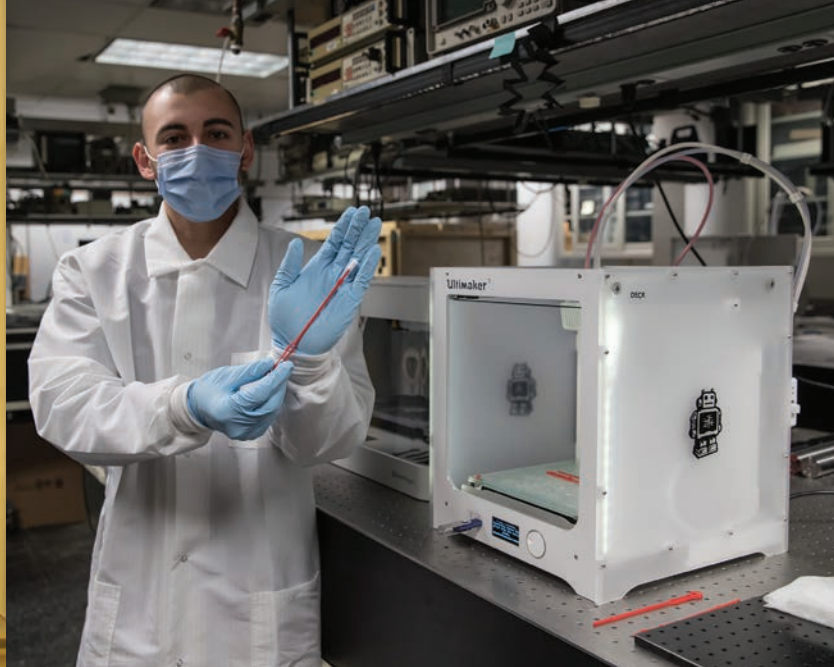


# NJIT's COVID CAVALRY

**When the Pandemic Dimmed**

**Campus Lights, Highlanders**

**Roared Back With Ingenuity and Grit**



In mid-March, the COVID-19 pandemic abruptly shuttered classrooms, laboratories and workspaces across the campus. But no sooner were the lights extinguished than the global NJIT community — stretching from Newark to China — mobilized to address the unprecedented global crisis.

To aid front-line workers, students and faculty with 3D printers and other fabrication technology designed and produced thousands of pieces of personal protective equipment (PPE) such as masks and face shields. Graduates working in hospitals and on emergency crews reached out to us for help, while generous alumni thousands of miles away provided equipment and funds to support us. Researchers in remote labs began creating novel methods to track, test and neutralize the virus.

To bolster societal infrastructure, health care experts from NJIT's New Jersey Innovation Institute are helping hospitals and practitioners navigate this turbulent period, while advising companies looking to make timely use of their technologies and manufacturing capabilities. A tech-savvy alumnus, now a judge, has taught about 2,500 lawyers, judges and law clerks to conduct court cases virtually.

Looking to the future, Atam Dhawan, senior vice provost for research, is helping to organize a large-scale national initiative to fast-track the development of innovative SARS-CoV-2 diagnostic tests to facilitate our safe return to normal life. A humanities professor is joining with scientists, economists, educators and others to prepare for a post-pandemic "sustainability transition."

*Top: Nicholas Warholak '19 is a designer on a team of NJIT physicists and advanced manufacturing specialists that created a novel test swab that can be 3D-printed using inexpensive, widely available materials and speedily assembled in a range of fabrication settings. They are making the design available, free of charge, during the COVID-19 pandemic. The device grips the swabbing material like forceps and ejects it into a sample vial hands-free.*



*Left: Daniel Brateris, director of experiential learning at NJIT's Newark College of Engineering, tries on a face shield that was designed and fabricated in the Makerspace at NJIT. Created for health care workers and emergency responders in Northern New Jersey, the shield is cut from clear polycarbonate plastic and can be sanitized and reused.*

*Bottom: Justin Suriano (left), manager of the Makerspace, also dons the shield prototype.*

## ON THE FRONT LINES

As emergency response teams in the region scrambled to acquire dwindling medical supplies to combat the surge in COVID-19 infections, diverse members of the NJIT community — from engineers to physicists to advanced manufacturing specialists to students — began designing and fabricating devices to help address the shortfall.

Students, faculty and staff at the Makerspace at NJIT have, as of May 15, produced 3,500 face shields for health care workers and emergency responders in Northern New Jersey. “Our goal was to build something as cleanly as possible that is easily sanitized and reusable,” said Daniel Brateris, director of experiential learning at NJIT’s Newark College of Engineering. The shields made in Makerspace are cut from clear polycarbonate plastic and can withstand even industrial-grade cleansers.

Responding to a design challenge issued by Albert Dorman Honors College, Greg Tanis, the engineering student who won the contest’s award, has, with the assistance of friends, produced nearly 1,500 face shields so far. Laura Gould, a Dorman architecture student, has so far made more than 1,200 masks for hospitals, emergency rooms and community organizations in the New York-metro region.

Inspired by these efforts, NJIT students and their collaborators formed The CommonHealth Project, a startup organization with a face-shield design they are producing through a crowdsourced assembly model. A team of teachers in Morris and Essex counties, led by NJIT alumna Jessica Liatys ’10, has produced

hundreds of masks, face shields and well over 1,000 ear guards. Concerned alumni, including some from China, have sent the university 13,000 face masks to help with the onslaught.

## INVENTION HUBS

A team of NJIT physicists has developed a novel test swab that can be 3D-printed using inexpensive, widely available materials and speedily assembled in a range of fabrication settings. To augment the nation’s testing capabilities, the inventors are making the swab’s design publicly available, free of charge, to large and small manufacturers.

The developers, from NJIT’s Additive Manufacturing Lab (AddLab), posted the design on the National Institutes of Health’s 3D Print Exchange website, which provides technology related to biomedical science that is readily compatible with 3D printers. While they filed a provisional patent on the design in mid-April, they say it’s important to make it available immediately. Basic medical supplies, including swabs, are still in short supply.

“Broad testing is essential to contain the spread of the virus,” said John Federici, director of the AddLab. The design has novel features that simplify fabrication and



**"WE NEED TO QUICKLY IMPROVE THE ACCURACY OF TESTS — THEIR SENSITIVITY AND SELECTIVITY — AND THEIR SPEED IN DELIVERING RESULTS. WE MUST ALSO MAKE THEM INEXPENSIVE AND USER-FRIENDLY SO THAT PEOPLE CAN, IN SOME CASES, USE THEM AT HOME AND SEND THE RESULTS THROUGH MOBILE DEVICES TO DATA NETWORKS. THIS WILL ALLOW US TO HELP INDIVIDUALS AND TRACK THE DISEASE THROUGHOUT THE POPULATION."**

- Atam Dhawan, Senior Vice Provost for Research and one of the organizers of a national initiative to fast-track the development of innovative SARS-CoV-2 diagnostic tests

storage, minimize material waste and reduce contamination risk. The device consists of two interlocking arms that work together, like forceps, to grip the swabbing material. By sliding the two arms against each other, the device can eject the sample, depositing it into a vial with no need to handle it.

A team of environmental engineers at NJIT is developing a new way to track the spread of SARS-CoV-2, the novel coronavirus, by combining advanced statistical methods with models that incorporate environmental conditions, such as wind speed, temperature and social distancing.

To date, modelers are largely tracking the growth in the number of cases and adjusting their projections as the numbers change, attributing flattening curves, for example, to social measures. With funding from a National Science Foundation RAPID (Rapid Response Research) grant, the NJIT team is creating a model that will include these and other parameters to make their predictions.

"We want to add the physical dimension to models, taking into account the mechanisms by which the disease spreads, to explain a large jump in cases in a location, for example, or the differences in rates of increase in different cities in the same region, as well as the connections among them," said Michel Boufadel, director of NJIT's Center for Natural Resources and a co-principal investigator of the grant.

The team aims to pin down critical points where infections accelerate, as in subways and grocery stores, and suggest ways to modulate the spread. In an indoor area, for example, these actions could hypothetically include finding means to diffuse the viral load, which may influence the severity of the disease, by introducing fresh, uncontaminated air.

#### **AT THE OPERATIONAL CENTER OF HOSPITALS AND THE COURT SYSTEM**

NJIT's New Jersey Innovation Institute (NJII) works with hospitals and health

care practitioners in the state to modernize and improve their systems for delivering evidence-based care, safely sharing patient information and providing critical data on diagnoses, admissions and discharges to the New Jersey Department of Health.

During the pandemic, the institute is working with hospitals and health care practitioners to ensure that all 71 hospitals in the state report COVID-19 related data as completely and accurately as possible to track and validate the spread of the disease and assess its impact on the population. NJII experts are also advising hospitals and practitioners on everything from how to apply for funding in order to keep their facilities open, to understand changes in the regulatory environment and to shift to telemedicine.

The institute is connecting hospitals in need of supplies, from masks and shields, to mobile devices, to clinical equipment, with manufacturers and distributors. NJII has, for example, identified providers of N95 masks and face shields and portable, trailer-based negative pressure isolation wards for the New Jersey Economic Development Authority, University Hospital and Hackensack Meridian Health.

On March 15, Stuart Rabner, chief justice of the New Jersey Supreme Court, suspended in-person proceedings in Superior Court, giving the judiciary two days to prepare for cases in virtual courtrooms. The next day, Passaic County Superior Court Judge Sohail Mohammed '88, a former electrical engineer and technology enthusiast, got to work.

In a series of Zoom conferences, Mohammed has taught about 2,500 attorneys, judges and law clerks the mechanics of conducting a case by phone, tablet and videoconference: how to virtually interview witnesses, take pleas from imprisoned defendants, send encrypted documents and create breakout rooms on Zoom so attorneys and their clients can confer privately during a trial.

In late April, he began preparing municipal court attorneys, judges and





*Left: Laura Gould, a third-year architecture student and Albert Dorman Honors College Scholar, has created more than 1,200 masks for hospitals, emergency rooms and community organizations in the New York-metro region. "My mother and I heard about the 100 Million Masks challenge in Washington, and we were really excited about the opportunity to serve the community. My thought process was basically, 'I don't have any medical experience, but I **can** sew, so I would be remiss not to help during this public health crisis.'"*

*Bottom: Gould's masks in a multicolored array.*

staff to take their cases virtual at the end of the month.

"Virtual courtrooms are not physical, but they're real," Mohammed told New Jersey Bar Association members honing their skills in one of his April Zoom workshops. So far, the courts have conducted more than 1,200 remote proceedings with 80,000 participants. From his own basement, Mohammed, a Family Court judge, has presided over arraignments, pleas, sentences and emergent motions.

"It has been critical to keep the doors of justice open and provide access to the courts in a situation such as this," Mohammed said. "We'll see more virtual courtrooms five years

down the line. Because of the COVID-19 pandemic, we were able to use technology to provide greater access to justice."

### SHAPING THE POST-PANDEMIC WORLD

Atam Dhawan, senior vice provost for research, is helping to organize a large-scale national initiative to fast-track the development of innovative SARS-CoV-2 diagnostic tests to assist the public's safe return to normal life. The National Institutes of Health (NIH) program, Rapid Acceleration of Diagnostics, will spend up to \$500 million over the next several months on promising technologies aimed at increasing

the nation's testing capacity by up to 100-fold.

The goal is to deliver new testing procedures to the public as soon as late summer and to make SARS-CoV-2 testing readily available to every American. Dhawan chairs the national advisory board of NIH's Point of Care Technology Research Network, which will coordinate the program's review of the anticipated thousands of proposals.

The National Institute of Biomedical Imaging and Bioengineering is currently soliciting ideas for both innovative point-of-care and home-based tests and improvements to clinical laboratory tests. The agency will support not just research on new methods, but their







Front-line heroes on the Lyndhurst Police Emergency Squad: (from left) Captain Tarcisio Nunes '08, Constantine Baltzis '20, Elizabeth DeCarlo '14 and John Fontanetta, M.D., the squad's medical director, who approved NJIT's face-shield design.

**"IT HAS BEEN CRITICAL TO KEEP THE DOORS OF JUSTICE OPEN AND PROVIDE ACCESS TO THE COURTS IN A SITUATION SUCH AS THIS."**

- Passaic County Superior Court Judge Sohail Mohammed '88

development, validation, commercialization and distribution.

"We need to quickly improve the accuracy of tests — their sensitivity and selectivity — and their speed in delivering results. We must also make them inexpensive and user-friendly so that people can, in some cases, use them at home and send the results through mobile devices to data networks. This will allow us to help individuals and track the disease throughout the population," Dhawan said. "We are learning important lessons that will enhance our preparation for future disease outbreaks and other disasters."

What does the global slowdown mean for the environment and sustainable living, and especially if some of the radical changes in everyday lifestyles and consumption habits persist long term? Earlier this spring, the topic brought together a diverse group of scientists, economists, educators and hundreds more around the world virtually during a live webinar titled, "COVID-19 Can Help Wealthier Nations Prepare for a Sustainability Transition."

"Few of us imagined that we would be looking into the eye of a cold stop shutdown of significant parts of the global economy," said Maurie Cohen, professor at NJIT's Department of Humanities and a host at

the event. "We designed this session as a platform to consider how the fundamental cultural and political narrative of our times is inevitably going to change, and in perhaps radical ways."

The online event — inspired by Cohen and colleagues on behalf of the Future Earth Knowledge-Action Network on Systems of Sustainable Consumption and Production — highlighted the need for sustainability issues and initiatives to take a prominent place in coming post-COVID-19 economic recovery plans. Participants weighed in from their living spaces and varied time zones, stretching from Japan and Australia to the West Coast of North America.

"The NJIT community is nimble, strategic and united in the face of a challenge. Together, we are harnessing our technical acumen, organizational skills, entrepreneurial drive and generosity to help the nation navigate this public health crisis," remarked NJIT President Joel Bloom. "Our students, faculty, staff, trustees and alumni are problem-solvers who possess great talent and fierce determination. They give me reason for optimism and hope." ■

*Author: Tracey L. Regan is an NJIT Magazine contributing writer.*