Nobel Voices Video History Project, 2000-2001

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Interviewer: Neil Hollander
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HOLLANDER:

If you don't mind, I'd like you to begin briefly by giving us your name and then briefly identifying yourself.

HEWISH:

Well, I'm Anthony Hewish. I'm now Emeritus Professor of Radio Astronomy in the University of Cambridge, and I'm aged seventy-six. I'm still active in research, but, of course, I'm no longer head of the research group which I directed towards the end of my career.

HOLLANDER:

Well, let's go way back. Can you remember, can you identify the moment as a child, perhaps, as a youth, that you first became interested in science?

HEWISH:

Oh, that was very early indeed. I think if I look back, I must have been about six years old, maybe seven years old, and I was playing with a few wires and electric batteries and torchlight bulbs, and I discovered for myself that if I put one of the wires from the battery onto a big—we had a big brass tray, and I discovered that if I connected one of my wires onto the tray, then I could touch this bulb down anywhere on the tray, and it would light up. That was the kind of discovery I made for myself, and I suddenly realized, "Hey, you know, this whole tray here is acting like a wire. That's pretty interesting."
It's pretty elementary science now, but, you know, in those days when you always used wires to connect things up, the fact that you could use this whole tray, metal tray, and you could put the bulb down anywhere, you know, that struck me as really quite a nice thing. I think that—I can't say it turned me on, but I've always been interested in how things work. I'm just curious about what goes on inside boxes.

HOLLANDER:

Do you know what moved you to even set up a circuit like this at that time?

HEWISH:

No. I mean, that goes too far back. I was just interested, curious is how things worked, and it was just another example of that, I think, just playing around with physical things. I mean, it didn't matter. It didn't have to be electricity. I would take clocks to bits to see how they worked and all that.

HOLLANDER:

Can you identify, maybe associate any person also or any other kind inspiration that moved you to carry on from there?

HEWISH:
Not really in those early years, I think. I mean, it was always when I began to go to school and classes and so on, I used to enjoy the aspects, things like practical chemistry and anything to do with placing things on the bench. I enjoyed and I could understand what was going on, and I just naturally enjoyed that. I had some good teaching, and I mean, it goes right back to my earliest education, I suppose, really.

HOLLANDER:

Any particular teacher that you can remember?

HEWISH:

Not in those days, no, no, no, no, no. I was just overly curious, and I was lucky to have teachers who got through and communicated to me.

HOLLANDER:

Where was this taking place?

HEWISH:

Well, it all began down in Cornwall, right in the west of England. For a while I went to a school on the north coast of Cornwall in a small town called Newquay. I was born down in the west country there, and I like it, still like it, very much. It was in school there that I started really to do what you might call serious science education, although I was only about ten years old at the time, nine or ten.

HOLLANDER:

Let's move forward. Do you have a recollection of when you really started getting into the field where your major work was to be?

HEWISH:

What got into that, well, that's very easy. My academic career was interrupted by World War II. I was a student in Cambridge University in 1942 for a year reading physics, mathematics, and chemistry, natural sciences, as we call it in Cambridge, for my degree course. But in those days there was a desperate shortage of electronics experts to operate and do research on radar, and after a year, I was directed to the Royal Aircraft Establishment in Farnborough, which is a place where air-to-air communications systems were being worked out. I finally, quite shortly, got involved with radar countermeasures; that's to say, radiating signals to jam enemy radars. And that's what I did for three years during the war period. I was involved with that at a place called Malvern in England. My special function there was not to design these pieces of equipment, but to teach the operators how to use it on the aircraft.

So in those days there was such a rush to get new equipment into operation, you couldn't lay on proper educational schools for these people. You simply had to go to the squadrons. I was on a bomber command squadron, and actually tell the boys there how to install it and how to twiddle the knobs and how to get the whole thing operating. In fact, we were installing the equipment in American aircraft, the famous B-17s. They were ideal aircrafts for these tasks, because you could hang antennas out of them in all directions and they'd still fly, you know. You could load them up. They weren't too streamlined, and you could load these up with all kinds of electronics for jamming. So I went onto a squadron which was doing that, and taught them how to use this radar.

HOLLANDER:

And then that led to?

HEWISH:

Well, that kind of thing, not that in detail, but I went on to other devices later. But that lasted me through the three years until the war came to an end. Then I was able to get back to Cambridge to continue my studies. I got back in 1946 and had had two years to finish my degree, and I did better than I expected, actually. No one expected me to get a first-class degree. I didn't, myself, but I worked pretty hard. Of course, I learned a lot during those three years that I'd been away. I was doing something, luckily for me, I was doing something related to academic studies in a sense. I was being fairly technical.

So when I'd finished at Cambridge, I got the opportunity to join a research group, and I discovered that Martin Ryle, whom I'd known during the war, he was involved with this same equipment as I was. He was starting a research group at the Cavendish Laboratory, Cambridge, studying radio waves from the sky, you know, wondering what they were. Since I understood radio technology and I understood the kind of the antennas being used, it was natural that I would want to go and do research with him. It was just an obvious thing to do. I mean, there were other options like low-temperature physics, nuclear physics, crystallography, various options, but this was such a natural choice. I mean, maybe you could say I was bit lazy, but I knew the techniques already, and I knew Martin Ryle, that he was a good chap to be working with. So it was a natural thing that I would want to go and work with him, and that's really how it began.

HOLLANDER:

Was there anything else pushing you towards astronomy besides [unclear]?

HEWISH:

No, nothing, nothing. I mean, I'd never thought of astronomy, particularly, as a child. I mean, everybody's interested in the stars in the sky and all of that, but I mean nothing drove me to be an astronomer and, in fact, we weren't astronomers in those days. I mean, we learned the astronomy as we went along.

The thing was, here was a mysterious phenomenon in physics. It relates back, actually, to the dark days of the war in 1942 when I didn't know this at the time—nobody knew it; it was a wartime secret—but radio waves initiated at the sun during a solar disturbance connected with sunspots had radiated strong enough signals to black out, to blot out, the south coast radars on the south coast of England.

John Hay was doing operational research for the antiaircraft people, and he discovered that the antennas that were picking up this interference were actually directed towards the sun at the time. Although it was a cloudy day, he knew where the sun was, and so he supposed that these signals probably came from the sun. He got on to the Royal Observatory at Greenwich, and they said, "Yes, indeed, this is a time when there's the solar activity. This is just what you expect. There are sunspots on the sun in the right place."

After the end of the war, it was a natural research project to understand these radio waves for coming from the sun, and that's what Martin Ryle was doing when I joined the group. But the very year I joined, it was discovered that radio waves were coming from other places, too. So here was a totally new phenomenon; we didn't know what it was. It was just a grand place to be starting research, because a few new mysteries are what you want to get into rather than doing a research field that's already been worked on for a long time. I mean, it's much better if you can, as a young research person, to get involved with something new, full of problems, and you make progress for yourself that way.

HOLLANDER:

Would you say from this experience that preparing for war, and war, can accelerate scientific progress?

HEWISH:

Well, of course. Of course, of course. I mean, this is obvious. I mean, maybe it's a sad fact, but some good comes out of war like this. I mean, it's a matter of survival, and you've just got to develop these things very quickly, and the incentive to do that is so great, that you work very hard to do these things. I'm sure that the techniques that we used immediately after the war were a direct result of wartime research work, so there they were. If there hadn't been a war, they wouldn't be there. So it did help us. It did help us to get started. There's no doubt about that. The equipment we were using, of course, was ripped out of aircraft and so on. It was war surplus equipment. It was already there to be used. So we used that.

HOLLANDER:

I can't help but stick my head in here and ask a question. You talk about mystery, and everybody [unclear] people all over the world. You've probably looked at more stars or [unclear] stars than anyone. What about these mysteries?

HEWISH:

I'm sorry? What about—

HOLLANDER:

What about these mysteries?

HEWISH:

What about these mysteries? Well, they're marvelous. I mean, this is what research is all about. We love mysteries, but I mean, where do you want me to go? I can talk about what they are forever, but—

HOLLANDER:

How do you feel about mysteries? Is it less of a mystery to you?

HEWISH:

Oh, yes, yes. I mean, mysteries are there to be solved in the world of physics, aren't they? And getting your teeth into solving some of those mysteries is a wonderful thing to do, although I have to say my research started off in a slightly more humble way. I got on to the research, which actually has been with me all my life, which is using these radio waves from what we now call radio galaxies, to understand the intervening material. I mean, using the radio waves to probe what's between us and these sources. So I use these radio waves as a source of radiation, which enables me to study, initially, it was the atmosphere above our heads. Nobody knew a great deal about what we called the ionosphere then. It's called the magnetosphere now. But I realized that you could use these waves to make studies of what was going on 100, 200 miles above the surface of the Earth, and that was a research field I could get into and do good work for myself. And we all like problems we can actually get our hands on and make our own.

No one was doing this. Martin Ryle was trying to solve the mysteries of radio galaxies. I wanted something for myself. So I thought, "Let's use these waves to probe the upper atmosphere." That's how my particular research began.

HOLLANDER:

You, of course, know that I'm fifteen. He's a bit older. He's sixteen. Can you explain to us the essence of your Nobel-winning research?

HEWISH:

Well, I'll do my best. The award was for the discovery of an entirely new kind of star way back in the 1930s. It had been predicted soon after the discovery of a new atomic particle, a new nuclear particle, I should call it, the neutron. James Chadwick, in 1932, discovered one constituent of an atomic nucleus was a neutral particle. Now, theoretical physicists are very clever people, and way back there in the 1930s, they had predicted that you could get a star made almost entirely of these neutrons, but it would be an extremely unusual kind of star, and it would probably result from the death of a star. I mean, we all know the sun is producing energy by nuclear fusion. That's nuclear fusion inside the sun. That nuclear reaction is what produces all this radiation, keeps us alive and gives us energy. But the sun won't produce energy forever. It's going to run short of fuel, and the question is, what happens when the star has become burned out?

Well, what happens is that gravity, which is a force which is always trying to pull a star inwards, the inward force of gravity is trying to compress stars, and when they stop burning, gravity can compress them into a much smaller volume, and the sun is going to, when it's finished burning, is going to ultimately end up as a star, well, about the same size as planet Earth, much, much smaller than it is at the moment, because gravity has compressed it. It's a ball, if you like, of compressed stellar ashes.

Well, now, that theory was pretty well understood before the discovery of the neutron particle. People realized that this process, something like this was going on. But when you have a neutron particle, you can see that there's another possibility. The possibility there is that gravity can become so strong that you can crush matter into a completely new form. You see, the key to this is knowing that matter is composed, all the matter around us in the Earth is composed of protons, which are positively charged particles, and electrons, which are negative-charged particles, and these neutrons. Now, it's the fact that there are electrical forces between the positive and negative charges that keeps the shape of atoms as we know it, and that determines the structure of materials, all materials, on the earth.

But if you can turn the electrons and protons, which are oppositely charged, into a neutron, essentially it's like squashing together a positive charge and a negative charge and making a neutral object, the neutron. If you squeeze hard enough, you can do that, and then you end up with neutrons. If this happens in the middle of a star, because of gravity, then you end up with—you've destroyed the positive and negative charges, you end up with a big ball of neutrons. And this was the hypothesis of a neutron star.

This would be absolutely an amazing object, because you compress the material so much under these conditions, that a body as heavy as the sun would be squashed into a ball just a few miles across. Now, the sun is roughly a million miles across, so you squash down by an enormous factor, and so this body would be so condensed that if you took a—imagine taking a small spoonful of it. That would weigh something like a hundred or a thousand million tons. It's hard for us to even contemplate such a thing, but that was the prediction.

Now, I knew nothing about this in my research. But that's the background, was that I discovered these stars. The strange thing that nobody predicted at all was that these neutron stars would produce flashes of radio waves, and I was the first one to actually discover these flashing stars in the sky.

HOLLANDER:

Why do they produce those radio waves?

HEWISH:

That's a long story, too. We still don't know properly why they—

HOLLANDER:

Fifteen years old.

HEWISH:

You are fifteen years, yes.

I mean, maybe a word about how it was we were lucky enough to actually find these stars, because we weren't looking for them. I mean, I didn't know anything about neutron stars when I was doing this research. The research I was engaged on was by then I was quite interested in radio galaxies.

Now, I maybe should say what a radio galaxy is. I think you're familiar with galaxies made of stars, these large things you can see with binoculars, even, if you look up into the sky from here. But a radio galaxy was an early discovery in radio astronomy. It turned out that some of these galaxies were emitting radio waves of great power, which meant you could detect them at enormous distance, and they were there for very interesting and unusual objects. But we didn't know what they were because radio telescopes then were not able to make good maps. With a radio telescope, you can't make photographs. I mean, you have to make images in a different way.

In the late 1950s and the '60s, we just didn't have the apparatus to make those images, and I was really rather keen to find out just how big are these radio galaxies in the sky. Are they small objects? Are they large objects? We simply didn't know. But I realized that I could use an effect which related back to my very earliest research about probing atmospheres using radio waves coming through.

I made the discovery with others in Cambridge that when radio waves from a radio galaxy travel through the planetary system, our own solar planetary system, towards the Earth, they get affected by gas blowing away from the sun. The sun's amazingly hot, and it's blowing off a gas into space all the time. We call it the solar wind. Not much was known about this in the days I was working, but the solar wind has been much studied by spacecraft since then.

But the whole of space around us here is filled with a gas which is blowing off the sun. I made the discovery that this gas was affecting the radiation coming through. It made radio galaxies fluctuate in intensity, varying, and it was an effect which is really just exactly like the twinkling of a star, but in this case, it was twinkling of a galaxy, and the twinkling was caused by gas coming off the sun.

Now, I can't go into this in detail, but I saw how to use this to see how big radio galaxies were. In a nutshell, I think you probably know that stars twinkle and planets do not. When you look at a planet in the sky, or the moon, it doesn't. It doesn't twinkle. That's because they're very, very large. You have to have objects which are really pinpoints of light, to twinkle. They have to have a tiny angular size. The radio galaxies clearly had a tiny angular size to twinkle. I saw that I could use this to make a quantitative measurement. I mean, I could get a real handle, as we say in physics, on this. I could see how to use this phenomenon just to measure how big radio galaxies were as you see them in the sky.

So I designed a big radio telescope, quite an unusual kind of telescope, because it had to be sensitive to this effect I'm talking about, this twinkling effect. That meant I had to make it operate at a much longer wavelength than radio telescopes usually operated on. I designed it to work at meter wavelengths; that is to say, VHF communication wavelengths. I also made it very sensitive to signals which were flickering. And almost as soon as we'd got it into operation, we discovered that there were these flashing stars.

I mean, it was my graduate student who first got onto this research. Much of the hard work of research, as I'm sure you know, is done by students who are learning how to do research. My graduate student, Jocelyn, Jocelyn Bell, was in charge of analyzing all the data we were getting from this telescope. She said, "Hey, there's something funny going on here, because one of these radio galaxies is showing a lot of twinkling at the wrong time of day." I mean, when the telescope was pointing way away from the sun, and you wouldn't expect much twinkling because the solar wind is much thinner when you look behind, yet, nevertheless, there was this flashing signal.

So I said, "Well, that's a funny thing. Let's look at the signal more closely. Maybe we've discovered a new kind of star." There were stars which could have produced signals like this, a bit like the sun only much further away. So I decided to set up equipment to actually look at these fluctuations of the signal in more detail so that I could actually see what shape they were, to see if they looked like scintillation or twinkling or looked like something else. The amazing thing was, we discovered this was something producing absolutely regular flashes, about just over once a second, tiny sharp flashes lasting a few thousands of a second and repeated with great accuracy.

So that was something entirely new and a total mystery. I mean, it just kept me awake at night wondering what the heck this thing could be. I mean, it looked so artificial. No star could do a thing like that. It was clearly something truly amazing.

So that was the first impact, and, in fact, the signals looked so artificial that we said to ourselves, well, is this the first detection of intelligence coming from outside? I followed that up very thoroughly, because if this is true, it's a dramatic discovery, and you have to make sure what you're doing in science. So we got on to analyzing the signal in much more detail, and I was able to measure how far away the source of this radiation was. It turned out to be coming from amongst the nearby stars.

Another thing that we learned pretty soon was that whatever was emitting the signal had to be about the size of a planet. It couldn't be bigger, because you can't get sharp flashes from a large body. I mean, it's just not possible because light takes time to travel from the different portions of a body, and if you have something which is large, if you switch it on and off, you still can't get sharp flashes, because the signal comes—there's a time difference in the signal coming from different parts of it. So this prevents you getting sharp flashes.

So here we had an artificial-looking signal coming from amongst the stars, and it just looked like a message. Well, what would you think? I mean, that makes you think that maybe you have to take this intelligence very seriously indeed. But there was one more thing to do. If it's life of some kind, it's on a planet and, therefore—I mean, life, I don't think—intelligent beings have to inhabit a planet, as far as I can see. Life has to start on a planet somewhere. So if these signals are coming—if they're intelligent, they're coming from some transmitter on a distant planet, not our solar system. I mean, I've already said it's out amongst the stars, but some unknown planet out there.

But you could tell if this was the case, because I had timed these pulses with enormous accuracy. I discovered that they were as accurate as the best clocks we had. They were keeping time to better than the millionth of a second from one day to the next. If you got flashes coming in that accurately, you can use an effect that we call in physics the Doppler effect. It's just that if a source is moving, you can measure it if you have an accurate—if it's flashing accurately.

[Taping interruption]

HEWISH:

Keep going. Okay, well, I'll take it up where I left off. I discovered that the flashing was so regular, the pulses were keeping time to better than a millionth of a second a day, and that meant that if the source of the flashes was in orbit about some star way out there, I could measure that orbital speed, because this affects the rate of flashing. If it's coming towards you, the flashing is slightly compressed. It's slightly faster. If it's going away from you, it's slightly slower, and you can use that to see if there's any planetary motion or whatever sending the signal.

Well, I used that, and it took me three weeks in December 1967 to decide that, in fact, there wasn't any detectable orbital motion. And really, I have to say that was a great relief. I didn't want to be the first guy to discover signals coming in from outer space, intelligent signals. I mean, okay, it's a great discovery, but it's a bit of a worry, too. Martin Ryle and I talked about this. "What the heck do we do if the evidence points strongly in favor of intelligence?" Because you can't just communicate to a science journal and say, "Look, you know, we've discovered this thing." I mean it's much, much bigger than that.

We were wondering what to do, and we would have consulted the top scientific brass in England. I would have called a meeting of the Royal Society, which is our principal science academy, and got the senior people there, the experienced older scientists, to hear it, to decide, first of all, whether they thought we were right, you know, just to confirm it. Then there would have been some national consensus about how you actually handled this thing, but luckily it didn't come to that. There was no orbital motion I could detect.

So at that stage, I said, "Okay, well, then, it has to be a star which is smaller than the planet Earth, and it's up there among the other stars. What could it be?" I simply really talked to friends, astronomer friends, who knew much more about stars than I did, and I heard about this hypothetical neutron star, that you can have stars which are small. So that was enough for me, that the fact that a star existed which was small enough to be a source of signal, and we submitted the discovery for publication.

At that time, I hypothesized that the radio waves were being generated by a vibration of the star. Neutron stars can actually vibrate in and out very fast, and that had already been thoroughly discussed by theoretical astronomers. So I thought, okay, if you have the star pulsing in and out, it can send shockwaves through its atmosphere, those can generate radio waves, and that's what we're seeing. And that's how I published it.

HOLLANDER:

And that was the Nobel Prize winning paper.

HEWISH:

That was the key. That was the Nobel Prize winning paper, yes, yes.

HOLLANDER:
For you and Ryle?

HEWISH:

Well, it was not Ryle, because Ryle really wasn't involved in this work. This was my own brand of research. I was in it with my own graduate students, and so it was myself, my graduate student Jocelyn Bell, and there were other people. Other radio telescopes were brought into this detective work to find out what the signal was and to measure how far away it was and so on, so there were five names on the paper. Colleagues had made useful measurements with other radio telescopes, and it all came together. I mean, I had to describe this whole thing in one paper. You couldn't kind of split it up, and so the other names were there. But Ryle wasn't, because he wasn't initiating the work.

HOLLANDER:

You then accomplished this work, and when did the Prize come?

HEWISH:

That discovery was made in November '67. We published it in February of '68. The Prize came in 1974.

HOLLANDER:

Doctor, you're touching on one of the fundamental mysteries [unclear]. Is there life out there?

HEWISH:

Nobody knows. I don't bother myself about this. There are no ways of calculating the probabilities. I mean, you might think it's highly unlikely that we're the only populated planet, and I think I subscribe to that view, but I really—it doesn't bother me one way or the other. We've no idea how many planets would support life, because we don't know how life originates. So we just have no idea whatever what the probabilities are of other human beings, and I wouldn't waste research money on trying to detect signals, intelligent signals. I mean, I think whatever comes will be a surprise, like my discovery of pulsars.

HOLLANDER:

But if you heard something which was of some intelligence, you wouldn't be surprised?

HEWISH:

No, not totally surprised, no. I wouldn't be surprised. I mean, clearly, this is an amazing discovery, but I mean, I have faced the situation. I was detecting things that I thought probably were, you know. I mean, I've met that situation, and of course it was a fantastic surprise. But I mean, the more philosophical aspect of it, am I surprised that intelligence could exist somewhere else, well, no, I think I'm not, because the universe is a huge place. We're not the only solar system around. There are other stars. We know there are lots of other planets. So it wouldn't be a surprise to me if there's life somewhere else. No, it certainly wouldn't.

HOLLANDER:

What does the Nobel Prize mean to you?

HEWISH:

Mean to me? Oh, well, when you get the Nobel Prize, you're walking on air. I mean, it's a wonderful thing. I mean, it's—I can't say it's enormously changed my life in the sense that if you're actually involved in a research group, that's what you have to keep on doing, and I was in Cambridge. I mean, you can't just drop it all and become an important figure touring the globe. You get lots of invitations to give lectures everywhere, but my philosophy was to say, "Well, look, I'm here in a wonderful place, Cambridge. I'm in a wonderful research group. I want to carry on doing exactly what I'm doing." And I think it helped to get funding, apart from that.

I mean, it's a tremendous boost, of course, personally, I mean, to know that you've been honored in this way and, as it were, it's a global decision. I mean, you don't apply for a Nobel Prize. It's just your name gets put forward from different places, and I mean, to feel that the world's scientists thought have that you were of sufficient merit to get the Prize, gives you personally a fantastic feeling.

HOLLANDER:

[unclear].

HEWISH:

Organized teamwork, yes.

HOLLANDER:

[unclear]?

HEWISH:

Yes, yes, I feel enormously lucky that I lived at a time when you could think up a research project for yourself, you could get the funding, you could achieve it, you know, within ten years, and get on with it all yourself, and only a few individuals involved. I think that's the most satisfying way of being a scientist. But when it comes to huge teams, now, I mean when literally hundreds of scientists are involved in a discovery, it's clearly much, much harder to single out, you know, who's the creative brain behind all this. Not working in that field, I can't really comment much except just to say I think it must be enormously difficult to award a Nobel Prize in modern particle physics, where you need huge accelerators which somebody's had to design and built, you need huge teams to operate this thing, and you need huge teams for theoretical interpretation and computation and all the rest. That all contributes to science. I mean, in a sense, the Nobel Prize is not perhaps a suitable award for groundbreaking discoveries in that area. But I mean, that's sad but true, I think.

HOLLANDER:

Eventually you and Ryle did receive [unclear].

HEWISH:

Yes, well, those were the days when you could pinpoint unique contributions, and we were extremely lucky. I mean, Ryle got his Nobel Prize for his own invention of a new type of radio telescope, and that's fine. And I got it for being the first man to set up equipment and observations to detect the first radio pulses and to understand what we were looking at.

HOLLANDER:

[unclear]?

HEWISH:

An inventor? I'd hardly put it that far, because what I used was, I put together known techniques to build the instrument. My original contribution was to conceive that that sort of instrument could do useful work. I mean, nobody had made anything like this before. But I didn't invent the technology which I used to put that into operation. I mean, the invention, the creativity, came in the observation, seeing what observations were needed, and getting on with it. They were not standard observations. I mean, I went out on a limb, doing something which was quite different from what you might call the bandwagon approach, where just everybody says, "Well, that's clearly something you ought to do. Let's go ahead and do it," and the big teams get on with it.

I mean, I've always enjoyed doing my own thing, and this was something I could do. A pretty big project, but I was totally in charge of the whole thing. And, you know, life these days isn't like that, unfortunately. In the early phases of a subject, in physics, that was the case, and you can do your own thing. It's getting harder and harder all the time, and I'm just very glad I was in at the ground-level stage of radio astronomy. I mean I'm just immensely fortunate to have taken up my research when I did. It's much harder now to make Nobel Prize-winning discoveries in astronomy.

HOLLANDER:

[unclear]?

HEWISH:

If a child did what?

HOLLANDER:

Crawls into your lap.

HEWISH:

Crawls into my lap. Yes.

HOLLANDER:

[unclear]?

HEWISH:

Oh, I might dream up a story. I've done it with grandchildren. I've forgot what I told them about. No, it would be about some little animals or something, yes. But they might go off to space and see what's going on up there. But it would have to be some, I don't know, some little rabbit or something, which, you know, happened to jump onto a meteorite or, you know, asteroid or something like that. I wouldn't bring Greek mythology into it. They know enough Greek mythology anyway. But I spun a few stories like that to my own children, yes.

HOLLANDER:

Would you send them into space?

HEWISH:

Would I send them into space?

HOLLANDER:

[unclear].

HEWISH:

Make them think—oh, surely, yes, of course. Yes. It's a wonderful place to go. Yes, of course. It's a great adventure. Yes, yes, indeed, indeed.

HOLLANDER:

[unclear]?

HEWISH:

Absolutely. In fact, I drew out a patent based on pulsars. Immediately the discovery was made, because we had discovered—actually when I published the work, we had discovered four different pulsars in different parts of the sky. Now, the flashing is so regular, you can use these for astronavigation. If you ever wanted to take a trip through the galaxy in a spacecraft—now, this is looking ahead—so far, we haven't gone outside the solar system, as you know. But if you wanted to do that and you wanted a navigational system, pulsars are your ideal thing, because we know more or less where they are, and you can navigate. I mean, if you want to get to Earth, you've got a readymade GPS navigation system just by looking at pulsars in different directions. I mean, they are so artificial that you can use that flashing to get a fix in three dimensions, and so you can get home again. It was a bit of a joke, but I took out a genuine patent on that. I patented the pulsar navigation device.

But on a more serious level—

HOLLANDER:

[unclear].

HEWISH:

Yes, that what Marvin Ryle said. He said, "Maybe you'll be rich in your old age." Well, that hasn't happened. [Laughs] Not rich financially, anyway.

But more seriously, pulsars are, as I've said, extremely accurate timekeepers, and accurate time is becoming of great importance. I mean, there are national time services sponsored by government funding all around the world. Well, it could be that pulsars could become a real time standard, you know. They are so accurate, that there's a readymade clock for you already. So your National Bureau of Standards might say five seconds of time is, you know, a flash of that pulsar.

HOLLANDER:

[unclear]. [Hewish laughs.] [unclear].

HEWISH:

Sounds good. You had your ten minutes. There's no escape now, except I'll go in the water.

HOLLANDER:

[unclear]?

HEWISH:

Yes, oh, yes. Well, I mean, it's certainly an enormous boost. I mean, it was a great boost for astronomy in the U.K., and it was a great boost for me. And I think it's a great stimulus. But you don't do your research thinking—at least in my experience, my colleagues and I never worked toward a Nobel Prize, you know. "I'm doing my research because there may be a Nobel Prize at the end of it." I mean, I just never dreamed of a Nobel Prize. So I don't think it's—I mean, that, I think, is not typical in the field of biology.

If you read the book by Crick and Watson, you know, you get the feeling that the prize was there to be won, and goddamn it, they were going to get it in the next three or four years, you know, and they were working for it, and this was a great race. But I don't think research groups in general operate like that. It's not a way to do systematic research. So I mean, it's a great stimulus and it's wonderful when it happens, and it focuses the world's attention on science. You know, it's a great stimulus to keep science going. But individually, I don't think you work hoping that tomorrow maybe you'll get the Prize. I mean, it's not a sensible way of carrying on. I mean, you do good work in a good group, and if you're lucky, you're in the right place at the right time to do the work that gets the Prize.

But there are lots of other groups with just as good scientists doing excellent progressive work, and for some reason they don't hit the jackpot, and that's bad luck, but I mean, their work stands as excellent science. So it is an enormous stimulus, but individually you don't think too much about prizes. At least I didn't, and I don't think most people do.

HOLLANDER:

[unclear]?

HEWISH:

I simply—through my wife, she really taught me. She's a pianist. I don't play any instrument, but I love listening to music, and the longer I live, the more depth I find in it and satisfaction. Really, I don't think I could live very easily now without music, depending on my mood. I mean, I love chamber music. I love Bach, Beethoven, Schubert, Brahms, even some modern composers I like. But I mean, music is a wonderful thing. It transports you to a different world which is outside of physics. It's got nothing to do with physics except for the mechanics of making the noises. But you're transported into another world, which I think is wonderful. Listening to music is one of my main hobbies.

HOLLANDER:

[unclear]?

HEWISH:

Visual arts? Yes, when I can understand it. I don't think I—I mean, I can't see enormous hidden truths in some modern art, I have to say, but, yes, I can see the inspiration of people like Turner and Constable and the Dutch School and so on. Yes, I love art. Yes, certainly.

HOLLANDER:

[unclear].

HEWISH:

You have. [Laughs] I'm running short of voice.

[End of interview]