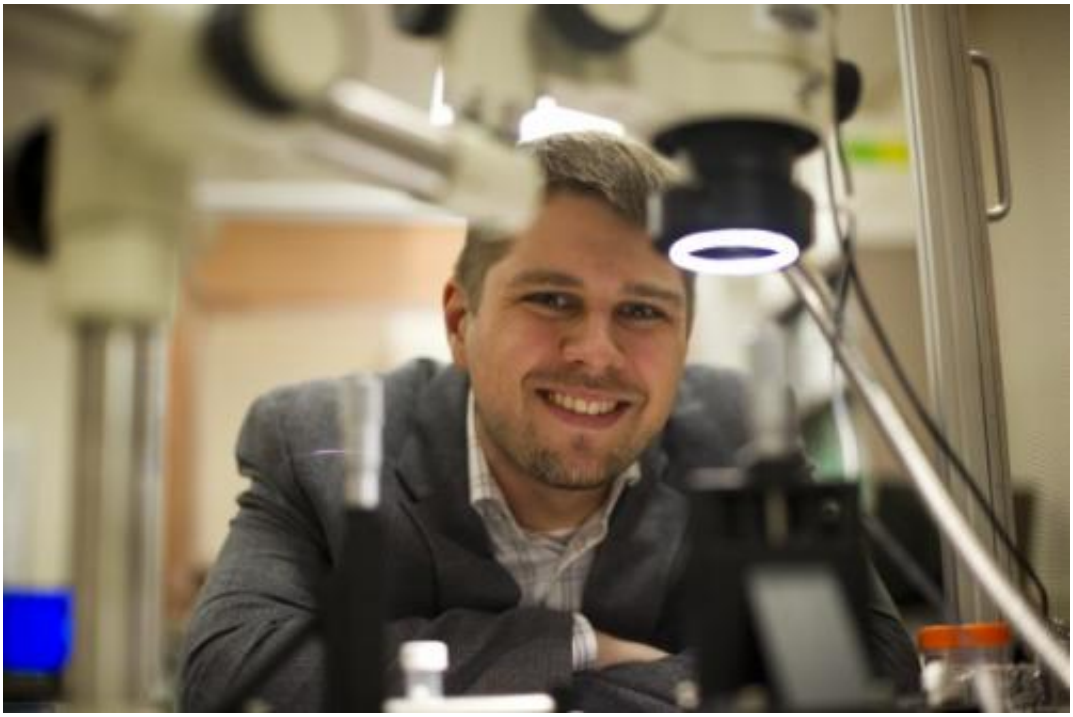
New device will help identify the millions of bacteria that populate the world

July 3 2014



DiPietro Assistant Professor of Chemical Engineering Ed Goluch has developed a device that could allow microbiologists to isolate previously uncultivable bacteria from the wild. Credit: Brooks Canaday/Northeastern University

Millions of microbial species populate the world, but so far only a few have been identified due to the inability of most microbes to grow in the laboratory. Edgar Goluch, an engineer, and Slava Epstein, a biologist, aim to change this. The pair, both researchers at Northeastern University, has developed a device that allows scientists to cultivate a

single species of bacteria that can then be studied and identified.

Goluch's previous research devices incorporated permeable membranes that allow sequestered bacteria to be exposed to the nutrients and molecules of their native environment. But natural competition between species, even in the wild, has so far limited the number of species of bacteria that biologists have been able to isolate with these methods and in traditional lab settings.

Goluch and Epstein's device, detailed in a paper released July 1 in the journal *PLOS ONE*, solves this problem. This new device permits just a single bacterial cell to enter an inner chamber containing a food source, to which the only access is a microscopic passageway just slightly narrower than a single cell. The passageway is so small that the first cell to enter it gets stuck, blocking entry by any other cell or species. Once inside, this cell pro-liferates as in previous devices, and when it does it fills up the inner chamber with a pure, single-species sample, since it is isolated from competition from other species.

In the paper, the team demonstrates the device's ability to separate mixtures of cell types in a laboratory setting. In one experiment, the researchers separated two different bacterial species whose cells are slightly different sizes—*E. coli* and *P. aueruginosa*. In a second experiment, they isolated a combination of similarly sized but differently shaped species that commonly show up together in the marine environment—*Roseobacter sp*. and *Pscyhoserpens sp*. Finally, they used the device to separate cells of the same species that had been differentially tagged to glow either red or green. This final experiment validates the hypothesis that the cells grown inside the food chamber are daughters of the single cell caught in the entryway. Epstein will test the devices in the biological setting beginning this month during a research trip to Greenland.

Going forward, funding from an Instrument Development Biological Research Grant from the National Science Foundation will enable Goluch and his team of engineers to begin optimizing the device and its manufacture on a larger scale.

Provided by Northeastern University