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Excerpt
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Part I INTRODUCTION

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Timothy Ferris

Timothy Ferris has experienced the best of two worlds. His scientific writing earned him the American Institute of Physics Prize, the American Association for the Advancement of Science writing prize, a Guggenheim Fellowship, and nominations for the National Book Award and the Pulitzer Prize; meanwhile, his interest in music led him to reporting and editing for *Rolling Stone* magazine. Ferris' interests in science and music converged when he produced the Voyager record, an interstellar calling card of human civilization, containing photographs, audio files, and music. His eleven books include *Seeing in the Dark* and *Coming of Age in the Milky Way*. He is a regular contributor to *The New Yorker* and *The New York Review of Books*, and has been published in over fifty periodicals. Ferris wrote and narrated two television specials: *The Creation of the Universe* and *Life Beyond Earth*. He has taught five disciplines at four universities, and is currently Professor Emeritus at the University of California, Berkeley. For thrills, Ferris tests high-performance Italian and German sports and grand-touring cars.

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CI I feel like a dilettante because you are a journalist and I'm playing one. Let's start with your career. Did you cut your teeth at *Rolling Stone*?

TF I started in 1968 as a general assignment reporter for United Press International in New York, and soon after became a feature writer for the old *New York Post* – when it was a shabby liberal tabloid, as opposed to the shabby conservative tabloid it has since become. After working for three years as a reporter, I quit to write my first book, supporting myself as a freelance writer. I was freelancing for *Rolling Stone*; it and *The New Yorker* were the two magazines I most admired, and *Rolling Stone* was more approachable for a young, unknown writer.

Just as I was discovering that I didn't yet know how to write a book, I was offered a job as the New York bureau chief of *Rolling Stone*. There I learned how to write long-form, 5000 to 10 000-word magazine pieces, which I find to be the hardest form of nonfiction. Once you master long-form nonfiction you can write chapters, which brings the writing of books potentially within reach. Thanks to this experience, when I left *Rolling Stone* I was able to start writing books.

CI Do you still have a paternalistic interest in *Rolling Stone*?

TF I do, although I haven't been following the magazine closely. Jan Wenner and I were brought a bit closer by the death of Hunter Thompson, who was a close friend of us both – and I still read the magazine irregularly. My son is a musician, so I got him a lifetime subscription – for \$99.

CI Your topic coverage for them was very broad. When did you start to home in on science?

TF Science had always been important to me, and I wrote about science at UPI and at the *New York Post* when I could. I did a cosmology piece for *Rolling Stone* that got a lot of notice in the rock-and-roll world. It's kind of a trade secret, but many of the rock stars of that era – Mark Knopfler, Keith Richards, Bob Dylan – are avid readers, and the response of rock musicians to the *Rolling Stone* piece suggested that perhaps there was an audience for science writing, so that I could perhaps write exclusively about the things that mattered most to me. Back then there were relatively few science writers, and it was often asserted that the general public didn't much care to read about science.

CI The book of yours that always struck me as a labor of love was *Coming of Age in the Milky Way*. It was so rich, so sweeping. Was writing that book an odyssey?

TF That book just about broke me down. It was a young man's project, initially, and when you're young you're hot to do what's never been done. In the course of more than a decade of researching *Coming of Age*, I got a lesson in *why* it hadn't been done before. I was foundering at the end, but a Guggenheim grant helped me make it to shore. Writing a book can take a lot out of you physically, since the writing is both sedentary and apt to invoke high levels of stress. In the late stages of the book I got into the habit of hitting the gym in the mornings. If you want to be a professional writer, you'll do well to keep yourself in good physical shape.

CI As you get into it, and the sheer scope becomes visible, do you ever have the feeling of being in too deep?

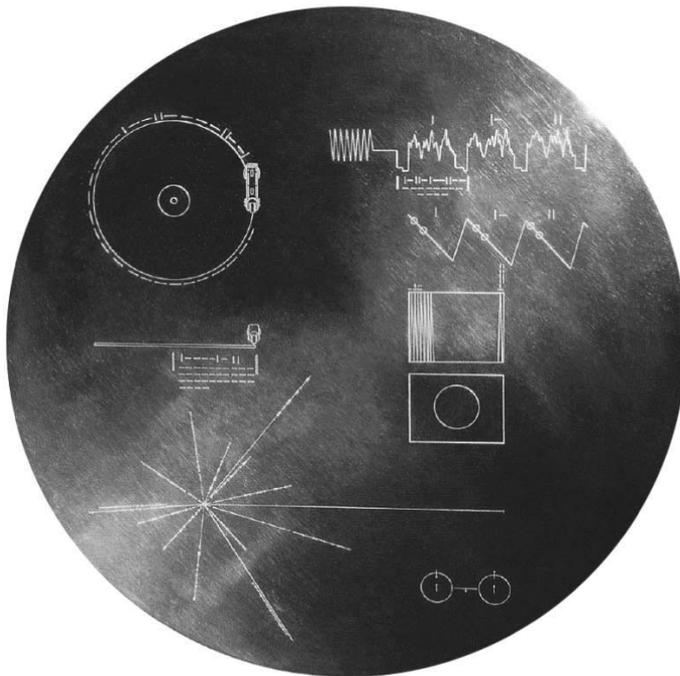
- TF Sure, and it's terrifying. While writing my first book, *The Red Limit*, I often vowed I would never write another book if I could just finish this one. Fortunately, our memory for pain is poor. By the time a book comes out, you tend to forget all the anxiety and exhaustion involved in writing it. You go on a book tour, everyone tells you how good it is, and you start to think that you actually write with felicity. While in that state of dangerous delusion, you sign another book contract.
- CI Women talk about this with childbearing.
- TF I don't know if the two are comparable, but the short-term memory for pain may come into the picture.
- CI Visual art is so different from writing. What did you find most interesting when you started to move into films?
- TF Making a film uses different parts of your brain; it gives you a nice counterpoint to writing for print. You're writing for the spoken voice.
- CI Do you start with a visual arc or a narrative? How do you put it together?
- TF I don't even know if it's an arc at all. Mostly I try to come up with scenes that I feel confident will work. I don't invest too much in how they are going to fit together, because generally the first way you assemble them doesn't work. If the scenes have a degree of independence, you can rearrange them and still make a coherent film. I love emotional effects attained by combining music and visuals with spoken words. That's what writing is – a written version of idealized speech, more like singing than thinking. I like my films to convey a sense that science is of a quality comparable to art, that it rewards aesthetic as well as intellectual involvement. That's why I put so much emphasis on the photographers, effects artists, and composers in the films.
- CI You've made amazing use of Brian Eno.
- TF We used Brian's music exclusively on *The Creation of the Universe*. For *Seeing in the Dark*, we have Mark Knopfler and Guy Fletcher, of Dire Straits. They're wonderful musicians and as stone-cold professional as you can find. When I asked Mark to do the title theme he said he would "attempt" it.
- CI Have there been any scientific concepts that you've found either impossible or incredibly challenging to convey visually?
- TF I recall saying, at our first production meeting for *The Creation of the Universe*, that there are essentially two approaches to presenting a difficult subject. One is to be so *unambitious* that you know you'll succeed. The other approach is to go ahead and swing for the bleachers – admitting that your audience isn't going to get all the content, or even *most* of it, in one viewing, but hopefully making a film they'll want to see more than once. That's the approach we took, and I'm always gratified when I hear from people who've seen *Creation* multiple times, because that was how it was meant to be viewed. I encouraged my collaborators to think of it as more like a record than a film.
- CI A lot of the skill is coming up with those metaphors, those analogies, and doing it visually. That process must be fun. Do you do that alone?
- TF I'll take good metaphors anywhere I can get them, although ultimately it's my job to come up with them. All metaphors are inexact – as Robert Frost said,

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that's the beauty of them - but the trick is to make them no more inexact than they need to be. To paraphrase Mark Twain, the difference between the right metaphor and all the others is the difference between lightning and a lightning-bug.

CI From a broad journalistic background, how did you get drawn to the issues of life in the universe? Was the Voyager project your first involvement?

TF I had a wide-ranging interest in astronomy since boyhood, and the Sagan-Shklovsky book, *Intelligent Life in the Universe*, helped inform my interest in the subject of extraterrestrial life. While at *Rolling Stone*, I proposed an interview with Carl, which was published in 1973. He and I became friends. I used to stay with him when I was at Cornell, and he would stay at my apartment in New York, and we listened to a lot of music together. When he and Frank Drake came



Humanity's "message in a bottle," the gold-plated analog phonograph record launched over 30 years ago on the twin Voyager spacecraft and now heading into interstellar space. The most distant human artifacts have multilingual greetings, world music selections, and images coded into the grooves. Timothy Ferris was on the small group who selected the images and music, and he wrote a book called *Murmurs of Earth* to describe the process of devising a time capsule for humanity (courtesy NASA/JPL).

up with the idea of the Voyager record, he asked me to produce it. I absorbed several of Carl's principal approaches to the question of searching for extra-terrestrial life, which I think are still effective and well thought out. So it was thanks largely to Carl that I had a sound framework for thinking about the subject.

CI Who else was involved in that project?

TF Frank Drake had a formative role, and the full cast of characters is set out in the book, *Murmurs of Earth*. Most of the people involved in the record weren't exobiologists, but people working in music and natural sounds - field recordings, ethnomusicography, and other arcane items like Roger Payne's hydrophone recordings of whale songs.

CI Have you had letters and emails over the years critiquing the musical selections?

TF To some degree, but unfortunately the record was never properly released, so it's been difficult for people to evaluate it since so few have ever heard it.

CI There's a slight irony in the fact that the object winging its way through space is an obsolete technology, even on Earth.

TF Perhaps, but if I were making the record again today I might well use the same technology. A metal analog disk is like Sumerian cuneiform script. We know that it will endure, whereas we don't know the lifetime of the optical dots on a DVD. Some of the people involved have since said, "If we'd had new technology, we could have put much more on it," but it's not necessarily the case that you'd get a better record by having five times as much music or by having five times as many photographs. Limitations can create a superior result in any creative project, and we can vouch for the billion-year projected survival time of the record.

CI Freeman Dyson argues that, on purely thermodynamic and physical grounds, analog computing is more powerful and more energy efficient than digital. Analog probably rules, cosmically.

TF One of the fascinating things about analog records is that you never know how much data are in the grooves. With a CD you always know that exactly, down to the bit, which means that there's an overt limit to what you can extract from the recording. Digital is a dance of seven veils without the veils.

CI With your awareness of astrobiology, what are the most exciting research results right now?

TF One exciting development is the detection of extrasolar planets, and the imminent prospect of obtaining spectra of their atmospheres to look for signs of life. The first detection of extraterrestrial life may be in reflected starlight passing through the atmosphere of some unseen planet many light years away. That would transform the field - dividing it, in a BC and AD manner.

Unlike SETI, extrasolar planet observations require that scientists make relatively few assumptions about life and how it evolves. Using spectroscopic methods, scientists ought to be able to detect evidence of a wide range of life forms on other planets. That's encouraging, particularly for those of us who feel that

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while life is probably commonplace in the universe, it's difficult to know how often intelligence arises, and how long it lasts when it does appear.

CI Do you think the first evidence will come from a distant star or our Solar System?

TF I don't know. Life on Mars is still an open question. Lewis Thomas wrote years ago in *The New York Times*, when we started to see the first images of Mars close up, that Mars may have life, but if so, we've never seen a planet that has life and looks so desolate. But the Earth prior to the emergence of life from the seas would have looked just as desolate in many ways.

CI And we're down to planets a few times the size of Earth.

TF That's a terrifically exciting prospect. The history of the Earth gives us grounds for optimism that similar planets might give birth to life, since life appeared on Earth so early in its history. There are always arguments against looking for life in any particular way, but the deciding issue is phenomenological: if you don't look, you're not going to find it. We tried *not* looking for tens of thousands of years, and sure enough we didn't find extraterrestrial life. The rationale for looking is not some perfect argument that it *must* be out there, it's that otherwise we're not going to find it.

CI But there's presumably still a lot to learn from scouring our own planet.

TF That's the second area that really excites me: the tremendously enlarged phase space within which we now examine life here on Earth. No one knows how far down into the Earth organisms prevail; those roots can be very deep. Some estimates have half the biomass down in solid rock. There are living organisms floating high in the atmosphere. To find terrestrial life thriving in these extreme environments does add encouragement to the search for extraterrestrial life.

CI What do you make of the Rare Earth hypothesis, the "Goldilocks" idea that certain things about the Earth and our environment in the Solar System were "just so" to make life possible?

TF I think the Rare Earth arguments are mostly the post hoc fallacy writ large. That doesn't mean I'm right – but again, the way to find out who's right is to keep looking. The people who think life is rare understandably get frustrated and say, "You could keep looking for life forever. If we examine ten thousand planets and they're all sterile, you'll still say, "Ten thousand and one might pay off." It's true. Sometimes exploration takes place in the service of illusory goals – like Ponce de Leon's search for the fountain of youth – but it's still a good idea to explore.

CI Suppose the universe is full of bugs, microbes, small life organisms, but bereft of large, sophisticated creatures. As far as the public is concerned, is there a sense that finding bugs out there won't be satisfying? That what we're looking for is companionship, and if the universe is full of pond scum, the public won't care?

TF It's easy to underestimate the public. When Carl and I were at JPL for the Viking landing and the first live picture came down from the surface of Mars, people all over the world were watching live – they were up at odd hours in Europe and Japan, where those pictures were shown live on TV. In the United States, the



The barren, desert-like surface of Mars, as revealed by one of the first pictures taken by the Viking lander when it touched down on Mars on July 20, 1976. The images dashed hope of obvious life on Mars, but it is a more interesting planet than it seems at first sight. Viking worked flawlessly for six years and it was spotted by the Mars Reconnaissance Orbiter in 2006 (courtesy NASA/JPL).

landing occurred when morning shows, like *The Today Show* and *Good Morning America*, were on the air, live. But they didn't cover it. They didn't break in and say, "Here comes the first live picture from the surface of Mars." The network science people were tearing their hair out with anger and frustration because their producers said the public didn't care.

Fast-forward to the Pathfinder landing, twenty years later. Now people didn't have to rely on television gatekeepers to tell them what to see: They could go to the Pathfinder mission website. And they did: The number of hits on that website on the first day was more than the cumulative TV audiences of all three morning shows on the major TV networks combined at the time of the Viking landing. People voted their interests, and it turns out that they were much more interested in Mars exploration than the communication professionals gave them credit for.

- CI You've hit on a bigger point in our culture. It seems there's a thirst for science in the popular culture that's not being met.
- TF Whenever anyone – a cab driver, a bartender, someone sitting next to me on a plane – asks what I do, I tell them about the book I'm working on, and I find that

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even when the subject is difficult they are always interested. The idea that “Joe Sixpack” won’t pay attention unless you tell him why it’s important is a journalistic fallacy that has lived on through repetition. It complements the gatekeeper idea, because it implies that you and I are smarter than Joe Sixpack, so we ought to tell him what to think and why. But I’ve been a college professor for decades, and in my experience, college professors aren’t any smarter than Joe. Throughout my career I’ve written books that don’t dumb things down. They ask a lot of their readers, and the readers have been up to it.

When we were making *Creation of the Universe*, our executive producer was reading a magazine published for cable television professionals. At that time, cable had a penetration of under a quarter of American households, and the industry wanted to know what kind of programming their audience wanted to see. So they conducted a survey, listing about fifty different kinds of programming. The survey results showed that the number-one favorite was news, number two was sports, and so on. My producer looked all the way down the list, and there was no science. He called the magazine and said, “We do science programming, and we just wondered – how bad is it? How low was the number of viewers who wanted more science on cable?” Their reply was that there hadn’t been a box to check for science; they hadn’t thought of it. “That’s a good idea,” they said. “When we do the annual survey next year, we’ll put science on there.” They did, and science came in third, right behind news and sports.

- CI As to how the public might react, suppose life is detected in a pivotal enough way that the evidence is unambiguous; it becomes a news story that biology on Earth is not unique. Will that change us, in the broadest sense?
- TF The change will be profound and long-ranging. The best historical parallel I can think of is the impact upon Europe of the discovery of the classical texts of Greece and Rome. Whole universities were founded to study Plato and Aristotle, plus there was an impetus to develop the printing press, owing to a growing demand from ordinary people who wanted to read these wonderful books they’d heard about. These effects rippled through the centuries, and they helped create the modern world. The discovery of life beyond the Earth, especially intelligent extraterrestrial life, could be like that. It wouldn’t be a question of what happened in the first few weeks or months, but of what happened over a period of decades and centuries.
- CI Might it give us a larger sense of responsibility and stewardship of our own part of the universe?
- TF It might very well. It takes time for these things to sink in. The realization of how thin the Earth’s atmosphere is, that it’s just a membrane, like the transparent membrane over the eye; that we’re on one planet among many; that our planet has been through enormous changes in its history, and that we don’t understand the mechanisms behind many of those changes, some of which would be at best *dis*-accommodating for us were they to occur today – these realizations are just beginning to penetrate into the general culture. It takes a while for people to incorporate them into their thinking.

- CI Let me ask about the future of life. The vast majority of species go extinct. We're on an exponential cusp of technological change, and it seems hard to predict our evolving role in the universe. Is that something you think about?
- TF The question that interested me as a boy – and still does today – is, “How do we understand the relationship between the human mind and the wider universe, of which it forms a part, but from which it also stands apart?” In other words, how best can we comprehend our place in the wider scheme of things? One of the reasons we would like to know about intelligent extraterrestrial life is that we don't know whether intelligence is a fluke or whether it typically arises, or what other species have done with it. I'm optimistic – I like people; I like what people have been able to create out of this life – and if I were asked to predict how long people will survive, that number would be more like a million years than a hundred years.
- CI Let's move on to intelligence and SETI. We share a planet with a handful of species that possess intelligence, but lack opposable thumbs or technology. Is that meaningful when we try to look for intelligence elsewhere?
- TF I make a sharp division between species that demonstrate the capacity to use an abstract symbolic language – and there is only one such species on Earth – and those that don't. By that definition, there's only one intelligent species on Earth. On the other hand, if you don't respect others you don't respect yourself, and I would encourage humans to keep that in mind in our dealings with animals. We can be a lot more decent in the way we interact with other living things. The concept that they have rights is not a foolish notion, even though it's often laughed at; universal suffrage was laughed at a century ago. I don't think we'll be giving animals the vote, exactly, but there's a lot of room to treat life more equitably – based not on its intelligence but on the fact that it's diverse and wonderful, and that we're dependent on it.
- CI Is SETI burdened with anthropocentric assumptions?
- TF A number of different strategies have been attempted with SETI, and it may be that we've only just scratched the surface. Still, it's discouraging not to receive a signal. If my idea of interstellar networks holds up, signal detection ought to be easier than looking for individual broadcasters, but I don't know how to measure that against the results to date. I don't think there's anything wrong with using radio, plus we also now have optical SETI as well. Given the many uncertainties in the SETI enterprise, I think it's appropriate that it has been a private enterprise for a while now, and that graduate students are not being encouraged to bet their careers on a SETI success. There's little way of knowing how long SETI is going to go on without a result, so keeping its annual funding modest makes more sense than launching a big-budget “War on Cosmic Loneliness.”
- CI That's the only substantive scientific criticism I've heard – that interpreting a null result is exceptionally difficult.
- TF SETI is more exploration than science, as Philip Morrison used to say. As long as somebody is passionate enough to want to keep funding the search, then the search can go on. It doesn't hurt anybody. People can criticize SETI all they like,