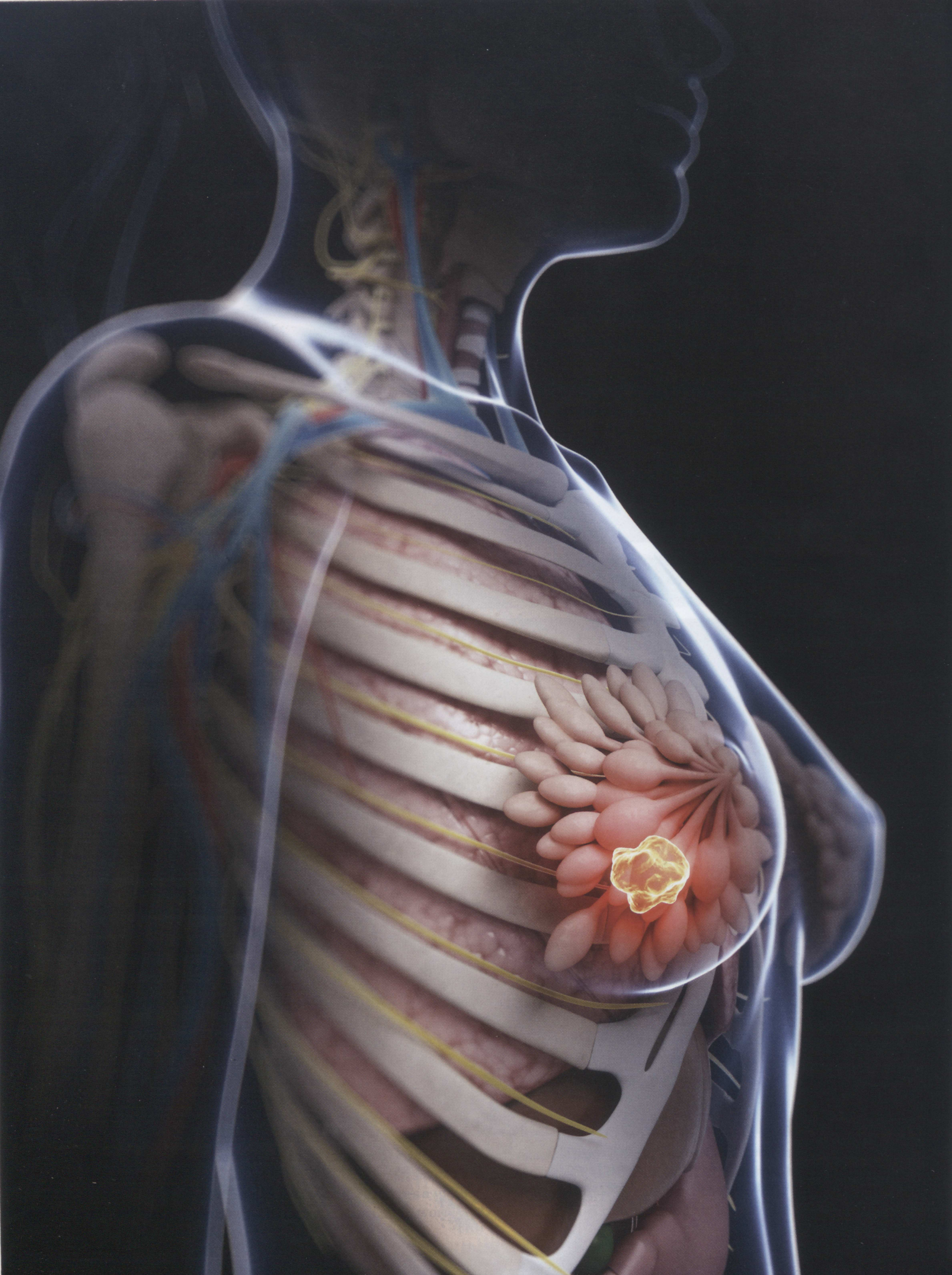

Building a Better Diagnostic Test for Breast Cancer

STORY BY DALE SMITH

In the United States alone, 2.8 million women live as survivors of breast cancer. They deal with the reality that in up to one of five cases the cancer will recur nearby or spread elsewhere in the body. Survivors often suffer from depression as they deal with these issues. Unfortunately, existing methods for spotting such tumors don't work very well, and masses escape notice until the cancer has become difficult to treat.

A promising new diagnostic approach in the research stage at MU may someday save lives and offer women peace of mind by locating recurrences or metastases early when physicians can best cure them. Because such cancers can differ from primary cancer by location and genetic makeup, detecting them requires its own approach. But an idea that looks great in the lab must travel a lengthy and expensive route before patients benefit in the clinic, says Raghuraman Kannan, associate professor of radiology in the School of Medicine. Still, he is optimistic, likening the decadelong journey to a trip to Mars. "We have liftoff," he says. "And we have a good spacecraft that will take us all the way."

Kannan and fellow researcher Amolak Singh, MD, professor of radiology, also have a new booster rocket in the form of their recent $99,281 grant from the Coulter Translational Partnership Program. The program, now in its third year at MU, funds promising biomedical innovations to help speed their movement from the research lab into routine clinical use. Mizzou is one of 16 U.S. universities working with the Wallace H. Coulter Foundation in this way. In a five-year, $5 million agreement, the foundation gives $666,667 annually, and MU adds $333,333. To date, the $2 million of Coulter program funding for 14 projects has helped generate $5.9 million in other funding and led to four technologies being licensed to startups for further commercialization.

Kannan and Singh's new diagnostic "probe" is a carefully constructed nanoparticle package, whose details are proprietary. Kannan can say that it includes a platform, or carrier, which could be of metal, protein or polymer. Onto the platform he loads an antibody or peptide that latches on to the surface of breast cancer cells. He also adds a molecule that's easily visible on a PET scan or CT scan. In clinic, the scenario would look like this: At follow-up visits after treatment for the primary tumor, doctors would inject patients with millions of molecular-scale copies of the probe. In less than two hours, the probes travel throughout the body and attach to sites specific to breast tumor cells. Radiology technicians would scan near patients' primary tumor sites as well as organs that are likely candidates for metastases, including the lymph nodes, liver, lungs, bones and brain. Singh says that any new tumors "light up" on the scans while still small and easier to treat. "Our test should work anywhere and at the very early stages when most current tests can fail or may have limitations," he says.

Since 2012, the $2 million in Coulter Translational Partnership funding at MU has yielded $5.9 million in outside funding that speeds biomedical innovations from research labs to clinical use.

Part of the Coulter grant pays for tests that verify the probe is nontoxic. Other monies verify that it targets only breast cancer cells. Existing diagnostics fall short because they often light up for noncancerous cells or spot only already-large tumors. With the new data, Kannan and Singh will approach investors or pharmaceutical companies for funding to take the probe through successive phases of human trials. The tab could total more than $60 million before the Food and Drug Administration clears the product for widespread use.

In the meantime, Kannan and Singh will be working on their own next step for the project. Starting with the same platform and molecule that binds to breast cancer cells, they will add chemotherapy to the probe. With this setup, they will deliver medicine directly to tumors. **M**