



## **Nobel Voices Video History Project, 2000-2001**

---

**Interviewee:** Charles Townes  
**Interviewer:** Neil Hollander  
**Date:** June 26, 2000  
**Repository:** Archives Center, National Museum of American History

HOLLANDER:

If you could please just introduce yourself to us.

TOWNES:

Well, I'm Charles Townes. I'm a physicist, but I also do astrophysics, and I'm presently teaching at the University of California in Berkeley.

HOLLANDER:

What is it exactly that you do, Doctor?

TOWNES:

Well, I've done a variety of things, and I have fun trying one thing after another. [Laughs] I've particularly worked with radiation. That's radio radiation, infrared radiation, visible radiation, and so on. I've done a lot of the different kinds of things, but typically, I do something I think is being overlooked, something where I think there might be some new interesting things to do. Then if it's good, it catches on, a lot of other people come into the field and so on, there's a lot of other people there, then they don't need me. I'll go do something else that's being missed. So I change fields about every ten years at least.

Right now, I'm doing interferometry on stars and other astronomical objects. Interferometry is a way of getting very, very precise images, looking at details, almost like getting a microscope on the sky. I have two telescopes that I can put far away from each other, and they're both used at the same time. I do it in infrared, because interferometry's been done in visible radiation, but not very much in infrared. We can see new kinds of things there, see details nobody ever seen before.

HOLLANDER:

What kinds of new details, for example, are you seeing?

TOWNES:

## **Nobel Voices Video History Project, 2000-2001**

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

Well, we're measuring the size of the stars, and we can measure them, I think, better than they've ever been measured before. I think previous measurements in some cases have been misleading. But also we can look through the dust that surrounds some old stars. Old stars put off a lot of gas and dust, and the infrared waves will go through the dust, and we can see the star, and other people haven't been able to see it before, see how big it is. Then we can watch the star as it blasts out dust. We can see the material come out and see it move and so on. So we can look at these clouds, we can see them move, we can watch the star change. We see changes that are so fast that we have to be there looking at least every month, because things are happening. If we had still more details, things would be happening still faster.

HOLLANDER:

Where did you get this interest in astronomy? Was there a precise moment or person or book or place where you could say, "This is where I've decided to be an astronomer"?

TOWNES:

No, I've always been interested in astronomy. Actually, what I like is the universe. I like natural history. I liked to roam in the fields and wade in the streams and catch insects and catch turtles and climb trees and watch birds and so on. I like all of those kinds of things. I used to look up at the sky. I've always liked astronomy. It's a fascinating field, as are most of these other things.

HOLLANDER:

Was there a specific moment where you decided, "I'm going to be an astronomer"?

TOWNES:

No. In fact, I sort of thought maybe I'd be an astronomer once or twice before, but it didn't work out. I thought I would do radio astronomy, for example, when it was a very new field, and I talked with a distinguished astronomer. I said, "Now, what do you think is the best thing to do in radio astronomy?"

He said, "Well, I don't think radio astronomy's any good, really. I don't think it will tell us anything." Well, he was absolutely wrong.

So I said, "Well, okay, I'll do something else then for the moment." Later, I did some radio astronomy.

Then I did an administrative job for a while, but I decided to stop that. When I stopped that, I said, "Now is the time I'll go into astronomy," so I moved to California, because that's a very good place, lots of mountains around, with lots of telescopes. It's a good

## **Nobel Voices Video History Project, 2000-2001**

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

place for astronomy. When I moved to California, I said, “Now I’m going to really go into astronomy.”

HOLLANDER:

Was there a particular book or something that you read that marked you, or a person you talked to, who sort of marked your life in general?

TOWNES:

No, no, I would say it was just looking at the stars and thinking about them. My parents, and I had a brother, who we liked to roam the fields and do things and look at things and figure out things. My parents encouraged us. I would say those are things that really got me interested.

HOLLANDER:

A totally unrelated subject. Do you know any good science jokes? What’s your favorite science joke?

TOWNES:

Oh, dear. [Laughs]

HOLLANDER:

While you’re thinking of that, what’s something humorous that’s happened to you in your career?

TOWNES:

Something humorous that happened to me. Well, I’m sure plenty of humorous things have happened to me, but let me see.

HOLLANDER:

How about an embarrassing moment?

TOWNES:

Well, I’ve made some mistakes. [Laughs]

HOLLANDER: For example?

TOWNES:

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

I've made some mistakes. Well, you know, when I did my thesis, I tried to measure the spin of a carbon isotope, that's carbon-13. I tried to measure the spin of nucleus, and I measured it, and I said, "Oh, the spin is a half." Now, however, then my professor, when we wrote it up, I had moved east by then, taken a job, and he wrote it up. He wrote up the paper and said, "Oh, the spin is three halves." Well, I wasn't bold enough to say and to argue with him and so on. He had reasons. But it turned out, and so I said, "Okay, we'll publish this and say it's three halves," but I was uncertain about it. I thought it was a half. But my professor was bigger than I was, I guess. But then about a half a year later, somebody else did another experiment on it, and sure enough, it was a half.  
[Laughs]

HOLLANDER:

Vindicated.

TOWNES:

I was wrong. But I was wrong for accepting that, you see. [Laughs] That happens in science. You can make mistakes.

I think, in fact, if you take radio astronomy, many American scientists made mistakes, that they didn't think radio waves would tell us much. But radio waves are fantastic in what they tell us about the heavens, about astronomical objects. It's been a very, very, very successful field. I've gone into radio work and then the infrared.

I've been flying in a big NASA plane so we can go up above most of the water vapor and most of the air and see through with waves that don't get all the way down to the ground. They go up so we can detect these particular waves, the particular wavelengths that people haven't been able to do before.

HOLLANDER:

Going back to the science joke, has one come into your head yet?

TOWNES:

A science joke. I'm afraid I don't. [Laughs]

HOLLANDER:

What are some of the things you dislike?

TOWNES:

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

Things I dislike? Well, you know, I never particularly liked to write. I didn't like to write. I thought, you know, people just say things. I like to know things, but just to be talking and saying things, I never liked to write. But I had to write in English class, and I had to write. What I found as I grew older as well, if you're going to do anything, you have to know how to communicate and you have to know how to write. You've got to write if you're going to produce something. So I gradually had to write.

Finally, after some labor, I produced a kind of an autobiography. Really, it's the story of the laser. I call it *How the Laser Happened: Adventures of a Scientist*. I finally got through with that and got it done, published last year. So I never particularly liked to write. I felt, well, writing is just making up words, you know, and trying to impress people and whatnot. I like to understand things. I like to figure out things. I like to make them work, and I think that basically is science. It's puzzle-solving. Science is puzzle-solving, figuring out how things work, what they are, what the universe is like. That's what I've always enjoyed.

HOLLANDER:

Would you consider yourself an inventor, then, in some ways, like of the laser?

TOWNES:

Oh, yes, I've done inventions, and I like to invent. But on the other hand, I primarily like to understand things. I like to understand things better. I don't invent just to be inventing, but in understanding things and trying to make things work, you frequently figure out new ways of doing things. The laser came about because I wanted to get to shorter wavelengths than we could get with microwaves. I was doing interaction microwaves and molecules—microwave spectroscopy—and I was studying molecules and the nuclei and atoms within them and so on. I wanted to get the shorter wavelengths, shorter than about a centimeter, waves about this length that we could make at that time, and I wanted to make them shorter, a millimeter or a tenth of a millimeter, and I kept thinking about ways of doing it.

That's when the idea of the laser and then the laser hit me. Well, I tried and tried. I tried for several years, different way of doing it. They didn't work. Finally, I had the right idea. I was just suddenly, "Hey, *that's* the way to do it."

HOLLANDER:

At the moment when you had the right idea, what happened? Was there a catalyst? Was there something happening? Why did that happen?

TOWNES:

Well, you know, I had been working on this for two or three years pretty hard. I tried

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

various things that didn't work. I was chairing a committee to try to figure out—I was serving on a national committee, and we went around and visited different laboratories and talked with people how could it be done and so on. We just didn't get anywhere.

We were having our last meeting down in Washington. I said, "Gee, we just haven't gotten anywhere, and why is this?" I woke up early in the morning and I went out and sat in the park, in the nice bright sunlight and the azaleas were out. "Why haven't we been able to do this?" I thought through all the things I tried, and this wouldn't work. I had an idea that maybe we could molecules to produce these waves, but I always told myself, well, but the second law of thermodynamics says, no, you can't get much energy out of it. The second law of thermodynamics is a very general law, but it applies if things are in thermal equilibrium; they're all the same temperatures. I kept saying, well, the second law of thermodynamics says it won't work. I said, "Now, wait a minute, wait a minute. The second law of thermodynamics, that doesn't have to apply. We don't have to have everything at the same temperature." Suddenly, wait a minute, I just missed this all along.

And I took out a piece of paper, and I knew all the numbers because I'd been thinking about it, and yes, it looks like that will probably work. That was really how the idea occurred.

But you see, I think the thing to do, you work and work, you think and think, and then suddenly the right idea comes. But you have to work at it.

HOLLANDER:

This is probably a difficult question for you, but what do you think needs to be invented now in the future? What needs to come?

TOWNES:

[Laughs] Well, of course, you say, "What do we have to have?" Well, really, our civilization gets along pretty well with what we have, but it would be nice to have a lot of other things. I was just talking recently about the problem with energy. We're using up all of our coal. Now, how can we get more energy efficiently and cheaply without polluting the atmosphere and without using up all our resources? How can we get more energy? That's something we need. That's something we need very badly.

There are a lot things, clearly, that will be done. I think genetics, for example, we'll be able to work with genetics, work with biological systems and do some fantastic things. I would say the primary thing we're going to need there is to understand what's the right thing to do and what will help people, particularly if we try to change the genetics of people. You know, how should we do this, and so on. I think that's the main thing to think of there, but clearly that's going to develop.

## **Nobel Voices Video History Project, 2000-2001**

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

I think biology's a wonderful field. Astrophysics is a wonderful field. All of these things. Another thing that's going to develop is what we call nano structures; that is, doing things on a very, very small scale. We can now build things atom by atom, sort of build what we want almost atom by atom, but we need to develop that. We need to know how to do it better and do it well, and that will produce a lot of very efficient, very small, low-energy requirements and so on, and probably cheap.

There's just whale of a lot of things that are going to come about. I'm sure they will. Just which ones will, we don't know because things that are going to be new, the new discoveries, those are things we don't know now, so we can't predict them. All we can say is, yes, things are going to be found out, but what, we don't know.

HOLLANDER:

How has science in a way transposed itself into your personal life or your life outside of science?

TOWNES:

Outside of science? Well, of course, scientists have in a sense a public responsibility because science affects our civilization so much, affects people so much. I was asked to come down to Washington at a time when Washington was having a crisis about missiles and about the space program and so on. A lot of people said, "Oh, don't do that, you know. You're doing so much more interesting things now in your laboratory." But I felt a responsibility, and I went down to Washington and worked there. I felt I could stand it for a couple years, which I did. I've been called on many times to try to help out and advise the government about what to do about technical problems. And that's very important. These are problems which politicians don't understand fully, and they know that. They need help. Scientists need to work in the public domain, outside of their own science, but with a scientific background.

In addition, I think teaching is a wonderful thing. I enjoy teaching. You learn a lot from students. They ask good questions. But furthermore, it's very important to the students and to our people. So I think for scientists to get outside the laboratory and talk with young people and teach and so on, that's another very important factor, which is not science per se, and yet it is very closely related and a scientific background is needed.

HOLLANDER:

If a young person like myself comes up to you and says, "Doctor, what should I do? What should I read? What course do you think I should take?" what would you say?

TOWNES:

I would say take everything. Take everything. Learn everything you can. Learn

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

everything you can, but particularly look out for the things that you find are interesting and fun, that you think are important and you enjoy. Those are the things you'll probably do best, the things you enjoy doing and that you find interesting, but also that you think are important. So do those. But to do those well, you want to learn as much as you can. Take some of everything. Get a very broad background. Then after you get a very broad background, then you can go on and do especially the things that you think are fun.

HOLLANDER:

You've mentioned the word "fun" a number of times and "play" [inaudible]. Have you been able to keep that sense of humor in everything through for you work?

TOWNES:

I enjoy my work. I frequently say, well, I've never worked. I just have fun. I just do physics, do what I want to do, and for some reason people have paid me for it. Now I'm supposed to be retired, but I keep on doing it because it's fun. It's very enjoyable. It's exciting and interesting, and I feel very fortunate to be able to do it.

HOLLANDER:

Don't you have people say, "Now, wait a minute, Doctor. This isn't fun. This is serious business"?

TOWNES:

Well, yes, it's serious, but enjoyable, and I work very intensively. Of course, I have a family and I had responsibility of my children when they were young. I spent a lot of time with them. Nevertheless, I worked pretty hard, and now I always work on Saturday. I take Sunday off. I take a real break on Sunday. But otherwise, I work nights and I work Saturdays, except, as I say, it's not really work. It's just doing things I think are important and I like to do, and as I say, those are the things you can do best, the things you enjoy doing.

HOLLANDER:

This attitude of fun, is that translated into your relations with your wife and your kids?

TOWNES:

Oh, sure, I tell them that, and I enjoy it and so on. I hope they enjoy my doing it.

HOLLANDER:

That's why I'm coming back to this question, do you have a favorite science joke now?

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

TOWNES:

A favorite science joke. I can't—I just don't. None occurs to me at the moment. Sorry.

HOLLANDER:

[inaudible] something humorous that's happened to you, the funniest thing that's happened to you in the lab or with your associates?

TOWNES:

Well, let me see. I'm not sure. I'm not sure I think of anything. I can tell you one thing that may be amusing. I wouldn't consider it a joke, exactly, but when I was working on the laser, that was the first idea of how to get energy out of molecules and atoms and later developed into the laser. But I wanted to produce microwaves first. Those are waves about, say, a centimeter, half centimeter, millimeter long. I had a student working on this, and we worked on it. We were working on it for about two years.

Then the chairman of the department came into my office with the previous chairman of the department, who was a Nobel laureate then. This chairman of the department became a Nobel laureate, a very distinguished physicist. I was a young man. They came in my office and said, "Look. You're wasting your time. You know that's not going to work, and we know it's not going to work. You just ought to stop. You're wasting the department's money and so on. You've got to stop."

Well, fortunately, I was an associate professor by then, and an associate professor has what we call tenure. That is, you can't be fired. You can't be fired unless you do something that's really immoral or something. You can't be fired just because you're not successful. Fortunately, I had tenure, and so I could tell them, "Well, no, I think it has a chance of working. I think it has a reasonable chance of working."

Well, they walked out of there a little annoyed.

In about two months, my student came into my classroom and said, "It's working." We all dashed up there to see it working, and sure enough, there it was, oscillating and producing waves and so on. All these people, these people who told me, "Oh, that's not going to work. We know it's not going to work. You know it's not going to work. It's stupid of you, you see," well, one of them, at least, kind of apologized, said, "Well, I guess I should know that you know more about what you're doing than I do." [Laughs]

And the other guy actually nominated me for a Prize, so he wasn't trying to pick on me. They were just wrong. We can always do that in science, you know. You can be wrong. You've got to recognize when you may be wrong, think hard about it. Somebody tells you you're wrong, think about it. Well, I had thought about it. I had worked out all the

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

equations and thought about it hard. No, I thought I was right, so I went ahead.

HOLLANDER:

Have you been wrong many times?

TOWNES:

Oh, yes, I've been wrong.

HOLLANDER:

For example?

TOWNES:

Oh, well, now, you see, I don't remember those so well. [Laughs] I don't remember those so well. I mentioned this wrong thing about the spin, the spin of a nucleus, you see. There was one time I was wrong. I make mistakes all the time, but then I don't remember those, you see. [Laughs] No, I'm afraid I can't tell you.

HOLLANDER:

Do you have any regrets, looking back over your professional career?

TOWNES:

Do I have any regrets? Well, let me say I've had lots of failures. Maybe this will help you instead of showing you where I was wrong. You see, I had lots of failures, things I didn't want to have to do and that they were wrong and so on. But almost always they turned out to be okay. For example, when I got my degree, I wanted to be in the university. I wanted to do pure research in the university. Well, this was the 1930s, depression time. There weren't any jobs. Bell Labs came along and offered me a job, and my professor said, "Look. That's a job. You ought to take it." Well, I didn't want to go to industry and make things. "Well, you'd better take it."

Well, there wasn't anything else around, so I took a job at Bell Labs. I thought, "Well, that's too bad," and that's a kind of a failure. I didn't want to go into industry. Not that industry's bad; I just wanted to be in the university.

I was there for eight years. I learned a whale of a lot. It was very important. I learned a whale of a lot there, and it started my career. I had a background from which I've drawn all the rest of my career, you see, and I started doing research there after the war. First, I happened to become an engineer and do radar work and do systems engineering, which is not what I wanted to do. But I learned so much. After the war, I used that to do

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

spectroscopy, microwaves, studied molecules, and that got me a nice job at Columbia University, and so I was there. So that was one failure, you see, which turned out to be okay.

Another failure, I'm not always interested in administrative work. I'd rather be in the lab. But, well, MIT asked me to go up there and be an administrator or provost, and the job was opening for president in a few years, and I thought, "Well, okay, MIT, that's the kind of place that I guess a scientist ought to be president." I didn't want to be a president of an ordinary university, but MIT was different. I felt, "Well, okay."

I went up there. I was provost for five years, and then they chose a new president. It wasn't me. [Laughs] Well, most of my friends felt terribly down about it, you see. But I said, "Well, gee, you know, maybe I don't have to do administrative work after all. I'll just pick out what I want to do in research and get back to doing full-time research."

That's when I went to California and started in astronomy. That gave me an opportunity to do astronomy. I'm having much more fun. That was another failure, you see, which it turns out all right, I would say generally well. Sure, you're going to have ups and downs and things that seem to be wrong, but you learn from them.

HOLLANDER:

Do you ever go to the movies?

TOWNES:

Sometimes.

HOLLANDER:

What kind of movies do you like?

TOWNES:

Oh, well, I used to like funny movies and adventure movies. Those are the ones I like. I don't go to movies very much now, but that's the kind of movies I like.

HOLLANDER:

What was the last movie you saw that you liked?

TOWNES:

Well, I think it's been six months since I've been to a movie, at least. Let's see. There was a movie about a young boy in World War II in Italy, in Florence. It had wonderful

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

pictures of Florence and so on. It was a young boy and his story of how he found his way. Eventually, he made friends with some English people, made friends with him, and so on, and they came over to the United States and whatnot. The adventures and success of this young boy, I thought that was a good movie.

HOLLANDER:

Have you ever had any adventures yourself, or have you gone on any adventures yourself?

TOWNES:

Adventures? Well, I'm not sure. All of what I'm doing is an adventure, in a sense. [Laughs]

HOLLANDER:

Any physical adventures, I mean?

TOWNES: I

've tried some hard things. I climbed the Matterhorn, for example. I got a Swiss guide to take me out there. Matterhorn is, you know, one of the highest peaks in Switzerland. It's very steep, and you climb about 5,000 feet, whereas if you make a misstep, you're way down in the valley. You've fallen. In fact, I went up and some guy had fallen off. Two guys had fallen off and killed themselves just before. But I made it up there with a good Swiss guide, made it up there and back.

Another time, I went down the Grand Canyon. I was very innocent about it. I was going across the country to go to Caltech to school, and I didn't have much money. I was traveling by bus, but I would stop off and see things I wanted to see. I wanted to see the Grand Canyon, so I stopped there. Oh, it was such an exciting, beautiful place. I wanted to walk down the canyon a bit, so very early in the morning, the place wasn't open for breakfast, so I said, "Well, I'll start walking. I'll just go and I'll come back for breakfast."

I walked down, and it was just so much fun, I kept on walking. I said, "Well, I'll go down to the bottom." So I went down to the bottom of the Grand Canyon. I had no water with me and nothing to eat. But there was supposed to be a ranch down at the bottom of the canyon where I could maybe get something, you see. So I walked down, climbed down 5,000 feet to the river, wonderful scenery, and I enjoyed it. Got down to the ranch, the ranch had been closed up.

So here I was in the hot desert country, no water, and all day have to climb up another 5,000 feet. I got pretty thirsty. I was, in fact, chewing on cactus to get a little water out

## **Nobel Voices Video History Project, 2000-2001**

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

of the cactus by the time I came back. So that's another one.

I like to hike. I guess another one, I was climbing in the Himalayas, and but there I got altitude sickness. So I had to stop and stay, and I was really, really quite sick for a while. I didn't make it as far as I wanted to go. I stopped.

HOLLANDER:

Where were you headed in the Himalayas?

TOWNES:

Well, we were up—oh, what's the highest mountain there?

HOLLANDER:

Everest?

TOWNES:

Yes, Mount Everest. We were headed up. We were headed up the mountain. We weren't going to go to the top, but probably go up to fifteen, eighteen thousand feet, something like that. I was up at about thirteen thousand feet, and I began to feel sick. I'd been up to that altitude before, but it's just a chancy thing, how much you feel. But I was throwing up all over the place and feeling pretty badly, so I had to stop and give up. So that was a failure. It was still fun to get up that far at least.

HOLLANDER:

Let me just ask you one last question. Society is moving in a rather strange undefined direction right now, or it seems to be undefined. Where do you think it's headed? Where do you think we're all headed?

TOWNES:

Well, that's a hard question. I think, clearly, technology is going to continue to develop. Science and our understanding will continue to develop. Human curiosity is there. We humans are curious. I think we'll go out into space, we'll travel into space, and so on. Now, I think more of a question is, what is going to be our sense of values? What do we value and how do we treat people? That's going to be very important.

I think with the decreasing attention to religion and the increasing openness saying, "Well, you know, just do what you want to do and so on," I'm a little concerned about what our sense of values are. If you look at our politicians, too, you know, it's hard to admire some of our politicians and what their sense of values are and the way they do

## **Nobel Voices Video History Project, 2000-2001**

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

things. So I think that's the critical thing for our society. How do we treat other people? Are we going to be able to make peace in the world? Are we going to be fair to other people? Are we going to bring up, help the people who are poor, and so on? I think those are the big questions about how humanity is going to develop. That is, our values and how we treat people.

Science and technology, I think, I have no doubt it will continue, and it will bring new possibilities. With those new possibilities, we ought to be able to do better and better, but only if we think about doing things right.

HOLLANDER:

On this question of values, something is missing, obviously. What is it?

TOWNES:

Well, I suppose what you might say is our sense of the meaning of the universe, the meaning of our lives. Do we think deeply enough about what it all means? We think about, well, here's the universe, what is it like, how does it work, and what is it like? But what's it here for, and what is its meaning? And what are our lives for? I think that's the thing which determines values. What are we all about, really, and why should we be here, and what should we be doing, and why is the universe here? Those are sense of values.

Well, we think, "Well, I'm just here to have as good a time as I can have," well, then you get very self-centered. If you think of civilization, of humanity, of development of life, of other sense of values, what does it all mean? It's a wonderful universe. Why is it here? It's very special. The more you study science, the more special you find the universe is. And our particular planet, how special it is, how special life is. What does it mean? That's what I think we must consider carefully.

HOLLANDER:

How do you answer some of those same questions that you're posing?

TOWNES:

Well, frankly, I believe in a creator. I believe in a god, not necessarily the same god that everybody defines so precisely. I think God is very hard to understand completely. It's impossible for us to understand, yet I feel his presence. I feel the presence of God. I feel the creativity that's there. I would say, in general, that's a very general answer, I know, but that's the basis of my own views and how I try to look at things.

HOLLANDER:

## **Nobel Voices Video History Project, 2000-2001**

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

Is this presence somehow going to help us reinstate values, for example, as you mentioned, the value of helping others and salvation of the world and so forth?

TOWNES:

Well, I think so. I think it can. I think it can. Much depends on how you react. If you feel that presence, what does it mean to you and how do you react and what's it about, still, you see? But if there's a purpose to the universe, we ought to be part of that purpose. We ought to try to be helping it. That, presumably, is to develop life, to perfect life, develop a better life all the time, and help the universe to grow and get better.

HOLLANDER:

I have to ask you one last question. I'm sure you've been asked this dozens of times. Also because we've been talking about life, what is out there?

TOWNES:

What is out there? [Laughs] Well, actually, it's fantastic things. Fantastic things. I've been looking. One of the things I helped discover was a big black hole at the center of the Milky Way. The Milky Way is a group of billions of stars, which is our galaxy that we're in. Our sun is just one of these stars, you see, and we're just a little planet swimming around the sun. You look into the center of our galaxy, which we can do now with waves, radio waves, and infrared. You can't see into it with light, because there are dust clouds there. But now with new technology and new techniques, we can see into there. We've looked into the center of the galaxy, and there in the very center was a big black hole. Now, that black hole has so much mass, nothing can ever get away from it, not even light. It's three million times as heavy as the sun and very compact. So things fall into it, they can never get away. That's just one of many discoveries.

You look in new ways. You look at things we've not looked at carefully before. You look with new technology, with new techniques, you look in more detail, and it always surprises. Always surprises. We find actually in the universe there's a lot of matter there. We don't know what it is. We know it's there, but we can't see it. We don't know what it is. Now, that's fascinating and [unclear].

Most of the matter in the universe are things we haven't seen, and we don't know why we can't see it. We don't know what it's like. And we've got to find ways of seeing this and what the universe is made of. We see only a very small part of it. We know there's matter there because we can feel its force of gravity, and yet we can't detect it, we can't see it.

Another thing is recently we've seen waves which were made in the initial Big Bang. The universe started, we had a unique period when it was very small and exploded. We see radio waves left over from that time, so we can say something about what happened

## Nobel Voices Video History Project, 2000-2001

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

then, but we still don't know very much about what happened then and how it developed. There are fascinating things to be found out. With new techniques, new thoughts, penetrating thought, we can figure more of that out.

HOLLANDER:

Do you think there's life out there or life of some kind?

TOWNES:

I think probably. I think life is rare, though. It's very hard to begin to start life, and you have to have very special conditions. Our universe is made in a very special way, with laws of science, laws of physics. It has to be very special in order for us to exist at all. But we do exist here, so clearly life can occur. But it probably started on Earth only once or twice, because we're all related. We all have the same structure of molecules. Our molecules are all left-handed. All life on Earth has left-handed molecules, not right-handed molecules. Well, the right hand is just as good as the left hand, and why aren't there some right hand? Well, it means it just started once or a few times. So it's rare.

We don't know just how life started, but it's clear it's improbable, but it happened. So I would say probably. And also you have just the right kind of planet, just the right conditions, and so on. So probably life exists because of so many billions of stars. Our own galaxy has 10 billion, roughly, and there are about 10 billion galaxies in the universe, so surely somewhere else there's something. [Laughs] Even though it's not probable, nevertheless, there's probably still a lot of different lives, a lot of different life forms in the universe somewhere. Whether we'll ever have a chance—how much of a chance we'll find we'll have to see them or find them or detect them, I don't know, but we should look. I'm all for digging under the ground in Mars and looking and seeing if we find bacteria there and so on. I think that would be great to explore.

HOLLANDER:

They just found water on Mars.

TOWNES:

That's right, that's right. We know there has been water on Mars and there's ice on Mars now, and so that would seem like a likely place if life has a reasonably high probability of forming. I think we ought to go look. Now, it may be that life on Mars spread there from the Earth. Microorganisms got blown off from either some comet hitting us or something, but we'll find that out. If we find that their life is closely related to ours, we'll find that out, too. In any case, I'm very eager to see that we get to Mars and look carefully to see what we'll find there.

The other planets, it probably wouldn't work at all. Venus, for example, you think is

## **Nobel Voices Video History Project, 2000-2001**

Charles Townes, June 26, 2000, Archives Center, National Museum of American History

---

pretty about like us, same distance from the sun and a similar planet, but there's a lot of carbon dioxide in the atmosphere, surrounded by carbon dioxide, so the surface is very, very hot. The surface of Venus is so hot it will melt lead. I don't think we'll find life there. [Laughs]

So planets vary a lot, and some of them are just completely unsuited. The Earth is unusual in being made just right, fortunately for us.

HOLLANDER:

I can't think of anything else.

TOWNES:

Okay. Well, ten minutes from now, I'll probably think of those jokes.

HOLLANDER:

If you do, please feel free. We'll be around for a while.

TOWNES:

Okay.

[End of interview]