

**James W. Hagadorn, PhD**

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**Education**

1998 University of Southern California, PhD  
1995 University of Southern California, M.S.  
1991 University of Pennsylvania, B.A.

**Employment**

July 2002-July 2010 Assistant Professor, Department of Geology, Amherst College  
Sept. 1998-Aug. 2002 Postdoctoral Scholar in Geology, Division of Geological & Planetary Sciences, California Institute of Technology

**Research Goals**

I seek to understand how animals and microbes first impacted ancient Earth environments. By learning how they did this and what changes their activities fostered, my research informs us of how the outer membrane of our planet works – today, in deep time, and potentially in the future.

**Current Research Projects**

1) What triggered the appearance of animals and the onset of biomineralization?: 520-600 million years ago, each of the major groups of shell-building animals appears in an ocean-scale bloom, and then goes extinct. This pattern suggests that a genetic, ecological, or environmental mechanism may be triggering their abrupt appearance and disappearance. In tandem with field-based environmental and geochronological analyses of sedimentary rocks that house these fossils, I have used X-ray CT and petrography to understand the growth and chemical evolution of these fossils. Preliminary work suggests that perturbations in ocean chemistry did not cause these biomineralization events.

2) Why & how did animals colonize land?: Marine animals appear to have colonized land shortly after they appeared in the oceans, yet we do not know what anatomical or behavioral strategies they employed to withstand the vicissitudes of

subaerial exposure, and why they made their initial forays across tidal flats and coastal dunes. Initial work suggests that the first terrestrial pioneers were scorpion-like and slug-like animals that grazed microbial mats in protected, low-energy, low-relief episodically emergent sand flats and associated tidepools.

3) What did prevegetated coastal systems look like and what processes controlled their development? These sandy coastal systems are common in Earth history during times of high sea level, and produce thick packages of sediment that are important oil, natural gas, and water reservoirs. Yet we know very little about what these coastal systems looked like, how they were impacted by tides, waves, and wind, and what processes facilitate their lateral and vertical migration such that they build wedges of sediment thick enough to become substantial rock reservoirs.

4) How do microbes affect landscapes?: Although there has been much progress made on identifying microbial structures in ancient sandstones and identifying modern analogues for these structures, no one has produced any of them in the lab. Thus, we have no idea what suite(s) of conditions control the formation of these structures. Moreover, most of the basic experimental sedimentology work that all geologists use to estimate flow velocities is flawed because it was conducted on sterile sediments. Yet microbes are ubiquitous in every wet environment on Earth – today and in the past – and they secrete sticky substances that dramatically affect the way grains of sand can be moved by physical transport processes. My pilot studies done in a microbe-inoculated laboratory flume confirm this supposition, and suggests that microbes have the potential to control the evolution of entire landscapes – including not only ancient marine landscapes but modern terrestrial settings like those in Colorado.

#### **Five most recent scientific publications:**

Hagadorn, J. W., Collette, J. H., and Belt, E. S., in press, Aeolian-aquatic faunas and facies of the Middle Cambrian Potsdam Group, New York: *Palaios*, 59 ms pp.

Collette, J. H. and Hagadorn, J. W., 2010, Three-dimensionally preserved arthropods from Cambrian Lagerstätten of Quebec and Wisconsin: *Journal of Paleontology*, v. 84, p. 646-667.

Seilacher, A., and Hagadorn, J. W., 2010, Early molluscan evolution: The trace fossil record: *Palaios*, v. 25, p. 565-575.

Hagadorn, J. W., and Seilacher, A., 2009, Hermits 500 million years ago?: *Geology*, v. 37, p. 295–298.

Farrell, U. C., Martin, M. J., Hagadorn, J. W., Whiteley, T., Briggs, D. E. G., 2009, Beyond Beecher's trilobite bed: Widespread pyritization of soft-tissues in the Late Ordovician Taconic foreland basin: *Geology*, v. 37, p. 907-910.

**My best loved popular-science publications:**

Discovery Channel Television, *Renovation Nation*, May 2008.

[http://www3.amherst.edu/~jwhagadorn/65Gothic/HouseVideo/HouseVideo\\_Take1.MPG](http://www3.amherst.edu/~jwhagadorn/65Gothic/HouseVideo/HouseVideo_Take1.MPG)

and

[http://www3.amherst.edu/~jwhagadorn/65Gothic/HouseVideo/HouseVideo\\_Take2.MPG](http://www3.amherst.edu/~jwhagadorn/65Gothic/HouseVideo/HouseVideo_Take2.MPG)

National Geographic Television, *The Shape of Life*, May 2000.

<http://www.amherst.edu/~jwhagadorn/service/YTNatGeo.mov> or

<http://www.amherst.edu/~jwhagadorn/service/YTNatGeo.mpg>

Hagadorn, J. W., 2005, Le Parc des Gallets: A fossil garden: Exhibit text and brochure,  
Parc archéologique de la Pointe du Buisson, 2 p.

Bottjer, D. J., Etter, W., Hagadorn, J.W., and Tang, C.M., 2002, *Exceptional Fossil Preservation: A Unique View on the Evolution of Marine Life*: Columbia University Press, New York.