INSIGHT

TAPPING INNOVATIVE SOLUTIONS & TECHNOLOGY AT JOHNS HOPKINS MEDICINE

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High-Powered Computing Center Boosts Big-Data Analysis

The Maryland Advanced Research Computing Center (MARCC) democratizes the big data revolution, giving researchers the computing muscle they need for enormous projects like analyzing human genetic activity, creating three-dimensional maps of the universe and peering into the human heart.

Natalia Trayanova and her computational cardiology team are using MRI scans, heart-specific proteins and other data to create highly detailed, digital simulations of patients' hearts. Zooming in to the molecular level or out to see the entire beating organ, researchers can pinpoint problem areas and test different treatments on a computer screen—considerably less invasive than an operating table.

This complex work, which could one day transform cardiac care, takes place at computing centers on the Homewood campus of The Johns Hopkins University. Some of the simulations run on many processors at once, so the work often has to wait, sometimes for weeks, until a sufficient number of machines are available at the same time, says Trayanova, who holds joint appointments in the school of medicine and Whiting School of Engineering.

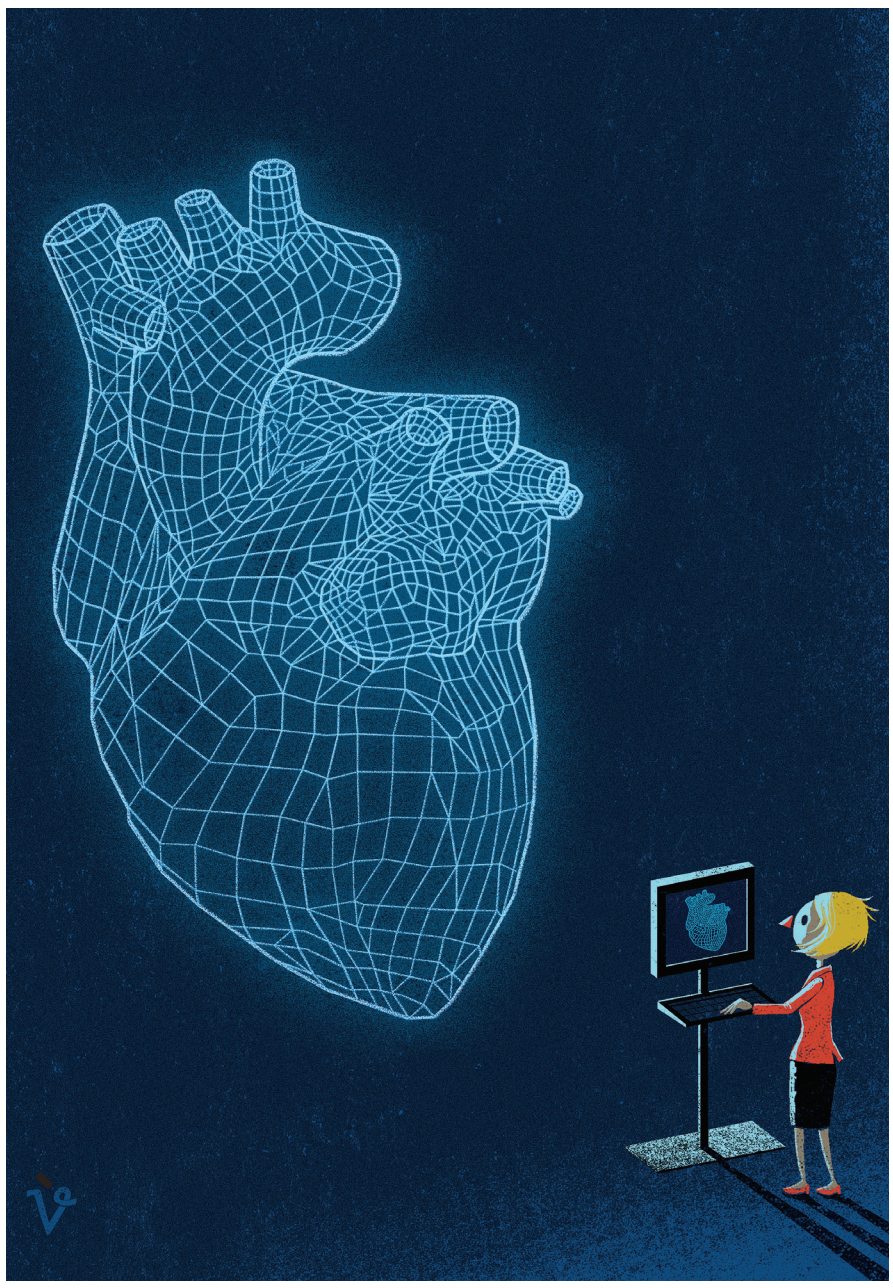
That's why she can barely contain her enthusiasm for last month's opening of MARCC (pronounced "MAR-see") at Johns Hopkins Bayview Medical Center. "Excitement is too mild a word," she says.

Built with $30 million from the state of Maryland, MARCC is the largest high-performance computing center in a mid-Atlantic academic setting, with more than 19,000 processors and 17 petabytes of storage capacity—equal to more than 20,000 home computers.

The 3,786-square-foot center is shared by the Johns Hopkins University School of Medicine, Bloomberg School of Public Health, Krieger School of Arts and Sciences, Whiting School of Engineering, and the University of Maryland, College Park. Fiber-optic cables connect the campuses at a speed of 100 gigabits per second, up to 10,000 times faster than a home Internet connection. Eighty percent of MARCC's computing power is already spoken for, but the Johns Hopkins Bayview lot has space for four additional modules.

The goal is to put high-powered computing within reach of all researchers. For Trayanova, that means her cardiac simulations can proceed without skipping a beat.

For more information or to open a MARCC account, visit http://marcc.jhu.edu/.



VIGG, THREE IN THE BOX

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Bedside App Engages Patients, Families and Care Team in the ICU

Glance around the surgical intensive care unit (ICU) and you might see people interacting with a new app. Developed at Johns Hopkins, the app aims to make patients and their families feel more comfortable during an ICU stay.

The app includes an interactive display detailing the equipment in an ICU room, a profile where people can upload a picture and share personal information so the care team can get to know a patient better, a goals section to identify what patients would like to accomplish during their visit, and a menu of activities for family members to do to help provide care for their loved one.

Accessible through iPads in the surgical ICU rooms, the information entered by patients and families is automatically shared with health care providers.

"This is the first time we have given a vehicle to patients and families to feel integrated as part of the health care team," says Rhonda Wyskiel, innovation coordinator for the Armstrong Institute and former ICU nurse. "There is no other technical intervention like this that truly engages families and caregivers at the bedside."

The app, called the Patient and Family Portal, includes the Family Involvement Menu, an idea that Wyskiel had when her mother was sick in an ICU. "I felt helpless and frustrated when I wasn't allowed to help her," she says. "I went back to work and realized I was forcing the same kind of rules and regulations on my patients."

Instead of setting rules, Wyskiel started involving family members. She soon created a list of things with which family members could help, such as brushing a patient's hair, helping them to eat or repositioning a patient in bed. She laminated the menu and hung it on the walls of patient rooms.

"People started using it," she says, "and family members had the opportunity to provide care for their loved ones in the hospital."

Years later, the menu is a key aspect of the app, a project funded by the Gordon and Betty Moore Foundation to eliminate harms and involve family in ICU care.

WEB EXTRA:
See a slideshow of the app at hopkinsmedicine.org/insight.

TECH/ENVY

A look at innovative developments outside the halls of Johns Hopkins Medicine

Doximity Offers HIPAA-Secure App

Doximity, a physician-only **social network** associated with *U.S. News & World Report*'s annual Best Hospitals survey, has launched an app for the **Apple Watch** that provides a hands-free, HIPAA-secure way for doctors to communicate about patient care.

Using the app, doctors can send and receive messages, get fax notifications, and manage colleague invites. Specific features include:

• Read and Respond: Doctors can read previews or full messages from other physicians at a glance and dictate responses hands-free.

• Incoming Fax Alerts: Physicians are notified of new faxes received on their free personal fax number. To view the full fax, doctors can automatically use Handoff to handle the message on their iPhone.

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A bionic pancreas that automatically makes a decision about insulin and glucagon dosing every five minutes is being tested by researchers at **Boston University** and **Massachusetts General Hospital**. Engineers have developed a system that uses continuous glucose monitoring along with subcutaneous delivery of rapid-acting insulin (to lower blood glucose) and glucagon (to raise blood glucose) as directed by a computer algorithm.

The monitoring and delivery of insulin and glucagon is controlled via an iPhone app. The goal is to reduce the impact of diabetes until a cure is found.

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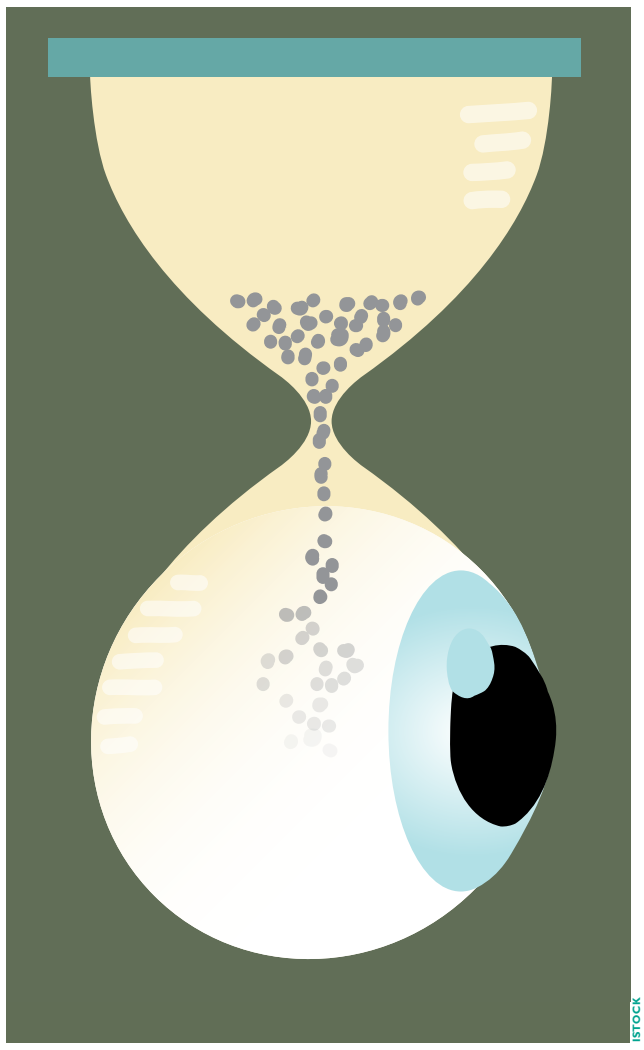
Secure, cloud-based storage of anonymized health data is now available through **IBM Watson**, an artificial intelligence system. Its new branch, **Watson Health**, will deliver this information to hospitals, researchers, physicians, insurers and patients.

The company has joined forces with **Apple, Johnson & Johnson, Medtronic** and others to improve collaboration and access to the ever-expanding wealth of medical data generated by researchers and patients, who are increasingly reporting data via personal devices.

In this effort, IBM also has announced collaborations with academic medical centers, including the **Memorial Sloan Kettering Cancer Center** and **Cleveland Clinic.**

Nanoparticles Curtail Rejection of Corneal Transplants in Lab Studies

Researchers at the Center for Nanomedicine have developed tiny particles smaller than 100 nanometers in size—or 1,000 times smaller than the thickness of a newspaper page—that have successfully preserved corneal transplants in mice.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"We are excited about this technology and the potential it has to receive funding to go into a clinical trial," says Justin Hanes, director of the Center for Nanomedicine at the Wilmer Eye Institute."Medication is released uniformly over time from tiny particles made of biodegradable plastics."

Eye disease specialist Walter Stark worked with Hanes and his team to create the drug-eluting nanoparticles that stay in place when injected to slowly and steadily administer medication. In preclinical animal studies, the innovation was 100 percent effective.

All the animals treated with the therapy once a week for nine weeks had clear corneal transplants. All those that did not receive the treatment eventually rejected their transplants.

In people, 10 to 20 percent of the 40,000 corneal transplants that take place each year are rejected. The cornea is the clear, dome-shaped surface that covers the front of the eye; injuries or diseases to it can cause blindness.

One reason for the high rate of rejection is that patients aren't using their eye drops as prescribed. Traditional therapy requires eye drops every hour or two during the first week after surgery, and then at regular intervals for a year or longer.

The ultimate goal of the new technology is to inject the nanoparticles in patients' eyes during surgery for a corneal transplant so they do not need to take eye drops as frequently after surgery. The slow release of medications over time avoids the problems of poor medication compliance, which happens in up to 80 percent of patients.

Researchers are using the same type of drug delivery system for other conditions, such as glaucoma and macular degeneration.

WEB EXTRA:
Learn more about the power of nanoparticles from Elizabeth Nance, who worked with Justin Hanes and was named one of *Forbes'* 30 Under 30 scientists. Visit hopkinsmedicine.org/insight.

Q&A: Finding the Right Project Management Tools

Insight caught up with Sallyann Koontz to get the scoop on what systems work well in the Johns Hopkins Medicine environment.

On an average day, the Johns Hopkins Medicine Internet strategy team has a portfolio of 120 projects being guided between concept and completion. To keep the process streamlined and orderly, project manager Sallyann Koontz relies on several project management and collaboration tools. *Insight* caught up with her to get the scoop on what systems work well in the Johns Hopkins Medicine environment.

What's the difference between project management and collaboration tools?

Project management tools allow teams to move a many-faceted project through multiple stages. A collaboration tool allows individuals to exchange ideas, but it doesn't assist with organizing, scheduling or keeping track of steps and stages.

What are the three primary attributes you look for in a project management tools?

- Ease of use – It should be intuitive, with functionality similar to other tools—email or Word, for example.
- Accessibility – Can you access the tool anywhere, on any device?
- Features – It should allow for scheduling, timelines, communication, file uploading and sharing.

What project management tools meet your criteria?

Basecamp allows multiple groups or cross-functional teams to seamlessly interact across stages and deliverables. It can be used for large and small projects, and it exists in a secure environment that is encrypted and backed up daily. Near and dear to any project manager's heart are timelines, and Basecamp is excellent at those.

Trello is best for small, focused teams. Providing an at-a-glance view for detailed projects, Trello is more nimble than Basecamp. However, its calendar and file storage functions are not as sophisticated as those in Basecamp.

Let's go back to the collaboration tools. What are some examples?

Google Docs is great. However, there are security concerns with Google Docs, which is part of the reason Johns Hopkins discourages its use. And honestly, it's also really slow.

JHBox is recommended by the institution. This platform offers cloud-based file sharing in a secure environment, with real-time collaborations.

Chatter is a collaboration tool that the Marketing and Communications Department will soon pilot. This tool from Salesforce gives users from different project groups, teams and events the ability to share messages, files and videos. I would call it Basecamp lite.

Any other recommendations?

For personal productivity, I like **Evernote**. It lets you take and save notes anywhere, any time, on any device. Love that!


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