

DESERT ISLAND DISCS,

an Interview of Stephen Hawking (1992)

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by Stephen Hawking

Fourteen

DESERT ISLAND

DISCS:

AN INTERVIEW

THE BBC's Desert Island Discs began broadcasting in 1942 and is the longest-running record program on radio; by now, it is something of a national institution in Britain. Over the years the range of its guests has been enormous. The program has interviewed writers, actors, musicians, film actors and directors, sports figures, comedians, chefs, gardeners, teachers, dancers, politicians, royalty, cartoonists—and scientists. The guests, always referred to as castaways, are asked to choose which eight records they would take with them if they were marooned alone on a desert island. They are also asked to name a luxury object (which must be inanimate) and a book

to accompany them (it is assumed that an appropriate religious text—the Bible, the Koran, or an equivalent volume—is already there, together with the works of Shakespeare). It is taken for granted that the means to play the records exists; the early announcements introducing the program used to say “. . . assuming there is a gramophone and an inexhaustible supply of needles to play them.” Today a solar-powered CD player is presumed to be the available means of bearing them.

The program is broadcast weekly, and the guests' choice of records is played during the interview, which normally runs for forty minutes. However, this interview with Stephen Hawking, which was broadcast on Christmas Day 1992, was an exception and ran longer than that.

The interviewer is Sue Lawley.

SUE: In many ways, of course, Stephen, you are already familiar with the isolation of a desert island, cut off from normal physical life and deprived of any natural means of communication. How lonely is it for you?

STEPHEN: I don't regard myself as cut off from normal life, and I don't think people around me would say I was. I don't feel a disabled person—just someone with certain malfunctions of my motor neurones, rather as if I were color blind. I suppose my life can hardly be described as usual, but I feel it is normal in spirit.

SUE: Nevertheless, you have already proved to yourself, unlike most castaways on *Desert Island Discs*, that you are mentally and intellectually self-sufficient, that you've got enough theories and inspiration to keep yourself occupied.

STEPHEN: I suppose I'm naturally a bit introverted, and my difficulties in communication have forced me to rely on myself. But I was a great talker as a boy. I need discussion with

other people to stimulate me. I find it a great help in my work to describe my ideas to others. Even if they don't offer any suggestions, the mere fact of having to organize my thoughts so that I can explain them to others often shows me a new way forward.

SUE: But what about emotional fulfillment, Stephen? Even a brilliant physicist must need other people to find that.

STEPHEN: Physics is all very well, but it is completely cold. I couldn't carry on with my life if I only had physics. Like everyone else, I need warmth, love, and affection. Again, I'm very fortunate, much more fortunate than many people with my disabilities, in receiving a great deal of love and affection. Music is also very important to me.

SUE: Tell me, which gives you greater pleasure, physics or music?

STEPHEN: I have to say that the pleasure I have had when everything works out in physics is more intense than I have ever had with music. But things work out like that only a few times in one's career, whereas one can put on a disc whenever one wants.

SUE: And the first record you'd play on your desert island?

STEPHEN: *Gloria*, by Poulenc. I first heard it last summer in Aspen, Colorado. Aspen is primarily a ski resort, but in the summer they have physics meetings. Next door to the physics center is an enormous tent where they hold a music festival. As you sit working out what happens when black holes evaporate, you can hear the rehearsals. It is ideal; it combines my two main pleasures, physics and music. If I can have both on my desert island, I won't want to be rescued. Not, that is, until I have made a discovery in theoretical physics that I want to tell everyone

about. I suppose a satellite dish, so I could get physics papers by electronic mail, would be against the rules.

SUE: Radio can hide physical shortcomings, but on this occasion it's disguising something else. Back seven years ago, Stephen, you literally lost your voice. Can you tell me what happened?

STEPHEN: I was in Geneva, at CERN, the big particle accelerator, in the summer of 1985. I was intending to go on to Bayreuth, in Germany, to hear Wagner's *Ring* cycle of operas. But I caught pneumonia and was rushed to hospital. The hospital in Geneva suggested to my wife that it was not worth keeping the life support machine on. But she was not having any of that. I was flown back to Addenbrookes Hospital in Cambridge, where a surgeon called Roger Grey carried out a tracheostomy. That operation saved my life but took away my voice.

SUE: But your speech was in any case by then very slurred and difficult to understand, wasn't it? So presumably the power of speech would have deserted you eventually anyway, wouldn't it?

STEPHEN: Although my voice was slurred and difficult to comprehend, the people close to me could still understand me. I could give seminars through an interpreter, and I could dictate scientific papers. But for a time after my operation, I was devastated. I felt that if I couldn't get my voice back, it wasn't worth carrying on.

SUE: Then a California computer expert read about your plight and sent you a voice. How does it work?

STEPHEN: His name was Walt Woltoz. His mother-in-law had had the same condition as me, so he had developed a computer program to help her communicate. A cursor moves

across a screen. When it is on the option you want, you operate a switch by head or eye movement, or in my case by hand. In this way, one can select words that are printed out on the lower half of the screen. When one has built up what one wants to say, one can send it to a speech synthesizer or save it on disk.

SUE: But it's a slow business.

STEPHEN: It is slow, roughly one-tenth the speed of normal speech. But the speech synthesizer is so much clearer than I was previously. British people describe its accent as American, but the Americans say it is Scandinavian or Irish. Anyway, whatever it is, everyone can understand it. My elder children adapted to my natural voice as it got worse, but my youngest son, who was only six at the time of my tracheostomy, never could make me out before. Now he has no difficulty. That means a great deal to me.

SUE: It also means you can demand good notice of any interviewer's questions and need only answer when you're good and ready, doesn't it?

STEPHEN: For long, recorded programs like this, it helps to have advance notice of the questions, so I don't use hours and hours of recording tape. In a way that gives me more control. But I really prefer to answer questions off the cuff. I do that after seminars and popular lectures.

SUE: But as you say, the process means that you have control, and I know that's quite important to you. Your family and friends sometimes call you stubborn or bossy. Do you plead guilty to being those things?

STEPHEN: Anyone with any nous is called stubborn at times. I would prefer to say I'm determined. If I hadn't been fairly determined, I wouldn't be here now.

SUE: Were you always like that?

STEPHEN: I just want to have the same degree of control over my life that other people have. Far too often, disabled people have their lives ruled by others. No able-bodied person would put up with it.

SUE: Let's have your second record.

STEPHEN: The Brahms Violin Concerto. This was the first LP I bought. It was 1957, and 33 rpm records had recently appeared in Britain. My father would have regarded it as recklessly self-indulgent to buy a record player, but I persuaded him I could assemble one from parts that I could buy cheap. That appealed to him as a Yorkshireman. I housed the turntable and amplifier in the case of an old 78 gramophone. If I had kept it, it would now be very valuable.

Having built this record player, I needed something to play on it. A school friend suggested the Brahms Violin Concerto, as no one in our circle at school had a record of it. I remember it cost thirty-five shillings, which was a lot in those days, especially to me. Record prices have gone up, but they are now a lot less in real terms.

When I first heard this record in a shop, I thought it sounded rather strange and I wasn't sure I liked it, but I felt I had to say I did. However, over the years it has come to mean a great deal to me. I would like to play the start of the slow movement.

SUE: An old family friend has said that your family, when you were a boy, was, and I quote, "highly intelligent, very clever, and very eccentric." Looking back, do you think that's a fair description?

STEPHEN: I can't comment on whether my family were intelligent, but we certainly didn't feel we were eccentric. How-

ever, I suppose we may have seemed so by the standards of St. Albans, which was a pretty staid place when we lived there.

SUE: And your father was a specialist in tropical diseases.

STEPHEN: My father did research in tropical medicine. He quite often went to Africa, to try out new drugs in the field.

SUE: So was your mother the greater influence on you, and if so, how would you characterize that influence?

STEPHEN: No, I would say my father was the greater influence. I modeled myself on him. Because he was a scientific researcher, I felt that scientific research was the natural thing to do when one grew up. The only difference was that I was not attracted to medicine or biology because they seemed too inexact and descriptive. I wanted something more fundamental, and I found it in physics.

SUE: Your mother has said that you always had what she described as a strong sense of wonder. "I could see that the stars could draw him," she said. Do you remember that?

STEPHEN: I remember coming home late one night from London. In those days they turned the streetlights out at midnight, to save money. I saw the night sky as I had never seen it before, with the Milky Way going right across. There won't be any streetlights on my desert island, so I should get a good view of the stars.

SUE: Obviously you were very bright as a child, you were very competitive in games at home with your sister, but you could come practically at the bottom of the class at school and not care about it at all, couldn't you?

STEPHEN: That was in my first year at St. Albans school. But I should say that it was a very bright class, and I did much

better in examinations than in classwork. I was sure that I really could do well—it was just my handwriting and general untidiness that caused me to be placed so low.

SUE: Record number three?

STEPHEN: When I was an undergraduate at Oxford, I read Aldous Huxley's novel *Point Counterpoint*. This was intended as a portrait of the 1930s and had an enormous cast of characters. Most of these were pretty cardboard, but there was one who was rather more human and was obviously modeled on Huxley himself. This man killed the leader of the British Fascists, a character based on Sir Oswald Mosley. He then let the Party know he had done it and put on the gramophone records of Beethoven's String Quartet, Opus 132. In the middle of the third movement he answered the door and was shot by the Fascists.

It really is a very bad novel, but Huxley was right about his choice of music. If I knew that a tidal wave was on the way to overwhelm my desert island, I would play the third movement of this quartet.

SUE: You went up to Oxford, to University College, to read maths and physics, where you worked by your own calculations an average of about an hour a day. Although it has to be said you rowed, drank beer, and played silly tricks on people with some pleasure, according to what I've read. What was the problem? Why couldn't you be bothered to work?

STEPHEN: It was the end of the fifties, and most young people were disillusioned with what was called the Establishment. There seemed nothing to look forward to but affluence and more affluence. The Conservatives had just won their third election victory with the slogan, "You've never had it so good." I and most of my contemporaries were bored with life.

SUE: Nevertheless, you still managed to solve in a few hours problems that your fellow students couldn't do in as many weeks. *They* were obviously aware, from what they've said since, that you had an exceptional talent. Were you aware, do you think?

STEPHEN: The physics course at Oxford at that time was ridiculously easy. One could get through without going to any lectures, just by going to one or two tutorials a week. You didn't need to remember many facts, just a few equations.

SUE: But it was at Oxford, wasn't it, that you first noticed that your hands and feet weren't quite doing what you wanted them to do. How did you explain that to yourself at that time?

STEPHEN: In fact, the first thing I noticed was that I couldn't row a sculling boat properly. Then I had a bad fall down the stairs from the junior common room. I went to the college doctor after the fall because I was worried that I might have brain damage, but he thought there was nothing wrong and told me to cut down on the beer. After my finals at Oxford, I went to Persia for the summer. I was definitely weaker when I came back, but I thought that was caused by a bad stomach upset that I had had.

SUE: But at what point did you give in and admit that there was something really wrong and decide to get medical advice?

STEPHEN: I was at Cambridge by then, and I went home at Christmas. That was the very cold winter of '62 to '63. My mother persuaded me to go and skate on the lake in St. Albans, even though I knew I was not really up to it. I fell over and had great difficulty getting up. My mother realized there was something wrong. She took me to the family doctor.

SUE: And then three weeks in hospital, and they told you the worst?

STEPHEN: In fact, it was Barts Hospital in London, because my father was a Barts man. I was in for two weeks, having tests, but they never actually told me what was wrong, except that it was not MS and that it was not a typical case. They didn't tell me what the prospects were, but I guessed enough to know they were pretty bad, so I didn't want to ask.

SUE: And finally, in fact, you were told that you had only a couple of years or so to live. Let's pause at that point in your story, Stephen, and have your next record.

STEPHEN: *The Valkyrie*, act one. This was another early LP, with Melchior and Lehmann. It was originally recorded on 78s before the war and transferred to an LP in the early sixties. After I was diagnosed with motor neurone disease in 1963, I turned to Wagner as someone who suited the dark and apocalyptic mood I was in. Unfortunately, my speech synthesizer is not very well-educated, and it pronounces him with a soft W. I have to spell him V-A-R-G-N-E-R to get it to sound approximately right.

The four operas of the *Ring* cycle are Wagner's greatest work. I went to see them at Bayreuth, in Germany, with my sister Philippa in 1964. I didn't know the *Ring* well at that time, and *The Valkyrie*, the second opera in the cycle, made a tremendous impression on me. It was a production by Wolfgang Wagner, and the stage was almost totally dark. It is the love story of twins, Siegmund and Sieglinde, who were separated in childhood. They meet again when Siegmund takes refuge in the house of Hunding, Sieglinde's husband and Siegmund's enemy. The excerpt I have chosen is Sieglinde's account of her forced wedding to Hunding. In the middle of the celebrations,

an old man comes into the hall. The orchestra plays the Valhalla motif, one of the noblest themes in the *Ring*, because he is Wotan, the leader of the gods and the father of Siegmund and Sieglinde. He plunges a sword into the trunk of a tree. The sword is intended for Siegmund. At the end of the act Siegmund draws it out, and the two run off into the forest.

SUE: Reading about you, Stephen, it almost seems as if that death sentence, being told you had only a couple of years or so to live, woke you up, if you like, made you concentrate on life.

STEPHEN: Its first effect was to depress me. I seemed to be getting worse fairly rapidly. There didn't seem any point in doing anything or working on my Ph.D. because I didn't know I would live long enough to finish it. But then things started to improve. The condition developed more slowly, and I began to make progress in my work, particularly in showing that the universe must have had a beginning in a big bang.

SUE: You've even said in one interview that you thought you are happier now than before you got ill.

STEPHEN: I certainly am happier now. Before I got motor neurone disease, I was bored with life. But the prospect of an early death made me realize life is really worth living. There is so much one can do, so much that anyone can do. I have a real feeling of achievement that I have made a modest but significant contribution to human knowledge despite my condition. Of course, I'm very fortunate, but everyone can achieve something if they try hard enough.

SUE: Would you go so far as to say that you mightn't have achieved all you have, had you not had motor neurone disease, or is that just too simplistic?

STEPHEN: No, I don't think motor neurone disease can be an advantage to anyone. But it was less of a disadvantage to me than to other people, because it didn't stop me doing what I wanted, which was to try and understand how the universe operates.

SUE: Your other inspiration, when you were trying to come to terms with the disease, was a young woman called Jane Wilde, whom you'd met at a party and fallen in love with and subsequently married. How much of your success, would you say, do you owe to her, to Jane?

STEPHEN: I certainly wouldn't have managed it without her. Being engaged to her lifted me out of the slough of despair I was in. And if we were to get married, I had to get a job and I had to finish my Ph.D. I began to work hard and found I enjoyed it: Jane looked after me single-handedly as my condition got worse. At that stage, no one was offering to help us, and we certainly couldn't afford to pay for help.

SUE: And together you defied the doctors, not only because you went on living but also because you had children. You had Robert in 1967, Lucy in 1970, and then Timothy in 1979. How shocked were the doctors?

STEPHEN: In fact, the doctor who diagnosed me washed his hands of me. He felt that there was nothing that could be done. I never saw him after the initial diagnosis. In effect, my father became my doctor, and it was to him I turned for advice. He told me there was no evidence the disease was hereditary. Jane managed to look after me and two children. It was only when we went to California in 1974 that we had to get outside help, first a student living with us, and later nurses.

SUE: But now you and Jane aren't together anymore.

STEPHEN: After my tracheostomy operation I needed twenty-four-hour nursing. That put a greater and greater strain on the marriage. Eventually I moved out, and I now live in a new flat in Cambridge. We now live separately.

SUE: Let's have some more music.

STEPHEN: The Beatles, "Please Please Me." After my first four rather serious choices, I would need some light relief. For me and many others, the Beatles came as a welcome breath of fresh air to a rather stale and sickly pop scene. I used to listen to the top twenty on Radio Luxembourg on Sunday evenings.

SUE: Despite all the honors that have been heaped on you, Stephen Hawking—and I should specifically mention that you're Lucasian Professor of Mathematics at Cambridge, Isaac Newton's chair—you decided to write a popular book about your work, for, I think, a very simple reason. You needed the money.

STEPHEN: While I thought I might make a modest amount from a popular book, the main reason I wrote *A Brief History of Time* was because I enjoyed it. I was excited about the discoveries that have been made in the last twenty-five years, and I wanted to tell people about them. I never expected it to do as well as it did.

SUE: Indeed, it's broken all the records and got into the *Guinness Book of Records* for the length of time it's been on the best-seller lists, and it's still there. Nobody seems to know how many copies have been sold worldwide, but it's certainly in excess of ten million. People buy it, obviously, but the question goes on being asked: Do they read it?

STEPHEN: I know Bernard Levin got stuck on page twenty-nine, but I know plenty of people have got further. All

over the world, people come up to me and tell me how much they have enjoyed it. They may not have finished it or have understood everything they read. But they have at least got the idea that we live in a universe governed by rational laws that we can discover and understand.

SUE: It was the concept of the black hole that first appealed to the public imagination and attracted renewed interest in cosmology. Did you ever watch all those *Star Treks*, "to boldly go where no man has ever gone before" and so on, and if so, did you enjoy them?

STEPHEN: I read a lot of science fiction when I was a teenager. But now that I work in the field myself, I find most science fiction a bit facile. It is so easy to write about hyperspace drive or beaming people up, if you don't have to make it part of a consistent picture. Real science is much more exciting because it is actually happening out there. Science fiction writers never suggested black holes before physicists thought of them. But now we have good evidence for a number of black holes.

SUE: What would happen if you fell into a black hole?

STEPHEN: Everyone who reads science fiction knows what happens if you fall into a black hole. You get made into spaghetti. But what is much more interesting is that black holes aren't completely black. They send out particles and radiation at a steady rate. This causes the black hole to evaporate slowly, but what eventually happens to the black hole and its contents is not known. This is an exciting area of research, but science fiction writers have not caught up with it yet.

SUE: And that radiation you mentioned, of course, is called Hawking radiation. It wasn't you who discovered black holes, although you've gone on to prove they're not black. But

it was their discovery that made you begin to think more closely about the origins of the universe, wasn't it?

STEPHEN: The collapse of a star to form a black hole is in many ways like the time reverse of the expansion of the universe. A star collapses from a fairly low-density state to one of very high density. And the universe expands from a very high-density state to lower densities. There's an important difference: We are outside the black hole, but we are inside the universe. But both are characterized by thermal radiation.

SUE: You say that it's not known what eventually happens to a black hole and its contents. But I thought the theory was that whatever happened, whatever disappeared into a black hole, including an astronaut, would eventually be recycled as Hawking radiation.

STEPHEN: The mass energy of the astronaut will be recycled as radiation sent out by the black hole. But the astronaut himself, or even the particles of which he is made, won't come out of the black hole. So the question is, what happens to them? Do they get destroyed, or do they pass into another universe? That is something I would dearly like to know, not that I'm thinking of jumping into a black hole.

SUE: Do you work, Stephen, on intuition—that's to say, do you arrive at a theory that you rather like and that appeals to you, and set about proving it? Or as a scientist, do you always have to make your way logically toward a conclusion and not dare attempt to guess it in advance?

STEPHEN: I rely on intuition a great deal. I try to guess a result, but then I have to prove it. And at this stage, I quite often find that what I had thought of is not true or that something else is the case that I had never thought of. That is how I

found black holes aren't completely black. I was trying to prove something else.

SUE: More music.

STEPHEN: Mozart has always been one of my favorites. He wrote an incredible amount of music. For my fiftieth birthday earlier this year, I was given his complete works on CD, over two hundred hours of it. I'm still working my way through it. One of the greatest is the *Requiem*. Mozart died before the *Requiem* was finished, and it was completed by one of his students from fragments Mozart had left. The introit we are about to hear is the only part completely written and orchestrated by Mozart.

SUE: To oversimplify your theories hugely, and I hope you'll forgive me for this, Stephen, you once believed, as I understand it, that there was a point of creation, a big bang, but you no longer believe that to be the case. You believe that there was no beginning and there is no end, that the universe is self-contained. Does that mean that there was no act of creation and therefore that there's no place for God?

STEPHEN: Yes, you have oversimplified. I still believe the universe has a beginning in real time, at a big bang. But there's another kind of time, imaginary time, at right angles to real time, in which the universe has no beginning or end. This would mean that the way the universe began would be determined by the laws of physics. One wouldn't have to say that God chose to set the universe going in some arbitrary way that we couldn't understand. It says nothing about whether or not God exists—just that He is not arbitrary.

SUE: But how, if there's a possibility that God doesn't exist, do you account for all those things that are beyond science:

love, and the faith that people have had and have in you, and indeed in your own inspiration?

STEPHEN: Love, faith, and morality belong to a different category to physics. You cannot deduce how one should behave from the laws of physics. But one could hope that the logical thought that physics and mathematics involves would guide one also in one's moral behavior.

SUE: But I think that many people do feel you have effectively dispensed with God. Are you denying that, then?

STEPHEN: All that my work has shown is that you don't have to say that the way the universe began was the personal whim of God. But you still have the question: Why does the universe bother to exist? If you like, you can define God to be the answer to that question.

SUE: Let's have record number seven.

STEPHEN: I'm very fond of opera. I had thought of choosing all my eight discs to be opera, ranging from Gluck and Mozart, through Wagner, to Verdi and Puccini. But in the end I cut it down to two. One had to be Wagner, and eventually I decided the other should be Puccini. *Turandot* is by far his greatest opera, but again, he died before he finished it. The excerpt I have chosen is Turandot's account of how a princess in ancient China was raped and carried away by the Mongols. In revenge for this, Turandot is going to ask her suitors three questions. If they can't answer, they will be executed.

SUE: What does Christmas mean to you?

STEPHEN: It is a bit like the American Thanksgiving, a time to be with one's family and to give thanks for the year past.

It is also the time to look forward to the year ahead, as symbolized by the birth of a child in a stable.

SUE: And to be materialistic about it, what presents have you asked for—or are you so well off these days that you're the man who has everything?

STEPHEN: I prefer surprises. If one asks for something specific, one isn't letting the giver have any freedom or the opportunity to use his or her imagination. But I don't mind it being known that I'm fond of chocolate truffles.

SUE: So far, Stephen, you've lived for thirty years longer than predicted. You've fathered children you were told you'd never have, you've written a best seller, you've turned age-old beliefs about space and time on their heads. What else are you planning to do before you quit this planet?

STEPHEN: All that has been possible only because I've been fortunate enough to receive a great deal of help. I'm pleased with what I have managed to achieve, but there's a great deal more I would like to do before I pass on. I won't talk about my private life, but scientifically, I would like to know how one should unify gravity with quantum mechanics and the other forces of nature. In particular, I want to know what happens to a black hole when it evaporates.

SUE: The last record now.

STEPHEN: I will have to get you to pronounce this. My speech synthesizer is American and is hopeless at French. It is Edith Piaf singing "*je ne regrette rien*." That just about sums up my life.

SUE: Now, Stephen, if you could take only one of those eight records with you, which one would it be?

STEPHEN: It would have to be the Mozart *Requiem*. I could listen to that until the batteries in my disc Walkman ran out.

SUE: And your book? Of course, the complete works of Shakespeare and the Bible are waiting for you.

STEPHEN: I think I will take *Middlemarch* by George Eliot. I think someone, maybe it was Virginia Woolf, said it was a book for adults. I'm not sure I'm grown up yet, but I will give it a try.

SUE: And your luxury?

STEPHEN: I will ask for a large supply of crème brûlée. For me, that is the epitome of luxury.

SUE: Not the chocolate truffles, then: a large supply of crème brûlée instead. Dr. Stephen Hawking, thank you very much for letting us hear your Desert Island Discs, and a happy Christmas.

STEPHEN: Thank you for choosing me. I wish you all a happy Christmas from my desert island. I bet I'm having better weather than you.

