

Curriculum Vitae for MUAWIA BARAZANGI

Education:

- Bachelor of Science (B.S.) 1965, University of Damascus, Faculty of Sciences. Concentration in physics and geology with emphasis on mathematics and chemistry.
- Master of Science (M.S.) 1967, University of Minnesota, Department of Geology and Geophysics (Applied Geophysics).
- Doctor of Philosophy (Ph.D.) 1971, Lamont-Doherty Earth Observatory of Columbia University, Department of Earth and Environmental Sciences (Seismology and Seismotectonics).

Academic Positions:

- Graduate Teaching and Research Assistant in the Department of Geology and Geophysics, University of Minnesota, 1965-1967.
- Fellow of the Faculty at the Graduate Faculties of Columbia University, 1967-1969; Graduate Research Assistant in seismology at the Lamont-Doherty Earth Observatory of Columbia University, 1969-1971.
- Postdoctoral Research Associate in seismology at the Department of Geological Sciences, Cornell University, 1972-1973; Research Associate, 1973-1975; Senior Research Associate I, 1975-1978.
- Associate Professor and Chairman of the Department of Geophysics at the Faculty of Earth Sciences, King Abdulaziz University, Jeddah, Saudi Arabia, 1979-1980.
- Visiting Professor, Department of Geological Sciences, Cornell University, summer 1979.
- Senior Research Associate II in seismology at the Department of Geological Sciences, Cornell University, 1980-1984; at the Institute for the Study of the Continents (INSTOC), Cornell University, 1984-1987.
- Adjunct Professor, Department of Geological Sciences, 1984-1987.
- Member of the Graduate Faculty in the Field of Geological Sciences, Cornell University, 1984-present.
- Assistant Director of INSTOC, 1984-1988; Associate Director, 1988-2010.
- Senior Scientist (this is the highest research position at Cornell; it is equivalent in professional stature to a full professor and therefore precludes retention of the Adjunct Professor title), INSTOC and the Department of Geological Sciences, Cornell University, 1987-1998.

- Professor, Department of Earth and Atmospheric Sciences, 1998-2009.
- Professor Emeritus, Department of Earth and Atmospheric Sciences, 2009-present.

Selected Special Work:

I . Professional Tasks

- A Principal Consultant and member of a scientific team assigned by UNESCO to conduct a feasibility study for a Programme for the Assessment and Mitigation of Earthquake Risk in the Arab Region (PAMERAR), October 1981- November 1982. Author of Chapters 3 and 4 and coauthor of Chapters 7 and 9 of *Assessment and Mitigation of Earthquake Risk in the Arab Region*, a book prepared by UNESCO in 1983 for the Arab Fund for Economic and Social Development (AFESD) and the Islamic Development Bank (IDB) as the final technical report on the feasibility study (251 pp.; nine chapters).
- Member of the Saudi Arabian National Technical Committee for the Study of Earthquakes (January - March 1983). The committee was established by the King Abdulaziz City for Science and Technology (KACST; in Riyadh) to study the assessment and mitigation of earthquake risk in Saudi Arabia. A final technical report on the subject was presented to KACST.
- As a representative of UNESCO toured Yemen, Syria, and Jordan during February 1982, April 1984, September 1985, and October 1987 to plan, advise, and coordinate the implementation of a Programme for the Assessment and Mitigation of Earthquake Risk in the Arab Region (PAMERAR). Prepared country proposals for the implementation of this program in the above countries and presented them to UNESCO.
- Initiated, planned and coordinated the first "International Symposium on Deep Structure of the Continental Crust: Results from Reflection Seismology", June 26-28, 1984 at Cornell University. The conference was attended by 270 earth scientists from 17 countries--almost all countries that perform deep reflection studies were represented in the symposium.
- Editor of two Geodynamics Series volumes published in 1986 by the American Geophysical Union and entitled: *Reflection Seismology: A Global Perspective* (volume 13, 313 pages), and *Reflection Seismology: The Continental Crust* (volume 14, 340 pages).
- Received a Fellowship from the United Nations Development Programme (UNDP) to spend the period July 15-30, 1988, in Damascus, Syria to advise the Syrian Atomic Energy Commission on earthquake hazard in the region. Also received a second Fellowship between March 9-25, 1999 to advise and help the National Syrian Seismological Center in Damascus, Syria on the analyses and interpretation of seismological data and the seismotectonics of Syria and surrounding regions. Also received a third Fellowship between September 4-20, 2004, to advise the Ministry of Local Administration and Environment in Damascus, Syria (which is responsible for natural hazards in Syria) on the earthquake hazard assessment of Syria and nearby regions. These assignments were under the U.N. Transfer of Knowledge Through Expatriate Nationals (TOKTEN) project.

- Member of the Commission on Geodynamics and Tectonophysics of the International Association of Seismology and Physics of the Earth's Interior (IASPEI), 1987-1991. The commission was chaired by Professor C. Froidevaux of France.
- Coordinator of the Global Geoscience Transects (GGT) program for the Middle East and North African countries, 1986-1997. The GGT program was part of the International Lithosphere Program (ILP; Task Group III.1) and was coordinated by Dr. J. Monger of Canada and Professor H.-J. Gotze of Germany.
- Member of the Committee for Developing Countries of the International Association of Seismology and Physics of the Earth's Interior (IASPEI), 1991-1997. The committee was chaired by Dr. R. Adams of England.
- Acting Editor of the Arab Countries of the project on the World Map of Major Active Faults, a project of the International Lithosphere Program, 1989-1996. The project was chaired by Dr. V. Trifonov of Russia.
- Member of the Editorial Board of GEOLOGY, 1991-1993, a leading monthly publication of the Geological Society of America.
- Invited by the U.S. Arms Control and Disarmament Agency to deliver a comprehensive oral presentation about seismology and the Middle East during the Arms Control and Regional Security Working Group meeting to advance the Middle East Peace Process sponsored jointly by the U.S. Department of State and the Russian Federation, May 31, 1995, Helsinki, Finland.
- Initiated, planned, coordinated, and presently the leader of the Cornell Syria Project, a cooperative joint research effort between Cornell and the Syrian Petroleum Company and Damascus University and funded by oil companies. The project is one of the most successful Industrial Associates programs, and sponsored for over ten years by Exxon, Mobil, Amoco, Occidental, Arco, Conoco, Unocal, Marathon, British Gas, among others. The objective is to better understand the geology and lithospheric structure of the Arabian plate, 1987-present.
- Leader of the Geographic Information System (GIS) project at Cornell to develop a diversified solid earth digital databases and easy to use and WWW access tools (<http://atlas.geo.Cornell.edu>). Though the project is sponsored in support of the Comprehensive Test Ban Treaty (CTBT), it already has a significant impact on earth science research and education, 1994-2003.
- Invited by the International Data Center of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) to deliver lectures about the Cornell Geographic Information System (GIS) project and the structure and seismotectonics of the Middle East and North Africa region, February 10-13, 1999, Vienna, Austria.
- Planned, coordinated, and participated in numerous international scientific workshops and symposia in Morocco, Turkey, Syria, Lebanon, Saudi Arabia, Egypt, and Algeria (1985-2012).

- Co-planned, initiated, and participated in the Eastern Turkey Seismic Experiment, a major multi-year project to study the Anatolian Plateau (1998-2003).
- Co-planned, initiated, and participated in the Active Tectonics of Syria/Lebanon project, a major multi-year, multi-disciplinary study of the northern segment of the Dead Sea Fault System, including paleoseismology (trenching), InSAR, and GPS (1999-present).
- Co-planned and coordinated the annual INSTOC scientific workshops on different themes concerning the structure of the continental lithosphere, 2005-present.

II . Administrative Tasks

- Member of the Policy Committee, College of Engineering, Cornell University, representing the Department of Geological Sciences, 1988-1991.
- Member of the Committee for Review and Promotion of Research Associates and Senior Research Associates, chaired by the Cornell Vice President N. Scott, 1991. A final proposal/report was submitted to the Cornell Provost Office for consideration.
- Member of the Research Center Directors, Cornell Research Centers, Office of the Vice President for Research and Advanced Studies, representing INSTOC at monthly meetings, 1990-2000.
- Appointed by the Chair of the Department of Earth and Atmospheric Sciences to assist with all aspects related to financial matters and the administration of this academic unit, 1994-2003.
- Acting Chair of the Department of Earth and Atmospheric Sciences for a period of five weeks in July and August of 2007.

Professional Societies: American Geophysical Union
 Geological Society of America
 Seismological Society of America
 Sigma Xi, The Scientific Research Society

Special Geophysical Field Work:

- 1966 Geophysical investigation of the "Mid-Continent Gravity High" structure in Minnesota, U.S.A., employing ground magnetic, gravity, and seismic refraction surveys. Also, as a visitor, worked for three weeks with the Pan American Oil Company (with the seismic reflection crew) in southwestern Wyoming for oil prospecting.
- 1968 8-week microearthquake study using portable seismic stations in coastal northern California, U.S.A., with special emphasis on the Cape Mendocino area. This is, to our knowledge, the first such study in the United States.

- 1969 8-week microearthquake investigation of the Intermountain Seismic Belt in Utah, Idaho, Wyoming and Montana (western U.S.A.).
- 1971 Survey of seismograph installations in Tonga and Fiji Islands in the southwest Pacific. Also, as a visiting scientist, joined the Scripps Institution of Oceanography of the University of California expedition on board the research ship Melville in an investigation of the Lau basin located behind the Tonga island arc.
- 1971 During a visit to the Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM), Centre de Noumea in New Caledonia (southwest Pacific) initiated a joint research program between the French geophysicists of ORSTOM and the geophysicists of the Department of Geological Sciences of Cornell University to study the seismotectonics of the southwest Pacific region, especially the New Hebrides (Vanuatu) island arc.
- 1977 8-week field investigation of the seismotectonics of the New Hebrides (Vanuatu) island arc in the southwest Pacific. The research program included the installation of a network of seismic stations on many islands.
- 1984 Planned, coordinated, and helped in the establishment of a seismological observatory at the University of Petroleum and Minerals, Dhahran, Saudi Arabia (January - June 1984). The observatory includes both short- and long-period seismographs.
- 1990 Planned, coordinated, and helped in the establishment of the Atlas digital seismic network in Morocco (1989-1991).
- 1994 Planned and advised on the establishment of the Syria digital seismic network.

Scientific Research:

(See publications for details.)

Scientific research includes investigation of the structure of the Mid-Continent Gravity High in Minnesota (1966); seismicity of the earth (1967); microearthquake seismicity and tectonics of coastal northern California and the Cape Mendocino triple junction (1968); tectonics of the intermountain seismic belt in western U.S.A. (1970); lateral variations of seismic wave attenuation and velocities near inclined zones of earthquakes in the upper mantle in relation to subduction of lithosphere, especially in the Tonga-Fiji-Vanuatu region of the southwest Pacific (1969-1976); detached lithospheric slabs in the upper mantle (1972-1973); seismicity at continental margins (1974); spatial distribution of earthquakes beneath South America, especially in Chile, Argentina, and Peru (1975-1978); global study of the geometry of Benioff zones (1976); field investigation of the seismotectonics of the New Hebrides (Vanuatu) island arc (1977); mantle velocity variations beneath oceanic and continental lithospheres (1978); seismic risk evaluation in western Saudi Arabia (1980); deep structure and evolution of the Tibetan plateau (1981-1992); seismotectonics of Zagros and the "Oman Line" region in southern Iran (1981-1983); deep structure of the western Great Valley (California) based on COCORP seismic reflection profiles near the 1983 Coalinga earthquake sequence (1983-1984); seismic wave velocities and propagation characteristics at regional distances in continents, especially plateaus (1976-2005); seismotectonics and earthquake hazard assessment in the Arab region (1981-present); seismotectonics of the Himalayan and Zagros continental collision zones (1981-1992); Sn propagation in the western USA (1985-1992); comparative studies of the lithospheric structures beneath major

continental plateaus (1988-1992); structure and tectonics of the Palmyra (Syria) and the Atlas (Morocco) intracontinental mountain belts (1988-2005); lithospheric structure of Italy (1993-1998); geology, structure, and evolution of the Arabian plate (1980-2005); structure and tectonics of the Euphrates fault system (1995-1998); historical seismicity, earthquake hazard, active tectonics, and structure of the northern segment of the Dead Sea fault system in Lebanon and Syria (1988-present); structure and tectonics of the Oman ophiolite mountain belt (1997-2002); structure, tectonics, and evolution of the Atlas and Rif mountain belts in Morocco, and the Atlas mountain system in North Africa (1988-present); GIS digital database development, especially for the Middle East and North Africa (1994-2003); lithospheric and upper mantle velocity and attenuation tomography of the Alboran Sea and the surrounding Betic (Spain) and Rif (Morocco) mountain belts, especially delamination of the lithosphere (1992-2003). Seismic wave attenuation at regional distances in the Middle East (1996-2005); structure of the lithosphere in Saudi Arabia and the Red Sea (1998-2005); structure and evolution of the lithosphere of the Anatolian Plateau in eastern Turkey (1999-2010); deformation of Morocco using a GPS network (1999-2010).

Publications of Muawia Barazangi

(Note: For co-authored papers, the first author is underlined if other than M.B.)

- 1967 "Geophysical investigations of the Hudson-Afton horst, Dakota County, Minnesota," *unpublished M.S. thesis, Dept. of Geology and Geophysics, University of Minnesota, Minneapolis, 75 pages.*
- 1969 "World seismicity maps compiled from ESSA, Coast and Geodetic Survey, epicenter data, 1961-1967," with James Dorman, *Bulletin of the Seismological Society of America*, 59, 369-380.
- 1970 "Seismicity map of the Arctic compiled from ESSA, Coast and Geodetic Survey, epicenter data, January 1961 through September 1969," with James Dorman, *Bulletin of the Seismological Society of America*, 60, 1741-1743.
- 1970 "Microearthquake seismicity and tectonics of coastal northern California," with Leonardo Seeber and Ali Nowroozi, *Bulletin of the Seismological Society of America*, 60, 1669-1699.
- 1971 "Late Cenozoic evolution of the Great Basin, western United States, as an ensialic interarc basin," with Christopher Scholz and Marc Sbar, *Bulletin of the Seismological Society of America*, 82, 2979-2990.
- 1971 "Lateral variations of seismic wave attenuation in the upper mantle above the inclined earthquake zone of the Tonga island arc: Deep anomaly in the upper mantle," with Bryan Isacks, *Journal of Geophysical Research*, 76, 8493-8516.
- 1972 "Tectonics of the intermountain seismic belt, western United States: Microearthquake seismicity and composite fault plane solutions," with Marc Sbar, James Dorman, Christopher Scholz and Robert Smith, *Bulletin of the Geological Society of America*, 83, 13-28.
- 1972 "Propagation of seismic waves through and beneath the lithosphere that descends under the Tonga island arc," with Bryan Isacks and Jack Oliver, *Journal of Geophysical Research*, 77, 952-958.
- 1972 "P and S travel times in the Tonga-Fiji region: A zone of low velocity in the uppermost mantle behind the Tonga island arc," with Yash Aggarwal and Bryan Isacks, *Journal of Geophysical Research*, 77, 6427-6433.
- 1973 "Descent of lithosphere beneath New Hebrides, Tonga-Fiji and New Zealand: Evidence for detached slabs," with Bryan Isacks, Jack Oliver, Jacques Dubois, and Georges Pascal, *Nature*, 242, 98-101.
- 1973 "Travel times of seismic waves between the New Hebrides and Fiji Islands: A zone of low velocity beneath the Fiji Plateau," with Jacques Dubois, Georges Pascal, Bryan Isacks, and Jack Oliver, *Journal of Geophysical Research*, 78, 3431-3436.

- 1973 "Seismic velocity anomalies beneath the New Hebrides island arc: Evidence for a detached slab in the upper mantle," with Georges Pascal, Jacques Dubois, Bryan Isacks and Jack Oliver, *Journal of Geophysical Research*, 78, 6998-7004.
- 1973 "Dynamics of the down-going lithosphere," with Jack Oliver, Bryan Isacks, and Walter Mitronovas, *Tectonophysics*, 19, 133-147.
- 1973 "High frequency shear waves guided by a continuous lithosphere descending beneath western South America," with Bryan Isacks, *Geophysical Journal of the Royal Astronomical Society*, 33, 129-139.
- 1974 "Seismic wave attenuation in the upper mantle beneath the southwest Pacific," with Bryan Isacks, Jacques Dubois and Georges Pascal, *Tectonophysics*, 24, 1-12.
- 1974 "Seismicity at continental margins," with Jack Oliver and Bryan Isacks, in *The Geology of Continental Margins*, edited by C. Burk and C. Drake, Springer-Verlag, New York, 85-92.
- 1975 "Global study of seismic wave attenuation in the upper mantle behind island arcs using pP waves," with Wayne Pennington and Bryan Isacks, *Journal of Geophysical Research*, 80, 1079-1092.
- 1976 "Spatial distribution of earthquakes and subduction of the Nazca plate beneath South America," with Bryan Isacks, *Geology*, 4, 686-692.
- 1977 "A search for velocity anomalies near the deep portions of the inclined seismic zone of the Tonga island arc," with Carl Sondergeld, Bryan Isacks, and Selena Billington, *Bulletin of the Seismological Society of America*, 67, 537-541.
- 1977 "Upper mantle structure beneath the Fiji plateau: Seismic observations of second P-arrivals from the olivine-spinel phase transition zone," with Cliff Frohlich and Bryan Isacks, *Geophysical Journal of the Royal Astronomical Society*, 50, 185-213.
- 1977 "Geometry of Benioff zones: Lateral segmentation and downwards bending of the subducted lithosphere," with Bryan Isacks. In *Island Arcs, Deep Sea Trenches and Back-Arc Basins*, Maurice Ewing Series, Vol. I, American Geophysical Union, 99-114.
- 1977 "Spatial distribution and focal mechanisms of mantle earthquakes in the Hindu Kush-Pamir region: A contorted Benioff zone," with Selena Billington and Bryan Isacks, *Geology*, 5, 699-704.
- 1977 "Relative excitation of the seismic shear waves Sn and Lg as a function of source depth and their propagation from Melanesia and Banda arcs to Australia," with Jack Oliver and Bryan Isacks, *Annali di Geofisica*, 30, 385-407.
- 1978 "Precise relocations of earthquakes and seismotectonics of the New Hebrides island arc," with Georges Pascal, Bryan Isacks, and Jacques Dubois, *Journal of Geophysical Research*, 83, 4957-4973.
- 1979 "A comparison of the spatial distribution of mantle earthquakes determined from data produced by local and by teleseismic networks for the Japan and Aleutian arcs," with Bryan Isacks, *Bulletin of the Seismological Society of America*, 69, 1763-1770.
- 1979 "Subduction of the Nazca plate beneath Peru: Evidence from spatial distribution of earthquakes," with Bryan Isacks, *Geophysical Journal of the Royal Astronomical Society*, 57, 537-555.
- 1980 "High frequency seismic wave propagation in western South America along the continental margin, in the Nazca plate, and across the Altiplano," with Douglas Chinn and Bryan Isacks, *Geophysical Journal of the Royal Astronomical Society*, 60, 209-244.
- 1980 "A regional study of mantle velocity variations beneath eastern Australia and the southwestern Pacific using short-period recordings of P, S, PcP, ScP, and ScS waves produced by Tongan deep earthquakes," with Cliff Frohlich, *Physics of the Earth and Planetary Interiors*, 21, 1-14.
- 1981 "Spatial distribution and mechanism of earthquakes in the southern New Hebrides arc from a temporary land and ocean bottom seismic network and from worldwide observations," with E. Coudert, B. Isacks, R. Louat, R. Cardwell, A. Chen, J. Dubois, G. Latham and B. Pontoise, *Journal of Geophysical Research*, 86, 5905-5925.

- 1981 "Seismicity and tectonics of the central New Hebrides island arc," with B. Isacks, R. Cardwell, J.-L. Chatelain, J.-M. Marthelot, D. Chinn and R. Louat, in *Earthquake Prediction: An International Review, Maurice Ewing Series No. 4*, American Geophysical Union, 93-116.
- 1981 "Lateral variations of high-frequency seismic wave propagation at regional distances across the Turkish and Iranian plateaus," with Katharine Kadinsky-Cade, Jack Oliver and Bryan Isacks, *Journal of Geophysical Research*, 86, 9377-9396.
- 1981 "Evaluation of seismic risk along the western part of the Arabian plate: Discussion and recommendations," *Bulletin No. 4, Faculty of Earth Sciences*, King Abdulaziz University, Jeddah, Saudi Arabia, 77-87.
- 1982 "Velocities and propagation characteristics of Pn and Sn beneath the Himalayan arc and Tibetan plateau: Possible evidence for underthrusting of Indian continental lithosphere beneath Tibet," with James Ni, *Geology*, 10, 179-185.
- 1982 "Seismotectonics of southern Iran: The Oman Line," with Katharine Kadinsky-Cade, *Tectonics*, 1, 389-412.
- 1983 "High-frequency seismic wave propagation beneath the Indian shield, Himalayan arc, Tibetan plateau and surrounding regions: High uppermost mantle velocities and efficient Sn propagation beneath Tibet," with James Ni, *Geophysical Journal of the Royal Astronomical Society*, 72, 665-689.
- 1983 "COCORP seismic reflection profiles near the 1983 Coalinga earthquake sequence: Deep structures," with E. Fielding, L. Brown, J. Oliver and S. Kaufman, in *The 1983 Coalinga, California Earthquakes, Special Publication 66*, California Division of Mines and Geology, 137-149.
- 1983 "Evaluating and reducing earthquake risk in Arab countries," with Badaoui Rouhban, *Nature and Resources (UNESCO)*, 19, No. 4, 2-6. (Also translated into Arabic and published in Lebanon in the magazine *Science and Technology*, No. 13, June 1988, 16-20.)
- 1983 "A summary of the seismotectonics of the Arab region," in *Assessment and Mitigation of Earthquake Risk in the Arab Region*, a book (251 pp.) prepared and published by UNESCO, 43-58.
- 1983 "Excitation of T phases from shallow and intermediate-depth earthquakes in the southern Vanuatu (New Hebrides) arc," with H. Ghalib and B. Isacks, *Bulletin of the Seismological Society of America*, 73, 1921-1928.
- 1984 "Seismotectonics of the Himalayan collision zone: Geometry of the underthrusting Indian plate beneath the Himalaya," with James Ni, *Journal of Geophysical Research*, 89, 1147-1163.
- 1984 "COCORP seismic profiles near Coalinga, California: Subsurface structure of the western Great Valley," with Eric Fielding, Larry Brown, Jack Oliver and Sidney Kaufman, *Geology*, 12, 268-273.
- 1984 "Seismotectonics and seismology in the Arab region: A brief summary and future plans," with Robin Adams, *Bulletin of the Seismological Society of America*, 74, 1011-1030.
- 1984 "Deep structure of the continental crust", a conference report, *Episodes*, 7, 43-44.
- 1985 "Active tectonics of the western Tethyan Himalaya above the underthrusting Indian plate: The upper Sutlej River Basin as a pull-apart structure," with James Ni, *Tectonophysics*, 112, 277-295.
- 1985 "Basement faults beneath the western Great Valley of California based on COCORP seismic reflection profiles near Coalinga", with Eric Fielding, *U.S. Geological Survey Open-File report*, 85-44, Menlo Park, California, 31-43.
- 1986 "The first decade of COCORP: 1974-1984," with Larry Brown, Sidney Kaufman and Jack Oliver, *Geodynamics Series Volume 13*, Amer. Geophys. Union, Washington, D.C., edited by Muawia Barazangi and Larry Brown, 107-120.
- 1986 "Seismotectonics of the Zagros continental collision zone and a comparison with the Himalayas," with James Ni, *Journal of Geophysical Research*, 91, 8205-8218.
- 1986 "Deep crustal structure and flexure of the Arabian plate beneath the Zagros collisional mountain belt as inferred from gravity observations," with David Snyder, *Tectonics*, 5, 361-373.

- 1987 "Deep seismic reflection characteristics of the continental crust," with Richard W. Allmendinger, K. Douglas Nelson, Christopher J. Potter, Larry D. Brown, and Jack E. Oliver, *Geology*, 15, 304-310.
- 1988 "Deep structure of the Zagros collision zone: Implications for earthquake hazard assessment and for the spatial distribution of oil fields in the Arabian Gulf region," in *Proceedings of the Third Arab Symposium on Earthquake Seismology*, held at King Saud University, Riyadh, Saudi Arabia, 8-10 March 1986, edited by A. Al-Furaih, 35-45.
- 1988 "Active tectonism within the Fiji platform, southwest Pacific," with Michael Hamburger, Ian Everingham, and Bryan Isacks, *Geology*, 16, 237-241.
- 1989 "The 1759 earthquake in the Bekaa Valley: Implications for earthquake hazard assessment in the eastern Mediterranean region," with N. N. Ambraseys, *J. Geophys. Res.*, 94, 4007-4013 (An Arabic translation of this paper is published in *Bulletin 'd Études Orientales*, Institut Francais de Damas, vol. XLVII, 235-246, 1995).
- 1989 "Mapping High Pn Velocity Beneath the Colorado Plateau constrains uplift models," with Noureddine Beghoul, *Journal of Geophysical Research*, 94, 7083-7104.
- 1989 "Continental collision zones: Seismotectonics and crustal structure," in *Encyclopedia of Solid Earth Geophysics*, edited by David James, Van Nostrand Reinhold Company, New York, 58-75.
- 1990 "Topographic expression of active faults in central Asia and topographic relief effects on Lg propagation," with E.J. Fielding, and B.L. Isacks, in *Proceedings of papers presented at 12th annual DARPA/AFGL Seismic Research Symposium*, September 18-20, Hanscom Air Force Base, Massachusetts, p. 257-263.
- 1990 "Seismic reflection structure of intracratonic Palmyride fold-thrust belt and surrounding Arabian platform, Syria," with J.H. McBride, J. Best, D. Al-Saad, T. Sawaf, M. Al-Otri, and A. Gebran, *The American Association of Petroleum Geologists Bulletin*, 74, 238-259.
- 1990 "Azimuthal anisotropy of velocity in the mantle lid beneath the Basin and Range province," with N. Beghoul, *Nature*, 348, 536-538.
- 1990 "Seismicity and crustal structure of the Fiji platform, southwest Pacific," with M. Hamburger, I. Everingham, and B. Isacks, *Journal of Geophysical Research*, 95, 2553-2573.
- 1990 "Bouguer gravity trends and crustal structure of the Palmyride mountain belt and surrounding northern Arabian platform in Syria," with J.A. Best, D. Al-Saad, T. Sawaf, and A. Gebran, *Geology*, 18, 1235-1239.
- 1990 "Crustal shortening in the Palmyride fold belt, Syria, and implications for movement along the Dead Sea fault system," with T.A. Chaimov, D. Al-Saad, T. Sawaf, and A. Gebran, *Tectonics*, 9, 1369-1386.
- 1990 "First tomographic study of western U.S. completed," with T. Hearn and N. Beghoul, *EOS, Transactions, American Geophysical Union*, 71, 1083 (and colored cover).
- 1991 "Northern Arabian platform transect across the Palmyride mountain belt, Syrian Arab Republic," with D. Al-Saad, T. Sawaf, A. Gebran, J. Best, and T. Chaimov, *Global Geoscience Transect I* (information packet), co-published by the Inter-Union Commission on the Lithosphere and American Geophysical Union, Washington, D.C., ISBN 0-87590-778-43.
- 1991 "Structure of the northeast Palmyride mountain belt and adjacent crustal blocks in Syria," with D. Al-Saad, T. Sawaf, A. Youssef, A. Gebran, J. Best, and T. Chaimov, in special volume of papers on Global Geoscience Transects presented during the 28th International Geological Congress, edited by L.-P. Cui and Q.-B. Wu, (in Chinese), Ministry of Geology and Mineral Resources, China, p. 37-46.
- 1991 "Tomography of the Western United States from regional arrival times," with T. Hearn and N. Beghoul, *Journal of Geophysical Research*, 96, 16,369-16,381.
- 1991 "A geological and geophysical information system for Eurasia," with E.J. Fielding, and B.L. Isacks, in *Proceedings of papers presented at 13th Annual PL/DARPA Seismic Research Symposium, Phillips Laboratory, Hanscom Air Force Base, Massachusetts, 8-10 October, p. 166-172.*

- 1992 "Mesozoic and Cenozoic deformation inferred from seismic stratigraphy in the southwestern intracontinental Palmyride fold-thrust belt, Syria," with T. Chaimov, D. Al-Saad, T. Sawaf, and A. Gebran, *Geological Society of America Bulletin*, 104, 704-715.
- 1992 "Crustal structure of central Syria: The intracontinental Palmyride mountain belt," with D. Al-Saad, T. Sawaf, A. Gebran, J. Best, and T. Chaimov, *Tectonophysics*, 207, 345-358.
- 1992 "Structure of the intracontinental Palmyride mountain belt in Syria and its relationship to nearby Arabian plate boundaries," with D. Seber, D. Al-Saad, and T. Sawaf, *Science and Technology Bulletin on Earth Science*, Yerbilimleri, Geosound, Cukurova University, Adana, Turkey, 20, 111-118.
- 1992 "Geometry and velocity structure of the Palmyride fold-thrust belt and surrounding Arabian platform in Syria," with D. Seber, T. Chaimov, D. Al-Saad, T. Sawaf, and M. Khaddour, *Science and Technology Bulletin on Earth Science*, Yerbilimleri, Geosound, Cukurova University, Adana, Turkey, 20, 103-110.
- 1993 "Continental margin evolution of the northern Arabian platform in Syria," with J.A. Best, D. Al-Saad, T. Sawaf, and A. Gebran, *The American Association of Petroleum Geologists Bulletin*, 77, 173-193.
- 1993 "Stratigraphy and structure of eastern Syria across the Euphrates depression," with T. Sawaf, D. Al-Saad, A. Gebran, J.A. Best, and T. Chaimov, *Tectonophysics*, 220, 267-281.
- 1993 "Upper crustal velocity structure and basement morphology beneath the intracontinental Palmyride fold-thrust belt and north Arabian platform in Syria," with D. Seber, T. Chaimov, D. Al-Saad, T. Sawaf and M. Khaddour, *Geophysical Journal International*, 113, 752-766.
- 1993 "Lithospheric structure of Tibet and western North America: Mechanism of uplift and a comparative study," with N. Beghoul, and B. Isacks, *Journal of Geophysical Research*, 98, 1997-2016.
- 1993 "Bouguer gravity and crustal structure of the Dead Sea transform fault and adjacent mountain belts in Lebanon," with K. Khair, M. Khawlie, F. Haddad, D. Seber, and T. Chaimov, *Geology*, 21, 739-742.
- 1993 "Seismic fabric and 3-D structure of the southwestern intracontinental Palmyride fold belt, Syria," with T. Chaimov, D. Al-Saad, T. Sawaf, and M. Khaddour, *The American Association of Petroleum Geologists Bulletin*, 77, 2032-2047.
- 1993 "Tectonic evolution of the northern Arabian plate in western Syria," with D. Seber, T. Chaimov, J. Best, R. Litak, D. Al-Saad, and T. Sawaf, in *Recent Evolution and Seismicity of the Mediterranean Region*, Kluwer Academic Publishers, 117-140.
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April 2012**