# MGS Virtual Luncheon Meeting

## Thursday, April 22nd

## 12:00 – 1:00pm

**Open to MGS members via Zoom**

**RSVP to montanageologicalsociety@gmail.com**
**by Wednesday April 21st to receive the Zoom link**

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## DR. NANCY HINMAN

**UNIVERSITY OF MONTANA, MISSOULA, MT**


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## Photochemical processes in hot springs – the reactive oxygen species story.

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Reactive oxygen species (ROS) are highly reactive molecules formed largely by photochemical reactions in surface waters and through biological activity. ROS are widespread, shape aquatic redox chemistry, and control biogeochemical cycles of redox-sensitive elements (Fe, S, O, and C). Of interest to this study, ROS can oxidize $Fe^{2+}$ to $Fe^{3+}$ in otherwise reducing conditions. This is important in biosignature preservation as $Fe^{3+}$ can then bind to cell membranes. Biosignatures are substances, objects, or patterns that provide evidence of past life. Rapid binding (i.e. entombment) can preserve complex organic molecules and cellular structures (i.e. biosignatures). Recent studies have found that entombment by $Fe^{3+}$, specifically, increases the potential for preservation. In hot spring systems, ROS are the primary oxidants and, thereby, determine Fe-oxidation rates and biosignature preservation potential. In most aquatic systems, ROS formation is typically controlled by photoreactions with dissolved organic carbon. However, Fe redox reactions more likely control ROS formation in Fe-bearing systems. Field and laboratory experiments were conducted in hot springs of Yellowstone National Park to better understand these coupled systems.


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## Biography

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Nancy Hinman, Ph.D., is a professor in the Geosciences Department at the University of Montana. Her work focuses mainly on biotic and abiotic chemical processes in natural systems that affect solution and mineral composition. She has focused on processes affecting concentrations of ROS and reactions of Fe-oxide minerals. She has conducted field work in thermal springs of Yellowstone National Park, El Tatio, Chile, and the Valley of Geysers, Kamchatka, Russia, as well as cold springs in western Montana. Current projects include photochemical processes; mineral composition, deposition, and diagenesis; identification of biosignatures; identification of organic matter dissolved in hot springs; and microbial interactions. On these projects, she collaborates with researchers at NASA- Ames Research Center, SETI Institute, Helmholtz Institute, Pacific Northwest National Laboratory, and universities from around the U.S. and the world. She received her BA in Chemistry from Reed College and her Ph.D. in Oceanography (Marine Chemistry) from Scripps Institution of Oceanography.