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Professor Mike Searle

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Research Profile

My main geological interests are the tectonic evolution of mountain belts, in particular processes associated with subduction, ophiolite formation and obduction, folding and thrusting, low-angle normal faults (eg: South Tibetan Detachment), regional metamorphism and crustal melting. I work mainly along the Alpine-Himalayan belt, the Karakoram ranges and Tibetan Plateau region and Southeast Asia (Burma, Thailand, Vietnam, Yunnan). I am also interested in large-scale strike-slip faults, particularly the Karakoram fault, Red River fault, Mae Ping fault, Sagaing fault and Dead Sea fault. My major research projects are in the following areas:

- **Oman Mountains, Arabia (Oman and UAE):** Detailed structural mapping, crustal shortening mechanisms, balanced and restored cross-sections, P-T-t evolution of sub-ophiolite metamorphic rocks and subduction-related blueschists and eclogites, style of folding and thrusting from the foreland fold-thrust belt to carpholite - eclogite facies High-Pressure rocks. Detailed structural mapping of the Musandam peninsula and Dibba zone (Oman and UAE). Obduction mechanisms of the Semail and Masirah ophiolites.
- **Himalaya (Pakistan, India, Nepal, Sikkim, Bhutan):** We are undertaking regional mapping and structural studies in combination with thermobarometry, determining P-T-t paths, metamorphic modeling and U-Th-Pb dating of accessory minerals. The major projects presently active are:
 1. Pliocene-Pleistocene metamorphism, melting and formation of cordierite leucogranites in the Nanga Parbat Syntaxis, Pakistan.
 2. Ultra-High Pressure metamorphism (coesite eclogites) and deep subduction of Indian crust Kaghan (Pakistan) and Tso Morari (India).
 3. Subduction-related metamorphism along the Main Mantle Thrust, Kohistan Arc (Pakistan).
 4. Origin and Emplacement of the Spontang Ophiolite and Indus suture zone, Ladakh (India).
 5. Crustal shortening and thickening mechanisms across Ladakh - Zaskar Himalaya (India).
 6. Structural, metamorphic and magmatic evolution of the Zaskar – Kishtwar High Himalaya (India).
 7. Structural, metamorphic and magmatic evolution of the Garhwal (Shivling, Bhagirathi, Meru) Himalaya (India).
 8. Structural evolution and inverted metamorphism along the Main Central Thrust zone (India, Nepal).
 9. South Tibetan Detachment low-angle normal faulting in the Himalaya (Zaskar, Nepal, South Tibet).
 10. Structural, metamorphic and magmatic evolution of the Annapurna-Manaslu Himalaya (Nepal).

11. Structure, metamorphism and melting in the Langtang – Shisha Pangma Himalaya (Nepal, South Tibet).
 12. Structure, metamorphism, anatexis and leucogranite formation (Channel Flow) in the Everest – Makalu Himalaya (Nepal, South Tibet).
 13. Structure, metamorphism and melting in the Eastern Himalaya (Kangchenjunga, Sikkim, Bhutan).
- Karakoram – Hindu Kush Ranges (Pakistan, Ladakh, SW Tibet): We are undertaking regional mapping and structural studies in combination with thermobarometry, determining P-T-t paths, metamorphic modeling and U-Th-Pb dating of accessory minerals. The major projects presently active are:
 1. Regional mapping of the Central Karakoram Ranges in the Hunza, Biafo, Shimshal, Snow Lake, Baltoro and Hushe regions (North Pakistan).
 2. Baltoro granite batholith petrogenesis, evolution and age in the Latok - Ogre, Trango Towers - Biale, Masherbrum, K7, Kondus and Bilafond glacier regions.
 3. Metamorphic evolution, P-T-t paths, pseudosection modeling and U-Th-Pb dating of accessory minerals along the Karakoram metamorphic complex.
 4. Structural evolution of the Karakoram Fault, K2 - Gasherbrum Ranges, Siachen – Nubra – Pangong region (North Pakistan, North India).
 5. Structural and thermal evolution of the Hindu Kush Ranges, NW Frontier (Pakistan – Afghanistan).
 - Tibetan Plateau: Indus - Tsangpo suture zone ophiolites, ophiolitic mélanges, U-Pb dating of trondhjemites, dacites from ophiolites, stratigraphy and timing of molasse deposits, ultra-potassic dykes; Gangdese granite magmatism and structural evolution of the India-Asia collision zone.
 - Karakoram Fault (Ladakh, Xinjiang, Tibet): Detailed structural mapping in the Tangtse - Muglib profile, the Darbuk-Shyok transect and Nubra valley, Ladakh; microstructural analysis, U-Pb dating of granites, active tectonics in Tangtse-Muglib-Pangong Lake region and Nubra valley, Ladakh.
 - Red River shear zone (Yunnan, Vietnam): Structural mapping of the Ailao Shan, Diancang Shan (Yunnan) and DayNuiConVoi (Vietnam) metamorphic complexes along the Red River shear zone; Sapa metamorphic rocks, FanSiPan alkali granite-syenite; Luc Yen ruby - phlogopite marbles; U-Pb dating of pre- syn- and post-kinematic granites to constrain age of strike-slip ductile shear.
 - Mogok metamorphic belt, Sagaing fault (Burma): Structural mapping of high-grade metamorphic rocks; P-T-t paths of sillimanite and andalusite schists; U-Pb dating of metamorphic and magmatic rocks; tectonic history of the Sagaing fault zone.
 - Mae Ping and Three Pagodas fault (Thailand): Structural mapping combined with regional stratigraphic, seismic, and well data to constrain timing of motion and amount of offset along the faults.
 - Andaman Islands ophiolites (India): Structural mapping, combined with U-Pb dating of gabbro - dacites of the ophiolite sequence and overlying arc-related volcanics.
 - Dead Sea fault (Jordan, Palestine, Lebanon, Syria): Structural mapping combined with Ar-Ar dating of Pliocene - Pleistocene alkali volcanic rocks offset by the Dead Sea fault.
 - Moine thrust zone, Assynt (NW Scotland): Structural mapping, construction of balanced and restored cross-sections and interpretation of the timing and evolution of the Moine thrust zone using cross-cutting relationships of Loch Ailsh and Borralan alkali intrusions.

At Oxford I have supervised 17 D.Phil students working in Oman-U.A.E. (Jon Cox, Clare Warren, Tom Jordan), Zaskar - Ladakh, N.W. Indian Himalaya (Ben Stephenson, James Walker, Richard Corfield, Christian Walker), Kohistan (Simon Gough) Hunza Karakoram (James Fraser), Baltoro Karakoram (Andrew Thow), Karakoram fault in Ladakh (Richard Phillips) Hindu Kush (Peter Hildebrand), SW Tibet (Gavin Chan) and the Everest region, Nepal and Tibet (Robert Simpson, Micah Jessup, John Cottle) and the Makalu region of Nepal (Mike Streule).

Teaching Profile

Anatomy of a Mountain Belt (4th year course)

Selected Publications

- Searle, MP, Elliott, JR, Phillips, RJ, Chung, S-L, (2011) 'Crustal-lithospheric structure and continental extrusion of Tibet', *JOURNAL OF THE GEOLOGICAL SOCIETY*. pp. 633-672 doi: [10.1144/0016-76492010-139](https://doi.org/10.1144/0016-76492010-139)
- Searle, MP, Parrish, RR, Thow, AV, Noble, SR, Phillips, RJ, Waters, DJ, (2010) 'Anatomy, age and evolution of a collisional mountain belt: the Baltoro granite batholith and Karakoram Metamorphic Complex, Pakistani Karakoram', *JOURNAL OF THE GEOLOGICAL SOCIETY*. pp. 183-202 doi: [10.1144/0016-76492009-043](https://doi.org/10.1144/0016-76492009-043)
- Searle, MP, Law, RD, Dewey, JF, Streule, MJ, (2010) 'Relationships between the Loch Ailsh and Borralan alkaline intrusions and thrusting in the Moine Thrust zone, southern Assynt culmination, NW Scotland', *Geological Society, London, Special Publications*. pp. 383-404 doi: [10.1144/SP335.18](https://doi.org/10.1144/SP335.18)
- Searle, MP, Yeh, M-W, Lin, T-H, Chung, S-L, (2010) 'Structural constraints on the timing of left-lateral shear along the Red River shear zone in the Ailao Shan and Diancang Shan Ranges, Yunnan, SW China', *GEOSPHERE*. pp. 316-338 doi: [10.1130/GES00580.1](https://doi.org/10.1130/GES00580.1)
- Crowley, JL, Waters, DJ, Searle, MP, Bowring, SA, (2009) 'Pleistocene melting and rapid exhumation of the Nanga Parbat massif, Pakistan: Age and P-T conditions of accessory mineral growth in migmatite and leucogranite', *EARTH AND PLANETARY SCIENCE LETTERS*. pp. 408-420 doi: [10.1016/j.epsl.2009.09.044](https://doi.org/10.1016/j.epsl.2009.09.044)
- Cottle, JM, Searle, MP, Horstwood, MSA, Waters, DJ, (2009) 'Timing of Midcrustal Metamorphism, Melting, and Deformation in the Mount Everest Region of Southern Tibet Revealed by U(-Th)-Pb Geochronology', *JOURNAL OF GEOLOGY*. pp. 643-664 doi: [10.1086/605994](https://doi.org/10.1086/605994)
- Searle, MP, Cottle, JM, Streule, MJ, Waters, DJ, (2010) 'Crustal melt granites and migmatites along the Himalaya: melt source, segregation, transport and granite emplacement mechanisms', *EARTH AND ENVIRONMENTAL SCIENCE TRANSACTIONS OF THE ROYAL SOCIETY OF EDINBURGH*. pp. 219-233 doi: [10.1017/S175569100901617X](https://doi.org/10.1017/S175569100901617X)
- Jessup, MJ, Cottle, JM, Searle, MP, Law, RD, Newell, DL, Tracy, RJ, Waters, DJ, (2008) 'P-T-t-D paths of Everest Series schist, Nepal', *JOURNAL OF METAMORPHIC GEOLOGY*. pp. 717-739 doi: [10.1111/j.1525-1314.2008.00784.x](https://doi.org/10.1111/j.1525-1314.2008.00784.x)
- Green, OR, Searle, MP, Corfield, RI, Corfield, RM, (2008) 'Cretaceous-tertiary carbonate platform evolution and the age of the India-Asia collision along the Ladakh Himalaya (northwest India)', *JOURNAL OF GEOLOGY*. pp. 331-353 doi: [10.1086/588831](https://doi.org/10.1086/588831)
- Searle, MP, Law, RD, Godin, L, Larson, KP, Streule, MJ, Cottle, JM, Jessup, MJ, (2008) 'Defining the Himalayan Main Central Thrust in Nepal', *JOURNAL OF THE GEOLOGICAL SOCIETY*. pp. 523-534 doi: [10.1144/0016-76492007-081](https://doi.org/10.1144/0016-76492007-081)
- Searle, MP, Noble, SR, Cottle, JM, Waters, DJ, Mitchell, AHG, Hlaing, T, Horstwood, MSA, (2007) 'Tectonic evolution of the Mogok metamorphic belt, Burma (Myanmar) constrained by U-Th-Pb dating of metamorphic and magmatic rocks', *TECTONICS*. pp. n/a-n/a doi: [10.1029/2006TC002083](https://doi.org/10.1029/2006TC002083)
- Searle, MP, Alsop, GI, (2007) 'Eye-to-eye with a mega-sheath fold: A case study from Wadi Mayh, northern Oman Mountains', *GEOLOGY*. pp. 1043-1046 doi: [10.1130/G23884A.1](https://doi.org/10.1130/G23884A.1)
- Phillips, RJ, Searle, MP, (2007) 'Macrostructural and microstructural architecture of the Karakoram fault: Relationship between magmatism and strike-slip faulting', *TECTONICS*. pp. n/a-n/a doi: [10.1029/2006TC001946](https://doi.org/10.1029/2006TC001946)
- Searle, MP, Phillips, RJ, (2007) 'Relationships between right-lateral shear along the Karakoram fault and metamorphism, magmatism, exhumation and uplift: evidence from the K2-Gasherbrum-Pangong ranges, north Pakistan and Ladakh', *JOURNAL OF THE GEOLOGICAL SOCIETY*. pp. 439-450 doi: [10.1144/0016-76492006-072](https://doi.org/10.1144/0016-76492006-072)
- Searle, MP, Stephenson, B, Walker, J, Walker, C, (2007) 'Restoration of the Western Himalaya: implications for metamorphic protoliths, thrust and normal faulting, and

- Searle, MP, (2007) 'Structural geometry, style and timing of deformation in the Hawasina window, Al Jabal al Akhdar and Saih Hatat culminations, Oman mountains', *GEOARABIA*. pp. 99-130
- Parrish, RR, Gough, SJ, Searle, MP, Waters, DJ, (2006) 'Plate velocity exhumation of ultrahigh-pressure eclogites in the Pakistan Himalaya', *GEOLOGY*. pp. 989-992 doi: [10.1130/G22796A.1](https://doi.org/10.1130/G22796A.1)
- Godin, L, Grujic, D, Law, RD, Searle, MP, (2006) 'Channel flow, ductile extrusion and exhumation in continental collision zones: an introduction', *Geological Society, London, Special Publications*. pp. 1-23 doi: [10.1144/GSL.SP.2006.268.01.01](https://doi.org/10.1144/GSL.SP.2006.268.01.01)
- Searle, MP, Law, RD, Jessup, MJ, (2006) 'Crustal structure, restoration and evolution of the Greater Himalaya in Nepal-South Tibet: implications for channel flow and ductile extrusion of the middle crust', *CHANNEL FLOW, DUCTILE EXTRUSION AND EXHUMATION IN CONTINENTAL COLLISION ZONES*. pp. 355-378 doi: [10.1144/GSL.SP.2006.268.01.17](https://doi.org/10.1144/GSL.SP.2006.268.01.17)
- Searle, MP, (2006) 'Role of the Red River Shear zone, Yunnan and Vietnam, in the continental extrusion of SE Asia', *JOURNAL OF THE GEOLOGICAL SOCIETY*. pp. 1025-1036 doi: [10.1144/0016-76492005-144](https://doi.org/10.1144/0016-76492005-144)
- Jessup, MJ, Law, RD, Searle, MP, Hubbard, MS, (2006) 'Structural evolution and vorticity of flow during extrusion and exhumation of the Greater Himalayan Slab, Mount Everest Massif, Tibet/Nepal: implications for orogen-scale flow partitioning', *Geological Society, London, Special Publications*. pp. 379-413 doi: [10.1144/GSL.SP.2006.268.01.18](https://doi.org/10.1144/GSL.SP.2006.268.01.18)
- St-Onge, MR, Searle, MP, Wodicka, N, (2006) 'Trans-Hudson Orogen of North America and Himalaya-Karakoram-Tibetan Orogen of Asia: Structural and thermal characteristics of the lower and upper plates', *TECTONICS*. pp. n/a-n/a doi: [10.1029/2005TC001907](https://doi.org/10.1029/2005TC001907)
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- Phillips, RJ, Parrish, RR, Searle, MP, (2004) 'Age constraints on ductile deformation and long-term slip rates along the Karakoram fault zone, Ladakh', *EARTH AND PLANETARY SCIENCE LETTERS*. pp. 305-319 doi: [10.1016/j.epsl.2004.07.037](https://doi.org/10.1016/j.epsl.2004.07.037)
- Searle, MP, Warren, CJ, Waters, DJ, Parrish, RR, (2004) 'Structural evolution, metamorphism and restoration of the Arabian continental margin, Saih Hatat region, Oman Mountains', *JOURNAL OF STRUCTURAL GEOLOGY*. pp. 451-473 doi: [10.1016/j.jsg.2003.08.005](https://doi.org/10.1016/j.jsg.2003.08.005)
- Searle, MP, Simpson, RL, Law, RD, Parrish, RR, Waters, DJ, (2003) 'The structural geometry, metamorphic and magmatic evolution of the Everest massif, High Himalaya of Nepal-South Tibet', *JOURNAL OF THE GEOLOGICAL SOCIETY*. pp. 345-366 doi: [10.1144/0016-764902-126](https://doi.org/10.1144/0016-764902-126)
- Searle, MP, Godin, L, (2003) 'The South Tibetan Detachment and the Manaslu Leucogranite: A structural reinterpretation and restoration of the Annapurna-Manaslu Himalaya, Nepal', *JOURNAL OF GEOLOGY*. pp. 505-523 doi: [10.1086/376763](https://doi.org/10.1086/376763)
- Searle, MP, Cox, J, (2002) 'Subduction zone metamorphism during formation and emplacement of the Semail ophiolite in the Oman Mountains', *GEOLOGICAL MAGAZINE*. pp. 241-255 doi: [10.1017/S0016756802006532](https://doi.org/10.1017/S0016756802006532)
- Searle, MP, Cox, J, (2002) 'Subduction zone metamorphism during formation and emplacement of the Semail ophiolite in the Oman Mountains', *Geological Magazine*. pp. 241-255 doi: [10.1017/S0016756802006532](https://doi.org/10.1017/S0016756802006532)

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Published Books

- M.P.Searle, 1991. *The Geology and Tectonics of the Karakoram Mountains*. John Wiley and sons, Chichester 358 p. plus fold out colour map at 1:250,000 scale of the central Karakoram.

Edited

- A.H.F.Robertson, M.P.Searle and A.Ries (Editors), 1990. The Geology and Tectonics of the Oman Region. Geological Society of London Special Publication, 49, 845 p.
- P.J.Treloar and M.P.Searle (Editors), 1993. Himalayan Tectonics . Geological Society of London, Special Publication, 74, 630p.
- M.Asif Khan, P.J.Treloar, M.P.Searle and M.Q.Jan (Editors), 2000. Tectonics of the Nanga Parbat Syntaxis and the Western Himalaya. Geological Society of London, Special Publication, 170, 485p.
- R.D. Law, M.P.Searle and L.Godin (Editors), 2006. Channel Flow, Ductile Extrusion and Exhumation in Continental Collision Zones. Geological Society of London, Special Publication, 268, 620p.

Other Information

Lecturer in the Department of Earth Sciences, Oxford University, and Senior Research Fellow in Worcester College, Oxford.

[Everest Map](#)