Outta sight. Although not as fashionable as this electronic garment, a cloak unveiled this year is a step toward true invisibility.

Although their function isn't completely clear, researchers think they could have helped support its body out of water and aided in breathing. Forays onto land would have offered an escape from sharks and other predators, as well as insects to eat. *Tiktaalik* isn't a perfect tetrapod, of course—among other traits, it lacks fingers and toes—but it was certainly a big step in the right direction.

5 THE ULTIMATE CAMOUFLAGE. Science veered toward science fiction this year as physicists cobbled together the first rudimentary invisibility cloak. Although far from perfect—the ring-shaped cloak is invisible only when viewed in microwaves of a certain wavelength traveling parallel to the plane of the ring—the device could usher in a potentially revolutionary approach to manipulating electromagnetic waves.

The disappearing act began in May, when two independent analyses predicted that it should be possible to ferry electromagnetic waves around an object to hide it. All that was needed was a properly designed shell of "metamaterial," an assemblage of tiny metallic rods and c-shaped rings. The waves churn the electrons in the rods and rings, and the sloshing affects the propagation of the waves. Both analyses specified how to sculpt the properties of the metamaterial and left it to experimenters to design the materials to meet those specs.

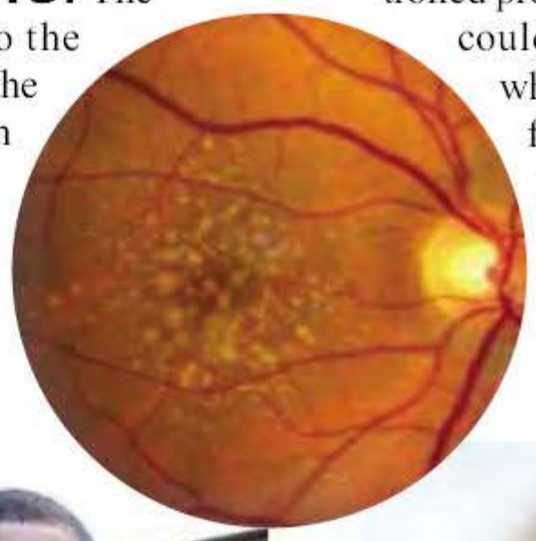
In October, the team that made one of the predictions did just that—almost. Physicists at Duke University built a ring instead of an all-concealing sphere. They made some approximations that rendered the cloak slightly reflective. Still, the thing whisked microwaves around a plug of copper, proving that the method works. Cloaks for visible light are likely years off, as researchers must figure out how to make metamaterials that work at such short wavelengths. Even then, the cloak would be a bust for spying because it would be impossible to see out of it.

The real breakthrough may lie in the theoretical tools used to make the cloak. In such "transformation optics," researchers imagine—à la Einstein—warping empty space to bend the path of electromagnetic waves. A mathematical transformation then tells them how to mimic the bending by filling unwarped space with a material whose optical properties vary from point to point. The technique could be used to design antennas, shields, and myriad other devices. Any way you look at it, the ideas behind invisibility are likely to cast a long shadow.

6 A RAY OF HOPE FOR MACULAR DEGENERATION PATIENTS. The year brought good news to the many people suffering from the vision-robbing disease known as age-related macular degeneration (AMD). In October, *The New England Journal of Medicine* published the results of two clinical trials showing that treatment with the drug ranibizumab improves the vision of roughly one-third of patients with the more serious wet form of AMD and stabilizes the condition of most of the others. Other approved treatments can only slow the progression of AMD.

Vision loss in the wet form of AMD is caused by the growth and leakage of abnormal blood vessels in the macula, the central region of the retina. Ranibizumab, a monoclonal antibody fragment produced by Genentech Inc. does better than other treatments because it specifically targets a protein called VEGF that stimulates that vessel growth. The U.S. Food and Drug Administration approved ranibizumab for AMD treatment this year, but researchers are also looking at a related antibody made by Genentech. That drug, known as bevicizumab, is approved for treating certain cancers but so far not for use in AMD. If it works, however, it could be a cheaper alternative to ranibizumab, which costs $1950 per monthly dose.

AMD researchers are making progress on another front as well. Over the past year and a half, they have uncovered several genes that influence an individual's susceptibility to the eye disease. One of them is the gene for VEGF itself, and another makes a protein that might also help regulate blood vessel growth. In addition, several groups have zeroed in on genes encoding proteins involved in inflammation, which can damage tissues if not controlled properly. Identifying those genes could help physicians determine whether a person is at high risk for AMD and thus should take preventive steps such as consuming more antioxidants and not smoking. And by shedding light on the causes



CREDITS (TOP TO BOTTOM): SHIZUO KAMBAYASHI/AP; MAURICIO LINARES; GREGORY HAGEMAN; NATIONAL EYE INSTITUTE, NATIONAL INSTITUTES OF HEALTH