

“How to Make a Golden Record” Transcript

From [September 16, 2016](#) episode of Science Friday.

<p>IRA FLATOW</p>	<p>This is Science Friday. I'm Ira Flatow. Back in 1977, I had just finished interviewing Carl Sagan about his latest book, <i>The Dragons of Eden</i>. We walked back to my office to chat, and we sat down. He asked me what projects I was working on.</p> <p>I mentioned in passing that I was collecting natural sounds, like thunder and rain. And I even got an earthquake. Dr. Sagan went quiet for second and asked if I could close the door. He then went on to describe the project he was working on-- creating a record like a vinyl LP.</p> <p>But this one would be gold plated. It would contain sounds of earth and be placed on the Voyager spacecraft that would soon be launched and find their way out of our solar system. And could I send whatever sounds I had? Send a copy of my tape to Annie, he said.</p> <p>Annie is, of course, Ann Druyan, who, with Dr. Frank Drake, Carl Sagan, and a small team of artists and scientists, were rushing to create this golden record in time for the launch of the two spacecraft later that year, 1977. And after [INAUDIBLE] passed Jupiter, Saturn, Uranus, and Neptune, the Voyagers would go where no spacecraft had gone before-- to interstellar space.</p> <p>NASA asked would Sagan and his team create a message to send to the stars for anybody or anything that might be able to pick up that record. The result of that question is one of the most storied objects in space history, the Golden Record.</p> <p>Part time capsule, part interstellar greeting, the record contains the story of Earth and of us. And among its contents are a diagram of DNA, a stellar map of Earth's position in the cosmos, and the music of Louis Armstrong, and also the sound of a kiss.</p> <p>[KISS NOISE]</p> <p>Over the next three weeks, Science Friday is celebrating the legacy of the Golden Record. And we're asking you, what would you include on an</p>
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	<p>updated golden record? We're collecting your suggestions at sciencefriday.com/goldenrecord. And in three weeks, we'll present your revamped record right here on the program.</p> <p>But first we're going to take a look back at the Golden Record's history with two of the people who helped create it. Ann Druyan was the creative director for the Golden Record Project. She co-wrote <i>Cosmos-- A Personal Voyage</i> with her late husband, Carl Sagan, and was awarded the Emmy and Peabody Awards for <i>Cosmos-- A Spacetime Odyssey</i>. She joins us from Los Angeles. Welcome back to Science Friday, Ann.</p>
ANN DRUYAN	Ira, it's always so great to be with you. And thanks for that impeccable introduction to the record.
FLATOW	Oh, you're quite welcome. I understand that a kiss was part of your experience on that record?
DRUYAN	<p>Yes, well, the idea was a kiss to last a billion years. The shelf life of the record itself was said back then to be a billion years. I think now people think it will last even longer. And of course, the same people who gave it that shelf life were the people who designed and built the spacecraft, which, of course, exceeded every design specification or wildest expectations. So yes, I was involved in that kiss. And it's very hard to do a kiss that would sound like a kiss. Some of the best kisses don't sound that great, so--</p> <p>Yeah, I was involved in that.</p>
FLATOW	<p>Going to ask a little more for the details later, but after I introduce Frank Drake, a legendary astronomer and astrophysicist. His Drake equation estimates the number of communicative intelligent civilizations in our galaxy. And he was responsible for the picture sequence on the golden record. He joins us today from Santa Cruz. Welcome back, Dr. Drake.</p>
FRANK DRAKE	Oh, thank you. It's a pleasure to be with you.
FLATOW	Let's talk about the genesis of the record and the sounds and the photos that were on there. Let's start at the beginning. How did each of you get involved in the record project? Frank, you can begin.
DRAKE	Well, the roots of this go back before the record to a previous thing we sent into space, which was a plaque on the Pioneer 10 and Pioneer 11 spacecraft.

	<p>NASA asked Carl at the time those were about to be launched to think of the possibility of putting a message on it.</p> <p>And he came to me, and we talked about it. We were colleagues all the time in those days. And I suggested we do a plaque with certain things drawn on it, including a map using pulsars to show the location of the Earth with respect to other places in the galaxy.</p> <p>The result was that plaque, and it was a very simple thing with a few crude sketches of human beings on it and other things. But that created a great deal of interest. So a year or two later, when it came time to launch the Voyagers, NASA said, hey, we want to do that again. And they went back to Carl and said, well, can you put a message on the Voyagers?</p> <p>Well, we happened to be vacationing together at the time in Hawaii. And we sat down and thought about, well, what should we do? Should we send another plaque? And I suggested a better thing would be a phonograph record, because it could contain much more information as well as sounds and music and good images. So that is how it started. And from that grew the project to create the record.</p>
<p>FLATOW</p>	<p>And Ann, how did you get involved?</p>
<p>DRUYAN</p>	<p>Around the end of 1976, Carl came to Tim Ferris and me. And we had worked together on a previous project, which would have been a kind of Cosmos for kids for the Children's Television Workshop. Well, that project never came to fruition. But we realized that the four of us, including Linda Salzman Sagan, just had a chemistry for creative work.</p> <p>And so I think after his conversation with Frank, Carl came to us and asked us if we would like to participate. And of course, we were overwhelmed by this kind of sacred task to confer the closest thing to immortality that we humans have yet to touch on the music and the images and what it was like to be alive, to put that all in a message to other possible other beings and certainly other world sometimes.</p>
<p>FLATOW</p>	<p>There's so much to choose from. How did you choose what got on the record?</p>

<p>DRUYAN</p>	<p>Well, we had a lot of help. We went to composers, ethnomusicologists. We went to the great Alan Lomax, who was actually responsible for the inclusion of Louis Armstrong's just brilliant melancholy blues and much else on the record.</p> <p>And we knew how ignorant we were about other kinds of music-- for instance, Chinese and Indian music. What arrogance it would be for us to pretend that we could make that selection in those other traditions. And so we went to the people who we thought could help us the best. And I look back on the 27 pieces of music. And I have to say, while there's been great music made since, I feel very, very pleased with what we managed to include.</p>
<p>FLATOW</p>	<p>I know you're a music buff, and you had certain ideas about what music had to be on the record. We're going to hear one of those tracks. And then I'll ask you to explain what it is.</p> <p>[MUSIC - BEETHOVEN, "STRING QUARTET NO. 13"]</p> <p>Ann, can you tell us what that is?</p>
<p>DRUYAN</p>	<p>I'm so moved to hear it. Yes. Many years before we began this wonderful task of finding the music for Voyager, my dear friend Jonathan Cott invited me to listen to a recording by the vague quartet of the Cavatina movement of Beethoven's late quartet, opus 130.</p> <p>And when I heard it, the first thing I thought of was, what can I ever do to repay Beethoven for what Beethoven has just given me? And so when Carl first proposed the project, the right thing I thought of was, hey, here's my chance to do a solid for Beethoven.</p> <p>And in researching the story of the late quartets, I found that Beethoven had written, of course, in German in the marginalia of one of the compositions, what will they think of my music on the star of Urania? And so I think he was talking about Uranus, recently discovered.</p> <p>And so he had that thought. And in another place in the margin, he wrote, the German word "Sehnsucht," which means longing. And that captured for me exactly what Voyager was all about-- this longing to make contact with</p>

	<p>other intelligences in the universe, to know if we are alone or if there are others who think about and wonder about us. And so that was absolutely the first piece that was committed, that we all committed to on Voyager.</p>
FLATOW	<p>Frank Drake, many people might not realize that there are pictures on this record, 116 of them. How do you put pictures on a phonograph record?</p>
DRAKE	<p>Well, you take the picture and scan it with a TV camera. The TV camera turns a picture into of a long oscillating waveform, which is what is sent to the TV set. You can do the same thing with sound. Sound is done in the same way as pictures are.</p> <p>And so the idea was to take pictures and put them into the form of a TV transmission and record that on the golden record. My original calculation told me we could only put about 10 pictures. We can only fit that many on the record in addition to all the music and other things.</p> <p>It turned out that was wrong. We could put a total of about 112. And so we had the goal of picking the 112 pictures which best depicted life on Earth, our culture, our technology, our physiology, and all of that. That's not many pictures, so it was a very hard task to do.</p> <p>In addition, NASA asked us to add five more pictures which were political, surprisingly. They were a list of the members of the congressional committees in the House and Senate who appropriate money to NASA. And we were to put those pictures with the names in English text. And of course, we've always wondered ever since, what are the extraterrestrials going to make of that?</p>
FLATOW	<p>[CHUCKLES]</p> <p>Now, you got a little pushback. You've got pictures of our anatomy on the plaque, on the record. But you had a little bit of trouble in getting the pictures you really wanted to put on there. You had to settle for something else, right?</p>
DRAKE	<p>Oh, that's right. There were some very interesting challenges put to us, which was mainly not to offend anybody. So we started out wanting to give a totally realistic and comprehensive picture of life on Earth and of us, including all our physiology.</p>

	<p>NASA got very nervous, because that implied we were going to have pictures of naked people and parts of naked people on the record. And they knew that could create a big public outcry. So we were instructed to have no nudity on the record and also not to have any picture which depicted a religion, because they realized that putting any religion was going to antagonize people of other religions whose picture are not included.</p> <p>So there were several taboos of religion, naked people. We did, in fact, find what we thought was an acceptable picture of a naked human. It was a picture of a pregnant woman. But even that was not allowed by NASA.</p> <p>And the other thing they told us was that, when we put in the detailed pictures of the human anatomy, all of the various parts of our body, which there are about 12 pictures, we came to the pictures of the genitals. And they told us, you may not construct a special picture for use on the record. You've got to take a picture out of a textbook, because that way NASA can't be blamed for transmitting pictures of nudity to the universe. They just didn't want smut to the universe, as some people were accusing them of doing.</p> <p>And so we took a picture out of a textbook and made that the picture which shows that part of human anatomy. And I've always thought that was going to be kind of a puzzle to the extraterrestrials, too, because all the parts on the picture are labeled in English text. And of course, they won't know what that means. And this will be one of the great challenges to their linguists to figure all this out.</p>
<p>FLATOW</p>	<p>I'm Ira Flatow. This is Science Friday from PRI, Public Radio International, talking with Frank Drake and with Ann Druyan about the Golden Record. How did you get it together, the record? You had like nine months to get the whole thing together, Ann?</p>
<p>DRUYAN</p>	<p>Actually, I think it was more like six, because, of course, everything on the spacecraft was being sterilized. And it had to be loaded onto the spacecraft, I believe, as early-- very early, months before the first August 20 and September 5 launches of the spacecraft.</p> <p>And so I think we had just until sometime mid-June, and then we were done. And so we had about six months. The entire record project, which was a</p>

	<p>full-time job, I think, for most of us-- the entire record cost the taxpayers \$18,000.</p> <p>And because every one of us were so inspired by the prospect of doing this, nobody wanted anything but that chance to touch forever. And so it was very hectic. There were all-night meetings about, should we just put our best foot forward?</p> <p>Do you we elide over Auschwitz and Hiroshima and some of the things we've done that cause us shame? Should we be honest about how many people on this planet at that time were dying of the lack of potable water or shelter?</p> <p>And so we had the most fantastic, lively philosophical debates. And in the end, I think Carl's dictum that the spacecraft itself would certainly tell the extraterrestrials of our dreams how sophisticated we were and at what level of technological adolescence we still were would probably reveal a lot more than anything we could possibly hide or say.</p>
<p>FLATOW</p>	<p>We're going to have to take a break. When we come back, we'll come back and talk lots more about the Golden Record history with Frank Drake and Ann Druyan. And you can take a second to explore the record for yourself. You want to see this scientific coating, everything else on there, go to sciencefriday.com and immerse yourself in our newest video, "The Golden Record Decoded."</p> <p>It's our first 360 virtual reality video. So you can scroll and swipe and swivel through the video right on your desktop. Or you have a Google Cardboard, a virtual reality headset, you can get on there in full 3D. Head over to sciencefriday.com/goldenrecord.</p> <p>This is Science Friday. I'm Ira Flatow. We're talking this hour about the Voyager Golden Record with two of its creators. In 1977, Ann Druyan and Frank Drake helped Carl Sagan create a message to extraterrestrials, a golden record that contained music and scientific formulas, pictures, greetings in 55 languages. And here now they are to talk with us about it.</p> <p>I'm going to play a bit of the Golden Record sound essay called "Sounds of Earth," because this track has sounds from both of you, where we're going to</p>

	<p>hear a sound like firecrackers going off. And then there's something that sounds kind of like clapping.</p> <p>[SPUTTERING AND REVERBERATING]</p> <p>[INTERMITTENT CRACKLING]</p> <p>Wow. Ann, I know that first sound is very special for you. Explain with that firecracker sound is.</p>
<p>DRUYAN</p>	<p>Well, I asked Carl if it were possible if I were to meditate for an hour while I was hooked up to a computer that was reporting all of the EKG my heart, my electroencephalogram, my brain waves, rapid eye movement-- every single signal that my body was giving out-- would it be possible for the extraterrestrials of the distant future to decrypt what I was thinking? And I remember his beautiful smile. And he looked at me. And he said, well, a billion years is a long time, Annie. Go do it.</p> <p>So I, with Tim Ferris's help, went to NYU Medical Center in New York. And I remember of the computer in those days was the size of a large bedroom. And today, your phone probably has more computing power than this apparatus had. And I meditated for an hour.</p> <p>Well, as life would have it, this was two days after Carl and I had declared our love for each other in a phone call. And we'd known each other for years, but the subject had never come up before. And here I was, a young woman, the beautiful spring of 1977, June, feeling as alive and as ecstatic as I think anybody could feel.</p> <p>And so I tried not to be selfish. I tried to relate the story of our planet and the story of life on this planet as well as the human species and to confine myself to a kind of mental itinerary. But of course, I was a woman newly fallen, madly in true love. And I remember how I felt, because I still feel that way for Carl.</p> <p>And so when I look back on it and realize that this most intimate message within the message within this great many-layered palimpsest of the Voyager record is, at its heart, the joy, really, the greatest joy of being alive. It just makes me feel so good.</p>

<p>FLATOW</p>	<p>Frank, do you have any idea of what the chances of any life form discovering the Voyager? I mean, it's already entered American culture. Isn't part of one of the Star Trek movies, the V'Ger, that someone picks it up and makes a god out of it?</p>
<p>DRAKE</p>	<p>The first Star Trek movie was about the discovery of the record. That's the basis of the whole movie. So yes, it's already played a role in the construction of movies. The chances of it ever being captured are very small, to be honest.</p> <p>It's moving at about 10 kilometers a second. It's going to take it hundreds of thousands of years to approach another star, and it will not approach it very closely. So it will only be a civilization with very sophisticated equipment, powerful radars, that might find this and perhaps go out and capture it and explore what's on it.</p> <p>So in a way, it's our goodbye message to the universe. This is going to persist as a readable decipherable record of us for literally billions of years beyond the time when our sun expands and swallows up the Earth. It's going to last beyond the lifetime of mankind as we know it now. So in a way, it's our going-away message.</p> <p>At the same time, it is a message to us in that it tells us what we might find and what might come to our system, either in the form of a record or in the form of a radio message. It just alerts us to the fact that message is meaningful. Messages describing other worlds and the creatures on them can be sent across the stars between the stars in a form which can be captured and understood.</p>
<p>FLATOW</p>	<p>A tweet from Phil Kalina who says, "Was the record sent with clues on how fast to play it?" And in general, yeah, are their instructions on there on what to do with the record?</p>
<p>DRAKE</p>	<p>Yes, there is an instruction book we sent with it. It's on the cover. The record is in a box on the two boxes, on the two Voyager spacecraft. And on the box are diagrams which tell you that you rotate the record at a certain speed, that you read it from outside in, because that, of course, is the convention we use, but there's nothing magic about that.</p>

	<p>And also, it shows you the first picture, which is on the record, which is actually just a circle. And that was put on because it allows the civilization that's decoding it to recognize that it has done the right thing. When it does the right thing, it's going to see a circle. And it's found the right way to decode the record.</p> <p>So you get little puzzles, like what's the horizontal-to-vertical ratio with the pictures? You can only describe that by actually sending one of the pictures. So we did send sufficient instructions to allow the record to be decoded and read.</p>
FLATOW	Did you also, I understand, send a needle to play it also?
DRAKE	Yes, we sent not just a needle. We sent a whole pick up.
FLATOW	The stylus.
DRAKE	Yeah, the whole stylus with the electronics which transfers the information from the stylus to an electrical wave.
FLATOW	On that little bit of tape I played before with the brainwaves, there was a pulsar on the end of that? Was it not?
DRAKE	<p>Yes, you're very smart. You recognized the sound of a pulsar. Not many people know that. That is the sound that one hears if one takes the radio emission of objects from which we call pulsars and convert them to sound.</p> <p>They don't send sound. They send radio pulses. And they're one of the most bizarre and wonderful objects we have discovered in the universe. What they are are rotating stars, stars which are like our sun but have collapsed into an object which is about 10 miles in diameter.</p> <p>It's actually just bulk nuclear matter with enormous densities, 100 trillion times the density of matter on Earth. And they spin at a rate of once a second and some of them in thousands of a second. They do a complete rotation. And every time they rotate, they send out a pulse of radio emission, which makes a pulse. And that's what produced the sounds that you heard from the record. And it is on the record to show that we have discovered them. And the fact that we have discovered them gives some kind of measure of the prowess of our technology.</p>

<p>FLATOW</p>	<p>Now, we were asking our listeners in our social community to come up with ideas for if they were to make the record now what things they would put on it. Ann Druyan, if you had a chance to do it all over again now, are there things about the record that you would change?</p>
<p>DRUYAN</p>	<p>There's nothing about the record that I would remove. Possibly Kurt Waldheim's address as Secretary of the United Nations back then, which was foisted upon us for political reasons, as Frank mentioned earlier.</p> <p>But I've often thought that, if there was one other piece of music that I could add, I would certainly pick Bob Marley's "No Woman, No Cry." And that's just because I've been listening to it my whole life. And it's a song of community and of the reality of life. And it continues to move me, never loses its pull. And so I would have added that one. But as I said earlier, I'm very proud of what we did include.</p>
<p>FLATOW</p>	<p>I'm going to play another little bit that I know is one of your favorite non-negotiable tracks that was included.</p> <p>[MUSIC - CHUCK BERRY, "JOHNNY B. GOODE"]</p> <p><i>(SINGING) Deep down in Louisiana close to New Orleans, way back up in the woods among the evergreens, there stood a log cabin made of earth and wood, where lived a country boy named--</i></p> <p>And you decided the Chuck Berry had to go to the stars?</p>
<p>DRUYAN</p>	<p>Yes, I did.</p> <p>Excuse me. Yes, I did, because first of all, at that moment in 1977, rock and roll was the most popular music on Earth. And I was militant about the idea that a progenitor of this music should be on the record rather than the huge number of derivative artists who had learned from Chuck Berry.</p> <p>I picked him, because he is not only a music virtuoso and an inventor of guitar riffs that people still use but also because I think he's one of the great American novelists. He was a man who could tell a story that had meaning, nuance, particularity in the brief passage of a song. And he told me much later that he first learned about its inclusion on the Voyager record at a low</p>

	<p>point in his life. And it became the high point because of that fact that his music will live on.</p> <p>Another passage on the record, of course, is "Dark Was the Night" by Blind Willie Johnson. And with Louis Armstrong and Chuck Berry, those are the three American artists on the record. And we felt that between them, they summed up America's musical gift to the world at that time.</p>
<p>FLATOW</p>	<p>Interesting. This is Science Friday from PRI, Public Radio International, talking with Ann Druyan and Frank Drake about the Golden Record. We're asking everybody to come up with their ideas for a new golden record over the next few weeks. Frank, is there anything that you would put on the record that might have left off or do something differently?</p>
<p>DRAKE</p>	<p>You're asking a very challenging question, because you might think that we would be able to put much more information on a new message, and you would be exactly right. But it's very hard to underestimate what the situation is.</p> <p>In 1977, the best thing we had was the old vinyl records. And they could take an hour of music and 100 television-quality pictures. Today we have DVDs and CDs. And a DVD, for example, can carry as much information as 1,000 golden records.</p> <p>And in a device which is much smaller than a vinyl record, you can go to your nearby electronics store and buy a tiny solid-state memory with a terabyte. That's 1,000 gigabytes of memory on it. That's equivalent to about 1,000 golden records for about \$100, and it's the size of an old cassette recording.</p> <p>Of course, if you send that, you need to send something that can play it. And we all own those. We carry them around in our pockets. Our cell phones can read those memories. So the next message could be something equivalent to a cell phone and one of those off-the-shelf terabyte memories.</p> <p>So what does it do? It tells us, boy, we can put 1,000 records on that thing. And instead of making life easy, as you would think, it makes it very challenging. How do you sort out and decide what's the best thing to do when you have that much capacity? You could send the whole Encyclopaedia Britannica with no problem at all. Should you do that, or</p>

	<p>should you be more choosy? Should you send videos? Just what should you send?</p> <p>So this is going to be a question that has to be answered by a huge number of people working together. And in fact, there's talk of doing that right now. Oh, nothing's being done. But there's talk of proceeding with this in assembling a large number of experts who will put together the answer to that question you asked. And I'm not going to give you my answer, because there's just so much you can say that it would take me a half hour to tell you all the things you can put on the record now.</p>
FLATOW	Is there a spacecraft you would put it on that's under development?
DRAKE	Haven't even thought about that.
FLATOW	You're thinking about a little microchip on a spacecraft.
DRAKE	The whole device would be the size of a cell phone. So it could go in almost any spacecraft.
FLATOW	Ann, what are your hopes for the Golden Record over the next 40 years? And I got about a minute for you to answer that.
DRUYAN	<p>Over the next 40 years, well, I don't think anything will happen to it over the next 40 years in terms of our putative extraterrestrials. But my hope is that we will on this planet begin to develop a degree of self-awareness, of self-consciousness.</p> <p>The Voyager record had two intended recipients, these extraterrestrials but also the people of Earth, to see ourselves as one organism capable of creating multiple kinds of beauty. And I guess my fondest hope is that we'll awaken to that fact and begin to treat each other, as Carl said so eloquently, as residents of a tiny pale blue dot.</p>
FLATOW	<p>Ann Druyan and Frank Drake, thank you both for taking time to be with us today. And happy celebration 40th anniversary of your upcoming record. Our Golden Record celebration here is going to continue over the next three weeks.</p> <p>We're asking you, what would you include on a golden record to alien civilizations? It can be a picture, a song, a piece of poetry, a mathematical</p>

equation. There are no limits. We want you to submit your pick at sciencefriday.com/goldenrecord. We'll be presenting your record here on the show October 7.

Also, if you're in the New York City area, join us September 27 at Greene Space at WNYC. We're going to listen to live music from the Golden Record. Hear what our panel of cultural commentators would put on the Golden Record 2.0. Folks from Studio 360, WQXR, and Brain Pickings live at the Greene Space September 27. Go to our website at sciencefriday.com for details. I'm Ira Flatow in New York.