

WATER QUALITY MONITORING

Development and Commercialization of Autonomous Chemical and Biological Instrumentation for Water Quality Monitoring

Principal Investigators:

- Christopher Palmer · Department of Chemistry and Biochemistry · UM
- Michael DeGrandpre · Department of Chemistry and Biochemistry · UM
- Orion Berryman · Department of Chemistry and Biochemistry · UM
- Steve Amish · Montana Conservation Genetics Laboratory · UM
- Gordon Luikart · Flathead Lake Biological Station · UM

Funding Amount: \$1,292,398

Brief:

Approximately 50 percent of all U.S. streams, lakes and groundwater are impacted by human pollution and development. The aim of this research team is to develop and commercialize a suite of autonomous environmental measurement and sampling systems for monitoring Montana's water resources. The specific objectives are 1) develop an arsenic sensor for groundwater; 2) build a portable analyzer to detect undesirable nutrients and organic pollutants; 3) apply cutting edge environmental DNA (eDNA) testing for early detection of aquatic invasive species and 4) develop and commercialize an autonomous water quality monitoring system for stream alkalinity and pH.

Objectives and Progress:

1. A selective compound for arsenate has been synthesized and assessment of arsenate binding is currently underway.
2. A sensitive method for analysis of anionic nutrients has been developed and the components for a portable nutrient analyzer have been assembled.
3. Active engagement in Montana's response to the detection of invasive mussels in the Missouri River Basin. Additional samples have been collected and are being analyzed to help inform management agencies. Began development of a prototype for the autonomous collection of DNA samples.
4. A system for measuring stream alkalinity has been built and is currently being tested.

Return on Investment:

- **Jobs (FTE)**
 - 4 research scientists & technicians
 - 6 graduate students
 - 4 undergraduate students
 - 1.5 postdoctoral researchers



Christopher Palmer
Department of Chemistry and
Biochemistry
Chem 203A
University of Montana
406-272-5637
christopher.palmer@umontana.edu

continued

- **Connections – private sector partnerships:**

- Sunburst Sensors—Missoula
- Big Sky Machining—Superior
- Vintage Lab Tech, LLC—Missoula
- S&K Electronics—Ronan

- **Leverage – additional grant funds received:**

- Sunburst Sensors’ two XPRIZE awards (\$1.5M)
- Berryman NSF CAREER award (\$675K)
- Luikart/Flathead Lake Biological Station secured \$125k in additional funding for eDNA research and monitoring from anonymous private donors.
- DeGrandpre Murdock Commercialization Grant (\$120K)

- **Output**

- Patents
 - Berryman—1 new application
 - DeGrandpre—1 to be issued in March 2017
 - Amish/Luikart—1 new application
- Publications from the grant support
 - Berryman—3
 - DeGrandpre—1
 - Palmer—1
- Educational/Public Outreach
 - Luikart: speaker, Science on Tap at Flathead Lake Biological Station on Aquatic Invasive Mussels in Montana; KPAX TV, Flathead researchers seek new ways to fight invasive mussels
 - Berryman: spectrUM chemistry camp lab tours; “Building with Biology” spectrUM event
 - DeGrandpre: STEMfest 2015, State Science Fair keynote speaker, Three Forks High School demonstration day

