

Putney, the Universe and Everything

By Beckie Coffey

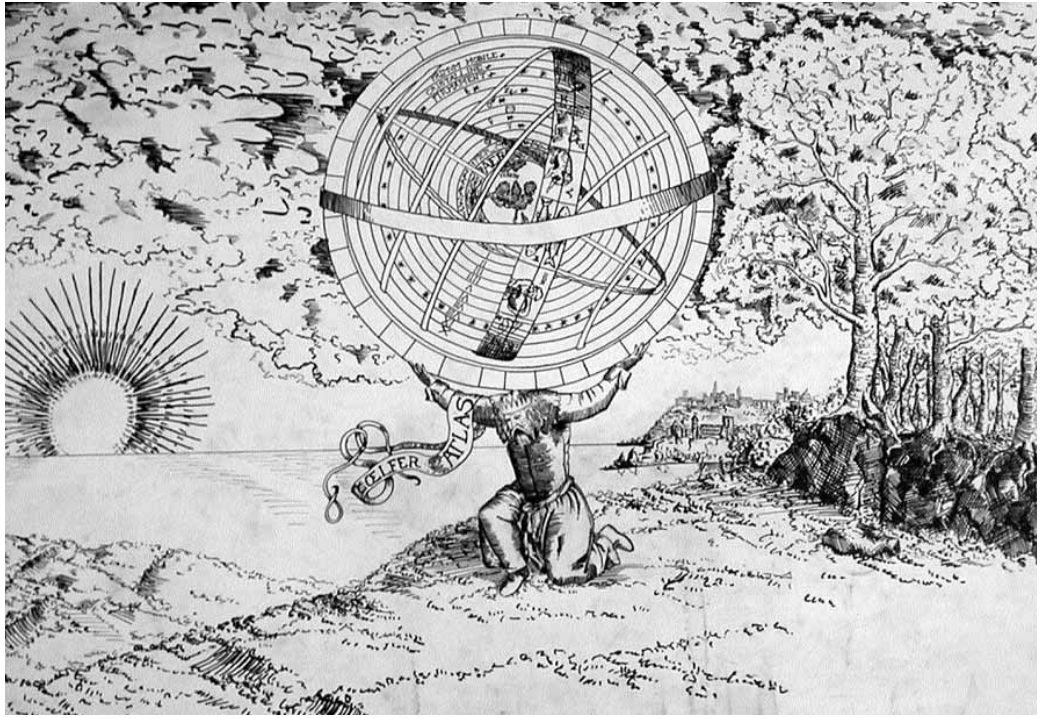
The movie that Kat Partington '04 saw most often when she was growing up is *The Little Star That Could*. That's not, however, why she enrolled in Introduction to Astronomy. Neither is the fact that Kat "grew up in a planetarium." (Her mother was director of the Henry Hudson Planetarium in Albany, New York.)

"And it wasn't because I loved math," she explains. "I didn't until I took Introduction to Astronomy. Now I love math."

Taylor McNeill '04 has always loved math. She wants to major in engineering at Smith. Taylor enrolled in Introduction to Astronomy because "it's about figuring out the mechanics of big, hulky things, and that's something I like."

Fred '04 Andrews' passions normally run towards piano and acting. He enjoys studying astronomy with Glenn Littledale '76 because "Glenn opens eyes. I've learned from him to see what's new and deep about something that seems old and familiar—the night sky."

Thirty or so juniors and seniors filled the Introduction to Astronomy classes during the fall 2003 semester. And for the past several years, Project Week has seen one astronomy project after another.



James Smyth '05 painted this panel during fall 2003 Project Week. Soon it will decorate the observatory. Now it hangs over the fireplace in the library.

(Right) Math and wood-working teacher Abijah Reed '53 and astronomy teacher Glenn Littledale '76 designed and built three Newtonian telescopes with parts purchased courtesy of a donation by the Lifton-Zoline family and with the help of students.

(Previous page) Vast clouds of dust are apparent in the Sculptor Galaxy (NGC-253), 8 or 9 million light years away.

Why is Astronomy Booming at Putney?

Kat, Taylor, and Fred all attribute the popularity of astronomy to the excellence of the astronomy teaching. Glenn Littledale, the science department chair, and Dean of Students Dave Arnstein are both experienced physics teachers, and astronomy is a subset of physics. Glenn has a B.S. and M.Ed. from Temple University. Glenn is also, according to Dave, an "amateur astronomer of some repute." Dave has a B.S. from Princeton, and an M.Ed. from Antioch, New England. Still, why astronomy and why now?

On a cold morning just before the end of the fall semester, no one in Glenn's Introduction to Astronomy class looked quite up to the task of a math-heavy science elective. No one, for example, wore a short-sleeved, front-buttoning

white shirt with a pocket protector. On the other hand, two students actually wore berets. The lecture that morning started with the story of Caroline and Sir William Herschel who, in the late 1700s, built enormous telescopes and systematically studied the sky, categorizing nebulae and mapping the stellar distribution of the observable universe. Before the morning's lecture was done, Glenn had covered the contributions of the Herschels as well as those of several other scientists, all the while talking the class through the ways those scientists discovered of calculating the luminosity and distance of stars and, ultimately, of approximating Earth's location in the galaxy and universe.

Glenn posed lots of questions along the way: Why was the mirror of the Herschels' scope a parabolic shape? Why was it bronze? How do you think they mounted the scope (which probably weighed half a ton), given that they wanted to map the entire sky? How did noting the angle of elevation and time of sighting of

each star enable the Herschels to map the sky? What was faulty about the model of the universe that they proposed? Why were they unable to anticipate the fault? Why was it reasonably safe for Henrietta Leavitt, working with the benefit of later technology, to assume that closely grouped stars are at approximately the same distance from the earth? How would her assumption about these stars have helped her discover that the time it takes a pulsing star to go from bright to dim is directly correlated to the star's luminosity? How would Leavitt's work have contributed to that of Edwin Hubble, who established that there are galaxies other than the Milky Way and demonstrated that those other galaxies are receding from ours, thus posing the "expanding universe" model still dominant today?

As varied and humanities-oriented as some of Glenn's questions sounded, the answers were all of a kind: mathematical.

"Math is the language of astronomy," Glenn explains, "and this is a course in which we constantly examine 'how we know what we know.' So we talk in human terms of people and discoveries but we use mathematics every day. Introduction to Astronomy is Math 3 concurrent, which is why it's a junior/senior level course."

A quick check of Putney's web site shows that Math 3 covers linear, quadratic, exponential, and logarithmic functions as well as an introduction to trigonometry, analytical geometry, matrices, and the theory of functions. The question, then, must be asked: Why does the

formal study of astronomy appeal to a student population that has long been considered arts-centric?

Glenn: "Who knows? Putney students are curious and there is a lot of sky around here."

Dave: "It doesn't hurt the course's appeal that a substantial portion of Introduction to Astronomy is observational astronomy. Glenn has done an incredible job of building the telescope collection. Furthermore, much of what the students do when they create their sky journals, for example, is study the sky without any technological intervention. We really do occasionally hang out in open fields on clear nights looking at the sky and having fun. We really do recapture the intimacy of a time with no TV and no electronic distractions, when what families and friends did at night was look up together and talk together. So that's part of what's appealing to the sorts of kids we have at Putney."

Glenn: "But even the star gazing that we do is not just looking up. It's learning how to see. Seeing the sky and extracting the relevant information are learned skills that require patience and a fair amount of understanding."



Heavenly Bodies

Fall 2003 Project Week saw Kim Chisholm, Ted Crook, Annie Rubel, Carissa Connelly and Spencer Sahim peering through Kim's 90-mm Maksutov Cassigrain, the school's 8-inch Schmidt Cassigrain and, by remote Internet control, two robotic, deep sky telescopes located at 7,300 feet elevation at the New Mexico Skies Observatory in Cloudcroft, New Mexico. All four students were engaged in astrophotography and following personal lines of inquiry. All four took advantage of CCD (charged couple device) technology, in which a camera records a black and white image on an extremely light sensitive CCD chip. Color images are taken by placing color filters in front of the camera and stacking the resulting images using astronomical image processing software. Their images are shown throughout this article.

Help Us Remember

The science department would love to hear any and all stories about Putney's astronomical past—who was working on what and when. There are suggestions of a fairly active program at one time, but a lot of holes in the file. Help us fill in the blanks. Send your stories to Glenn Littledale, in care of the school. Or e-mail him at glittledale@putneyschool.org.

(Above) Craters, crevices, and mountains on Earth's moon.

(Right) This globular cluster in Pegasus (M15) is approximately 30,600 light years away.

Facing page: (Top) Random, gorgeous, deep sky.

Facing page: (Bottom) The Great Nebula in Orion (M42) is 1,500 light years away



Build It and They Will Come

Introduction to Astronomy is only in its third year as a course offering at Putney. This year, demand for the course was so high that a third section—the one taught by Dave—had to be added. The course itself was added to the academic curriculum in direct response to student interest.

“There has always been a strong curiosity about astronomy here,” says Glenn. “Even before we had formal instruction in astronomy, every Project Week Dave, Lorne [Johnson, history department chair] and I have sponsored student-initiated astronomy projects.”

The school's astronomy program got an enormous boost several years back when the Lifton-Zoline family (Abigail '93, Josselin '96, Gabriel '00 and parents Pam and John) gave a financial gift to the school in the hopes of stimulating the astronomy program. With that money, Glenn secured the mirrors, eye pieces, and assorted hardware for three Newtonian

telescopes for night sky viewing, in addition to the 12-inch computer-controlled telescope, CCD (charged couple device) camera and dome. Glenn then designed the scopes' housings and mounts in close collaboration with math and woodworking teacher Abijah Reed '53 and, for the length of a single Project Week, several eager students. During the following months Abijah and Glenn tweaked the design and completed building the scopes. Then, in 2003, with a second gift from the Lifton-Zoline family, Glenn purchased a solar telescope and mount that uses a narrow-band hydrogen alpha filter to block most of the sun's light and produce detailed, high-contrast solar views.

This means that the school is now equipped for both daytime and nighttime viewing.

“We have some pretty great toys thanks to Glenn, Abijah, and the Lifton-Zoline family,” says Dave. “We have an observatory on the ridge. You can see it if you stand at the barn and look up. Great equipment and a working observatory are unusual in a high school. To be honest, they probably have a lot to do with the current level of student interest in astronomy at Putney. Glenn and I hope that, five years down the road, we'll have the entire observatory computer-controlled so that computers open the dome, control the positioning and focus of the scopes, and control the color filters.”






Excitement on the Horizon

An exciting astronomical event on the horizon these days is the June 8 transit of Venus across the Sun. Still, according to Fred Andrews, the March Break trip to Sonoita, Arizona, where Glenn and four Putney astronomy students will be the guests of the Alexander family (Jim, Camilla and daughter Camilla '03), runs a close second to Venus in the "upcoming thrills" category. Jim Alexander is an enthusiastic amateur astronomer who has built a home observatory that pretty much matches the description of the observatory that Glenn and Dave hope to have in place at Putney in five years' time.

March Break 2004 will be a week of "staying up all night long, staring at monitors, futzing with filters, and having an incredible time keeping our eyes open," says Fred, who also went on the trip in 2003. "Last year we spent the days hiking in the desert and that was

wonderful. But the nights were easily as good as the days. What could be better than learning to see? The Alexanders themselves were extraordinarily welcoming hosts. They got us enthusiastic and kept us motivated and patient when we worked at night. We spent the nights in a dark room filled with computers and tiny monitors showing our telescope-generated images. I loved the process of controlling the scopes and following a hunch and waiting for and then capturing something observable. I liked using filters, adding and subtracting color, and finally creating an image that showed what I had hoped was there all along. I loved talking about what I'd found and photographed. The Arizona trip was a life-changing experience for me."

Learning to see. Learning to have an opinion and follow a hunch. Learning to communicate about a discovery or an opinion. Speaking the language of mathematics. These are the skills that Putney tells parents it is going to teach the students. In Putney's burgeoning astronomy program, teaching those skills is precisely what happens. 



Beckie Coffey has worked extensively as a television producer, writer and radio commentator. Her daughter, Kathryn Schwartz '07 is a student here, so it was pretty easy to cajole Beckie into writing this story for us.

Other Science Projects

If you think astronomy is neat, check out these other atypical offerings from the science department: Leslie Frothingham, in her first year as a Putney faculty member, is teaching her Molecular Genetics classes how to clone cells. Abby Mnookin, after a year of internship teaching, is filling in for Cathy Abbott, who's on sabbatical this year to do research in Alaska. Abby's Conservation Ecology class was often seen on snowshoes this winter, in search of tracks and habitats. Hans '85 Estrin's Ecological Footprint of the Michael S. Currier Center class is producing a website presentation of their findings. And our Agroecology and Farm Semester classes are still going strong.