## **IODP** Proposal Cover Sheet

921 - APL

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Hole 896A Biosphere Restoration

Title	Restoring and sampling ODP Hole 896A for linked crustal, fluid, and biosphere studies						
Proponents	Beth Orcutt, Geoff Wheat, Keir Becker, Brandi Kiel Reese						
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Keywords	Deep biosphere, observatory, hydrogeology  Area  Costa Rica Rift						
Proponent Information							
Proponent	Beth Orcutt						
Affiliation	Bigelow Laboratory for Ocean Sciences						
Country	United States						
	Permission is granted to post the coversheet/site table on www.iodn.org						

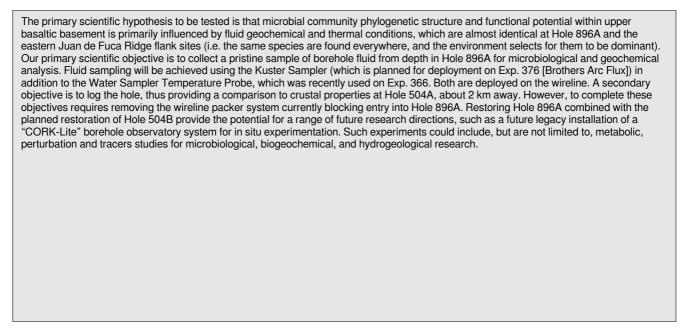
## Abstract

Leveraging the proximity and activities of planned Expedition 384 Panama Basin Crustal Architecture to restore Hole 504B by removing an observatory to enable new logging, we propose a 3-4 day APL to visit the nearby (<2 km away) Hole 896A to remove a similar borehole observatory and sample the deep biosphere. Hole 896A represents an opportunistic analogue to the Juan de Fuca Ridge flank system (i.e. IODP Expeditions 301 and 327), allowing hypothesis-testing pertaining to the diversity and function of the microbial deep biosphere within basaltic crust. Hole 896A was originally drilled in 1993 to a total depth of 469 meters below seafloor, penetrating 290 m of basaltic basement with an age of 6-7 Ma. Upper basement conditions at this site are very similar to the Juan de Fuca Ridge flank, experiencing hydrothermal (58°C) and chemicallyreduced and highly altered fluids that circulate in relatively young basaltic crust. Hole 896A was revisited in 2001 during which wireline operations revealed the presence of flocculent material in the basement portion of the borehole. This material suspiciously resembled flocculent microbial mat material observed at 'snow blower' hydrothermal vents. Initial evaluation of flocculent material that was opportunistically scraped from wireline tools confirms the presence of biofilm-forming microorganisms, yet the compositions of the microbial communities were distinctly different from those observed in the Juan de Fuca Ridge flank subsurface, even though thermal and chemical compositions are nearly identical. Differences may suggest site-specific characteristics influence the structure of subsurface crustal microbial communities, or that temporal events may influence composition (as has been observed at the Juan de Fuca). We propose to restore Hole 896A with the operational goals of (1) removing a stuck wireline packer system from the borehole, (2) conducting wireline operations with advanced temperature and fluid sampling tools to collect samples for microbiological and geochemical analyses, and (3) time permitting, log the hole to complement currently scheduled logging in Hole 504B. Similar operations are planned for Expedition 384 in Hole 504B, so the technical expertise, tools, and sensors will be on site. Currently Hole 896A is inaccessible; however, the proposed operations will not only make this legacy hole available to future cutting-edge coupled microbiological, biogeochemical and hydrologic experiments but also will provide initial samples to facilitate and direct research directions. Proposed operations will further the current IODP science plan, advancing Biosphere Frontiers and other challenges (e.g., 10 and 14).

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## Scientific Objectives



Non-standard measurements technology needed to achieve the proposed scientific objectives

Removal of the wireline CORK that is stuck in Hole 896A will require a fishing tool, and removing the packer will require either a fishing overshot or a mill to grind it up. Such tools will already be onboard to conduct similar operations at Hole 504B during Expedition 384. Wireline operations will require a sampler to collect fluid from the borehole. We propose using the Kuster Sampler (planned for deployment on Exp. 376) and/or the Water Sampler Temperature Probe (used on Exp. 366). Logging operations would require the sample tool suite that will be used in Hole 504B.

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## Proposed Sites (Total proposed sites: 1; pri: 1; alt: 0; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)		(m)	Drief Cita angaifia Objectives
			Sed	Bsm	Total	Brief Site-specific Objectives
CRR-01A (Primary)	1.2168 -83.7232	3459	0	0	0	Removal of the wireline CORK that is stuck in Hole 896A will require a fishing tool, and removing the packer will require either a fishing overshot or a mill to grind it up. Such tools will already be onboard to conduct similar operations at Hole 504B during Expedition 384. Wireline operations will require a sampler to collect fluid from the borehole. We propose using the Kuster Sampler (planned for deployment on Exp. 376) and/or the Water Sampler Temperature Probe (used on Exp. 366). Logging operations would require the sample tool suite that will be used in Hole 504B.

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