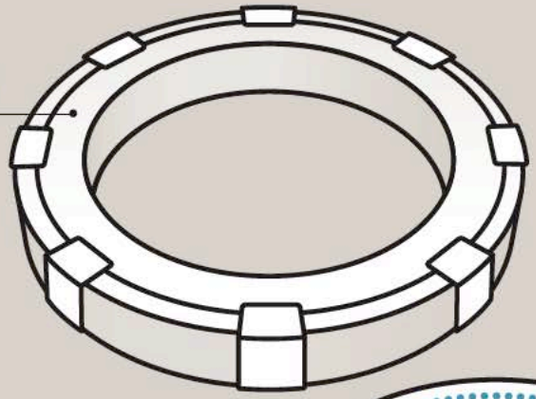
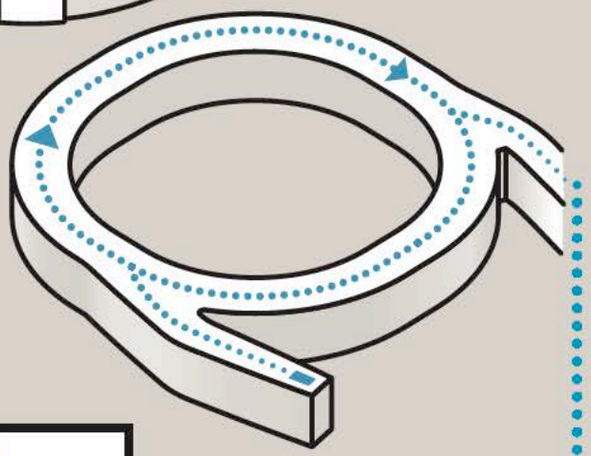
HOW IT WORKS

# Inside Our Proton Therapy Center

The proton is small, but it takes big machinery to generate and move these subatomic particles for treatment.

**The Synchrotron**
A synchrotron is a type of particle accelerator used to accelerate protons for use in proton therapy. It is 26 feet in diameter and composed of a ring of small magnets. Protons are injected into the ring and begin traveling around the ring at great speeds, about 10 million times per second. Put another way, the speed of the protons is so fast, it could circle around the earth five times in one second. It is advanced technology over earlier generations of proton therapy because it can produce beams of a wide range of energies and reduces the risk of unnecessary and unwanted radiation to the patient.



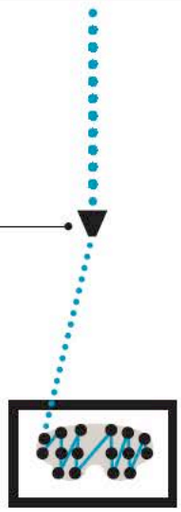


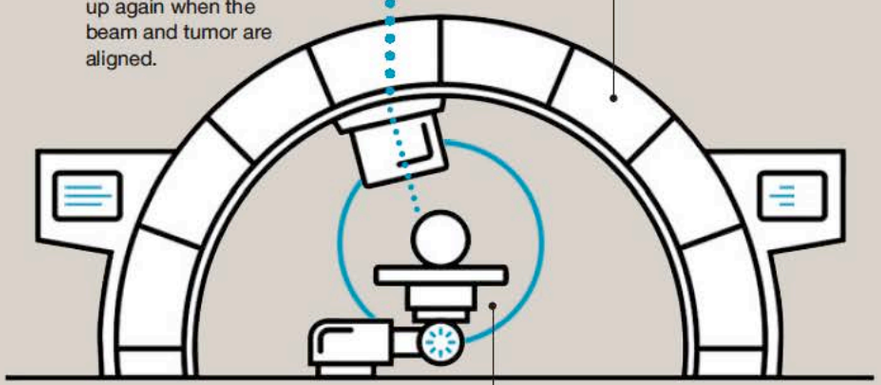
**Gantries**
Protons travel down magnetic devices into the treatment rooms. A 360-degree, rotating, 30-foot-diameter iron framework, called a gantry, controls the speed and direction of protons. It allows radiation oncologists to direct the beam at any angle and deliver the proton beam with pinpoint accuracy to a patient's cancer.

Our center has four of these, with one gantry dedicated exclusively for pediatric patients and another for much-needed research.

**Respiratory Gating**
The slightest motion can cause tumors to move. Our proton therapy beam tracks directly to the tumor, stopping if the tumor shifts with the patient's breathing and starting up again when the beam and tumor are aligned.

**Pencil Beam Scanning**
This new technology funnels the protons into a narrow beam—just a pencil tip's width—coming out of the proton therapy machine hundreds of times per second, scanning the tumor back and forth and up and down, just to the edges of the tumor, to paint it layer by layer with the cancer-killing proton beam. Our advanced technology is intensity modulated, making it possible to deliver varying degrees of energy targeted to the specific composition of each area of the tumor.





**On-Board Imaging**
Ours will be among the first to have on-board imaging. Plans for a CT Couch, invented by medical physics Director **John Wong** in collaboration with Hitachi, will provide a built-in CT scanner that merges images of the cancer taken during treatment planning with ones taken the day of treatment to verify that the tumor being treated has not changed or moved. It facilitates precision treatment within one-tenth of 1 millimeter accuracy.