel published the most popular geology book on the Yellowstone-Teton parks, has sold some 30,000+ copies, "Windows Into The Earth, The Geologic Story of Yellowstone and Grand Teton National Parks", Oxford University Press, 2002.

BBC Documentaries: BBC did a documentary on Bob Smith's Yellowstone research in 1994 where he coined the term Yellowstone Supervolcano. Bob has now been honored for BBC recognition this year, 2021, and is preparing an a documentary on his 67 year Yellowstone career shot at the University of Utah, Grand Teton National Park and is leading a Yellowstone National Park helicopter aerial imaging of the features and areas Bob has worked in.

Professor Smith served as:
Post-Doctoral Scholar, Columbia University,
Six+ years a Guest Professor at the Swiss Federal Institute of Technology
Spent a year as a Visiting Scholar at Cambridge University.
His European geophysical studies including the evolution and structure of the Swiss-French Alps, Greece, Italy the Mediterranean Sea and geodetic work in Germany.

British Antarctic Survey: Bob served on the 1962-63 British Antarctic Survey expedition as the United States Exchange Scientist to the Antarctica where he conducted geophysical surveys of the Palmer Peninsula, Sandwich Islands, South

Georgia, and Halley Bay science station. *For his research and service, he received the British Antarctic Survey Gold Emblem and the U.S. Antarctic Medal.*

Institution Founding, Bob
co-founded several major U.S. research institutions including IRIS (Institutions for Research In Seismology), UNACO (University NAVSTAR Consortium for GPS and Geodesy),
Co-founder and chaired the Southern California Earthquake Center Science Advisory Committee
Principal founder of the original NSF EarthScope Project.

Bob's Meritorious Government Service included presentations for the prestigious United States Senate and House Committees on Science and Technology, 2008 and 2009, on Science in America and on his long-term Yellowstone research.

Society Membership: Bob is a Distinguished Fellow of the American Geophysical Union and the Geological Society of America, and member American Association Advancement of Science.

Bob has also served on numerous university, state, and federal advisory committees, too long to include.

Bobs Book on The Geology Of the Yellowstone-Teton Geologic Systems (co-authored with Lee Siegel): "Windows Into The Earth: The Geologic Story of Yellowstone and Grand Teton National Parks, Oxford Univ. Press, 2000, is the most popular geology book on these parks and has sold ~30,000 copies.

Institution Service: Served on numerous committees of the National Academy of Sciences: Committee on Seismology, Yellowstone Deep Drilling, Geology, Geophysics and on my contributions to the Yellowstone science. Served on NSF National Advisory Council and on numerous NSF Science Review Committees: Geophysics, Active Tectonics, Geology, Computational Earth Science, etc.

Organizations that support and collaborate in Robert B. Smith's Research
University of Utah Seismology and Active Tectonics and the Seismograph Stations, the National Park Service, the National Science Foundation, EarthScope, Yellowstone Volcano Observatory, the Brinson Foundation, the Teton Science Schools.

Bob Has Convened of Dozens of National and International Meetings and Workshops

Bob Smiths University of Utah Laboratory: The University of Utah Seismology and Active Tectonics Research Group with loads of our data links: www.uusatrg.utah.edu/index.html

Bob Smiths Research Data Links:
University of Utah Yellowstone-Teton real-time earthquake data quake.utah.edu/earthquake-center/quake-map

Yellowstone-Teton GPS ground motion studies from University of Utah and other GPS stations, borehole strain/tilt data and Lidar via the GAGE UNAVCO data archive: unavco.org/what-we-do/

Bob continues his Yellowstone-Teton research where he makes discoveries every year and where he treats Yellowstone volcanic-tectonic system as:
a living, breathing, shaking and baking laboratory.

Robert B. Smith
Email: robert.b.smith@utah.edu Homepage: uusatrg.utah.edu
Distinguished Professor and Professor Emeritus of Geophysics
Department of Geology and Geophysics
University of Utah
Sutton Bldg, Rm. 243 Ph: (801) 581-7129
115 So. 1460 E. Cell: (801) 557-2239
Salt Lake City, Utah 84112

1335 Middle Meadow Road . Ph. 307 733 7426
P.O. Box 181
Grand Teton National Park
Moose, Wyoming 83012

1874 Jeremy Drive, Ph 801 278 5894
Salt Lake City, Utah
894121