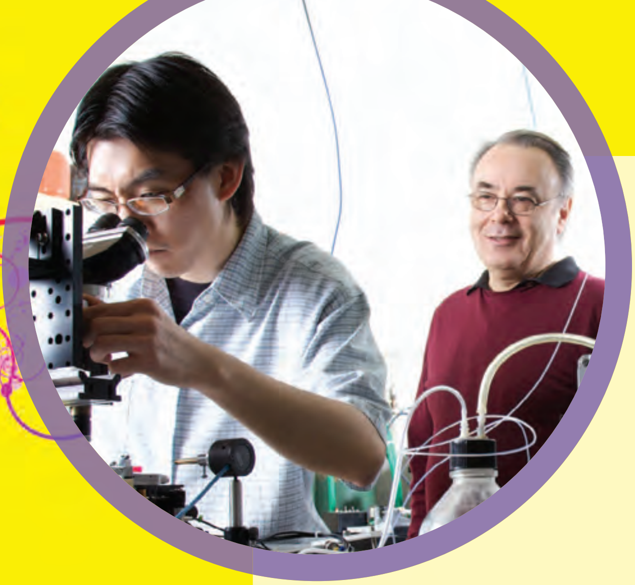


David Keng, left, and Stephen Arnold

Top seeded

Last March, New York University Provost David McLaughlin announced the first 15 research collaborations between NYU and NYU-Poly faculty to receive ***"seed"*** funding from a special competitive research pool.

As that first batch of projects nears completion, results are beginning to pour in -- and more than a few good ideas have taken root.

Stephen Arnold, Thomas Potts Professor of Physics and Institute Professor of Chemistry and Physics, remembers the Eureka moment when he solved the physical puzzle at the heart of his project.

Arnold works with light-powered sensors to detect nanoparticles suspended in solution. Each sensor consists of a miniature glass bead, or microsphere; laser light is made to circle endlessly around the interior of the bead, generating a light field just beyond it. Particles moving through the field create fluctuations in it, thereby, revealing their presence.

But sensing rates seem to be much faster than they should be, given how slowly one would expect particles to drift randomly toward the sensor. So Arnold, who applied for seed funding with NYU physicist **David Grier**, asked David Keng, an NYU-Poly graduate student, to run some tests on the particles floating around a sensor in his lab.

"He ran back into the lab after around an hour and said, 'They're in orbit!'" Arnold recalls. "I remembered that I distinctly said,'We're moving them with massless particles; I think we've created an optical tractor beam.'" (To see what Keng saw, go to NYU-Poly's channel on YouTube.com and search for "Whispering Gallery Mode Carousel.")

After months of more detailed measurements, Arnold confirmed that the light field around the sensor was indeed driving the particles around the sphere, while simultaneously pulling them towards it 50 times faster than one would expect. The phenomenon could be used to build biodetectors capable of rapidly sensing something as small as a single influenza virus.

Arnold recently won a $400,000 grant from the National Science Foundation to continue this research, and has filed a patent on several inventions that could flow from it.

Nikhil Gupta, an assistant professor of mechanical and aerospace engineering at NYU-Poly, and **Paulo Coelho**, assistant professor from NYU's Department of Biomaterials and Biomimetics, chose to investigate multiple aspects of how natural and man-made composite materials behave under pressure. Now they're reaping multiple rewards. "We're probably going to have to start dividing this thing into three or four different pieces," Coelho says.

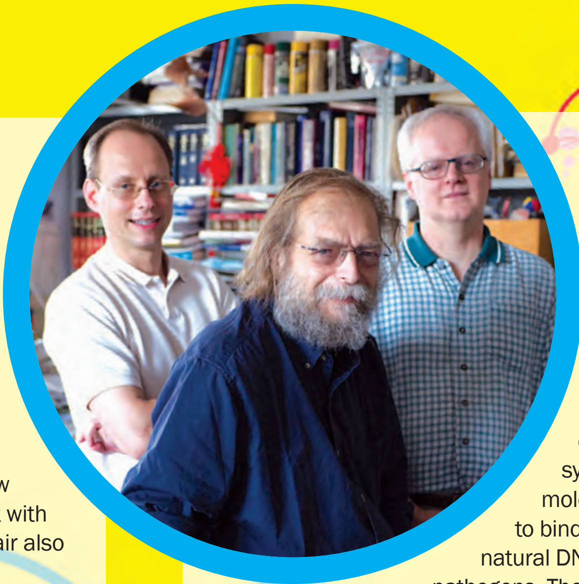
In addition to running computer simulations of how bones shift around biomedical implants, a subject with implications for dentistry and orthopaedics, the pair also looked at how the engineered composites used in battlefield armor and the natural ones that comprise bone behave when battered by shockwaves—a topic of considerable interest to the military.

"There are two problems when IEDs explode," says Gupta, referring to the improvised explosive devices that have wreaked havoc on American troops in Iraq. "All the debris, the gravel and sand covering the IED, are accelerated. If people are wearing ballistic armor, that can save them from the impact. But it can't protect them from the shockwave, which passes right through it."

Using specialized equipment built by Gupta and his students, the researchers examined how rabbit femur bones held up under pressure. "It's important to see how they fracture, and what the mechanisms are, in order to reverse-engineer armor that would protect against shockwaves," Coelho says. They also studied the microscopic structure of engineered composites that are used to make protective gear.

Vasanth Shunmugasamy, an NYU-Poly student who did much of the testing and analysis, received an award for the master's thesis he wrote summarizing the work. And Gupta along with Assistant Professor Maurizio Porfiri has already landed a $2 million grant from the navy to study marine composites for blast and impact response.

Nikhil Gupta, left, and Paulo Coelho



L-R, Rastislav Levicky, Nadrian Seeman and James Canary

Call it a match made in heaven–or at least in the lab. **Rastislav Levicky**, an associate professor of chemical and biological engineering, uses a synthetic DNA-like molecule called morpholino to bind with and identify the natural DNA from dangerous pathogens. The NYU chemists **James Canary** and **Nadrian Seeman** use both natural and synthetic DNA to assemble nanoscale structures. By pooling their respective expertise, both groups came out ahead.

Canary and Seeman, for example, borrowed Levicky's technical know-how to learn more about morpholino and how they might use it. "We drew on his expertise to test out some structural characteristics of the molecule, to see if we could incorporate it into our designs," Canary says.

And Levicky drew on his colleagues' expertise to better understand exactly how natural and synthetic DNA bind to one another—a crucial step towards building a commercially viable biodetector, which could happen within a year or two.

Now Levicky would like to begin testing a synthetic DNA molecule that Canary and Seeman have developed. They, in turn, are already planning additional experiments of their own.

"We're learning a lot from each other," Levicky says, "and we're very much looking forward to continuing this productive collaboration."

To date, three rounds of seed grants have initiated 33 collaborative research projects involving researchers from eight departments at NYU-Poly and seven schools of NYU. Several projects have already resulted in joint publications and in follow-on research proposals to federal funding agencies such as the National Science Foundation and the National Institutes of Health.