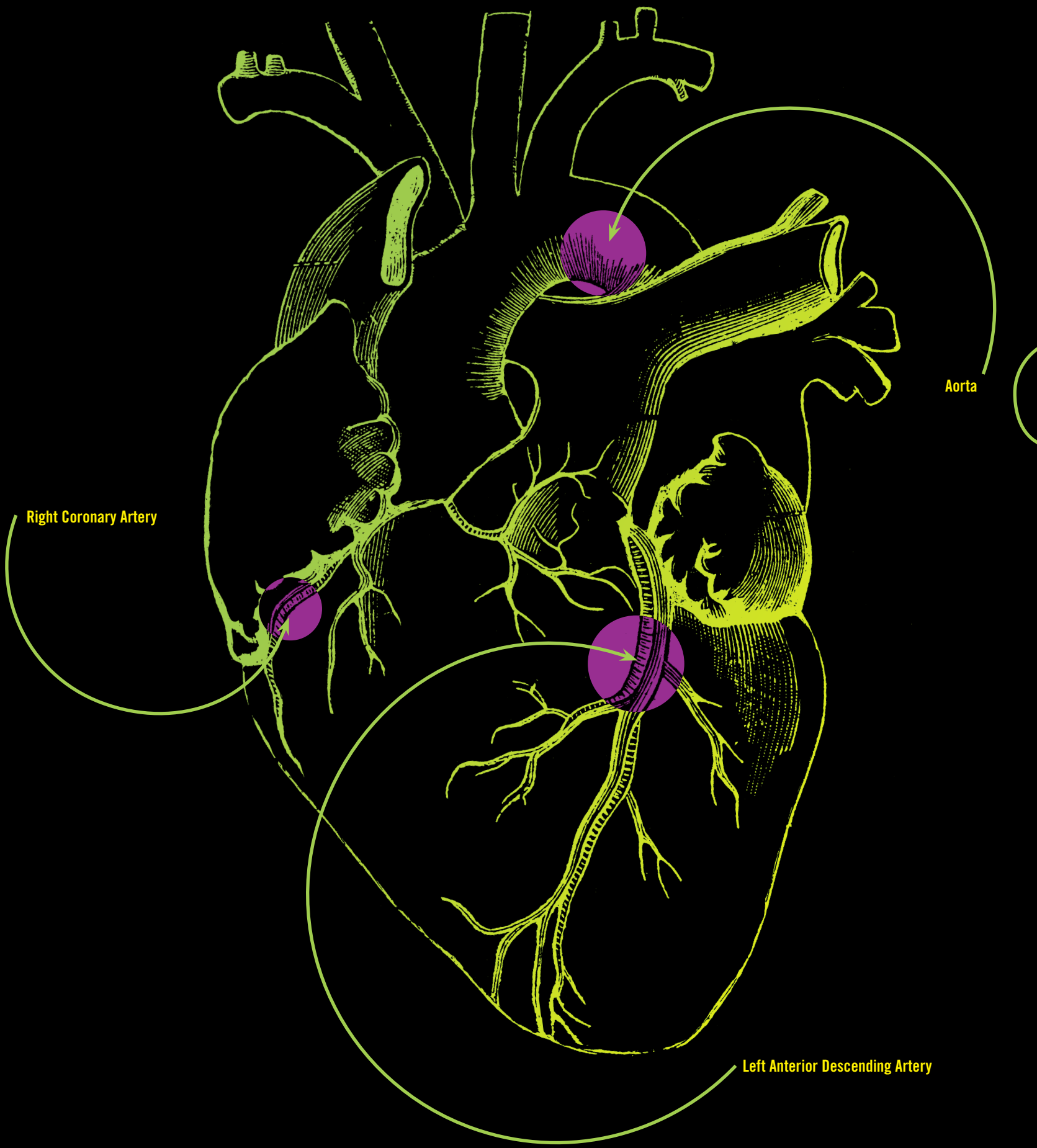
Aorta
Right Coronary Artery
Left Anterior Descending Artery

TAKING MEDICAL EDUCATION UNDERGROUND

Two Geisel medical students are using new media to demystify clinical skills for their peers.

By Matthew C. Wiencke

On a video screen are two outstretched hands on a table, slightly elevated and holding a black cord. Xinran (Leo) Liu, a Geisel medical student, begins speaking in a clear, friendly voice:

"Hey, guys. So today we're going to teach you how to do a two-handed square knot in seven minutes or less. So the first thing you want to do is get your starting position right."

Liu then shows, very carefully, each step of tying a two-handed surgical square knot, stopping at key points and explaining what to do and why. At one point, for example, the cord needs to run parallel as you loop it over your index finger in order to make the knot tight.

Square knots are used in surgery to tie off blood vessels or stitch up incisions. It's a basic skill that medical students learn in surgery rotations, but, says Geisel student Whitney de Luna, "it's taught so quickly in medical school, so it's nice to have a video that does it slowly that you can play over again until you understand it." To test the video, Liu and de Luna recruited a Dartmouth librarian. After watching the video, she tied a knot on her first try.

The video is one of the first, and most popular, that Liu, de Luna, and their medical student colleague at New York University, Sharath Bhagavatula, have produced. Since its beginnings in the fall of 2011, their video project, called UndergroundMed, has exploded into a popular and highly regarded resource for medical students. UndergroundMed's website (http://videos.undergroundmed.net/) now contains more than 70 videos. These videos, plus a collection of earlier prototype videos, have logged about 158,000 views on YouTube.

UndergroundMed is a student-run organization that makes short (each video is under seven minutes), practical, and interactive videos, all with the goal of making important clinical topics more accessible and easier to understand for medical students. The project is the brainchild of de Luna and Liu. Their idea for UndergroundMed resulted from the difficulties they and others had making the transition from the time spent reading and in classrooms in the first two years of medical school to the clinical rotations required in the third and fourth years. "We said, maybe we could bridge that gap," says de Luna.

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One popular UndergroundMed video depicts the stages of development of infants.

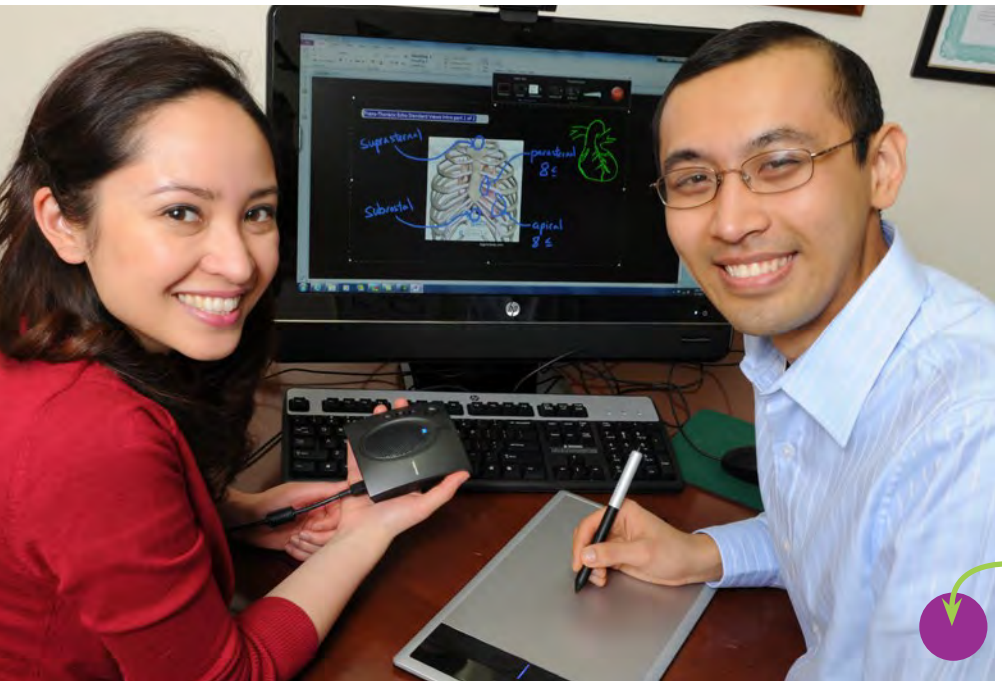
A challenging part of the clinical years in medical school is "learning that knowledge that isn't in the books," says Liu. "There are no good resources out there." Both Liu and de Luna thought it would be neat to use technology to bring the basic principles of clinical education to medical students in a fun and interactive way.

Liu had been taking classes through Khan Academy—a nonprofit organization that produces educational videos on math, science, history and other topics—and was interested in this model of education. UndergroundMed has adopted many of the techniques that Khan Academy uses, such as pen tablet technology, simple graphics, and a conversational voiceover.

One of their first projects was a video on the basics of IV fluids. Their process was very simple; they used PowerPoint and a small camera. They put multiple slides of drawings and text on PowerPoint to illustrate their script, then recorded the computer screen and Whitney's voice. The result was rough, but it got them thinking about how they could redesign the videos and use better technology to make them "useful, fun, and educational for students," says Liu.

Soon they started using more advanced software, including Camtasia to create and edit a video from a computer screen and tablets to draw on a screen and record. Liu's mentor at Geisel, Brian Remillard, an associate professor of medicine, let the team use his office at DHMC, where Remillard was doing video work for a project in Haiti and had a large computer screen and a better microphone.

Jon Gilbert Fox



Whitney de Luna and Leo Liu have learned a great deal about creating effective educational videos since founding UndergroundMed.

The students now produce almost all of their videos in Remillard's office. Over time, they also improved their knowledge of the software they needed, learning how to add more graphics and use more engaging and interactive visuals. Subject matter is selected from their books, online resources, lectures, and personal clinical experiences. The idea is to keep the project affordable so that after Liu and de Luna graduate this spring, other Geisel students can continue UndergroundMed on a fairly modest budget.

Once the team created their own website (Bhagavatula is the lead web designer), started posting their videos to YouTube, and developed a Twitter feed, the project really started taking off. Students loved it and faculty began referring to the site in their classes. Soon many positive comments started coming in from students and residents on YouTube. One e-mail from a 2012 Geisel graduate read, "I'm starting an ICU rotation tomorrow and decided to spend today brushing up on things since I've never done ICU in med school. . . . I stumbled on Whitney's central line/A line videos and loved them!"

The team also developed a strategy for its project: they would include videos on five main topics for each core clerkship. As a result, UndergroundMed covers a huge landscape, including anesthesia, radiology, pediatrics, psychiatry, internal medicine, surgery, obstetrics and gynecology, and more. One video discusses how to determine the severity of acute pancreatitis. Another explains how to identify heart chambers and heart valves on chest x-rays. A popular recent video explains how the Match Day algorithm works.

Along the way, the students have had help from MedU, an organization that creates and delivers medical education programs to medical students and is led by Geisel faculty members Leslie Fall and Norman Berman, both professors of pediatrics. The staff of MedU helps the UndergroundMed team maintain its website and provides mentorship and advice.

Liu, de Luna, and Bhagavatula also work closely with Geisel faculty who review the videos and give advice about developing the project and legal issues. Rather than turn the project into a for-profit business, Liu and de Luna decided to keep it a nonprofit, student-run enterprise with the goal of improving medical education.

UndergroundMed has been a hit on the national scene, too. De Luna and Liu made two successful presentations at national meetings: one at the 2012 annual meeting of the Association of American Medical Colleges, the other at a MedU conference. At MedU they gave a live example of how to make a video in front of 50 clerkship directors from across the U.S. "We made a two-minute video on the spot for them to show that it was actually an easy thing," says de Luna. Next they invited the clerkship directors to make their own videos as practice. The directors loved their presentation. "People came up to us and said, 'You guys just nailed everything, your presentation was flawless,'" says Liu. Likewise at the AAMC conference, many medical students were inspired by their work.

There is a strong theoretical basis to the work of UndergroundMed, as de Luna and Liu point out. Both have studied and drawn inspiration from educational psychologists (including Richard Mayer and Richard Anderson) and they put theory into practice in their videos. For example, they draw on multimedia learning theory, which states that the best learning occurs when visual and verbal materials are presented simultaneously (graphics and narration)—a technique UndergroundMed uses in all of its videos. Other tips they have developed: use words in a conversational style; always use a human voice, not a machine voice; and avoid adding an image of the speaker (too distracting). Another principle they've learned is to keep the videos tightly focused.

They also employ a structured framework to help viewers progress, building slowly and presenting information in concentrated chunks. "That's why we have take-home points in the videos, and that's why we have focus points," Liu says. "Get rid of extra information," he adds. "Focus on what's important."

A good example of this technique is a video on developmental milestones in infants, which has a voiceover by de Luna and drawings by Liu (he does all the artwork for the videos and trained in sketching and watercolor for eight years). De Luna designed the video for students who did not grow up with younger siblings and do not have children and so may need some clear, succinct ways to remember milestones for the growth of babies. The video is divided into distinct three-month time points. Each stage has a list of key characteristics and an illustration of a baby or toddler at that time point.

Since de Luna, Liu, and Bhagavatula all graduate from medical school this year, they are working hard to recruit students to take over and possibly expand the project. Bhagavatula is also working on adding outlines to accompany each video and organizing the videos into an interactive map. All three will stay on as advisors and oversee future planning for UndergroundMed. The response from faculty and students both at Geisel and nationally has been overwhelmingly positive. So even with the next step in their medical education looming, they're still thinking about the future of their creation. Liu believes that what they have accomplished thus far is only the beginning of what UndergroundMed can become. "Our goal is always to push to improve medical education for medical students," Liu says. De Luna adds, "This is just the beginning."

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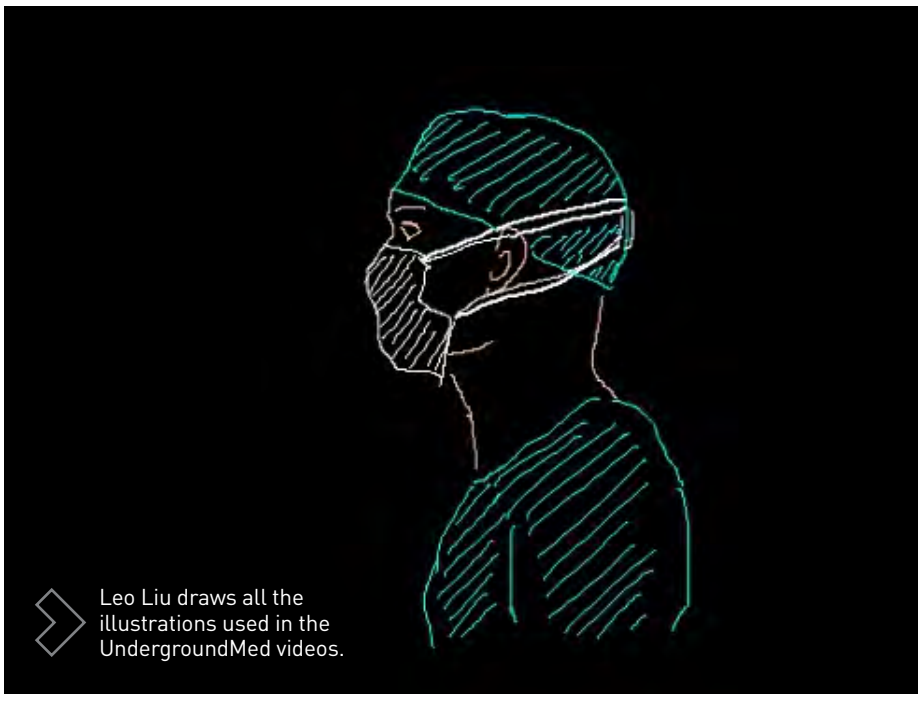

Leo Liu draws all the illustrations used in the UndergroundMed videos.