who have just published preprints claiming to have built the first invisibility cloaks that can hide large objects from visible light. Now George Barbastathis and colleagues at the Massachussets Institute of Technology and the University of Singapore report the cloaking of 2D millimeter-sized objects. Meanwhile Shuang Zhang and team at the University of Birmingham, Imperial College and the Technical University of Denmark have managed to cloak millimeter-sized 3D objects from prying eyes. Unlike most other cloaks that use artificial metamaterials, both cloaks use natural calcite crystals.

5th place: Hail the first sound lasers

Two independent groups of physicists have been jointly awarded fifth place after they unveiled the first phonon "lasers". These emit coherent sound waves in much the same way as lasers emit coherent light waves. One team was led by Tony Kent at the University of Nottingham in the UK and the other by Ivan Grudinin at Caltech. One of the devices emits sound at about 400 GHz while the other operates in the megahertz range. As sound penetrates most materials, the lasers could be used to obtain 3D images of tiny nanostructures.

6th place: A Bose–Einstein condensate from light


The first photon BEC

Many physicists believed it could not be done, but now a team in Germany has created a Bose–Einstein condensate (BEC) from photons, earning them the sixth slot. BECs are formed when identical bosons – particles with integer spin – are cooled until all particles are in the same quantum state. Although photons are the most common boson of them all, they are easily created or destroyed when they interact with other matter – making it very difficult to cool photons to form a condensate. But that did not deter Martin Weitz and colleagues at the University of Bonn, who got round this problem by continuously pumping the BEC with a laser to make up for lost photons. Beyond the pure chutzpah of making the BEC, the breakthrough could actually help boost the performance of solar cells.

7th place: Relativity with a human touch

Seventh place in our league table goes to physicists in the US who have shown us the human face of relativity. James Chin-Wen Chou and colleagues at the National Institute of Standards and Technology (NIST) used two of the world's most accurate optical clocks to show that time speeds up in a clock that is hoisted a mere 33 cm above the other. They also saw time slow down in a clock moving less than about 35 km/h relative to its twin. While there's nothing groundbreaking about the physics – Einstein's theories of relatively are on very solid ground – it's reassuring that its effects can be seen at human distances and speeds.

8th place: Towards a *Star Wars* telepresence


F-4 Phantom holograph

Anyone who uses physics to realize a scene from *Star Wars* deserves a place in our top 10, which is why Nasser Peyghambarian and collegues at the University of Arizona and Nitto Denko Technical Corporation come in at number eight. In 1977 audiences were wowed by the special effects in that cinematic classic, which included a hologram of Princess Leia making a distress call to Obi-Wan Kenobi. Now, Peyghambarian and team have taken a big step towards making such real-time, dynamic holograms a reality by inventing a photorefractive polymer screen that reacts very quickly to laser light.

9th place: Proton is smaller than we thought

Physicists have been making measurements of protons for more than 90 years so you would have thought its size would be settled. But this year an international team led by Randolf Pohl at the Max Planck Institute for Quantum Optics discovered that the proton is about 4% smaller than previously thought – bagging ninth place in our list. The surprising result was obtained by studying "muonic" hydrogen in which the electron is replaced by a much heavier muon. The finding could mean that physicists need to rethink how they apply the theory of quantum electrodynamics (QED) – or even that the theory itself needs a major overhaul.