



S.C. Hall of Fame Transcript

Charles H. Townes

Charles H. Townes was born in Greenville, South Carolina, July 28, 1915, and grew up on a farm.

"I like the out of doors, I like natural history. I like the stars, I studied birds, flowers, insects, collected butterflies. So I was very interested in natural history and what the world was like.

When I took my first course in physics, I said, oh that's very basic. You really try to understand things, how they work, and why they work and so on. You have equations, and you can work out things numerically. Oh, that's just what I want!"

Townes studied at Furman and Duke Universities, then headed west.

"Cal Tech at that time seemed to me the very best place. So I took a bus from South Carolina out to California. It was easy to get into graduate school, but it was hard to get any financial help at that time, those were the years of the Depression. So I went to Cal Tech and after one semester, they gave me a teaching assistantship."

After getting his Ph.D., Townes moved back east to work for Bell Laboratories. As America prepared for World War Two, theoretical physics had to take a back seat to application.

"Oh dear, I didn't want to do engineering, I wanted to do physics. But I had to do it, so I started working on radar, and I learned a great deal from that, that was very important to me."

After the war, Townes became a professor at Columbia University, where his experience in radar led to the idea for the MASER—"Microwave Amplification by Stimulated Emission of Radiation"—a device that transformed microwaves into an intense, coherent stream.

There were skeptics...

"For example Bohr, Niels Bohr, a famous physicist... I was visiting him in Denmark... and Niels Bohr said, what are you doing, and I said we've just made the maser, I call it, which is producing



very pure frequencies from ammonia molecules, amplifying at a very pure frequency. He says, oh no, that's not possible."

But it was possible...

"Einstein was the one who pointed out how these atoms work. You see, they either absorb or they stimulate and emit. Einstein didn't foresee amplification but he understood the mechanisms, the quantum mechanics."

MASER technology led to the LASER—"Light Amplification by Stimulated Emission of Radiation"—created by manipulating the quantum state of atoms, forcing them to emit a concentrated beam of light.

[Clip]

"I was primarily interested in the scientific uses, nevertheless I could see a lot of uses. On a broadband width, you could send an enormous amount of communication on a light beam. In addition—very high power, very concentrated power. You could burn things, and weld things, cut them, and so on. I could foresee many things. On the other hand there were many things I couldn't foresee, such as the medical uses. It never occurred to..."

In 1964, Charles Townes shared the Nobel Prize in Physics for his work on maser and laser devices.

From 1966 until 1970, Townes was Chairman of NASA's Science Advisory Committee for the Apollo lunar landing program.

And in 1967, he accepted a position at the University of California at Berkeley, and entered a new discipline.

"I came out here in order to do astronomy. I decided I could see some new things to be done in astronomy that other people were missing. For example, microwave astronomy... It's been a very important field now, and I've found a way to measure the size of stars."

The general public is interested in scientific discovery, but often has a short attention span.

"I think they're kind of interested in discoveries of physics and astronomy but they don't recognize its importance economically. And even the politicians can't support science so



strongly because it isn't going to pay off immediately. It pays off many years later. Now for example, the maser and laser... the laser is now billions of dollars of business, but it has been about 50 years. And it frequently takes about 20 years for a scientific discovery to begin to pay off heavily.

I think many people don't recognize that, that engineering contributes to science, science contributes a great deal to engineering. Interaction between them is very, very important. The maser required the combination of the oscillator and quantum mechanics, and so do lasers. It's that combination that produces the new ideas."

Townes has influenced many younger scientists...

"Arno Penzias was a student of mine, and he discovered the "Big Bang," the origin of the universe. What could be more important than to find out the universe had a beginning? That impacts our philosophy a great deal."

Townes is known for his views on the compatibility of science and religion.

"I don't think there's any basic conflict between the two.

Science attempts to understand how the universe works. Religion seeks to understand how the universe began and what the meaning is.

What is it that God created? It has to be very specially constructed; fantastic laws of science have to be there in order for us to be here."

In 2005, the Templeton Prize—for "Progress Toward Research or Discoveries about Spiritual Realities"—was awarded to Charles Townes.

He is the only person other than the Dalai Lama and Mother Teresa to win both a Templeton Prize and a Nobel Prize.