

## Bradley R Hacker

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### EDUCATION

Ph.D. Geology, University of California, Los Angeles; 1988  
Dissertation: *Experimental Deformation & Metamorphism of Amphibolite & Basalt*.  
M.S. Geology, University of California, Davis; 1984  
Thesis: *Stratigraphy and Structure of the Yuba Rivers Area, Sierra Nevada*.  
B.S. Geology, with honors; University of California, Davis; 1982

### PROFESSIONAL EXPERIENCE

PROFESSOR, University of California, Santa Barbara, 2000–present  
VISITING SCHOLAR, ETH Zurich, 2012  
ACTING DIRECTOR, Institute for Crustal Studies, 2008–2009  
ASSOCIATE DIRECTOR, Institute for Crustal Studies, 2001–2007  
VISITING SCHOLAR, University of Arizona, 2004  
VISITING SCHOLAR, Harvard University, 1998  
ASSOCIATE PROFESSOR, University of California, Santa Barbara, 1998–00  
ASSISTANT PROFESSOR, University of California, Santa Barbara, 1996–98  
RESEARCH ASSOCIATE, Stanford University, 1992–96  
POST-DOCTORAL RESEARCHER, UCLA, 1988; Stanford University, 1989–92  
RESEARCH ASSISTANT, UC Davis, 1982; UCLA, 1984–88  
TEACHING ASSISTANT, UC Davis, 1982; UCLA, 1984–86  
COMPUTER PROGRAMMER, TECHNICAL WRITER & EDITOR, Apple Computer, 1978–84  
COMPUTER PROGRAMMER, Tymshare, Inc., 1977

### RESEARCH PRIORITIES

Field, laboratory, and theoretical studies of tectonics, particularly: i) the formation and exhumation of ultrahigh-pressure rocks; ii) ophiolite emplacement and the formation of inverted metamorphic gradients; iii) the role of phase changes in earthquakes, diagenesis, and magmatism in subduction zones; iv) the formation and refining of continental crust; v) rheology, anisotropy and phase changes in the lower crust; and vi) rock physical properties. Analytical method development: electron back-scatter diffraction (EBSD), laser ablation split stream inductively coupled plasma mass spectrometry (LASS), monazite and titanite chronometry. Software development:  $^{40}\text{Ar}/^{39}\text{Ar}$  data analysis, ICP data analysis, rock physical properties.

### HONORS

2015–16 Jack E. Oliver Visiting Professor, Cornell University  
2015 Geological Society of America Structural Geology and Tectonics Outstanding Publication  
2011 Astor Visiting Lecturer, Oxford University  
2010 Fellow, American Geophysical Union  
2001 Fellow, Geological Society of America  
2001 Fellow, Mineralogical Society of America  
1997 Fellow, Cave Research Foundation  
1987 Sigma Xi research award  
1982 Arco award for undergraduate academic excellence

## FIELD EXPERIENCE

UHP tectonics: Norway, China, Papua New Guinea. Ophiolite emplacement: Oman, Sierra Nevada, Klamath Mtns. Formation of continental crust: Tibet, Talkeetna Mtns, Chugach Mtns, Sierra Nevada, Klamath Mtns. Collisional orogens: Tibet, Himalaya, Pamir, Myanmar.

## PROFESSIONAL MEMBERSHIPS

2012 American Association for the Advancement of Science  
1994 National Speleological Society  
1987 Mineralogical Society of America  
1984 Geological Society of America  
1983 American Geophysical Union

## EXTRAMURAL GRANTS

NSF EAR-1545903, \$260,623, 6/1/16–5/31/21, “PIRE: ExTerra Field Institute and Research Endeavor (E-FIRE)”  
NSF EAR-1551054, \$332,772, 2/11/16–2/11/19, “Collaborative Research: Characterizing and Modeling Crustal Recycling”  
NSF EAR-1419751, \$173,765, 01/01/15–12/31/16, “Collaborative Research: Did the Pamir gneiss domes and salient form by northward underthrusting of India or southward subduction and rollback of Asia?”  
NSF EAR-1429648, \$524,244, 08/01/14–7/31/17, “MRI: Acquisition of a Thermal Ionization Mass Spectrometer (TIMS) for high-precision isotopic research of the Earth’s mantle, crust and oceans”  
NSF EAR-1348003, \$304,644, 03/01/14–2/28/17, “What Causes UHT Metamorphism? Lengthscales and Timescales”  
NSF EAR-1249703, \$92,091, 03/01/13–02/28/16, “Collaborative Research: the role of fluids in intermediate-depth seismicity and wedge anisotropy: Case studies for Cascadia and Alaska, with a comparison to Japan”  
NSF EAR-1219942, \$329,323, 08/01/12–07/31/15, “What Determines Whether the Deep Continental Crust Flows?”  
NSF EAR-1008760, \$266,136, 05/01/11–04/31/15, “Collaborative Research: The Suturing Process: Insight from the India–Asia collision zone”  
NSF EAR-0635485, \$188,658, 01/01/09–12/31/12, “Collaborative Research: Testing Channel-flow Models using Middle-crustal Rocks of North Himalayan Gneiss Domes”  
NSF EAR-0838269, \$341,828, 07/01/09–06/30/12, “How Does the Lower Crust Thicken and Grow During Continent Collisions? A Case Study of the Pamir”  
NSF EAR-0911485, \$391,382, 07/01/09–06/30/12, “The Dynamics of UHP Tectonism: Does the Western Gneiss Region Consist of Multiple (U)HP Blocks With Different Histories?”  
NSF EAR-0923552, \$1,077,500, 09/15/2009–08/31/2011, “MRI: Acquisition of an Electron Microprobe for UCSB Researchers and Educators”  
NSF EAR-0745588, \$162,838, 01/01/08–12/31/10, “Collaborative Research: Using Mineral Physics to Interpret Seismic Anisotropy of Basin & Range Crust”  
NSF EAR-742451, \$141,339, 06/01/08–05/31/10, “Collaborative Research: Element Recycling from UHP Metasediments: Evidence and Consequences”  
NSF EAR-0545441, \$138,744, 01/01/06–12/31/09, “Collaborative Research: EarthScope integrated investigation of Cascadia subduction zone tremor, structure and process”  
NSF EAR-0607775, \$312,317, 07/01/07–06/30/09, “Collaborative Research: How Is Rifting Exhuming the Youngest HP/UHP Rocks on Earth?”  
NSF EAR-0510453, \$328,180, 07/01/05–6/30/08 “The Assembly of UHP Terranes: Was the Western Gneiss Region Built By Sequential or Repeated (Ultra)High-Pressure Events?”  
NSF EAR-0649933, \$389,745, 06/01/07–05/31/08, “Acquisition of a New Electron-Imaging Facility.”

NSF EAR-0632774, \$15,000, 06/15/06–05/31/07, “Support for the Penrose Conference on Arc Crustal Genesis and Evolution; July 9–15, 2006; Valdez, Alaska”

NSF EAR-0309995, \$116,316, 05/01/03–04/30/06, “Direct Observation of Depth Variation in Fault Zone Structure Through and Below the Seismogenic Crust”

NSF EAR-0215641, \$130,127, 9/1/02–10/31/05, “Collaborative Research: Thermal, Petrological, and Seismological Study of Subduction Zones”

NSF EAR-9910899, \$294,463, 08/01/00–07/31/05, “Geology, geochemistry, structure and physical properties of the Talkeetna arc crustal section, south central Alaska”

NSF EAR-0003568, \$218,872, 08/01/01–07/31/05, “Subduction and Exhumation of Ultrahigh-Pressure Rocks: Field and Drilling Studies in Eastern China”

NSF EAR-9814889, \$249,871, 06/01/99–5/31/02, “Exhumation of ultrahigh-pressure rocks in the Scandinavian Caledonides”

NSF EAR-9809840, \$93,730, 07/01/98–6/30/01, “Collaborative Research: The Thermal, Petrological and Seismological Structure of Subducting Oceanic Lithosphere”

NSF EAR-9725667, \$59,988, 07/01/98–6/30/00, “Collaborative Research: Petrotectonic Study of Ultrahigh-Pressure Rocks from the Kokchetav Massif, Northern Kazakhstan, and the Maksyutov Complex, South Ural Mountains, Russia”

NSF EAR-9728643, \$49,988, 01/01/98–12/31/99, “Collaborative Research: Structure of the Crust and Upper Mantle Beneath the Tibetan Plateau Interior.”

NSF EAR-9417958, later EAR-9796119, \$300,131, 03/01/95–02/28/98, “Exhumation of Ultrahigh-Pressure Rocks in the Dabie Mountains, Central China.”

DE-FG03-93ER14366, \$319,996, 11/01/93–11/01/96, “Experimental Investigation of Kinetics and Rheology During Diagenesis.” (written by B.R. Hacker; P.I. J.G. Liou)

NSF EAR-9204741, \$114,262, 09/01/92–02/29/96, “Formation of the Sole of the Oman Ophiolite.” (written by B.R. Hacker; P.I. M.O. McWilliams)

PRF 27528-AC2, \$48,564, 06/01/93–08/31/95, “Experimental Investigation of Kinetics and Rheology During Diagenesis.” (written by B.R. Hacker; P.I. J.G. Liou)

### POSTDOCTORAL SCHOLARS SUPERVISED

2013–2014 Fulbright Fellow Daniel Viete

2011–2013 Matthijs Smit

2011–2013 Ellen Kooijman

2010–2011 Sarah Brownlee

2010–2011 Hans Vrijmoed

2009–2010 Stacia Gordon

2004–2005 Jeremy Hourigan

2002–2003 Swiss National Fonds Postdoctoral Fellow Martyn Robyr

2001–2003 University of California President’s Postdoctoral Fellow Mary Leech

1995–1996 Swiss National Fonds Postdoctoral Fellow Edwin Gnos

### ADVISEES RECEIVING DEGREES

2015	Forrest Horton: Himalaya gneiss dome formation, focused radiogenic heating in southern Madagascar, and fertilization of the Neoproterozoic ocean by mantle-derived phosphorus	Ph.D.	postdoctoral scholar, Caltech
2014	Robert Holder: Monazite Trace-Element and Isotopic Signatures of Ultrahigh-Pressure Metamorphism: Examples from the Western Gneiss Region, Norway	M.S.	Ph.D. student, UCSB
2014	Michael Stearns: Genesis and Evolution of the Pamir Plateau: A Petrochronologic View	Ph.D.	University of Utah, researcher
2011	Katherine Spencer: Exhumation history of the Western Gneiss Region, Norway from Titanite Geochronology	M.S.	Aurora Geoscience

2011	Adam Ginsburg: UHP Tectonism of the Western Gneiss Region, Zircon U-Pb Geochronology	M.S.	Campbell Geo, Inc.
2011	Steven Arauza: Absence of Trace-Element Zoning Identifies Reset Lu-Hf and Sm-Nd Garnet Ages	M.S.	TX
2011	Monica Erdman: Velocity Anisotropy of Basin and Range Lower Crust from Electron-Backscatter Diffraction	M.S.	Ph.D. student, Rice
2010	Jennifer McGraw: Exhumation Depths of the Lower Crustal Domes of the Pamir	M.S.	Ph.D. student, Lehigh
2009	Emily Peterman: The Development and Use of Monazite and Garnet Geochronology with Application to Tectonic Processes	Ph.D.	Bowdoin College Prof
2008	Nicolas Barth: Strain within the Ultrahigh-Pressure Western Gneiss Region of Norway Recorded by Quartz LPOs	M.S.	U Otago PhD student
2008	Andrew Kylander-Clark: Slow Subduction and Exhumation of a Thick Ultrahigh-Pressure Terrane: Western Gneiss Region, Norway	Ph.D.	UCSB Development Engineer
2006	Scott Johnston: The Evolution of the Nordfjord–Sogn Detachment Zone and the Exhumation of Norwegian Ultrahigh-Pressure Rocks	Ph.D.	Cal Poly Prof
2006	Joshua Cole: Fault-Zone Deformation and Strain Partitioning at the Brittle–Ductile Transition, SEMP Fault, Austrian Alps	M.S.	REI, Seattle
2006	Matthew Rioux: “The Growth and Differentiation of Arc Crust: Temporal and Geochemical Evolution of the Accreted Talkeetna Arc, South-Central Alaska	Ph.D.	M.I.T. researcher
2005	David Young: “Amphibolite to Ultrahigh-Pressure Transition in Western Norway”	Ph.D.	UT San Antonio prof
2003	Emily O. Walsh: “Exhumation of the Ultrahigh-Pressure/High-Pressure Terrane of the Western Gneiss Region, Norway” (NSF Graduate Fellow)	Ph.D.	Cornell College Prof
2003	David B. Root: “Zircon geochronology of ultrahigh-pressure eclogites and exhumation of the Western Gneiss Region, southern Norway”	Ph.D.	Boston
2002	Luc Mehl: “Arc-parallel flow within the mantle wedge: Evidence from the accreted Talkeetna arc, south central Alaska”	M.S.	Alaska Pacific University instructor

### UNDERGRADUATE SENIOR THESES COMPLETED

2014–2015	Adam Arce
2013–2014	Colin Eckhart
2011–2012	Jon Munnikhuis
2010–2011	James Worthington
2009–2010	Monica Erdman
2009–2010	Hannah McKay
1999–2000	Christopher Mattinson
1998–1999	Javier Santillan

### PUBLISHED BOOKS AND THESES

1. Hacker, B.R., 1978, *The Cashier*: Apple Computer, Inc., Cupertino, California, c. 100 pp.
2. Hacker, B.R., 1979, *The Silentye Operation and Reference Manual*: Apple Computer, Inc., Cupertino, California, 63 pp.
3. Hacker, B.R., 1980, *Apple /// Apple Business BASIC Reference Manual*: Apple Computer, Inc., Cupertino, California, 165 pp.
4. Hacker, B.R., 1982, *Imagewriter User's Manual*: Apple Computer, Inc., Cupertino, California, 120 pp.

5. Hacker, B.R., 1983, *Apple /// Pascal Technical Reference Manual*: Apple Computer, Inc., Cupertino, California, 168 pp.
6. Hacker, B.R., 1984, Stratigraphy and Structure of the Yuba Rivers Area, Central Belt, Northern Sierra Nevada, California: M.S. Thesis, University of California, Davis, 125 pp.
7. Rose, C., Hacker, B.R., Anders, R., Withey, K., Metzler, M., Chernicoff, S., Espinosa, C., Averill, A., Davis, B., and Howard, B., 1985, *Inside Macintosh Volume I*: Reading, Massachusetts, Addison-Wesley, 550 pp.
8. Rose, C., Hacker, B.R., Anders, R., Withey, K., Metzler, M., Chernicoff, S., Espinosa, C., Averill, A., Davis, B., and Howard, B., 1985, *Inside Macintosh Volume II*: Reading, Massachusetts, Addison-Wesley, 429 pp.
9. Rose, C., Hacker, B.R., Anders, R., Withey, K., Metzler, M., Chernicoff, S., Espinosa, C., Averill, A., Davis, B., and Howard, B., 1985, *Inside Macintosh Volume III*: Reading, Massachusetts, Addison-Wesley, 281 pp.
10. Hacker, B.R., 1988, *Experimental Deformation and Metamorphism of Amphibolite and Basalt*: Ph.D. Dissertation, University of California, Los Angeles, 364 pp.
11. Hacker, B.R. (editor), 1996, *Caves of Gunung Buda*. Good Earth Press, Santa Cruz, CA, 55 pp.
12. Hacker, B.R. (editor), 1998, *Caves of Gunung Buda 1997*. Buda Caves Project, Santa Cruz, CA, 65 pp.
13. Hacker, B.R., and Liou, J.G. (editors), 1998. *When Continents Collide: Geodynamics and Geochemistry of Ultrahigh-Pressure Rocks*. Kluwer Academic Publishers, 323 pp.
14. Hacker, B.R., McClelland, W.C., and Liou, J.G. (editors), 2006. *Ultrahigh-Pressure Metamorphism: Deep Continental Subduction*. Geological Society of America Special Paper 403, 206 pp.

## **PUBLISHED PAPERS**

1. Edelman, S.H., Day, H.W., Moores, E.M., Zigan, S.M., Murphy, T.P., and Hacker, B.R., 1989, *Structure across a Mesozoic ocean-continent suture zone in the northern Sierra Nevada, California*: GSA Special Paper 224, 56 p.
2. Hacker, B.R., and Christie, J.M., 1990, Brittle/ductile and plastic/cataclastic transitions in experimentally deformed and metamorphosed amphibolite, in Duba, A.G., and others, eds., *The Brittle-Ductile Transition in Rocks*: American Geophysical Union Monograph 56, p. 127–147.
3. Hacker, B.R., and Goodge, J.W., 1990, Comparison of Early Mesozoic high-pressure rocks in the Klamath Mountains and Sierra Nevada, in Harwood, D.S. and Miller, M.M., eds., *Paleozoic and early Mesozoic paleogeographic relations; Sierra Nevada, Klamath Mountains, and related terranes*: GSA Special Paper 255, 277–296.
4. Hacker, B.R., and Peacock, S.M., 1990, Comparison of the Central Metamorphic Belt and Trinity terrane of the Klamath Mountains and the Feather River Terrane of the Sierra Nevada, in Harwood, D.S. and Miller, M.M., eds., *Paleozoic and early Mesozoic paleogeographic relations; Sierra Nevada, Klamath Mountains, and related terranes*: GSA Special Paper 255, 75–92.
5. Hacker, B.R., 1990, Simulation of the metamorphic and deformational history of the metamorphic sole of the Oman ophiolite: *Journal of Geophysical Research*, v. 95, p. 4895–4907.
6. Hacker, B.R., Yin, A., Christie, J. M., and Snoke, A.W., 1990, Differential stress, strain rate, and temperatures of mylonitization in the Ruby Mountains: implications for the rate and duration of uplift: *Journal of Geophysical Research*, v. 95, p. 8569–8580.
7. Hacker, B.R., 1990, Amphibolite-facies to granulite-facies reactions in experimentally deformed unpowdered amphibolite: *American Mineralogist*, v. 75, p. 1349–1361.
8. Hacker, B.R., and Christie, J.M., 1991, Observational evidence for a possible new diffusion path: *Science*, v. 251, p. 67–70.
9. Ernst, W.G., Hacker, B.R., Barton, M.D., and Sen, G., 1991, Igneous petrogenesis of magnesian metavolcanic rocks from central Klamath Mountains, northern California: *Geological Society of America Bulletin*, v. 103, p. 56–72.
10. Hacker, B.R., 1991, The role of deformation in the formation of metamorphic field gradients: ridge subduction beneath the Oman ophiolite: *Tectonics*, v. 10, p. 455–473.

11. Hacker, B.R., and Christie, J.M., 1992, Experimental deformation of a glassy basalt: *Tectonophysics*, v. 200, p. 79–96.
12. Hacker, B.R., Ernst, W.G., and Barton, M.D., 1992, Metamorphism, geochemistry, and origin of magnesian volcanic rocks, Klamath Mountains, California: *Journal of Metamorphic Geology*, v. 10, p. 55–69.
13. Hacker, B.R., Yin, A., Christie, J. M., and Davis, G.A., 1992, Stress magnitude, strain rate, and rheology of extended middle crust inferred from quartz grain sizes in the Whipple Mountains, California: *Tectonics*, v. 11, p. 36–46.
14. Hacker, B.R., Kirby, S.H., and Bohlen, S.R., 1992, Time and metamorphic petrology: calcite to aragonite experiments: *Science*, v. 258, p. 110–113.
15. Hacker, B.R., 1993, Evolution of the northern Sierra Nevada metamorphic belt: petrological, structural, and Ar/Ar: *Geological Society of America Bulletin*, v. 105, p. 637–656.
16. Hacker, B.R., Ernst, W.G., and McWilliams, M.O., 1993, Genesis and evolution of a Permian–Jurassic magmatic arc and accretionary wedge, and reevaluation of the terrane concept in the Klamath Mountains: *Tectonics*, v. 12, 387–409.
17. Hacker, B.R., and Ernst, W.G., 1993, Jurassic orogeny in the Klamath Mountains: A geochronological analysis, in Dunne, G.C., and McDougall, K.A., eds., *Mesozoic Paleogeography of the Western United States-II*, Pacific Section Society of Economic Paleontologists and Mineralogists, v. 71, p. 31–60.
18. Hacker, B.R., and Kirby, S.H., 1993, High-pressure deformation of calcite marble and its transformation to aragonite under non-hydrostatic conditions: *Journal of Structural Geology*, v. 15, p. 1207–1222.
19. Hacker, B.R., and Peacock, S.M., 1994, Creation, preservation, and exhumation of UHPM rocks: in Coleman, R.G., and Wang, X., eds., *Ultrahigh pressure metamorphism*: Cambridge University, p. 159–181.
20. Hacker, B.R., 1994, Rapid emplacement of young oceanic lithosphere: Argon geochronology of the Oman ophiolite. *Science*, v. 265, p. 1563–1565.
21. Ernst, W.G., Liou, J.G., and Hacker, B.R., 1994, Petrotectonic significance of high- and ultrahigh-pressure metamorphic belts: inferences for subduction-zone histories. *International Geology Review*, v. 36, pp. 213–237.
22. Hacker, B.R., Donato, M.M., Barnes, C.G., McWilliams, M.O., and Ernst, W.G., 1995, Timescales of orogeny: Jurassic construction of the Klamath Mountains: *Tectonics*, v. 14, pp. 677–703.
23. Barnes, C.G., Donato, M.M., Barnes, M.A., Yule, J.D., Hacker, B.R., and Helper, M.A., 1995, Geochemical compositions of metavolcanic and metasedimentary rocks, Western Jurassic and Western Paleozoic and Triassic belts, Klamath Mountains, Oregon and California. *U.S. Geological Survey Open File Report 95-227-A*, 63 pp.
24. Hacker, B.R., and Wang, Q., 1995, Ar/Ar geochronology of ultrahigh-pressure metamorphism in central China. *Tectonics*, v. 14, pp. 994–1006.
25. Hacker, B.R., Ratschbacher, L., Webb, L., and Dong Shuwen, 1995, What brought them up? Exhumation of the Dabie Shan ultrahigh-pressure rocks. *Geology*, v. 23, pp. 743–746.
26. Hacker, B.R., Wang, X., Eide, E.A., and Ratschbacher, L., 1996, The Qinling–Dabie ultrahigh-pressure collisional orogen. In *The Tectonics of Asia*, edited by An Yin and T.M. Harrison, pp. 345–370.
27. Lee, J., Miller, M.M., Crippen, R., Hacker, B.R., and Ledesma, J.V., 1996, Middle Miocene extension in the Gulf Extensional Province, Baja California: Evidence from the southern Sierra Juarez. *Geological Society of America Bulletin*, v. 108, pp. 505–525.
28. Dong Shuwen, Ratschbacher, L., Hacker, B.R., and Webb, L., 1996, Exhumation of the Dabie Shan ultrahigh-pressure rocks. *Die Geowissenschaften*, v. 14, pp. 42–43.

29. Hacker, B.R., 1996, Eclogite formation and the rheology, buoyancy, seismicity, and H<sub>2</sub>O content of oceanic crust. in *Dynamics of Subduction*, edited by G.E. Bebout, D. Scholl, S. Kirby, and J.P. Platt: AGU Monograph, pp. 337–346.
30. Hacker, B.R., and Mosenfelder, J.L., 1996, Metamorphism and deformation along the emplacement thrust of the Samail ophiolite, Oman. *Earth and Planetary Science Letters*, v. 144, pp. 435–451.
31. Hacker, B.R., Mosenfelder, J.L., and Gnos, E., 1996, Rapid emplacement of the Oman ophiolite: Thermal and geochronologic constraints. *Tectonics*, v. 15, pp. 1230–1247.
32. Jové, C., and Hacker, B.R., 1997. Experimental investigation of laumontite → wairakite + H<sub>2</sub>O: A model diagenetic reaction. *American Mineralogist*, v. 82, p. 781–789.
33. Hacker, B.R., Sharp, T., Zhang, R.Y., Liou, J.G., and Hervig, R.L., 1997, Determining the origin of ultrahigh-pressure lherzolites. *Science*, v. 278, p. 702–704.
34. Hacker, B.R., Diagenesis and fault-valve seismicity of crustal faults, 1997. *Journal of Geophysical Research*, v. 102, p. 24,459–24,467.
35. Hacker, B.R., and Gnos, E., 1997, The conundrum of Samail: Explaining the metamorphic history. *Tectonophysics*, v. 279, p. 215–226.
36. Zhai, X., Day, H.W., Hacker, B.R., and You, Z., 1998. Paleozoic metamorphism in the Qinling orogen, Tongbai Mountains, central China. *Geology*, v. 26, p. 371–374.
37. Hacker, B.R., 1998, Metamorphic sole of the Samail ophiolite, Oman. in *Fault Related Rocks—A Photographic Atlas*, edited by A.W. Snoke, J.A. Tullis, and V.R. Todd, Princeton University Press, Princeton, N.J., pp. 564–565.
38. Grasemann, B., L. Ratschbacher, and B.R. Hacker, 1998. Exhumation of ultrahigh-pressure rocks: thermal boundary conditions and cooling history, in *When Continents Collide: Geodynamics and Geochemistry of Ultrahigh-Pressure Rocks*, edited by B.R. Hacker and J.G. Liou, Kluwer Academic Publishers, Amsterdam, p. 117–139.
39. Hacker, B.R., Ratschbacher, L., Webb, L., Ireland, T., Walker, D., and Dong, S., 1998. U/Pb zircon ages constrain the architecture of the ultrahigh-pressure Qinling–Dabie Orogen, China. *Earth and Planetary Science Letters*, v. 161, p. 215–230.
40. Miller, D., Negrini, R., McGuire, M., Huggins, C., Minner, M., Hacker, B.R., Sarna–Wojcicki, S., Meyer, C., Fleck, R.J., and Reid, S.A., 1998, New upper age constraint on the Kern River Formation. in Reid, T., *Outcrops of the Eastern San Joaquin Basin*, San Joaquin Geological Society Field Trip Guidebook, pp. 23–31.
41. Dilek, Y., Thy, P., Hacker, B.R., and Grundvig, S., 1999. Structure and Petrology of Tauride Ophiolites and Mafic Dike Intrusions (Turkey): Implications for the Neo-Tethyan Ocean *Geological Society of America Bulletin*, v. 111, p. 1192–1216.
42. Webb, L.E., Hacker, B.R., Ratschbacher, L., and Dong, S., 1999. Thermochronologic constraints on deformation and cooling history of high and ultrahigh-pressure rocks in the Qinling–Dabie orogen, eastern China. *Tectonics*, v. 18, p. 621–638.
43. Schmid, J.C., L. Ratschbacher, B.R. Hacker, I. Gaitzsch, and S. Dong, 1999. How did the foreland react? Yangtze foreland fold-thrust belt deformation related to exhumation of the Dabie Shan ultrahigh-pressure continental crust (eastern China), *Terra Nova*, v. 11, p. 266–272.
44. Wang, C.Y., Zeng, R.S., Mooney, W.D., and Hacker, B.R., 2000, A crustal model of the ultra-high pressure (27 kb) Dabie Shan orogenic belt derived from deep seismic reflection profiling. *Journal of Geophysical Research*, v. 105, p. 10857–10869.
45. Hacker, B.R., Gnos, E., Ratschbacher, L., Grove, M., McWilliams, M.O., Sobolev, S.V., Wan, J., and Wu, Z., 2000. Hot and dry deep crustal xenoliths from Tibet. *Science*, v. 287, p. 2463–2466.
46. Hacker, B.R., Ratschbacher, L., Webb, L.E., McWilliams, M., Calvert, A., Dong, S., Wenk, H.-R., and Chateigner, D., 2000. Exhumation of ultrahigh-pressure rocks in east-central China: Late Triassic–Early Jurassic tectonic unroofing. *Journal of Geophysical Research*, v. 105, p. 13339–13364. f
47. Ratschbacher, L., Hacker, B.R., Webb, L.E., McWilliams, M.O., Ireland, T.R., Dong, S., Calvert, A., Chateigner, D., and Wenk, H.-R., 2000. Exhumation of the ultrahigh-pressure continental crust in

east-central China: Cretaceous and Cenozoic unroofing and the Tan-Lu Fault. *Journal of Geophysical Research*, v. 105, p. 13303–13338.

48. Liou, J.G., Hacker, B.R., and Zhang, R.Y., 2000. Ultrahigh-pressure (UHP) metamorphism in the forbidden zone. *Science*, v. 287, p. 1215–1216 (invited)
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