

Princeton University

HONORS FACULTY MEMBERS
RECEIVING EMERITUS STATUS



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EDWARD JOHN GROTH III



Professor Edward J. Groth is retiring after 46 years at Princeton. Ed was born in St. Louis, Missouri, in 1946. In high school in Scottsdale, Arizona, he was on the varsity tennis team and was the winner of several state math contests. A school newspaper reported that “Ed, who has been accepted at Caltech on the early decision plan, hopes to be a physicist.” He received his B.S. in physics in 1968 from Caltech and then came to Princeton to pursue his doctorate, which he received just three years later. He was then an instructor for a year, joined the faculty in 1972, received tenure in 1978, and has been at Princeton since. He has taught almost all of the undergraduate courses in the physics department and a number of the graduate ones. He served eight years as associate chair in physics and has been on a good number of University committees. He has been a faculty adviser in Rockefeller College since 1987. He is the Princeton representative on the Universities Space Research Association (USRA).

Ed’s Ph.D. was on the absolute timing of the Crab Nebula pulsar, a rapidly spinning neutron star. His adviser was Dave Wilkinson, but Ed also worked quite closely with Bruce Partridge (professor of physics and astronomy emeritus, Haverford College) and Paul Boynton (professor of physics, University of Washington). The measurement was made at Princeton’s FitzRandolph Observatory near the athletic fields. The two primary goals were to establish a set of absolute time references for tests of Einstein’s general theory of relativity and to search for the emission of gravitational waves. It turned out that this particular pulsar was not stable enough and indeed had glitches, or star quakes, a discovery on its own. (In 1974, Princeton’s Russell Hulse and Joseph Taylor, then at the University of Massachusetts–Amherst, discovered the famous binary pulsar. They used it measure the emission of gravitational radiation, for which they shared the Nobel Prize in 1993.) The Crab pulsar measurement was state of the art. It blended high-speed electronics

with fancy algorithms for taking Fourier transforms of long sections of data.

In 1971, Ed and his colleagues wrote a paper with Paul Horowitz of Harvard and many other colleagues on comparing the pulse arrival times of the Crab as determined by four different observatories. They all agreed. They could have no idea that many years later, starting in 1999, Ed, Paul Horowitz, Dave Wilkinson, and Norm Jarosik would collaborate on comparing the arrival times of pulses. At this later date, though, the group—part of “Optical SETI,” the optical search for extraterrestrial intelligence—was looking for possible optical signals sent to us from an advanced civilization. To many, it makes more sense for an extraterrestrial to send signals at visible as opposed to radio wavelengths. Needless to say, they did not find extraterrestrial signals correlated between observatories but it did lead to a revival of the FitzRandolph Observatory that included many local amateur astronomers.

Around the same time in the 1970s, Ed and Jim Peebles began a program to make cosmological N-body simulations in which galaxies containing billions of stars are treated as massive though point-like particles that interact gravitationally. This is now a huge field of study.

In the mid-1970s, Ed began to work with Jim Peebles and other colleagues on characterizing the spatial distribution of galaxies as determined by large astronomical surveys. The research continued through the late 1980s. With Bernie Siebers and Mike Seldner, they made large-scale maps of the Lick Observatory’s galaxy catalog of Donald Shane and Carl Wirtanen. A version of this appeared on the inside back cover of Stewart Brand’s *The Next Whole Earth Catalog*. Such surveys are now a major scientific endeavor. For example, large swaths of sky have been mapped with exquisite accuracy and depth by the Sloan Digital Sky Survey.

In the late 1970s, Ed was selected as the data and operations team leader for what became the Hubble Space Telescope. After launch in 1990, he was appointed the deputy principal investigator for the Wide Field and Planetary Camera and became one of the core group of people figuring out Hubble’s initial difficulties. He designed a survey of the sky that is now called the “Extended Groth Strip.” It’s located just off the end of the handle of the Big Dipper.

Some 50,000 galaxies have been identified in the strip, and many astronomers are studying what can be inferred from them about how galaxies formed.

In an early analysis of the Groth Strip, Ed, his student Jason Rhodes, and colleague Alexandre Refregier made the first space-based detection of the “weak gravitational lensing” of galaxies. This is an effect in which images of distant galaxies are distorted a small amount, or “lensed,” by large concentrations of mass between us and the galaxies. To understand the effect, one needs the general theory of relativity. There are now proposals for satellite missions that have a major component dedicated to measuring just the lensing signal Ed and colleagues detected.

Ed freely shared the fruits of his labors and expected others to do so. He was a widely respected computer programming whiz. He wrote one of the early plotting packages, GPLOT, for the Fortran programming language and made it freely available. He designed fonts before they were commonly available. He was instrumental in starting the digital archive for the Hubble Space Telescope as recalled by Tod Lauer at a recent celebration, and he wrote some of the first programs to deconvolve the initial distorted Hubble images. Ed was in the vanguard of scientific computation and kept the Princeton group ahead of the competition for years.

Behind a sometimes gruff exterior, he was quick to help anyone at any level most anytime. After a heart attack, Ed became an avid bicyclist. In addition to his frequent multiday rides, he organizes two bike trips for his colleagues in the department. He is an avid softball player and known to friends as “the Babe Ruth of the Degenerate Neutron Stars.”