Written Testimony of Eric Roy, Scientific Founder | Hydroviv

Field Hearing: Addressing the Lead Crisis Through Innovation & Technology before the United States House of Representatives Committee on Science, Space, and Technology

October 15, 2019

Thank you Chairwoman Sherrill, Ranking member Norman, and members of the subcommittee for your invitation to share my views on how scientist-entrepreneurs can be better supported by the Federal Government to develop technologies that predict, detect, and treat water quality issues like the crisis currently underway in Newark. While today's testimony is informed by my experience working at companies that were funded by or sold technology to the Department of Defense, Department of Homeland Security, Environmental Protection Agency (EPA), I am not speaking on behalf of any of these employers or organizations.

Hydroviv is a water filter company that I started as a charitable effort in response to the Flint lead crisis. At the time, I was working for a startup that developed technology used by First Responders and Military personnel to detect chemical warfare agents, explosives, illegal drugs, and other hazardous substances. I was able to use my experience in chemistry and advanced materials as well as my manufacturing connections to build custom water filters that could handle Flint's lead levels, and donated them to families and child-centric organizations. This was never intended to be anything more than a charitable effort run from my apartment, but public awareness of water quality problems in the US has continued to grow, which eventually led to Hydroviv launching nationwide on Shark Tank this past April.

From this and other entrepreneurial pursuits dealing with water, I've learned that companies working on water quality problems face barriers getting their technology in the field that are not encountered by companies that develop solutions for other interests of the Federal Government like defense and homeland security. In this testimony, I will focus on two specific areas where I believe the Federal Government can help reduce these barriers.

The first barrier faced by entrepreneurs that work on water quality problems is fundamental access to the highest priority problems. For these high-priority interests, it would be beneficial for federal agencies to align private sector, academic, and government stakeholders in the same way that they do for Defense and Homeland Security priorities. This deliberate alignment is different than what I've encountered with federal agencies that work on water.

A recent example relevant to this hearing has to do with the water filters that were distributed by the City of Newark to families with high levels of lead in their water. Despite being rated to remove lead, these filters were surprisingly ineffective under real-world conditions, and scientists from various government and academic organizations are actively researching why this is the case. However, according to the scientists that I've spoken to who are working on this problem, the scope of their work is limited to researching the problem and does aim to make improvements to water filtration technology, which is ultimately the problem that needs to be

solved. Moreover, the results of these studies won't be published for months, or even years, which means that the scientists and engineers who are in a position to make improvements on filtration technology have to wait before they can start working on the solution. Active alignment of these scientists by federal agencies would undoubtedly shorten the time it takes to get improved filtration technologies in the hands of impacted citizens.

The second thing I'd like to discuss today is a cost barrier faced by companies that are looking to transition technology from the laboratory to the public. Cost-effective third party validation is a major barrier to entry for water-centric technologies. Without it, technology developers struggle to establish their products as credible and distance themselves from ineffective products that use marketing gimmicks. This is particularly common in the consumer products space because most consumers don't have the expertise or access to tools that would allow them to evaluate a technical product, and the certifying bodies that the government points consumers to for validated products are cost-prohibitive, and therefore serve as a barrier to market entry.

For security interests, the Federal Government reduces these types of barriers by establishing cost-effective programs and providing access to "proving grounds" that allow technology developers to validate their products under real-world conditions so they can go to market. If this existed for companies working on water quality, a successful trial would establish credibility and enable them to go to market with a municipal pilot project or raise investment so they would be able to pay for the costly certifications that governments point consumers to. In turn more prediction, diagnostic, and treatment technologies would graduate from the laboratory to the public, and as a result these innovation areas would become more attractive to outside investment.

I've seen first-hand how alignment between government, academic, and private sector stakeholders can shorten the time to market and lead to more effective technologies. I want to thank everyone for their time and I would be happy to work with members of this subcommittee on anything that has been discussed today.

Eric G. Roy, Ph.D.
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EDUCATION

2004 Colby College. Chemistry (ACS Degree). BA.
2009 University of Maine. Sensor Science, Engineering, and Informatics. Certificate
2009 University of Maine. Laboratory for Surface Science & Technology/Oceanography (Advisors: Mark Wells, Carl Tripp)

EMPLOYMENT

July 2015-Present	Scientific Founder, Hydroviv, LLC.
Mar 2016-July 2017	Strategic Program Manager, Cobalt Light Systems Inc (Acquired by Agilent Technologies Inc.)
Jan 2014-Mar 2016	Product Manager, Rigaku Analytical Devices
2010-Jan 2014	Chief Scientist. Orono Spectral Solutions Inc.
2008-2010	Founder & Consultant. Perspective Environmental Solutions
2008-2010	Research Scientist. Orono Spectral Solutions Inc.
2006 - 2008	NSF IGERT Fellow. University of Maine
2005 - 2006	NSF GK-12 Fellow. University of Maine

GRANTS AND CONTRACTS AWARDED (AS PI OR Co-PI)

Amount: $7,345,926
Awarding Agency: US Army RDECOM # W911SR-10-C-0064
Title: Chemical Point Detection - Development of new methodologies for the preconcentration and identification of low levels of chemical and biological hazards in water and air

Amount: $1,088,298
Awarding Agency: US Army, SBIR (Phase II) (PI) # W911SR12C0052
Title: Self Reporting Field Detection System Based on Phase I

Amount: $80,000
Awarding Agency: US EPA SBIR (Phase I) (PI) # EP-D-12-011
Title: Preconcentration Technology for Field Analysis of Organophosphates in Water

Amount: $150,000
Awarding Agency: US Army SBIR (Phase I) (PI) # W911SR11C0051
Title: Surface Modified M8 Chemical Agent Detector Paper for Facilities Monitoring

SELECTED PUBLICATIONS

(1) **Roy, E. G**., M. L. Wells, and D. W. King. 2008. The Persistence of Fe(II) in Subarctic Pacific Surface Waters. Limnology and Oceanography 53: 89-98.

(2) **Roy, E. G**., C. Jiang, M. L. Wells, and C. P. Tripp. 2008. Determining Subnanomolar Iron Concentrations in Oceanic Seawater Using a Siderophore-Modified Film Analyzed by Infrared Spectroscopy. Analytical Chemistry 80: 4689-4695.

(3) Reddy, C.V., **Roy, E.G**., Doucette L.D., and C.P. Tripp. 2010. The Use of Reactive Thin Films for IR-based Detection of Toxic Compounds in Water. IEEE Sensors. 10 (3): 604-607

(4) **Roy, E.G.** and M. L. Wells. 2011. Evidence for Regulation of Fe(II) Oxidation Rates by Organic Complexing Ligands in the Eastern Subarctic Pacific. Marine Chemistry 127: 115-122.

(5) Xiu, P., A. P. Palacz, F. Chai, **E. G. Roy**, and M. L. Wells (2011), Iron Flux Induced by Haida Eddies in the Gulf of Alaska. Geophysical Research Letters 38, L13607.

(6) Chappell, P.D., Whitney, L.P., Haddock, T.L., Menden-Deuer, S., **Roy, E.G**., Wells, M.L., and B.D. Jenkins. 2013. *Thalassiosira* spp. Community Composition Shifts in Response to Chemical and Physical Forcing in the Northeast Pacific Ocean. Frontiers in Microbiology 4: 273.

(7) **Roy, E.G**., Wilcox, P., Hoffland, S., and Pardoe, I. 2015. Detection of Munitions Grade G-Series Nerve Agents Using Raman Excitation at 1064 nm. SPIE Vol. 9455.

(8) **Roy, E.G.,** Dentinger, C., and Robotham, C. 2015. Detection of Homemade Explosives Using Raman Excitation at 1064 nm. SPIE Vol. 9455.

SELECTED PRESENTATIONS, SEMINARS, AND INVITED TALKS

The Persistence of Fe(II) in Surface Waters of the Iron-limited Subarctic Pacific. 2006 Ocean Sciences Meeting, Honolulu, HI. Oral Presentation.

Scientists Teaching Science: A Novel Way to Introduce the Scientific Method to Grade K-12 Students. 2006 Ocean Sciences Meeting, Honolulu, HI. Poster Presentation.

Evidence for Biological Control of Fe(II) Oxidation Rates in Surface Waters of the Eastern and Western Subarctic Pacific. 2007 ASLO/AGU/TOS Meeting, Santa Fe, NM. Oral Presentation.

Development of a Reactive Film to Measure Iron in Seawater Using Infrared Spectroscopy. 2008 European Geosciences Union General Assembly. Vienna, Austria. Oral Presentation.

Cutting-Edge Analytical Methods to Make Ultratrace Iron Measurements in Seawater: An Interdisciplinary Problem Solving Approach. Invited Speaker: Colby College Seminar Series, Fall 2008.

Chip-Based Detection of Dissolved Iron in Natural Seawater Using a Siderophore-Based Biosensor. 2008 Ocean Sciences Meeting, Orlando, FL. Oral Presentation.

Evidence for Control of Fe(II) Oxidation Rates by Strong Fe(III) Complexing Organic Ligands in Eastern Subarctic Pacific Surface Waters. 2009 ASLO/AGU/TOS Meeting. Nice, France. Oral Presentation.

Development of a Reactive Film to Measure Iron in Seawater Using Infrared Spectroscopy. 2009 ASLO/AGU/TOS Meeting. Nice, France. Oral Presentation.

Development and Use of a Reactive Biomimetic Film to Measure Trace Iron Concentrations in Natural Seawater. 2010 Ocean Sciences Meeting, Portland, OR. Oral Presentation.

** During his time at OSS, Rigaku, Cobalt Light Systems, and Agilent, Dr. Roy has also given over 30 external presentations as a technical expert to Industry Stakeholder Technical Committees on topics pertaining to reactive materials enabling the detection, identification, and measurement of toxic substances and explosives and over 35 external presentations as a subject matter expert in sensing technologies for environmental and safety/security applications