Ancient microbe-sediment systems of the barberton greenstone belt, South Africa

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Southern part of the Barberton Greenstone Belt, South Africa, shows mafic/ultramafic volcanics and cherts of the Kromberg Formation, Onverwacht Group, in the foreground and to the right, looking SSW toward the reddish-colored sediments of the Fig Tree and Moodies Groups at the Swaziland border. See the open-access article by Frances Westall et al. Credit: Westall et al., *Geology*, 2015.

The modern sedimentary environment contains a diversity of microbes

that interact very closely with the sediments, sometimes to such an extent that they form "biosediments." But can such a phenomenon be fossilized? How far back in time can "biosedimentation" be traced? In this study for *Geology*, Frances Westall and colleagues examine some of the oldest rocks on Earth—in the Barberton Greenstone Belt, South Africa (older than 3.3 billion years), to answer this question.

Westall and colleagues use multi-scale methods to document the simultaneous presence of diverse types of microorganisms, including phototrophs and chemotrophs, directly interacting with coastal volcanic sediments that were bathed by hydrothermal fluids. They note that the hydrothermal fluids acted as a major nutrient source for the chemotrophic microbial communities and thus strongly controlled their development and distribution, while distribution of the photosynthetic biofilms was, of course, controlled by access to sunlight.

The silica-rich hydrothermal fluids also contributed to the rapid fossilization of the microbes and lithification of the sediments, fixing the diversity of microbial life and their interactions with the sediments for posterity. Westall and colleagues thus show that intricate microbe-sediment systems are deep-rooted in time and that at least some early life may indeed have been thermophilic.

More information: Archean (3.33 Ga) microbe-sediment systems were diverse and flourished in a hydrothermal context, Frances Westall et al., Centre de Biophysique Moléculaire (CBM), Centre National de la Recherche Scientifique (CNRS), Orléans, France. Published online ahead of print on 26 May 2015; http://dx.doi.org/10.1130/G36646.1. This article is OPEN ACCESS online.

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