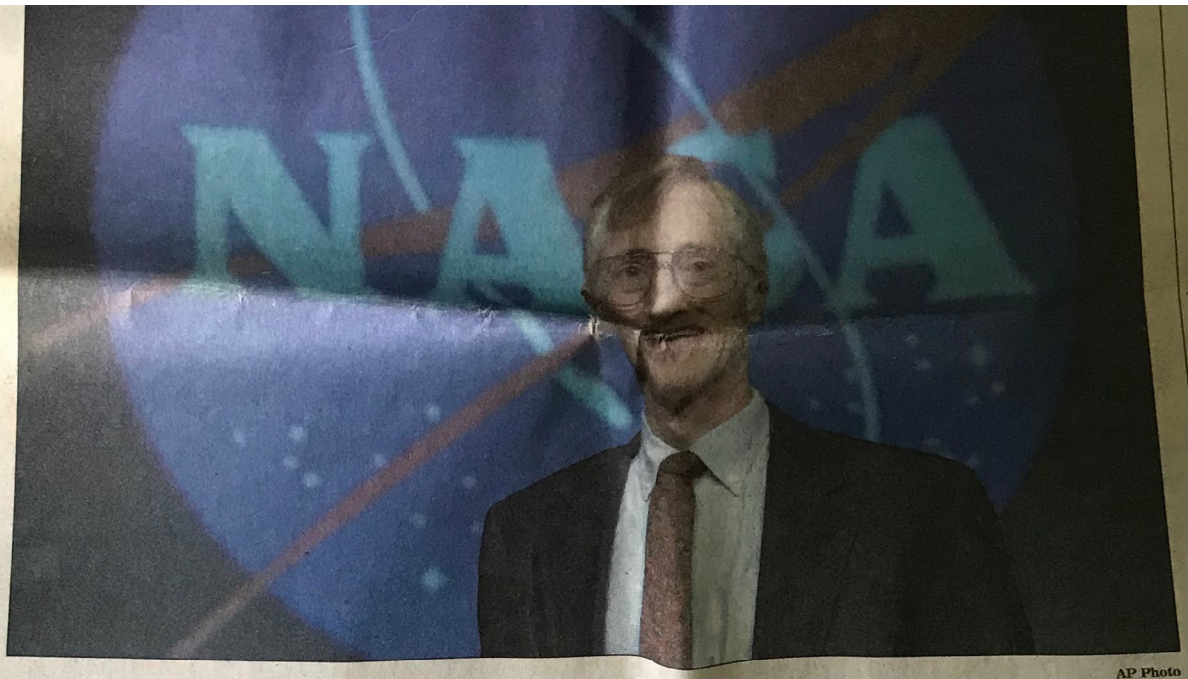


AP Photo

Nobel Prize for Physics winner John Mather, a graduate of Newton High School, speaks at a news conference at NASA headquarters in Washington after receiving word that he had won the Nobel Prize in physics.

Newton's Nobel

Nobel laureate to return for weekend event

By STEPHEN J. NOVAK
snovak@njherald.com

For almost 30 years, Emily Robbins was "the tough math teacher" at Newton High School.

But in 1960, she found she couldn't teach freshman student John Mather.

"Early in the year, I was teaching the students how to square binomials," Robbins said. "I went over the steps, but John was able to do them in his head — he was already a unit ahead."

For the rest of the year, Mather taught himself the subject material with little instruction. By the end of the semester, Robbins decided she had to apologize to him.

"John, I'm sorry," Robbins said. "I don't think I taught you anything."

Mather replied, "Ms. Robbins, you did fine. You let me do my own thing, and I'm where I want to be."

At that time, Mather was a farmboy from Wantage with an aptitude for science and math.

Now, Dr. John Mather, 60, is a senior astrophysicist at NASA's Goddard Space Flight Center in Greenbelt, Md., working on the replacement for the Hubble Space Telescope.

Last October, he was in Stockholm, Sweden, to receive the 2006 Nobel Prize in physics with his colleague George Smoot for their work that provided definitive evidence of the Big Bang and the origins of the universe — the first Nobel ever awarded to a NASA scientist.

And Saturday, he will return home to speak at the Sussex County Scholar-Athlete banquet.

The occasion will signify Mather's first journey back to his old stomping grounds in about four years — but returns have been rare since he graduated from Newton High School in 1964. Mather himself admitted that he never had much reason to come back after his family moved to East Brunswick and his friends went their separate ways.

His last excursion was in 2003 when Newton High School inducted him into its Hall of Fame. During that trip, he returned to the halls of his alma mater and took his wife, Jane, to see his old house on the Lusscroft Farm where he had grown up. But there was one thing that he didn't get to do, and he plans to make up for it next weekend.

"I really want to see some of my old teachers," Mather said over the phone from the Goddard center.

After his high school graduation, when his family moved, he had drifted out of contact with his former mentors for many years.

Robbins had been close with the Mather family, having gone to the First Presbyterian Church of Sussex with them for several years and by serving as Mather's ride to school. Mather was part of a small group of students who paid tuition to attend Newton High School in the days before High Point Regional High School opened. Robbins, who lived in the Wantage area, used to drive the students to and from Newton every day.

"I haven't seen him in years," Robbins said, though she said she did get a chance to talk to him on the phone after he was awarded his Nobel Prize.

It wasn't until about 15 years ago that William LaBance, a science teacher at Newton for about five years and High Point for 30, realized just how far his student had come.

"When his parents left, I lost track (of Mather)," LaBance said. "I didn't know what he was doing until I caught a program on television about cosmology. He was speaking about the cosmic background radiation."

Since then, the retired teacher has seen Mather's name in several scientific journals and papers. At the Newton Hall of Fame induction in 2003, LaBance was also able to obtain an autographed copy of Mather's

See NOBEL, Page A5

Nobel

Continued from Page A1

book "The Very First Light."

After the Nobel ceremony, LaBance received a letter from Mather offering a personal tour of the Goddard center, though he has not had the chance to take up the offer.

"I knew he was going to do something big in science," LaBance said. "It's really neat what he has accomplished and what he is still accomplishing."

It has been a while, but both teachers are looking forward to spending time with their former student at the scholar-athlete banquet. Several teachers from Mather's high school years will be attending.

"I was thrilled to hear he was coming back, that I get to see him again," Robbins said.

LaBance is working on just what he will say. "Somewhere along the line, I got interested in cosmology," he said. "I'm looking forward to being able to talk to him and maybe come up with some good questions about current theories."

Robbins expressed her pride in Mather, saying it wouldn't be fair for the other schools having students recognized that night.

"One school isn't supposed to dominate (the banquet)," Robbins said. "But they don't have a John Mather."

Growing up in Sussex

The caption under John Mather's picture in the Newton High School 1964 yearbook describes him as "intellectual."

But LaBance, had another word for him: Brilliant.

"He probably could have taught me science, he was that brilliant," LaBance said, recalling his early teaching years — the Vernon resident's first job out of college was to teach Mather.

"Science was his thing," LaBance said. "He was very into wanting to learn anything and everything ... but he never tried to show you up. He may have known the answer to the question, but he would never flaunt it — he was very humble.

"But he was well beyond the fundamental courses."

Mather first got his interest in science while he was growing up on the Lusscroft Farm in Wantage — from 1931 to 1970 the farm served as a branch of the New Jersey Agricultural Experiment Station of Rutgers University. Mather's father, Dr. Robert Mather, was the head researcher for the facility that developed artificial insemination for dairy cows.

"My father was a researcher, a biologist, and he was looking for ways to make better milk," Mather said. "But I wasn't really interested in his kind of science."

Mather's first interest came during an elementary school trip to the Museum of Natural History in New York, where he was fascinated by the dinosaur exhibit.

"From the first minute I saw the bones, I thought, 'oh golly, this is really exciting,' " Mather said. "And I was only eight years old. I wanted to know more."

Mather's interest in origins took him to another of his father's interests — astronomy. By the time he entered high school, Mather already had a developed strengths in science and math. He stood out as a straight-A student and a member of the National Honor Society as well as several academic clubs, including the math club and the archaeology club.

But it was the 60s "space race" between the U.S. and the Soviets that locked his focus on the heavens.

"There were so many things going on — the discovery of 'canals' on Mars, Sputnik ... it was all very terrifying to the general public," Mather said. "I think I was already headed in that direction before high school ... but there were many big discoveries then."

In 1969, while he was in between college and graduate school, Mather was working at a summer camp, figuring it would be his last "free" season.

"I was tucking kids in," was Mather's excuse for not catching the live broadcast of Neil Armstrong's first steps on the moon. Though the moment might have signaled the end of the race, the science was far from over. It was the need for more discoveries that helped pave the way for Mather's success.

Working at the 'big lab'

After he earned his Ph.D. from the University of California at Berkeley in 1974, Mather found an opportunity at NASA almost immediately.

"Right after grad school, NASA issued an announcement (asking for) proposals for new satellites," Mather said. His graduate work had focused on measuring energy left over from the Big Bang from ground stations and high-altitude balloons, but he and his instructors decided satellites would eliminate interference from the atmosphere.

Mather went to the Goddard center, which he called "the big lab," and proposed his idea for the Cosmic Background Explorer (COBE), the satellite project that eventually won him the Nobel Prize.

Michael Hauser, currently the deputy director of the Space Telescope Science Institute in Baltimore, was at the meeting. Hauser was several years Mather's senior in the field, but said he was "happy to join the meeting."

"We discussed what would be desirable to measure if we could get the instruments into space," Hauser said. "He has a particular genius for analyzing instrumental calculations and designs."

The total team of about 1,600 people, of which Mather was in charge, decided on three instruments that would analyze the background radiation leftover from the Big Bang. The piece of equipment Mather was most closely involved with essentially measured the temperature of space (which they found to be about minus 455 degrees Fahrenheit). The others looked at minute temperature variations and the amount of light the universe has produced in it's 13.7 billion-year lifetime.

After the satellite was launched in 1989, the team began gathering data and less than one year later, Mather gave a presentation to the American Astronomical Society on his preliminary findings. Hauser called the presentation "one of the most historic moments ever in astronomy."

"He had just put up the graph (comparing the data to temperature predictions) and everyone saw that it matched perfectly," Hauser said. "He didn't need to say a word (before) he got a standing ovation. Everyone knew how difficult it was to obtain this information and how profound it was for the science ... that pretty much sealed his Nobel Prize."

Not only had Mather confirmed the predictions of the background radiation, but according to astronomers his project's finding of slight variations provide important clues as to how the universe developed.

"To me, it just seemed like what we were going to find," Mather said. "(We all) were very excited and relieved at the same time. If the results had been different, we would have had to defend them."

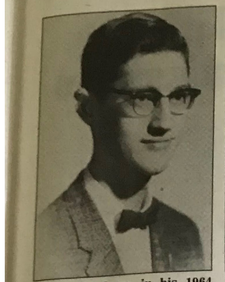
Even while he was being applauded for the findings, Mather shared the credit.

"I don't remember his exact words following (the applause), but no doubt he thanked the team," Hauser said. Even during his speech before the world's top scientists and Sweden's royal family at the Nobel ceremony, which Hauser attended, Mather "used most of his two minutes to give credit to his team."

Mather said the award was "somewhat anticipated, but not really expected."

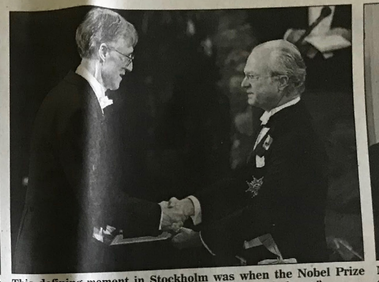
"No one starts out life with the intention of getting a prize," Mather said. "You start out thinking that you have a good idea. Then you work at it and once in a while, if you're lucky, it works."

FROM PAGE ONE

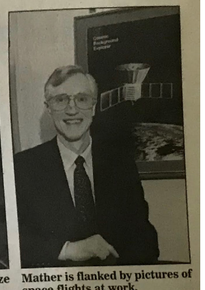


Mather is shown in his 1964 Newton High yearbook picture.

His accomplishments earned him a place on the wall of honor at Newton High School. He plans to visit it on his trip back.



This defining moment in Stockholm was when the Nobel Prize was awarded, recognizing his research on the "big bang."



Mather is flanked by pictures of space flights at work.

Question & Answer

By Stephen J. Novak
snovak@njherald.com

There seems to be a connection with the origin of the universe, New Jersey and the Nobel Prize.

At least on two occasions.

The first was in 1964 when Arno Penzias and Robert Wilson, scientists for Bell Laboratories in Crawford Hill, Monmouth County, accidentally discovered energy left over from the Big Bang, the event that scientists believe marked the beginning of the universe. Their discovery, called the cosmic background radiation, earned them a Nobel Prize in 1978.

Less than 30 years later, NASA scientists George Smoot and John Mather also received a Nobel Prize for their work heading a project called the Cosmic Background Explorer. COBE was a satellite able to measure the energy discovered by Penzias and Wilson to thousandths of a degree and provided definitive evidence of the Big Bang.

At its start, all the matter in the universe was compressed into one small form according to astronomers. The Big Bang released all the energy and matter in the universe, which is still expanding.

But how does essentially measuring the temperature of space provide clues of the origins of the universe? Dr. Mather explains his work, COBE's results and the next mysteries astronomers must solve.

Question: How did you first get involved with trying to measure the cosmic background radiation and how did COBE come about?

Answer: It was the hot topic while I was a graduate student. The radiation had been discovered in 1965 and I was looking for a thesis project only five years later.

Everybody knew this was a thing that ought to be measured really well because it was from the Big Bang. But it was a very difficult thing to measure because basically we were stuck at the bottom of the atmosphere. It was a pretty good topic for a graduate student thesis.

For a student project, you either do it on the ground or the next thing after that is to hang your instrument on a high-altitude balloon. That was my thesis project.

(In 1974) NASA had this announcement just a few months after I finished my school. They said, "Submit proposals for new satellites."

Well, what am I going to suggest? My thesis project would have been better in space. Most of the hazards it faced were from air. My inviter said we'll call up (other scientists) and we'll start up a team ... so we did. We wrote up a proposal, sent it in and we were considered with the other 150 proposals.

We got selected eventually. Two years later we got started seriously. Then in 1982 they finally approved starting the project and it took another seven years after that to launch it.

Q: How have your discoveries helped to advance our knowledge of the origins of the universe?

A: Two major things came out of the COBE work.

The first one was we measured the spectrum of the radiation from the Big Bang — the spectrum is how intense it is at every different wavelength. The critical question was "Is it really the Big Bang at all?" Measurements of the radiation had shown that it might not be at all. If that was true, then all bets were off, maybe the Big Bang was all wrong.

When we got our data and all our measurements fit the curve exactly, people were very excited and relieved at the same time.

Our measurements were so good, they basically ended the whole subject. The radiation matched the prediction perfectly and there is no other scientific theory that explains that. The Big Bang is it. So that's the number one advance.

The number two advance was ... this radiation isn't equally bright in all directions, not quite. It should be almost, because if you say it comes from the whole universe then unless we're at some special spot, it should be the same in all directions — that's the sign that it's cosmic. But if you look really, really closely, it's not exactly the same. This was the second major discovery.

These hot and cold spots in the radiation are thought to represent the conditions of the Big Bang itself. They must have been imprinted there by that great explosion.

Q: That provides some clue as to how the universe formed, right?

A: Yeah, you bet. The opinion is those primordial conditions, plus the force of gravity, caused modern day things to exist. The cluster of galaxies, the stars ... all of those things came from that.

Q: How does that make you feel, that you pretty much discovered direct evidence of the beginning of the universe?

A: Yeah, maybe I should feel more proud about that. To me, it seemed that was what we were going to find. I wasn't surprised when we found all this stuff — I thought it would be there that way.

But seeing how much everybody else has recognized the importance of it, well, that's pretty nice. Actually, thousands and thousands of scientific papers have been written about these hot and cold spots in the radiation because they tell us how the universe began.

Q: If, as you say, the Big Bang is it, what else still needs to be answered?

A: There are at least three or four big mysteries out there.

One of them is that astronomers measure that the matter (like) you and I are made of is only a very small part of the total stuff (in the universe). You've probably heard of dark matter and dark energy — those two things are total mysteries to us. (Dark matter is thought to make up a large portion of the universe — dark energy acts the opposite of gravity and is speeding up the universe's expansion. Both have been theorized but not detected or measured)

We are pretty sure that they are there and that is about it. We don't know what their properties are and we don't know how they connect with anything else.

Q: Will the James Webb Space Telescope (the Hubble replacement project for which Mather is the senior scientist) help detect these things?

A: Yes, it will help. Although since that stuff is dark, you can't see it even with a big telescope.

What you hope to see is the effects of it. The dark matter has gravitation and s it's measurable because of the way it affects the motions of other things. And the dark energy causes the universe to accelerate its expansion.

him: Brilliant.
ber of the National Honor Society as well as several academic clubs,
the University of California at Berkeley in 1974, Mather found an
The total team of about 1,600 people, of which Mather was in
Not only had Mather confirm the predictions of the backgrou radiation, but according to