CURRICULUM VITAE – ROBERT MILLER HAZEN – June 2017

Work Address (CIW): Geophysical Laboratory
5251 Broad Branch Road, NW
Washington, DC 20015-1305
Work Telephone: 202-478-8962
FAX 202-478-8901
E-mail rhazen@ciw.edu
Websites: http://hazen.gl.ciw.edu
http://deepcarbon.net
http://dtdi.carnegiescience.edu

Work Address (GMU): George Mason University
Mail Stop 1D6
Fairfax, VA 22030-4444
Work Telephone: 703-993-2163
FAX 703-993-2175

Place of Birth: Rockville Centre, NY
Citizenship: USA
Date of Birth: November 1, 1948

Marital Status: Married August 9, 1969 to Margaret Joan Hindle
Children: Benjamin Hindle Hazen (b. June 18, 1976)
Elizabeth Brooke Hazen (b. September 1, 1978)

Education:

Massachusetts Inst. of Tech.	1966-1970	B.S. Earth Science
Massachusetts Inst. of Tech.	1970-1971	S.M. Earth Science
Indiana University	1969	Summer Field Geology
Harvard University	1971-1975	Ph.D. Mineralogy & Crystallography

Employment History (Scientific Research and Education):

Executive Director and PI, Deep Carbon Observatory, 2008-
Clarence Robinson Professor of Earth Science, George Mason University, 1989-
Senior Staff Scientist, Geophysical Laboratory, Carnegie Institution, 1978-
President, Robert & Margaret Hazen Foundation, 2008-
Research Associate, Smithsonian Institution, Department of Paleobiology, 2007-
President, Hazen Associates, Ltd., 1994-2007
Professional Trumpeter, 1965-2013
Visiting Researcher, Univ. California at Santa Barbara, Chemistry Department, 1987.
Summer Faculty, IBM T. J. Watson Research Center, 1978.
Research Associate, Geophysical Laboratory, 1976-1978.
NATO Postdoctoral Fellow, University of Cambridge, Department of Mineralogy and Petrology, Cambridge, England, 1975-1976.
Research Assistant and Teaching Fellow, Harvard, 1973-1975.
Field Assistant, U. S. Geological Survey, Summers of 1970 and 1971.
Curator of Geological Collections, M.I.T., 1967-1970.
Laboratory Assistant, Isotopes, Inc., Westwood, NJ, Summer, 1967.

Professional Experience—Scientific Research and Education:

From 1971 to 1999 most of Robert Hazen's scientific research focused on the close relations between crystal structure and physical properties. He developed several high-pressure and high-temperature techniques and applied these techniques to understanding effects of temperature and pressure on atomic arrangements, particularly in deep Earth environments – work summarized in *Comparative Crystal Chemistry* (Wiley, 1982) and the edited volume *High-Temperature and High-Pressure Crystal Chemistry* (Mineralogical Society of America, 2000). He studied a wide variety of materials, including lunar minerals, ceramics, ferroelectrics, solidified gases, and organometallics. Hazen led the team of Carnegie scientists who first isolated and identified several new high-temperature superconductor structure types. Some of these studies are summarized in *Breakthrough: The Race for the Superconductor* (1988), *The New Alchemists* (1994), and *The Diamond Makers* (1999).

In January 1989, Hazen joined the faculty of George Mason University as Clarence J. Robinson Professor of Earth Sciences. This opportunity arose from his interest in engaging students of all ages, especially students who are not science majors, in the natural sciences. Science is central to all our lives, and a firm grounding in scientific literacy informs our citizens in a broad range of topics related to health, environment, resources, business, and education. Science is also an engine of discovery, and represents a great human adventure. Accordingly, he has developed undergraduate courses in scientific literacy (with Prof. James Trefil), scientific ethics, symmetry in art and science, and the image of the scientist in popular culture, as well as graduate seminars in astrobiology and the origins of life. Their writings include the bestselling *Science Matters: Achieving Scientific Literacy* (Doubleday, 1990; 2nd edition, 2010) and *The Sciences: An Integrated Approach* (Wiley, 1993; 8th edition, 2015). He has been active in national efforts to reform science education and has presented lectures and workshops on undergraduate science curricula at more than 100 colleges and universities. He contributed as a writer for the *National Science Education Standards*, and served on the Executive Board of the National Research Council's Committee on Science Education, as a member of the American Association for the Advancement of Science's Committee for the Public Understanding of Science and Technology, and on the National Academy of Sciences' committees to write *Teaching About Evolution and the Nature of Science* (1998) and to revise the influential pamphlet, *Science and Creationism* (3rd edition, 2007).

In 1996, thanks to a new perspective on science research opportunities fostered by teaching integrated science, Hazen began research on high-pressure organic synthesis and the varied roles of minerals in processes that led to the origins of life. Working with a team of scientists at the Carnegie Institution, he developed a proposal to join NASA's Astrobiology Institute to study physical and chemical environments of high-pressure hydrothermal systems and their possible role in prebiotic organic synthesis and the origin of life. Recent research projects include studies of mineral-mediated organic synthesis, the role of minerals in stabilizing organic compounds, the nature of mineral-molecule interactions in aqueous solutions, and the chiral selectivity of enantiomeric mineral surfaces. He is also active in the development of micro-analytical tools for paleontology. Some of this work is summarized in *Genesis: The Scientific Quest for Life's Origins* (National Academy, 2005) and in *The Story of Earth* (Viking, 2012). The latter book served as the basis of an episode of NOVA (WGBH-TV), which aired in January 2016.

In 2006 Robert Hazen began studies in the changing diversity and distribution of minerals in the near-surface environments of Earth and other terrestrial planets and moons, a field that he called "mineral evolution." Earth's mineralogical history is thereby divided into ten stages, each of which saw significant changes in near-surface mineralogy. Principal findings include the realization that different planets and moons achieve different stages of mineral evolution. Furthermore, as many as 60% of known mineral species on Earth probably could not have appeared prior to the origin and evolution of life. Recent mineral evolution studies reveal significant correlations between Earth's near-surface mineralogy and the supercontinent cycle, changes in atmospheric and ocean chemistry, and the emergence of the terrestrial biosphere.

These studies led in the Summer of 2014 to recognition that mineral diversity-distribution data display many of the trends known for ecosystems. For example, mineral distributions conform to Large Number of Rare Event (LNRE) frequency distributions. LNRE statistical models lead to predictions of the type, age, and localities of Earth's "missing" minerals—species that occur on Earth but have not yet been discovered. These new methods may help to transform aspects of mineralogy from a descriptive to a predictive science. Hazen is also active in the study of emergent systems (especially their relevance to origins of life), the quantification of complex systems (through the formalism of functional information), and the evolution of complex systems under selective pressures.

Hazen is Executive Director of the Deep Carbon Observatory (DCO), a 10-year effort to achieve fundamental advances in understanding the chemical, physical, and biological roles of carbon in Earth (http://deepcarbon.net). The DCO has more than 1,000 collaborators from 45 countries with total funding from governmental, corporate and private sources exceeding $500 million. In addition to his studies of carbon mineralogy through Earth history, Hazen is responsible for the integration and synthesis of all of DCO's diverse research projects, which collectively address the quantities, movements, forms, and origins of carbon in Earth.

As part of George Mason University and the Carnegie Institution's ongoing educational activities, Robert Hazen has supervised approximately 50 young scientists as Summer Interns, Predoctoral Fellows, and Postdoctoral Fellows. He currently advises 5 Ph.D. students at the University of Arizona and Johns Hopkins University.

Professional Experience—Popular Writing in History and Science

Hazen, frequently in collaboration with his wife Margaret Hindle Hazen, has written several books and many related articles on aspects of the history of American science and society. Previous works include *American Geological Literature* and *North American Geology* (a bibliography and review, respectively, of early American geological research), *Wealth Inexhaustible* (a history of American mining and other mineral industries), and *The Poetry of Geology* (a collection of geological poetry of the 18th and 19th centuries). *The Breakthrough: The Race for the Superconductor* (Summit, 1988) is his popular account of the discovery of high-temperature superconductivity. The Hazens also wrote *Keepers of the Flame* (Princeton, 1990), a cultural and technological history of fire in early America, published by Princeton University Press. Hazen's books, *The New Alchemists: Breaking through the Frontiers of High-Pressure Research* (Times Books, 1994) and *The Diamond Makers* (Cambridge University Press, 1999), explore the history of diamond making and other high-pressure applications.

In 1990 Hazen, with physicist James Trefil, wrote *Science Matters: Achieving Scientific Literacy* (Doubleday, 1991; second edition 2009), which now has more than 250,000 copies in print in a dozen languages. That volume proposes a definition of scientific literacy based on overarching scientific principles. In conjunction with the book Hazen has appeared on NBC's *The Today Show*, CBS's *Nightwatch*, *NOVA* (WGBH, Boston), and numerous other national and local TV and radio programs. Hazen also contributed articles and editorials to *Newsweek*, *The New York Times Magazine*, *Chronicle of Higher Education*, *The Scientist*, and other periodicals. Hazen and Trefil have also written three undergraduate textbooks that amplify these themes, *The Sciences: An Integrated Approach* (Wiley, 8th edition, 2015), *The Physical Sciences* (Wiley, 1996), and *Physics Matters* (Wiley, 2003). *The Sciences* also served as the basis for Hazen's 60-lecture video and audio course, "The Joy of Science," which is distributed nationally as part of the Great Courses series (The Teaching Company, Chantilly, Virginia). *Why Aren't Black Holes Black: Unanswered Questions at the Frontiers of Science* (Anchor, 1998), written with Maxine Singer, adopts the style of *Science Matters*, but focuses on the most compelling unanswered questions that drive today's science. *Genesis: The Scientific Quest for Life's Origin* (Joseph Henry Press, 2005), with a companion 24-lecture series, "The Origins of Life" (The Teaching Company, 2005), surveys the origins-of-life research field.

Hazen's most recent book, *The Story of Earth* (Viking, 2012) examines more than 4.5 billion years of Earth history framed in the context of the coevolving geosphere and biosphere. *The Story of Earth* was named a semi-finalist in the 2013 Royal Society (London) Science Book Prize, a finalist in the 2013 Phi Beta Kappa Science Book Prize, and one of Kirkus Reviews "top 25 non-fiction books" of 2012. The book, and the thematic subject of mineral evolution, will be the basis of an episode of NOVA (WGBH TV, Boston) now in production and to be aired in the Fall of 2015. The book has also been developed as a 48-lecture video/audio course in the Great Courses series, published by The Teaching Company (2013).

The Hazen Collection of Trilobites

From 1968 to 2014 Robert Hazen amassed one of the largest collections in private hands of trilobites (fossil arthropods from the Paleozoic Era). Robert and Margaret Hazen collected many of the specimens in Europe, Africa, and North America. Beginning in 2007 most of this collection was transferred by donation to the Smithsonian Institution's National Museum of Natural History. Approximately 100 specimens of the 2000-piece collection are on display at the Museum, including approximately 50 specimens in the new Hall of Ocean Life, which opened in November of 2008. An additional collection of more than 300 specimens has been donated to the University of Arizona Mineral Museum and formed the core of the exhibit "Meet the Trilobites: Arizona's First Inhabitants." An illustrated catalog of the collection

is in preparation. These specimens also form the basis of recent taphonomic studies of preserved biomolecules that have demonstrated the preservation of chitin byproducts in specimens as old as lower Middle Cambrian (~500 Ma).

Employment History (Professional Music):

Founding Member, Cambridge Symphonic Brass Ensemble, 1967-1975
Solo Trumpet, Emmanuel Bach Orchestra, Boston, 1973-1975; Guest soloist 2006-2008
Founding Member, Washington Chamber Symphony, 1977-2003
Founding Member, Washington Chamber Orchestra, 1980-1988; European tour, 1986
Member, National Gallery Orchestra, 1977-2010
Member, Washington Bach Consort, 1977-2010; German tour 2000
Founding Member, National Chamber Orchestra, 1979-1985
Founding Member, and Board of Directors, National Philharmonic, 2004-2016
Alternate Musician, National Symphony Orchestra, 1978-2005; national tour, 2004
Member, Filene Center (Wolf Trap and Wolf Trap Opera) Orchestra, 1977-2006
Freelance Union musician, Boston and Washington, 1971-2016

Professional Experience—Music:

Robert Hazen played symphonic trumpet professionally from 1966 until his retirement in November 2016. He was a tenured member of the National Gallery Orchestra (1977-2010), the National Philharmonic (2004-2010), and the Washington Bach Consort (1977-2010). He studied in Boston with Natalo Paella, Andre Come, and Armando Ghitalla, and in Washington with Steven Hendrickson, Adel Sanchez, Emerson Head, and Chris Gekker. He appeared as soloist with the Boston Symphony Esplanade Orchestra, the National Gallery Orchestra, the Washington Handel Festival Orchestra, the Washington Chamber Symphony, the National Gallery Orchestra, the Emmanuel Music Orchestra (Boston), and on BBC TV in England in a live performance of Henry Purcell's *Sonata in D*. Hazen has given many recitals in the United States and Great Britain, including the Busch-Reisinger and Gardner Museums in Boston, the Smithsonian and Corcoran Museums in Washington, and Kings College and St. Johns College in Cambridge England. In 1998 he appeared as soloist at the Kennedy Center with the Washington Chamber Symphony, for which he played 2nd trumpet from its founding in 1977 until its demise in 2003.

In 1967 he co-founded the Cambridge Symphonic Brass Ensemble, a brass quintet that thrives to this day. They performed hundreds of concerts and recitals throughout New England, including the first performances of the Christmas Revels at Sanders Theater in Cambridge, the first Ascension Day brass concerts from the Tower of the Busch-Reisinger Museum on the Harvard University campus, and many concerts at the Castle Hill Music Festival.

He has performed as an extra trumpeter with numerous ensembles in Europe and North America, including the Boston and National Symphonies; Orchestre de Paris; the New York, Boston, Washington, and Metropolitan Operas; and the Jeoffrey, American, Washington, Baltimore, Kirov, and Royal Ballets. His frequent appearances with National Symphony Orchestra include performances with Mistislav Rostropovich, Erich Leinsdorf, Antal Dorati, and Leonard Slatkin. He performed with the NSO on their 2004 national tour, including performances at Carnegie Hall.

He continued to perform on historic instruments until 2012 with such ensembles as the Washington Bach Consort, the Folger Consort, the Handel Choir of Baltimore, the Cathedral Choral Society, the Wolf Trap Opera, and the Washington Bach Sinfonia. Hazen has recorded on both modern and historic instruments with ensembles on DDG, Pro Arte, New World, Nonesuch, Smithsonian, and AMI records.

Robert and Margaret Hazen are authorities on the history of bands in America. They assembled one of the largest collections of brass band ephemera in the world and they wrote *The Music Men: An Illustrated History of Brass Bands in America* (Smithsonian Institution Press, 1987), which won the 1989 ASCAP Deems Taylor Award. They subsequently wrote the script and appeared in a documentary film on the history of bands, produced by SIRS Inc. and shown on PBS TV. The Hazen Collection of Brass Band Ephemera is now preserved in the archives of the Smithsonian Institution. More than 100 historic brass instruments collected by Robert Hazen are also in the collections of the Smithsonian Institution, the Boston Museum of Fine Arts, and the National Music Museum (Vermillion, South Dakota).

Robert and Margaret Hazen performed as semi-professional Renaissance dancers from 1972 to 1984. They were members of the Cambridge Court Dancers (Boston) and the Dupont Circle Consortium (Washington) in numerous venues, including the Boston Museum of Fine Arts, the Cloisters, Dumbarton

Oaks, the Folger Theatre, and the Smithsonian Institution.

Robert Hazen is also an amateur cellist. He plays regularly with Margaret Hazen (a violist) and a growing circle of musical friends. They completed their first Beethoven string quartet cycle in 2012 and are now engaged in a Shostakovitch cycle.

Professional and Committee Memberships:

Mineralogical Society of America (Life Fellow, 1982; Program Committee, 1978-80; MSA Award Committee, 1983; Associate Editor, 1983-87; Councilor, 1987-90; Mineral Physics Representative, 1990-94; Special Editor, 1997-98; Nominating Committee, 2002; Vice President, 2003-04; President, 2004-05; Past President, 2005-06; Chairman Benefactors Committee, 2005-; Distinguished Public Service Award, 2009; Member (2011-) and Founding Chairman (2011-2013), Data Science Committee (2013-2015); Roebling Medal, 2016.

International Society for the Study of the Origins of Life (Elected to the Executive Council, 2011-2014)

American Geophysical Union (Mineral Physics Committee Executive Panel, 1984-88; Macelwane Award Committee, 1986-88; *Journal of Geophysical Research* Associate Editor, 1985-87; Editor of "Mineral Physics News;" History of Geophysics Committee; Sullivan Award Committee, 1999-2002)

National Research Council (Committee on K-12 Science Education and Executive Committee, 1995-2001; *National Science Education Standards*, writing team; Working Group on Teaching Evolution and coauthor *Teaching About Evolution and the Nature of Science*; writing team for 3rd edition of *Evolution and Creationism*, 2004-2007; Physics and Chemistry of Earth Materials Steering Committee, 1985-87; Board of Earth Sciences Committee on Education)

National Academy of Sciences, Science and Entertainment Exchange, Advisory Board, 2008-

National Science Foundation, Biosciences Directorate Advisory Board, 2009-2012; Distinguished Lecturer, 2012 and 2017.

American Association for the Advancement of Science (Fellow, 1996; Committee for the Public Understanding of Science, 2001-2008)

Geological Society of America (Fellow, 2015; Pardee Symposium Chair, 2012)

Geochemical Society (Plenary Lecturer, 2012; Fellow, 2013)

American Chemical Society (Ipatief Prize, 1986)

American Institute of Physics (Andrew Gemant Award Committee, 1997-2003)

Geological Society of Washington (Bradley Lecturer, 2011)

Sigma Xi (Distinguished Lecturer, 2008-2010)

History of Earth Science Society

National Committee for the History of Geology (Executive Committee and Secretary, 1978-1983)

International Committee for the History of Geology (Corresponding Member, 1983-1989)

American Musical Instrument Society

International Federation of Musicians (AFL-CIO)

International Trumpet Guild

Historic Brass Society

Advisory Board Memberships

Rruff.info mineralogical database, International Advisory Board

Mindat.org mineralogical database, International Advisory Board

Earth Life Sciences Initiative, Tokyo Tech, Japan, International Advisory Board, 2012-

National Science Foundation, Biosciences Directorate, Advisory Board, 2009-2012

Earth & Sky (National Public Radio), 1999-2013

National Science Resources Center (Smithsonian and NAS), 1992-1996

NOVA (WGBH TV, Boston) Advisory Board, 1993-

California State University-Wide Science and Math Collaborative, 1993-1995

The Carnegie Council (Washington, DC), 1993-

George Mason University, Institute of the Arts, Core Faculty, 1994-2002

Winding Your Way through DNA Project (UCSF), 1994-1996

Idaho State Science Education Project, 1995-1996

Virginia Urban Corridor Science Collaborative, 1995-1997

Advisory Board, *Encyclopedia Americana*, 1995-2011

National Philharmonic, Board of Directors, 2003-2011

Hazen has also served as advisor to state science education groups in Connecticut, Idaho, New York, New Hampshire, North Carolina, Texas, and West Virginia.

Fellowships, Scholarships, Academic Honors:

Vienna Museum of Natural History, Guest of Honor at opening of their "Mineral Evolution" exhibit (2017)
The Chauncey Holmes Lecture, Syracuse University (2017)
Roebling Medal, Mineralogical Society of America (2016)
The Morgan Lecturer, Appalachian State University (2016)
Elected Fellow, Geological Society of America (2015)
Austrian Academy of Sciences, Mineral Evolution symposium held in his honor (2015)
The Leibnitz Lecturer, University of Potsdam (2015)
The Ingerson Lecturer of the Geochemical Society (2014)
Foster-Hewitt Lecturer, Lehigh University (2014)
Elected Fellow, Geochemical Society (2014)
Plenary Keynote Lecturer, Society of Economic Geology (2014)
Plenary Keynote Lecturer, American Society of Cell Biology (2014)
Keynote Lecturer, Gordon Research Conference on Biomineralization (2014)
Keynote Lecturer (2 sessions), International Mineralogical Association (2014)
Capital Science Lecturer, Carnegie Institution (2014)
Arthur Storke Lecturer, Columbia University (2013)
Finalist, Phi Beta Kappa Science Book Prize (2013)
Semi-Finalist, Royal Society (London) Science Book Prize (2013)
Nobel Symposium Lecturer, Royal Academy, Stockholm, Sweden (2013)
Linus Pauling Lecturer, Portland, Oregon (2013)
Qualline Lecture, University of Texas (2013)
Naff Symposium Lecture, University of Kentucky (2013)
Plenary Lecturer, Goldschmidt Conference (2013)
Condon Lecture, Oregon State University (2012)
Moore Lecture, Oregon State University (2012)
Vetlesen and Fish Lectures, University of Rhode Island (2012)
Virginia Outstanding Faculty Award (2011)
Linnaeus Prize and Lecture, Uppsala, Sweden (2011)
Keynote Lecturer, Deep Carbon Cycle Workshop, Sendai, Japan (2011)
Keynote Lecturer, American Association for the Advancement of Science, Annual Meeting, Washington DC (2011)
Distinguished Scientist Lecture, Trinity University, San Antonio, TX (2010)
Keynote Lecturer, Origins of Life Symposium, Groningen, Netherlands (2010)
Keynote Lecturer, Synthetic Biology Symposium, Vienna, Austria (2010)
Pardee Symposium Organizer, Geological Society of America, Denver, CO (2010)
Keynote Lecturer, International Mineralogical Association, Budapest, Hungary (2010)
The Bradley Lecture, Geological Society of Washington (2010)
Mineralogical Society of America, Distinguished Public Service Medal (2009)
The Baldwin Lecture, Miami University of Ohio (2009)
The Charter Lecturer, University of Georgia (2009)
"Mineral evolution" selected by *Science News* as a "science story of the year" (2008)
Sigma Xi, Distinguished Public Lecturer (2008-2010)
National Science Foundation, Biosciences Directorate, Distinguished Public Lecturer (2007)
Elected Chair, Gordon Research Conference on the Origin of Life (2007-2008)
The Robert Reed Lecturer, The Ohio State University (2007)
The Elsasser Lecturer, The Johns Hopkins University (2007)
The Darwin Lecturer, Northwestern University (2007)
The Sokol Lecturer, Montclair State University (2007)
Invited Guest Editor of *Elements*: Volume 1, #3, "Genesis" (2005); Volume 6, #1 "Mineral evolution" (2010)
Mineralogical Society of America, Elected Vice President (2003-2004) and President (2004-2005); Distinguished Lecturer (2003-2004)

"Life's Rocky Start" selected for *Best Science Writing of 2001*, Natalie Angier, Editor. (2002)
Smithsonian Institution Senate of Scientists, Distinguished Lecturer (2001)
Elizabeth Wood Science Writing Award, American Crystallographic Association (1998)
Physics Today 50th Anniversary Essay Contest, Honorable Mention (1998)
The Dibner Lecturer, Smithsonian Institution (1996)
Educational Press Association Award, for the *Time* magazine essay "Why my kids hate science" (1992)
ASCAP Deems Taylor Award, for *The Music Men* (with Margaret Hazen, 1989)
The Ipatief Prize of the American Chemical Society (1986), "To recognize outstanding chemical experimental work in the field of high pressure."
The Mineralogical Society of America Award (1982) "For outstanding contributions to the chemistry of crystals at high pressure."
Geophysical Laboratory Postdoctoral Fellowship (1976-1978)
NATO Postdoctoral Fellowship in Science (1975-1976)
The Bowdoin Prize (Harvard University essay award), Honorable mention (1974)
National Science Foundation Graduate Fellowship (1971-1974)
Ancient and Honorable Artillery Society Prize for history, MIT (1973)
United States Geological Survey Junior Field Assistant (1970)
Elected President, MIT Geology Club (1969-1970)
Phi Lambda Upsilon (National Chemistry Honorary), MIT (1969)
Baton Society, MIT music honorary (1969)
Elected President, MIT Symphony Orchestra (1968-1970)
Outstanding Musician Award, New York State Invitational, Fredonia, NY (1966)
New Jersey All-State Orchestra and All-State Band (1965-1966)
The Harvard Prize for the outstanding underclassman, Ridgewood High School (1965)

Grants for Research (Robert Hazen is PI unless otherwise noted):

"Chance, necessity, and the origins of life," Templeton Foundation (1/1/2017-12/31/2019), $400,000.
"Carbon Mineral Evolution: Deep Carbon, Deep Time, and the Co-evolution of the Geosphere and Biosphere," Alfred P. Sloan Foundation (11/1/2016-12/31/2018; R.T. Downs, PI), $230,000.
"The Deep Carbon Observatory Secretariat: Years 8 and 9," Alfred P. Sloan Foundation (7/1/2016-6/30/2018), $2,200,000.
"Experimental and Theoretical Studies of Hadean and Archean Geochemical and Mineralogical Environments," Simons Foundation (4/1/2016-3/31/2017), $25,000.
"The Co-evolution of the Geosphere and Biosphere," Keck Foundation, (1/1/2015-12/31/2017), $1,400,000.
"The Deep Carbon Observatory Secretariat: Years 6 and 7," Alfred P. Sloan Foundation, (7/1/2014-6/30/2016), $2,250,000.
"Integrative and Synthetic Research for the Deep Carbon Observatory" (11/1/2013-10/31/2016), $400,000.
"Mineralogical Characterization of Methane Hydrate," Carnegie Canada Foundation, (11/1/2012-10/31/2013), $8,300.
"The Deep Carbon Observatory Secretariat: Years 4 and 5," Alfred P. Sloan Foundation, (7/1/2012-6/30/2014), $2,250,000.
"Deep Carbon Instrumentation II," Alfred P. Sloan Foundation, (4/1/2012-12/31/2013), $1,150,000.
"Collaborative Research: An Interdisciplinary Study of Chiral Adsorption on Mineral Surfaces," NSF (9/15/2010-9/14-2013), with Dimitri Sverjensky (Johns Hopkins) as co-PI, $610,000.
"Deep Carbon Instrumentation," Alfred P. Sloan Foundation, (6/1/2010-12/31/2010), $900,000.
"The Deep Carbon Observatory," Alfred P. Sloan Foundation. (7/1/2009-6/30/2012). $4,000,000.
"Astrobiological Connections," NASA Astrobiology Institute, (2/15/2009-2/14/2015). $6,414,585. (George Cody, PI).
"The Deep Carbon Cycle: A Proposal for Interdisciplinary Study." Alfred P. Sloan Foundation, 2007-2009. $400,000.
"Proposal to NASA-NAI for Support of the 2008 Origin of Life Gordon Research Conference." NASA Astrobiology Institute, 2007-2008. $30,000.
"Investigating the Biosphere's Roots in Deep Earth Geochemistry." Keck Foundation, 2007-2009, with M.

Fogel, PI, and 4 others. $1,200,000.

"Astrobiological Pathways: From the Interstellar Medium, Through Planetary Systems, to the Emergence and Detection of Life," NASA Astrobiology Institute, Approximately $6,300,000 for 2003-2008, with Sean Solomon and others.

"Collaborative Research: An Interdisciplinary Study of Chiral Adsorption on Mineral Surfaces," NASA and NSF co-funded, 2007-2010, with Dimitri Sverjensky (Johns Hopkins) as co-PI, $570,000

"Signs of Life: A search for γ-sulfur in Canadian hot springs." Turner Foundation, $8,000 for 2005-2008.

"A Multidisciplinary Study of Selective Adsorption of Chiral Molecules on Mineral Surfaces," NSF. $95,714 for 2003-2004, with Andrew Steele.

"High-Pressure Crystal Chemistry of Earth Materials," NSF. $270,000 for 1999-2002, with Charles Prewitt and Hexiong Yang.

"Hydrothermal systems: Physical, chemical, and biological evolution and cosmic environments," NASA Astrobiology Institute, Approximately $3,200,000 for 1998-2003, with Sean Soloman and others.

"High-pressure, hydrothermal organic synthesis," NSF Life in Extreme Environments (LExEn) and SGER programs, $100,000 for 1997-1999, with George Cody and Russell Hemley.

"Wonderful Life: Isotope micropaleontology of the Burgess Shale," Turner Foundation, $30,000 for 1997-1999; $5,000 extension for 2001-2002.

"Mineral catalyzed biochemical reactions in high-pressure hydrothermal environments," NSF SGER Program, $10,000 for 1997-1998.

"Acquisition of a four-circle single-crystal diffractometer with a CCD detector," NSF Division of Earth Sciences, $161,000 for 1997-2000, with Larry Finger and others.

"High-Pressure Crystal Chemistry of Earth Materials." National Science Foundation grant awards for 1990-1993 ($240,000) and 1993-1998 ($380,000), with Larry Finger.

"Mineral Energetics: Relationships among structure, bonding, thermochemical properties and elastic properties of minerals in the system MgO-Al_2O_3-SiO_2-H_2O." National Science Foundation grant awards for 1986-1987 ($54,600), for 1988-1990 ($140,000), with Larry Finger.

"Mineral Energetics: Relationships among structure, bonding, thermochemical properties and elastic properties of minerals in the system BeO-Al_2O_3-SiO_2-H_2O." National Science Foundation Grant Awards for 1984-1986 ($250,000), with Larry Finger.

"Mineral Physics: relationships between physical properties and crystal structure" National Science Foundation Grant Awards for 1978-1979 ($80,000.00), for 1980-1981 ($120,000.00), for 1982-1984 ($158,000.00), and approved for 1985-1988 ($185,000.00) with Larry W. Finger.

"Mineral Physics Conference" National Science Foundation Grant Award for travel and other expenses associated with this conference, held at Airlie House, VA, October, 1977. ($13,000.00) with Charles T. Prewitt.

"Origin and history of returned lunar samples and selected meteorites" NASA grant award for 1978-1979 ($55,000.00) with Peter M. Bell and David Mao.

Robert Hazen was also on the scientific staff of the Center for High-Pressure Research, funded by the National Science Foundation, 1990-2002, Charles T. Prewitt, Principal Investigator.

Published Abstracts and Invited Lectures: Approximately 180 abstracts have been published in proceedings of professional societies since 1971. Invited/plenary/keynote papers have been presented at meetings of the following societies:

AIRAPT (High-pressure research society)
American Association for the Advancement of Science
American Chemical Society
American Crystallographic Society
American Geophysical Union
American Physical Society
American Society of Cell Biology
Biophysical Society
Coast Geological Society (Santa Barbara, CA)
COMPRES
Dallas Mineral Symposium
Deep Carbon Observatory

Earth-Life Science Institute (Tokyo, Japan)
European Mineralogical Association
Geochemical Society
Geological Society of America
Geological Society of Washington
Gordon Research Conference (High Pressure)
Gordon Research Conference (Origin of Life)
Gordon Research Conference (Biomineralization)
Gordon Research Conference (Geobiology)
Industrial Diamond Association
International Mineralogical Association
Japan Geosciences Union
Kavli Futures Workshop
Mineralogical Society (Great Britain)
Mineralogical Society of America
Philosophical Society of Washington
Potomac Geophysical Society
Society for Economic Geology

Invited lectures have been delivered at numerous colleges, universities and national laboratories, including:

University of Alaska (Anchorage)

University of Arizona (Tucson, AZ)

Arizona State University (Tempe, AZ)

University of California (Santa Barbara, CA)
University of California (Los Angeles, CA)
California State University (Fresno, CA)
Jet Propulsion Laboratory (Pasadena, CA)
NASA Ames Research Lab (Moffett Field, CA)
Loyola Marymount University (Los Angeles, CA)
Coast Geological Society (Ventura, CA)

University of California (Berkeley, CA)
Stanford University (Stanford, CA)
CalTech (Pasadena, CA)
Beckman Center (Irvine, CA)
University of California (Santa Cruz, CA)
University of Southern California (Los Angeles)
Scripps (La Jolla, CA)

University of Colorado (Boulder, CO)

University of Connecticut (Storrs, CT)
Central Connecticut State Univ. (New Britain, CT)

Yale University (New Haven, CT)
Fairfield University (Bridgeport, CT)

University of Delaware (Newark, DL)

University of Delaware (Lewes, DL)

Georgia Tech (Atlanta, GA)
University of Georgia (Athens, GA)

Georgia Southern University (Statesboro, GA)

University of Idaho (Moscow, ID)

University of Chicago (Chicago, IL)
Northwestern University (Evanston, IL)

Southern Illinois University (Carbondale, IL)
Argonne National Laboratory (Argonne, IL)

Purdue University (Lafayette, IN)

University of Indiana (Bloomington)

Iowa State University (Ames, IA)

McPherson College (McPherson, KS)

Centre College (Danville KY)
University of Kentucky (Lexington, KY)

Eastern Kentucky University (Richmond, KY)

The Johns Hopkins University (Baltimore, MD)
Salisbury State University (Maryland)
Carnegie Inst., Dept. Embryology (Baltimore, MD)
Army Research Lab

University of Maryland (College Park, MD)
NASA Goddard (Greenbelt, MD)
NIST (Gaithersburg, MD)
Space Telescope Science Institute

Harvard University (Cambridge, MA)
Massachusetts General Hospital (Boston, MA)
Boston College (MA)

University of Massachusetts (Amherst, MA)
Schlumberger Research (Cambridge, MA)
MIT (Cambridge, MA)

University of Minnesota (St. Paul, MN)

University of Missouri (Kansas City, MO)
Washington University (St. Louis, MO)

University of New Hampshire (Durham, NH)
Keene State College (Keene, NH)

Princeton University (Princeton, NJ)
Rutgers University
Montclair State University (Montclair, NJ)
Princeton Plasma Physics Laboratory

St. Johns College (Santa Fe, NM)
University of New Mexico (Albuquerque)
Los Alamos National Lab (Los Alamos, NM)

State University of New York (Stony Brook, NY)
Cornell University (Ithaca, NY)
University of Buffalo (Buffalo, NY)
Lamont-Doherty (Columbia Univ., Palisades, NY)
RPI (Troy, NY)
Simons Foundation (NY, NY)
IBM Watson Res. Cen. (Yorktown Heights, NY)
The Century Club (New York, NY)
State University of New York (Cortland, NY)
American Museum of Natural History (NY, NY)
Alfred P. Sloan Foundation (NY, NY)
Syracuse University (Syracuse, NY)

Duke (Durham, NC)
Elon College (Elon College, NC)
East Carolina University (Greenville, NC)
Appalachian State University (Boone NC)

Denison University (Granville, OH)
Wright State University (Dayton, OH)
Miami University (Oxford, OH)
The Ohio State University (Columbus, OH)
Case Western Reserve Univ (Cleveland, OH)

University of Oklahoma (Norman, OK)

Linfield College (McMinnville, OR)
Portland State University (OR)
Oregon State University (Corvalis, OR)

Pennsylvania State Univ. (University Park, PA)
Academy of Natural Sciences of Philadelphia
University of Pittsburgh (Pittsburgh, PA)
Carnegie-Mellon University (Pittsburgh, PA)
Villanova University (Villanova, PA)
University of Pennsylvania (Philadelphia, PA)
LaSalle University (Philadelphia, PA)
Lafayette University (Easton, PA)
Franklin and Marshall Univ. (Lancaster, PA)
Lehigh University (Bethlehem, PA)

University of Rhode Island (Providence, RI)
Brown University (Providence, RI)

Clemson University (Clemson, SC)
University of Charleston (Charleston, SC)
The Citadel (Charleston, SC)

Tennessee Technical University (Cookville, TN)
University of Tennessee, Knoxville
East Tennessee State Univ. (Johnson City, TN)
University of Tennessee, Martin

Texas Tech (Lubbock, TX)
Trinity College (San Antonio, TX)
University of Texas (Austin, TX)

George Mason University (Fairfax, VA)
Union Theological Seminary (Richmond, VA)
Virginia Commonwealth University (Richmond, VA)
National Science Foundation (Ballston, VA)
Mary Washington College (Fredericksburg, VA)
Virginia Tech (Blacksburg, VA)
Old Dominion University (Norfolk, VA)
William and Mary (Williamsburg, VA)

Norwich University (Northfield, VT)
St. Mary's College (Burlington, VT)

Howard University (Washington, DC)
Carnegie Institution (Washington, DC)
National Academy of Sciences (Washington, DC)
George Washington University (Washington, DC)
Smithsonian Institution (Washington, DC)
Brookings Institution (Washington, DC)
Naval Research Laboratory (Washington, DC)

University of Washington (Seattle, WA)
University of Puget Sound (Tacoma, WA)

University of West Virginia (Morgantown, WV)
Marquette University (Milwaukee, WI)

University of Wyoming (Laramie, WY)

University of Melbourne (Australia)

University of Vienna (Austria)
Austrian Academy of Sciences (Vienna)

Natural History Museum of Vienna (Austria)

McMaster University (Hamilton, Ontario, Canada)
Royal Ontario Museum (Toronto, Ontario, Canada)
McGill University (Montreal, Quebec, Canada)
University of British Columbia (Vancouver)

Institute for Geology and Geophysics (Beijing, China)

University of Cambridge (England)
University of Oxford (England)
University of Newcastle (England)
University of Liverpool (England)

Institute de Physique du Globe (Paris, France)
Air Liquide Research (Paris, France)
Schlumberger Research (Paris, France)
Sorbonne (Paris, France)

University of Kiel (Germany)
University of Freiberg (Germany)
University of Muenster (Germany)
German Research Institute (Potsdam)
University of Potsdam (Germany)
University of Greifswald (Germany)
University of Bochum (Germany)
University of Cologne (Germany)
University of Bremen (Germany)

University of Groningen (Holland)
University of Utrecht (Holland)

Technical University (Budapest, Hungary)
Eötvös University (Budapest, Hungary)

University of Rome (Italy)
Campiglia Maritima (Italy)
University of Florence (Italy)
University of Milan (Italy)

University of Tokyo (Japan)
Tokyo Tech (Japan)
Tohoku University (Sendai, Japan)

University of Bergen (Norway)
St. Andrews University (Scotland)

Spanish Astrobiology Institute (Madrid)
Palace Royale (Santandar, Spain)

University of Uppsala (Sweden)
Swedish Royal Academy of Sciences (Stockholm)
University of Stockholm (Sweden)

Selected Television Appearances:

CNN, “Sonia Live”
CBS, “Nightwatch”
NBC, “The Today Show”
KDFW (Dallas, TX), “Point of View”
KHOU (Houston, TX), “AM Houston”
Maryland Public TV, “The Environment”
Spanish Public TV, “REDES”
Discovery Science, “Sci-Fi Science”
PBS, “Science Journal”
WGBH (Boston), “NOVA” (several episodes)
BBC (London), “Horizon”
IDEA TV (Brazil)
History Channel, “Modern Marvels”
Discover Channel, “Naked Science”
National Geographic, “Origins”
Japan National Public Television

Selected Radio Appearances (1-Hour Live Talk Shows):

NPR, “Science Friday”
Monthly hour-long appearances on Wisconsin Public Radio
WAMU (Washington), “Diane Rehm Show” and “Mike Cuthburt Show”
KPRC (Houston), “Doug Johnson Show”
KLBJ (Austin, TX) “PM Show”
KING (Seattle), “Jim Altoff Show”
KABC (Los Angeles), “Michael Jackson Show”
KXLY (Seattle), “PM Show”
WNYC (New York), “New York & Company”
KNBR (San Francisco), “Leo LaPorte Show”
BBC (London)
WBZ (Boston), “Lovell Dyett Show”
KFI (Los Angeles), “Lora Cain Show”
KMOX (St. Louis), Morning show
KSDO (San Diego), “Roger Hedgecock Show”
WAMC (Albany, NY), “The Best of Our Knowledge”
WJNO (West Palm Beach, FL), “Jack Cole Show”

WKAR (Michigan Public Radio), “Carey Bernstein Show”
KNSS (Witchita, KS), “Morning Magazine”
Virginia Public Radio, “With Good Reason”
KDKA (Pittsburgh, PA), “Open Mike”

Selected Taped Radio Spots:
NPR “All Things Considered,” “Weekend Edition”
CBS “Countdown to Tomorrow”
ABC “Chuck Taylor”
WKYS (Washington), “Sunday Morning Magazine”
KIKK (Houston), “Talkin Country”
Southern Baptist Radio, “Master Control”
KPLU (Seattle), “Morning Edition”
KMPS (Seattle), “Introspect”
KGW (Portland, OR), “Peter Wiseback Show”
National Public Radio, “All Things Considered”
Wisconsin Public Radio, “To the Best of Our Knowledge”
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Christian Science Monitor (2016) What makes Earth unique? A few rare minerals say scientists.
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International Business Times (2017) Anthropocene: The 208 crystals that don't exist anywhere else in the universe.

Scientific American (2017) Found: Thousands of Man-Made minerals—Another argument for the Anthropocene.

Washington Post (2017) Humans have caused an explosion of never-before-seen minerals all over the Earth.

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