Earth's Ambassador: A contextual history of the Voyager interstellar message

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Can we pretend
That from now on
There is no yesterday?
Paint a picture of tomorrow
With no colors from today?

-Bill Withers

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Introduction

On August 20th, 1977, a spacecraft carrying a record of life on Earth was launched towards interstellar space. The spacecraft was NASA's Voyager, whose main mission was to take photos and measurements as it passed Jupiter and Saturn before carrying on into interstellar space. The record was its supplementary cargo, in case the spacecraft were ever encountered by extraterrestrial life on their billion-year journeys. "Record" in this instance, is literal: this message to the cosmos took the form of a gold-plated phonograph record, inscribed with images, music and sounds from the planet and its inhabitants. The message was conceived, developed and produced in less than eight months by Carl Sagan, popular American astronomer and TV personality, with the help of Frank Drake, Ann Druyan, Timothy Ferris, Jon Lomberg and Linda Salzman Sagan. Two scientists, two writers, two artists, united by friendship and a fascination with extraterrestrial life. The final products contained 118 images, 100 minutes of music and sounds, and greetings in 55 languages, intended to create a complex representation of humanity and life on Earth to a potential advanced extraterrestrial civilisations.

This was the first object to feature representations of human life and culture to be launched beyond our atmosphere and remains the furthest representation of humanity in the universe. It has inspired revivals, tributes and artistic responses, and has arguably defined how the human race represents itself beyond Earth. The question becomes: how does it represent us? As will become apparent in this thesis, it says almost nothing about human conflict and struggle; in the words of Sagan biographer Keay Davidson, the project is 'the cosmic equivalent of a Hallmark greeting card — all sweetness and light, but with no deep, dark truths'.[1] Most notable is the lack of any hint of the major political moments of the period it was made in: no Vietnam or Cold War, no Nixon scandal, no social rights movements. The question then becomes, to what extent is the Voyager record a useful historical source for studying the United States in the 1970s? This thesis hopes to answer this question by asking who made the message, for whom was it made, and why. More specifically, these sub-questions relate to the socio-political context the record

[1] Davidson, Keay. *Carl Sagan: A Life*. New York: J Wiley, 1999, 309.

was made in, the philosophies of the key participants, the methodologies they employed in creating the message, what the resultant product was, and how it was received, both nationally and internationally. By exploring these questions, I hope to determine what the record says about the time it was made in and, crucially, what it doesn't say.

Despite its notoriety and historical primacy, the Voyager message has had little attention from the historical community. This is not to say there have been no critics of the Voyager message, however, the vast majority are in the field of communications studies, linguistics or exobiology; they are concerned with the possibility and ethics of communicating with extraterrestrials.[2] Astrobiologist Douglas Vakoch, for example, has put forth a plethora of articles concerning the semiotics and mechanics of communicating with extraterrestrials, and frequently uses the Voyager message as an overly anthropocentric case study.[3] The few studies of the message in the humanities are present generally focus on the representational capabilities of the Voyager message without much attention to the context of its creation.[4] There are, however, no studies of the message and its creation as a historical event, studied in the context of its creation. This paper aims to address this imbalance.

This thesis also hopes to contribute to the related historiographies of critical heritage studies and archival studies. To do so, this paper explores the Voyager message as a heritage object. I acknowledge that heritage arguably does not 'exist' in that it has no concrete nor discrete

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[2] Atwell, E. S., and J. R. Elliott. "A corpus for interstellar communication." In *Proceedings of CL2001: International Conference on Corpus Linguistics*, pp. 31-39. UCREL, Lancaster University, 2001; Lemarchand, Guillermo A., and Jon Lomberg. "Communication among interstellar intelligent species." *Communication with Extraterrestrial Intelligence* (2011): 371-396; Brin, David. "A contrarian perspective on altruism: the dangers of first contact." In H. Paul Shuch ed. *Searching for Extraterrestrial Intelligence*, pp. 429-449. Springer, Berlin, Heidelberg, 2011.

[3] Vakoch, Douglas A. "Constructing messages to extraterrestrials: an exosemiotic perspective." *Acta Astronautica* 42, no. 10-12 (1998): 697-704; Vakoch, Douglas A. "The dialogic model: representing human diversity in messages to extraterrestrials." *Acta Astronautica* 42, no. 10-12 (1998): 705-710; Vakoch, Douglas A. "Signs of life beyond Earth: a semiotic analysis of interstellar messages." *Leonardo* 31, no. 4 (1998): 313-319; Vakoch, Douglas A. "The conventionality of pictorial representation in interstellar messages." *Acta Astronautica* 46, no. 10-12 (2000): 733-736.

[4] Nelson, Stephanie, and Larry Polansky. "The Music Of The Voyager Interstellar Record." *Journal of Applied Communications Research* (1993): 358-376; Connie Samaras, 'Is It Tomorrow or Just the End of Time?' In Jennifer Terry and Melodie Calvert eds. *Processed Lives: Gender and Technology in Everyday Life*. London: Routledge, 1997; Paglen, Trevor. "Friends Of Space, How Are You All? Have You Eaten Yet? Or, Why Talk To Aliens Even If We Can't." *Afterall: A Journal of Art, Context and Enquiry* 32 (2013): 8-19.

definition, though I will suggest the Voyager record falls under heritage scholar Laurajane's Smith definition of heritage as being 'an act of making meaning in and for the present'.[5] The purpose of exploring the message as heritage is that a critical heritage approach facilitates the analysis of social, cultural and political dynamics in a particular place and time, including how they influence the creation of heritage objects. I suggest that such dynamics, relating in this case to America in the 1970s, were reflected in the methods of the team and the final message content, and are therefore essential to understanding the Voyager message itself.

With this in mind, there are specific debates within these fields that this thesis hopes to contribute to. In terms of critical heritage studies, I refer to the cross section between cultural heritage and cultural diversity. This particularly refers to the work of William Logan and Peter Bridgewater, Salvatore Arico & John Scott, who explore the relationship between cultural diversity and cultural heritage.[6] With regards to archival studies, I refer to the debate on the political role of the archivist, perhaps best summarised by archival theorist David Wallace, particularly to the theories of 1970s' archival theorist Howard Zinn.[7] Thirdly, this thesis contributes to Cold War historiography in two ways. Firstly, to the study of the cultural Cold War, exploring how the US and USSR competed for ideological supremacy with cultural exports.[8] Secondly, to discussions of the scientific Cold War, exploring US-Soviet interactions with regards to space exploration.[9] I argue that the Voyager message, in its methods and content,

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[5] Smith, Laurajane. *Uses of Heritage*. London: Routledge, 2006, 1.

[6] Logan, William. "Cultural diversity, cultural heritage and human rights: towards heritage management as human rights-based cultural practice." *International Journal of Heritage Studies* 18, no. 3 (2012): 231-244; Bridgewater, Peter, Salvatore Arico, and John Scott. "Biological diversity and cultural diversity: The heritage of nature and culture through the looking glass of multilateral agreements." *International Journal of Heritage Studies* 13, no. 4-5 (2007): 405-419.

[7] Wallace, David. "Archives and Social Justice". In Terry Eastwood and Heather MacNeil eds. *Currents of Archival Thinking*, pp. 271-298. Denver: ABC CLIO, 2017; Delgado, David J. "The 34th Annual Meeting of the Society of American Archivists." *The American Archivist* 34, no. 1 (1971): 43-54.

[8] Poiger, Uta G. *Jazz, Rock, and Rebels : Cold War Politics and American Culture in a Divided Germany*. Berkeley: University of California Press, 2000; Carletta, David M. "" Those White Guys Are Working for Me": Dizzy Gillespie, Jazz, and the Cultural Politics of the Cold War during the Eisenhower Administration." *International Social Science Review* 82, no. 3/4 (2007): 115-134; Von Eschen, Penny. *Satchmo Blows Up The World: Jazz Ambassadors Play The Cold War.* Harvard University Press, 2009.

[9] Fenrich, Eric. "Detente and Dissent: Apollo-Soyuz, Ruth Bates Harris, and NASA's Rhetoric of Cooperation." *Quest* 22, no. 1 (2015): 4-15.

represent a complexity to US-Soviet interactions in the late 1970s that is not accounted for by the historical debates in these fields.[10]

This thesis refers to a collection of sources to explore the questions posed above. The main source is the content of the record itself, the images, music, sounds and spoken greetings selected by the team. However, this source cannot be analysed in a vacuum: how the content is described is as important as what the content is. Therefore, I will also consult accounts of the content and message process, both at the time of creation and in the intervening forty years. The main source in this is the book *Murmurs of Earth: The Voyager Interstellar Record*, written a year after Voyager launched by the team who curated the message.[11] Each Voyager collaborator contributes a chapter to the book describing their relationship to the project. Carl Sagan begins with an overview of the project, followed by Frank Drake providing some context by summarising similar projects aimed at communicating with extraterrestrials. The subsequent four chapters deal with the four sections of the record: Jon Lomberg describes the image selection process, Linda Salzman Sagan the spoken greetings, Ann Druyan the sounds and Tim Ferris the music. The greatest limitation of *Murmurs* is that it stands alone; there is no secondary contemporary account of the curation process. The other sources in this set are reflective accounts of the creation process, normally in the form of interviews with the participants taken throughout the forty years between the message launch and today.[12] Included in these is my own interview with Tim Ferris, taken in September of 2019.[13] The final set of sources are intended to facilitate contextualisation of the record, from conception to development to completion. This includes biographical information on the participants and contextual information on the time period in the form of contemporary publications and secondary histories. By combining all of

[10] Kennan, George F. "After the Cold War - American Foreign Policy in the 1970s." *Foreign Affairs* 51 (1972): 210-227; Hanhimäki, Jussi M. *The Rise and Fall of Détente: American Foreign Policy and the Transformation of the Cold War*. Washington, D.C.: Potomac Books, Inc., 2012.
[11] Sagan, Carl, Frank D. Drake, Ann Druyan, Timothy Ferris, Jon Lomberg, and Linda Salzman Sagan. Murmurs of earth: the Voyager interstellar record. New York: Random House, 1978, 162. Subsequently cited as: [Author], Murmurs, [page].
[12] Chief among these are: Nelson and Polansky, "The Music Of The Voyager Interstellar Record."; Ferris, Tim. "How The Voyager Golden Record Was Made." *The New Yorker*, 20 Aug 2017, https://www.newyorker.com/tech/annals-of-technology/voyager-golden-record-40th-anniversary-timothy-ferris [Accessed 23 Oct 2019].
[13] This will be subsequently cited as Ferris, Personal interview.

these sources I hope to overcome the partiality of the accounts of the message creation process and the fallibility and inconsistencies inherent in reflections on the project.

The five chapters that comprise this thesis surround subquestions that attempt to aid the exploration of the Voyager record as a historical source. The first chapter gives a detailed overview of the history of the project, the people involved and the main socio-political contexts of the time. In this, I ask how and why the project came into being, what social and political beliefs the collaborators demonstrated at the time, and what were the key defining factors affecting the institutions they lived and worked in, as well as those affecting the country more broadly. The second chapter asks how extraterrestrials – supposedly the intended audience of the Voyager – were conceived of by the American public in general and by project leader Carl Sagan in particular. The third and fourth chapters explore two goals of the project: the representation of human diversity, and the optimistic rendering of the human race. These chapters question how and why these goals were formed, how they relate to the contexts discussed in the previous two chapters, to what extent they are successfully pursued. The final chapter asks how the Voyager record was received publicly and what relation this bore to the previously discussed contents.

Chapter 1: overview and context

No one sends such a message on such a journey
without a positive passion for the future.[14]

To further introduce the concept behind the Voyager message, this chapter begins with an overview of the message creation process and an introduction of the key responsible individuals and their socio-political environment. To gain insight into these elements, I will be analysing contemporary accounts from the Voyager collaborators, biographical information from interviews and secondary sources on American social and political history. By exploring the actions and philosophies of the core team, particularly in relation to American domestic politics and foreign policy in the years surrounding the Voyager's launch in 1977, I hope to suggest at the perspectives that may have influenced the representation of humanity the interstellar message presents. The Voyager may continue to represent humanity today, in the depths of interstellar space, but it is necessarily a product of its time, and must be studied with its particular contexts in mind.

The Voyager message: an overview

The idea of the Voyager interstellar message was first suggested by NASA in December 1976. According to Carl Sagan, it was John Casani, project manager for the whole Voyager shuttle mission, who suggested creating a message to be attached to the spacecraft.[15] The concept of attaching messages to probes was originated by Sagan with the Pioneer plaques of 1971, and as the Voyager probes were to become the furthest man-made objects from Earth and the first to reach interstellar space, it seemed appropriate to ask Sagan to compose another message in a bottle. Sagan accepted and recruited five collaborators drawn from his colleagues, friends and family, to help deliver the project. These collaborators were Sagan's wife at the time, artist Linda

[14] Sagan on the Voyager record. *Cosmos*. "The Persistence of Memory." 11. Directed by Adrian Malone. Written by Carl Sagan, Ann Druyan and Steve Soter. *PBS*, 7 Dec 1980.
[15] Sagan, *Murmurs*, 21.

Salzman Sagan (1940-);[16] a long-time colleague and fellow extraterrestrial expert Frank Drake (1940-); his friend, former *Rolling Stone* science writer Timothy Ferris (1944-), and his wife at the time, writer Ann Druyan (1949-); and Jon Lomberg (1948-), artist and another collaborator of Sagan's. Sagan also consulted with numerous experts in astronomy, (ethno)musicology and science fiction, including Vice President of Hewlett-Packard, Bernard M. Oliver, executive director of the Center for World Music in Berkeley, Robert E. Brown, and author Arthur C. Clarke.

Between December 1976 and August 1977, the exact format of the Voyager message changed a number of times. According to Sagan, his initial idea was to create a plaque with some engraved images, 'a modest extension' of his previous project, the Pioneer plaques.[17] Then, in January 1977, whilst at a meeting of the American Astronomical Society in Honolulu, Frank Drake recommended Sagan send a phonograph record, allowing them to send both visual and audio content. A third change was made between May and June, when a technical breakthrough increased the bandwidth of the proposed phonograph, allowing for three times as much audio-visual content to be encoded. With more space to fill, the next decision was to include various human spoken languages; in Sagan's words, 'the record was to be a greeting, it clearly had to include a "Hello."'[18] The final component was to be a sound essay comprised of non-musical, non-linguistic sounds of Earth and its inhabitants. While the whole team collaborated on the whole record, each member was nominally responsible for a different section; Jon Lomberg the images, Tim Ferris the music, Linda Salzman the greetings and Ann Druyan the sound essay. Frank Drake supplied scientific content and guided the image section, and Sagan coordinated the project and acted as the sole liaison between the team and NASA.

The final record was made of copper, plated in gold and encased in aluminium, then attached to the shuttle with a phonograph needle and instructions on how it should be played, written in the language of images, science and mathematics; according to Sagan the only truly 'universal'

[16] Moving forward, Linda Salzman Sagan will be referred to singularly by her maiden name Salzman, in an effort to avoid confusion.
[17] Sagan, *Murmurs*, 40.
[18] Sagan, *Murmurs*, 23.

languages.[19] It began with a recorded message from the then Secretary General of the United Nations, Kurt Waldheim, reading, in part: 'We step out of our solar system into the universe seeking only peace and friendship, to teach if we are called upon, to be taught if we are fortunate. We know full well that our planet and all its inhabitants are but a small part of the immense universe that surrounds us and it is with humility and hope that we take this step.'[20] After Secretary General Kurt Waldheim's message, the audio content continued with Salzman's greetings in fifty-five languages, then Druyan's twelve-minute sound essay, comprised of nineteen tracks featuring various human and non-human sounds. The audio culminated with music: twenty-seven selections, making up around eighty-seven minutes of music. They represented fifteen countries; generally, each selection was the sole representative of its country of origin, but there were five countries that were represented by more than one piece: Germany (five pieces), the USA (four), the USSR (four),[21] Peru (two) and Indonesia (two). Furthermore, two composers were represented by more than one piece: Bach (three) and Beethoven (two). The images could be viewed alongside the audio. Of the final 117 images,[22] sixty-six physically depicted the human race in one form or another. A further nineteen did not explicitly depict humans but showed human technologies, structures and other human-related information. The remaining thirty-one images depicted terrestrial nature and geography (fourteen), space or celestial bodies (eight), non-human animals (seven) and mathematical or physical information (three).[23] The final pressing featured a stamp in the centre with a rendition of Earth, the words 'United States of America, Planet Earth' and an engraving by hand: 'to the makers of music, all worlds, all times'.

[19] Sagan, *Murmurs,* 20.
[20]Quoted in Sagan, *Murmurs*, 26.
[21] Each of these four selections represents a different member of the Soviet Union: Bulgaria, Georgia, Azerbaijan and Russia.
[22] The precise number of images is somewhat confused. The official figure listed is 118, though this categorises the list of Congressional representatives as one image. In fact, this list took up four images, meaning the true total is 121. This analysis, however, uses the officially listed figure but excludes the first image: a circle on a blank background included to help calibrate the image projection. As a result, all further statistics are based on a total of 117.
[23] A more detailed list of all contents is listed in the appendix.

The team

Carl Sagan was the natural choice for heading such a project. NASA recognised him as a trustworthy astronomy expert and he may have advised on NASA projects as early as 1958, before completing his PhD.[24] In 1968 he became a lecturer on NASA's Astronaut Training Program where he worked until 1972 and after which continued to collaborate on various spacecraft programs throughout the 1970s, including the unmanned space probes Pioneer (launched 1971) and Viking (1975).[25] Furthermore, Sagan headed the team that designed the first interstellar message project: a set of gold plaques depicting Earth and humans, launched with the Pioneer probes. His work was driven by a long-held fascination with the search for extraterrestrial intelligence, a subfield of exobiology or the study of life beyond Earth commonly known by the acronym SETI. Sagan claimed that he was eight years old when he decided alien life must exist and that this belief supplanted his Jewish faith.[26] He pursued his interest in SETI throughout his academia, elaborating on the theory that there might be life on the Moon in his 1960 PhD thesis with the University of Chicago titled "Physical Studies of the Planets".[27]

Sagan's research connected him to Frank Drake, another SETI pioneer. Drake was educated at Cornell and Harvard and has made significant contributions to the fields of astronomy and exobiology. In the late 1950s, Drake performed 'the world's first observational SETI experiment' with the Howard Tatel telescope, and invited Sagan to what is now referred to as the first SETI conference in Green Bank, West Virginia, in 1961.[28] It was at this conference that Drake coined the 'Drake Equation', comprising a set of measurable variables that, if calculated, could estimate the likelihood that advanced civilisations exist elsewhere in the universe. It is for this work that Drake is known as a SETI pioneer: historians of science acknowledge that humans

[24] Sagan implied in letters at the time that he was advising space agencies, but could not name which and on what. Davidson, *Carl Sagan*, 91.
[25] Terzian, Yervant, and Virginia Trimble. "Obituary: Carl Sagan, 1934-1996." *Bulletin of the American Astronomical Society*, vol. 29 (1997): 1483.
[26] Davidson, *Carl Sagan,* 20.
[27] Sagan, Carl. "Physical Studies of the Planets". PhD Thesis, University of Chicago, 1960.
[28] Shuch, H. Paul. "Project Ozma: the birth of observational SETI." In H. Paul Shuch ed. *Searching for Extraterrestrial Intelligence*, pp. 13-18. Springer, Berlin, Heidelberg, 2011, 13.

have speculated on the existence of alien life for centuries, but research like Drake's moved the field from philosophy to 'scientifically underpinned endeavour.'[29] The Drake Equation is a particularly notable milestone and is still used by scientists today to theorise on diverse subjects from habitable planets to mass extinction events.[30] Drake helped Sagan develop the Pioneer plaques along with Sagan's wife at the time, Linda Salzman. From my research, there is very little biographical information publicly available on Salzman before her work on Pioneer and Voyager, and what is available is communicated through friends and family interviewed by Sagan's biographer Keay Davidson. Born in New York to Jewish parents, Salzman is described as 'free-spirited', 'a rebel and something of an iconoclast'. She married Sagan in 1968, and reportedly 'taught [Sagan] how to have fun' and opened him up to meeting 'more casual, non-academic people'.[31]

Perhaps through Salzman's non-academic influence, the remaining three Voyager team members were friends Sagan made between 1971 and 1972. Artist Jon Lomberg was born in Philadelphia and grew up with an interest in astronomy, using space and celestial forms as an inspiration for this art. Being a budding astronomer, Lomberg read Sagan's publications and, impressed by his work on the Pioneer plaques, wrote Sagan 'a fan letter' in 1972.[32] Sagan replied, in turn impressed with Lomberg's art, and the pair quickly developed a mutual partnership, bonding over a 'mutual obsession...with the idea of extraterrestrials'.[33] Tim Ferris was also interested in astronomy and extraterrestrial life, became fascinated with Sagan's work and subsequently

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[29] Schenkel, Peter. "SETI requires a skeptical reappraisal." *Skeptical Inquirer* 30, no. 3 (2006): 26.
[30] A sample of such works from recent years: Vakoch, Douglas A., and Matthew F. Dowd, eds. *The Drake Equation: Estimating The Prevalence Of Extraterrestrial Life Through The Ages*. Cambridge University Press, 2015; Seager, Sara. "The Search For Habitable Planets With Biosignature Gases Framed By A 'Biosignature Drake Equation'." *International Journal of Astrobiology* 17, no. 4 (2018): 294-302; Loper, Robert D. "Carrington-class Events as a Great Filter for Electronic Civilizations in the Drake Equation." *Publications of the Astronomical Society of the Pacific* 131, no. 998 (2019): 1-5.
[31] Davidson, Carl Sagan, 207, 195, 206.
[32] Lomberg, Jon. "Artist of the Cosmos: Jon Lomberg, A Personal Statement" *The Planetary Society*, 24 Jan 2008 https://web.archive.org/web/20080124124435/http://srb.npaci.edu/cgi-bin/nsdl.cgi?uid=%2F2004-09-03T23%3A57%3A15Z%2F42A4CFF9E80A515A6ECD7A185991488D%2Fbiolomberg.html [Accessed 4 Nov 2019].
[33] Gilbert, Samuel. "The Man Who Helped Design a 10,000-Year Nuclear Waste Site Marker". *Vice*, 26 Apr 2018, https://www.vice.com/en_us/article/9kgjze/jon-lomberg-nuclear-waste-marker-v25n1 [Accessed 14 Oct 2019].

interviewed him for *Rolling Stone* magazine.[34] While Lomberg and Sagan bonded over exobiology, Ferris and Sagan shared a mutual love of music. According to Ferris, they both appreciated classical music and he introduced Sagan to blues and rock.[35] Sagan's friendship with Ferris introduced him to Ann Druyan, author and Ferris' wife at the time. Druyan had a fascination with science motivated by classical Greek mathematicians and a love for music fuelled by personal relationships with jazz great Duke Ellington and Beatles frontman John Lennon.[36]

'A time and place that encouraged dissidence rather than domesticity'

The team was drawn together by Sagan and united over the love for astronomy and music, but they also all had to navigate the political upheaval of 1970s America. For many Americans, the decade was defined by blows to national pride, be it at home with the Watergate corruption scandal of 1972, or abroad with the loss of the Vietnam war in 1975. Furthermore, with civil rights movements for women, black and queer people gaining momentum, the country was increasingly divided along lines of culture and identity. Historian Peter Carroll argues that even stances in the debate on recession and inflation were based on social views rather than economic expediency.[37] Considering the pervasive influence of politics at this time, it is important to investigate the immediate political climate relevant to the Voyager collaborators, and how they reacted to this socio-political tumult.

Ithaca, New York was Carl Sagan's home from when he began working at Cornell University in 1968 until his death in 1996. It was also, at one point or another, the home of three other Voyager collaborators: Frank Drake, who worked as a Professor of Astronomy at Cornell from 1964 to 1981; Linda Salzman, as Sagan's second wife from 1968 to 1981; and Ann Druyan, as Sagan's third wife from 1981 to 1996. As a result, Cornell was also the home of the Voyager

[34] Ferris, Timothy. "Carl Sagan: Life on Other Planets?" *Rolling Stone*, 7 Jun 1973 https://www.rollingstone.com/culture/culture-news/carl-sagan-life-on-other-planets-162285/ [Accessed 4 Nov 2019].
[35] Ferris, Personal interview.
[36] Richman, Ruth. "Lucky Ann Druyan Enjoys A Life Of Curiosity." *Chicago Tribune,* 15 Nov 1992 https://www.chicagotribune.com/news/ct-xpm-1992-11-15-9204130523-story.html [Accessed 10 Dec 2019].
[37] Carroll, Peter N. *It Seemed Like Nothing Happened: America in the 1970s*. Rutgers University Press, 1990, xiii.

message, with most of the meetings regarding content being held at Sagan's residence, according to Tim Ferris.[38] Therefore, it is important to note that, in the years between Sagan's arrival at Cornell in 1968 and the launch of the Voyager in 1977, the college was the site of much social and political unrest. Students protested the war in Vietnam openly and frequently from its start in February 1965, continuing even after the end of the war. In 1975, a talk by Nguyen Cao Ky, former prime minister and vice president of South Vietnam, was prefaced by a visiting professor calling Ky 'a mass murderer, assassin and fascist' and concluded in a hail of eggs and boos from the students. The incident would go on to make national news.[39] Regarding domestic issues, 1968 was a landmark year for social rights groups at Cornell. In April, the African American Society, a student group championing civil rights for black people, stormed and occupied the economics department of the university, in protest of the racist views of a visiting professor and set parts of the campus ablaze in response to the death of Martin Luther King Jr.[40] Less than a month after these events, the college became the second in the country to found a chapter of the Student Homophile League, a queer interest group which grew rapidly, becoming more active and militant in the 1970s.[41]

By all accounts, Ann Druyan would likely have fit in well in Ithaca. Druyan claimed to have grown up 'in a time and place that encouraged dissidence rather than domesticity', and as a result was politically active from a young age.[42] She claimed that, as a teenager, she supported early feminist movements and protested 'the institutional and social racism of the 1960s'.[43] Protesting the Vietnam war, Druyan recalled in Davidson's biography that she went to 'every major march in Washington,' and 'was teargassed many times.'[44] She was not alone: Sagan reportedly

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[38] Ferris, Tim. Personal interview, 2019.
[39] Altschuler, Glenn C. and Isaac Kramnick. *Cornell: A History, 1940–2015*. Ithaca: Cornell University Press, 2014, 234, 235.
[40] Altschuler and Kramnick, *Cornell: A History,* 161, 162.
[41] Beemyn, Brett. "The Silence Is Broken: A History Of The First Lesbian, Gay, And Bisexual College Student Groups." *Journal of the History of Sexuality* 12, no.2 (2003): 205, 218.
[42] Davidson, *Carl Sagan*, 310.
[43] Druyan, quoted in Griner, David. "Q&A: Ann Druyan on Preserving Carl Sagan's Memory and Inspiring a New Generation of Science Lovers". *Adweek*, 19 Jun 2017, https://www.adweek.com/creativity/qa-ann-druyan-on-preserving-carl-sagans-memory-and-inspiring-a-new-generation-of-science-lover/ [Accessed 14 Oct 2019].
[44] Davidson, *Carl Sagan*, 311.

attended 'one or two' of the large-scale protests.[45] Indeed, in our interview in September, Tim Ferris claimed that 'it was clear to everybody who was working for the Voyager project that [the war in Vietnam] was a mistake', though I could find no evidence of Drake, Salzman or Lomberg's political actions. The threat of war was particularly present for Ferris, who recalled that he was nearly drafted to serve in the war. He managed to claim medical deferment and went on to counsel young people at the time on how to avoid being drafted.[46]

Though the team were apparently united against Vietnam, there did seem to conflict in other areas of politics. In our interview Ferris claimed that, 'for some of the Voyager team, the Soviet Union was a plus for the world...a new experiment'. While he did not name names, Druyan revealed in her interviews with Davidson that she was enamoured with leftist political thinkers, calling Leon Trotsky 'one of the greatest historical writers of all time'.[47] Ferris, on the other hand, was vocally anti-left in our September interview, and strongly opposed to the Communist 'totalitarian state'. Ferris and Druyan also appear to have disagreed on the influence of politics on their work. When I questioned Ferris on the implications of the Voyager message, he was steadfast that it was an apolitical scientific endeavour: 'the idea that everything is politics is a Marxist dogma, and I think is just clearly wrong.'[48] Druyan, on the other hand, saw obvious links between politics and science. In a 2017 interview, when asked why science has become 'more political' since the 1970s, Druyan refuted the question, responding: 'It's always been political...there's no way to separate the human components from a human enterprise, which is what science is.'[49]

Voyager and the Cold War

Druyan and Ferris' disagreement on communism is notable as the Voyager project arose during a shift with regards to US-Soviet relations. When it came to open political interactions between the two powers the Nixon administration pursued a policy of *détente*, preferring appeasement and

[45] Davidson, *Carl Sagan*, 214.
[46] Ferris, Personal interview.
[47] Davidson, *Carl Sagan*, 311.
[48] Ferris, Personal interview.
[49] Druyan, quoted in Griner. "Q&A".

collaboration rather than direct confrontation. However, Cold War historian Jussi Hanhimäki argues that the Watergate scandal damaged Nixon's reputation and galvanised opponents of the president, thus raising the profile of anti-Soviet politicians who were frustrated with the Nixon administration's attempts to collaborate with the USSR.[50] The writing of contemporary political scholar George Kennan supports this argument: Watergate was public knowledge in June 1972, and by October Kennan was warning *Foreign Affairs* journal readers that, though tensions between the powers had lowered, 'does not mean that the Soviet Union is no longer a serious problem in American foreign policy. The Soviet regime continues to be inspired by an ideology hostile in principle to the Western nations.'[51]

Hanhimäki argues that *détente* was all but abandoned by 1974, however US-Soviet interactions regarding the Voyager record suggest a more complex story. Rather than an exhaustive summary of US-Soviet relations leading up to the Voyager launch, here I will focus on two aspects of their ideological warfare: culture and science. In the first instance, cultural exports were used by both powers in an attempt to promote their respective ideologies. From the 1960s onwards, both powers sent cultural ambassadors on tours to targeted international locations in a display of artistic dominance. The USSR often used the Bolshoi Ballet, while the US recruited jazz musicians like Louis Armstrong and Dizzy Gillespie.[52] One battleground for this cultural warfare was Germany, the front lines of the Cold War, divided as it was between the two powers. In its indefatigable bid for ideological supremacy, West Germany imported American music and culture as a tool for promoting capitalism and attracting defectors from East Germany.[53] The Voyager record, however, represents a complex cultural interaction between the two powers, featuring competition but also cooperation, as will be explored later in the thesis.

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[50] Hanhimäki, Jussi M. *The Rise and Fall of Détente: American Foreign Policy and the Transformation of the Cold War*. Washington, D.C.: Potomac Books, Inc., 2012, 77.
[51] Kennan, George F. "After the Cold War - American Foreign Policy in the 1970s." *Foreign Affairs* 51 (1972): 219.
[52] Carletta, David M. "" Those White Guys Are Working for Me": Dizzy Gillespie, Jazz, and the Cultural Politics of the Cold War during the Eisenhower Administration." *International Social Science Review* 82, no. 3/4 (2007): 115-134; Von Eschen, *Satchmo Blows Up The World*.
[53] Poiger, *Jazz, Rock, and Rebels*.

In the realm of science, on the other hand, relations were arguably more defined by cooperation rather than competition. This is a less studied area in Cold War historiography; Hanhimäki, for example, makes no mention of US-Soviet collaborations on space programs. In 1975, a year after what Hanhimäki describes as the end of *détente*, the two powers conducted their first joint space mission, with an American Apollo module and the Soviet Soyuz 19 capsule meeting in Earth's orbit and docking together. The event was described by the newly-appointed President Ford as a 'door to useful cooperation in space between our two countries' and was an important symbolic mission, if unremarkable from a scientific standpoint.[54] The mission would not have been possible were it not for technological exchanges and regular telephone communication between American and Soviet scientists throughout 1975.

NASA's politics

The Apollo-Soyuz project also gives insight into NASA's political inclinations. As overseer and final adjudicator of the Voyager message, the agency's attitude towards foreign and domestic politics is highly relevant to the socio-political of the message itself. With this in mind, NASA historian Eric Fenrich points out that the agency at this time claimed to support 'peace in space and peace on earth' by pursuing socially progressive policies with regards to domestic and foreign policy. However, Fenrich also argues this was little more than 'empty rhetoric': he dismisses NASA's supposedly progressive attitude towards US-Soviet scientific collaboration by pointing out that the Apollo-Soyuz project was the only one of its kind.[55] This, however, is somewhat misleading. While he is correct that there were no further collaborative manned missions between the powers before the end of the Cold War, Sagan did collaborate with Russian officials to curate the Voyager message, as will be explored later.

Fenrich's accusation appears to be more appropriate for NASA's attitude on domestic issues. According to Fenrich, while the agency purportedly aimed to integrate its staff by hiring more

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[54] Ezell, Edward Clinton and Linda Neuman Ezell. *The Partnership: A History Of The Apollo-Soyuz Test Project*. Washington, D.C.: National Aeronautics and Space Administration, Scientific and Technical Information Office, 1978.

[55] Fenrich, Eric. "Detente and Dissent: Apollo-Soyuz, Ruth Bates Harris, and NASA's Rhetoric of Cooperation." *Quest* 22, no. 1 (2015): 12.

employees from minority backgrounds, 'internal racism, allegations of ineptitude, and lack of will on the part of NASA's leadership reduced the agency's integration attempts to a near-imperceptible crawl'. This assessment is supported by Gregory Lewis' 1997 article, which indicated that federal institutions like NASA exhibited rampant employment discrimination on the grounds of sexuality, despite legislation against this in 1975.[56] Furthermore, Fenrich's assertion of a 'lack of will' correlates with NASA historian Robert Lanius' account of the agency's Director at the time, James C. Fletcher. Lanius describes Fletcher, a Mormon, as 'a conservative political figure', and argues that his religion and Western American heritage factored into his management style.[57] In this, Lanius does not refer to Fletcher's internal social policy but rather the Director's support of SETI. However, these same characteristics correlate with the lack of progressive social action suggested by both Fenrich and Lewis.

The discrimination and social conservativism apparently rife in NASA are indicative of broader social attitudes across the country. While above I described the vocal minority movements at Cornell, it is important to bear in mind that these were just that: a vocal minority. In American society more largely, discrimination against marginalised groups was widespread. This is perhaps most keenly felt by queer people, who were classified as mentally ill by the American Psychological Association until 1973, and for whom conversion therapy was still a prescribed 'cure' throughout the decade.[58]

Conclusion: everything is politics

This chapter has introduced what the Voyager message was, who put it together and in what political climate it came into being. It indicated that those who compiled the message were politically active though occasionally in conflict, and that they lived and worked in environments dominated by social disenfranchisement, protest and dissent. This was the direct environment in

[56] Lewis, Gregory B. "Lifting The Ban On Gays In The Civil Service: Federal Policy Toward Gay And Lesbian Employees Since The Cold War." *Public Administration Review* (1997): 387-395.
[57] Lanius, Roger D. "A western Mormon in Washington, DC: James C. Fletcher, NASA, and the final frontier." *Pacific Historical Review* 64, no. 2 (1995): 237.
[58] Lamberg, Lynne. "Gay is okay with APA—forum honors landmark 1973 events." *JAMA* 280, no. 6 (1998): 497-499; Card, Robert D. "Counseling The Homosexual In A Private Practice Setting." *Issues in Religion and Psychotherapy* 1, no. 1 (1975): 10-13.

which the Voyager record came together, in a time where the Cold War powers competed on culture and cooperated on science. The Voyager represents a confluence of these two factors, and so I would argue was highly political.

Chapter 2: SETI

The greater significance of the Pioneer 10 plaque is not as a message to out there; it is a message to back here.[59]

An important factor raised in the last chapter is that the Voyager collaborators and, according to Roger Lanius, the Director of NASA were all motivated by the search for extraterrestrial intelligence (SETI). The Voyager project, and the Pioneer plaques before it, were dependent on a belief in extraterrestrial intelligence, and as a result, I believe it is important to explore the context of SETI in its own right. This chapter will ask how extraterrestrials were perceived, both in the popular consciousness and scientific contexts, and investigate the socio-political influences and implications of this perception, with reference to Carl Sagan's writings on previous SETI projects and analysis of and commentary on contemporary science fiction.

The Pioneer plaques

As the first direct message to potential extraterrestrial intelligence, the Pioneer plaques were influential in establishing precedent on how to communicate information to unknown species and, most importantly for this thesis, how to represent the human race beyond Earth. As a result, it serves to briefly summarise the process behind the project and the public reaction to it. The Pioneer plaques were created by Carl Sagan, Frank Drake and Linda Salzman and launched with NASA's Pioneer 10 probe on March 2nd, 1971, and subsequently the Pioneer 11 probe on April 6th, 1973. Each six-inch by nine-inch gold plate depicted various scientific diagrams showing Earth's location in relation to other major celestial bodies, an image of the spacecraft transporting them and an illustration of a man and a woman to represent humankind (Fig.1). As experts in SETI, Drake and Sagan developed the scientific content of the plaques while Salzman, a visual artist, was involved to create depictions of the human race.

[59] Sagan, Carl. *The Cosmic Connection*. New York: Anchor Press, 1973, 32.

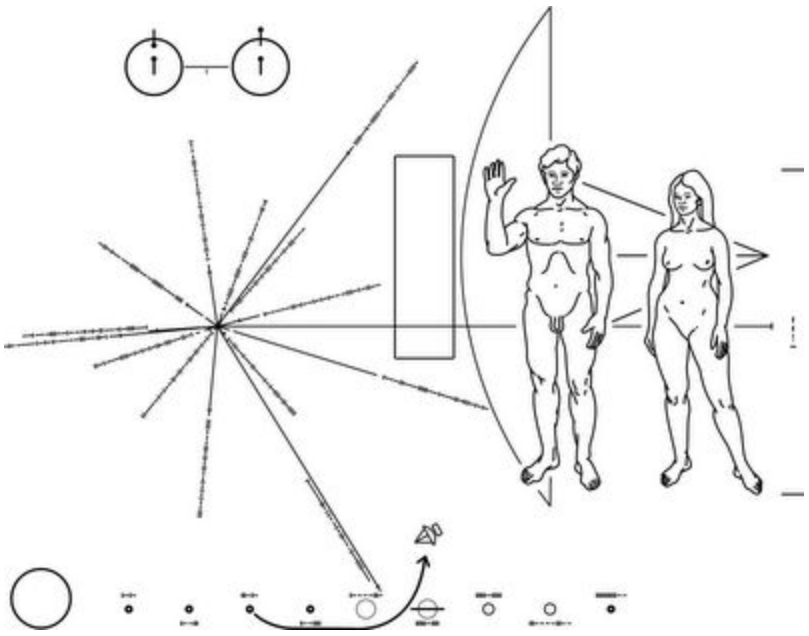

Fig.1: The Pioneer plaque design.

In an attempt to be as representative of as much of the human race as possible, Sagan explained that he, Drake and Salzman designed the man and woman to appear 'panracial'. Reflecting in 1973, Sagan claimed that they hoped to 'represent at least three of the major races of mankind' by giving both figures Caucasian features, the woman 'a partially Asian appearance' and the man a 'broad nose, thick lips, and a short "Afro" haircut'.[60] Regardless of the team's intentions, the resultant product told a different story. According to Sagan in 1973, due to an imprecise engraving process, the woman's hair appeared blonde and the man's intended haircut 'transmuted into a very non-African Mediterranean-curly haircut'.[61] However, Robert Kraemer, Director of Planetary Programs at the time, had a different recollection. Reflecting two decades later, he claimed that the pan-racialisation of the images was NASA's doing. Kraemer explained that 'the public affairs people' thought Salzman's initial drawings were 'too ethnic', and 'neutralised them into a racial mixture.'[62] The design of the female figures was also recalled inconsistently. 'The decision to omit a very short line' on the female figure resulted in a lack of

[60] Sagan, *The Cosmic Connection*, 27.
[61] Sagan, *The Cosmic Connection*, 27.
[62] Macauley, William R. "Inscribing Scientific Knowledge: Interstellar Communication, NASA's Pioneer Plaque, and Contact with Cultures of the Imagination, 1971–1972." In Alexander C. T. Geppert ed. *Imagining Outer Space: European Astroculture in the Twentieth Century*, pp. 285-303. Palgrave Macmillan, London, 2012, 295.

visible female genitalia. According to Sagan, the reasoning behind this was that the team feared that a more biologically accurate image would be deemed too explicit by NASA, thus preventing the plaques from being sent altogether. Reflecting a year after the launch, Sagan admitted that he 'may have judged NASA's scientific-political hierarchy as more puritanical than it [was]', and mentioned how the initial idea of attaching a plaque to Pioneer 'was met with approval at all steps up the NASA hierarchy.'[63] Kraemer however, claims Salzman initially included a line indicating female genitalia, but it was erased by his superior at NASA, John Naugle, out of fear the public would label it as 'pornographic.'[64]

The intention behind this almost mathematical construction of humans — where racial and sexual characteristics can be picked and rearranged like factors in an equation — comes across more as artistic interpretation than scientific representation. While any representation of humanity in a restricted medium is necessarily affected by individual interpretation, the fact that this approach was not critiqued by Sagan, Drake or Salzman suggests a lack of awareness of the social repercussions of this depiction on Earth. And, when the plaque design was publicised before the Pioneer launch in March, repercussions there were. There were indeed complaints that the images were too explicit: one letter to the *Los Angeles Times* was shocked that NASA would 'spread this filth even beyond our solar system', and a number of periodicals reproduced a censored version, according to Sagan.[65] Conversely, feminists asked why the woman's genitalia was *not* shown, and why the woman wasn't waving like the man, claimed she looked 'too passive'.[66] The image was further criticised for being 'too straight', and was reproduced on the front page of the *Berkeley Barb*, a satirical California magazine, with the caption 'Hello, we're from Orange County', mocking the white heteronormativity of these supposed Earth

[63] Sagan, *The Cosmic Connection*, 24, 18.
[64] To add to this confusion, Sagan claims in *The Cosmic Connection* that the idea that NASA censored the female image was fabricated by Tom O'Toole of the *Washington Post* and reproduced by other journalists. Macauley, "Inscribing Scientific Knowledge," 295; Sagan, *The Cosmic Connection, 26.*
[65] "Letters to the Editor," *Los Angeles Times,* 5 Mar 1972, 118; Sagan, *The Cosmic Connection*, 26.
[66] Sagan's reasoning for why only one figure was waving was that he did not want any alien observers to think that 'one of our arms is bent permanently at the elbow.'; Owens, Craig. "The Discourse of Others: Feminists and Postmodernism." In Hal Foster, ed. *The Anti-Aesthetic: Essays on Postmodern Culture*, pp. 57-82. Port Townsend: Bay Press, 1983, 60-61.

ambassadors.[67] This latter criticism was restated in 1993, by queer theorist Michael Warner, who argued the human figures are a 'bizarre fantasy-image' clearly intended to represent a gendered, heterosexual couple. According to Warner, as a symbol of humanity, the image 'testifies to the depth of [Earth's] culture's assurance (read: insistence) that humanity and heterosexuality are synonymous.'[68]

Considering the supposed scientific goal of this message one would perhaps assume that Sagan and his team could ignore these criticisms; after all, the plaques were intended for an alien species unaware of feminism and heteronormativity. However, Sagan makes clear in his reflections on the project that the plaques had two audiences: the extraterrestrial and the human. Sagan raises this point in *The Cosmic Connection,* demonstrated in this chapter's epigraph, and professes regret that their representation of humanity was disappointing. This care and attention towards human reception apparently carried forth into the Voyager process. Bernard M. Oliver, scientific advisor, long-time friend of Sagan's and then Vice President of Hewlett-Packard, provided what Sagan described as the first suggestion on the Voyager's mission statement. Oliver's view was that, while 'there is only an infinitesimal chance that the plaque will ever be seen by a single extraterrestrial...it will certainly be seen by billions of terrestrials. Its real function, therefore, is to appeal to and expand the human spirit'.[69] The following chapters will explore how the Voyager message was curated with consideration to this human spirit.

A very human alien

I do not, however, wish to imply a hard distinction between these two audiences, in fact I would argue that Sagan's conceptions of extraterrestrial audience was, consciously or unconsciously, notably human. To this day there is no scientific evidence confirming the existence of advanced extraterrestrial civilisations, therefore any intended extraterrestrial recipient of a SETI message is, to a great extent, a construct of the sender's mind. Therefore, to fully understand the

[67] *Berkeley Barb,* 2 Mar 1972, 1.
[68] Warner, Michael. *Fear of a Queer Planet: Queer Politics and Social Theory.* London: University of Minnesota Press, 1993, xxiii.
[69] Sagan, *Murmurs*, 11.

motivations behind the Voyager message, it is important to determine the philosophical and social factors surrounding the concept of extraterrestrials at the time.

Sontag and Spielberg: aliens in popular consciousness

For most non-scientific observers, extraterrestrials exist purely in the realm of fantasy, and yet perceptions of aliens in science fiction can indicate socio-political realities beyond the literature, TV and film in which they are contained. Renowned essayist and philosopher Susan Sontag posited this approach in her 1965 essay "The imagination of disaster". Analysing American science fiction films from the 1950s and 60s, she argued for the real-world impact of fantasy to 'lift us out of the unbearably humdrum and to distract us from terrors, real or anticipated.' In accordance with this, Sontag identified a subset of science fiction films that promoted a 'utopian fantasy', typified by a 'yearning for peace, or at least for 'peaceful coexistence' amongst nations, which she argued was a manifestation of a Cold War society in which the threat of annihilation from foreign invaders was a present reality. This 'UN fantasy', as Sontag called it, the arrival of invasive or otherwise warlike extraterrestrials united normally conflicting international ideologies.[70]

Sontag identified three key themes that contributed to humanity's success over extraterrestrials in these films: 'ascendency of reason over feelings, the idealization of teamwork and the consensus-creating activities of science [and] a marked degree of moral simplification'. Regarding the first two: when aliens became the common enemy, science and technology are the tools of humanity's salvation; 'the great unifier[s]', in Sontag's words. She then claimed that, in these films and in Western society more generally, science is connected to rationality and logic and directly opposed to subjectivity and emotion. Salvation and survival, therefore, is linked to 'reasonableness' and opposed to emotion. Praising the salvific quality of science leads to the third key element, moral simplicity typified by a lack of social criticism. In her estimation, 'the notion of science as a social activity, interlocking with social and political interests, is unacknowledged'. How then do these films frame the extraterrestrial? In two ways, Sontag claimed. Firstly, as the foreign enemy, intrinsically and unavoidably different yet with apparently

[70] Sontag, Susan. "The imagination of disaster." *October* 65 (1965): 42, 46, 47.

anthropomorphic characteristics; essentially, a foil for Communism. Secondly, as rational and emotionless and thereby a reflection of our salvific science, a source of inspiration: 'the wave of the future, man in his next stage of development'. [71]

Though Sontag wrote about films of the 1950s and 60s, almost all of these common characteristics are evident in one of the most popular extraterrestrial science fiction films of the 1970s: Steven Spielberg's *Close Encounters of the Third Kind,* released in 1977, three months after the Voyager launched.[72] The film revolves around a fleet of unidentified spacecraft visiting Earth, causing fascination and obsessive joy in those who witness them. Firstly, 'the idealization of teamwork and the consensus-creating activities of science' are central to the plot, and international cooperation is a recurring theme. The film opens with a multinational cast of characters speaking in French, Spanish and English, and while the bulk of the film takes place in the United States the characters also visit Mexico, India and Mongolia. Secondly, the representation of international cooperation in itself reveals moral simplification and a lack of social criticism, as the depiction of these non-Western locations is somewhat problematic. In each country, the local people are rural and technologically primitive. They are juxtaposed against the financial and technological superiority of white-skinned Westerners dressed in suits and armed with scientific instruments.

Such paternalistic, colonial attitudes have also been highlighted in the film's depiction of extraterrestrials. Writing in 1987, critic Hugh Ruppersburg connected Spielberg's aliens to Joseph Conrad's deistic depictions of white missionaries arriving in Africa in his 1899 novel *Heart of Darkness.*[73] However, when it comes to Sontag's image of aliens, *Close Encounters* proves the rule. In fact, rather than championing rationality, the climax of the movie relies on the triumph of inexplicably strong emotion over scientific reason. This victory for emotion could perhaps be explained by a different interpretation of extraterrestrials in science fiction: as representations of the divine. Ruppersburg's analysis is predicated on the idea that, 'to the poor

[71] Sontag, "The imagination of disaster," 47, 48.
[72] *Close Encounters of the Third Kind.* Directed by Steven Spielberg, USA: EMI, 1977.
[73] Ruppersburg, Hugh. "The Alien Messiah in Recent Science Fiction Films." *Journal of Popular Film and Television* 14, no. 4 (1987): 161.

humans singled out, [the aliens] seem inescapably godlike.'[74] Indeed, recurrent symbols of heavenly light and converted masses support this analysis, and Christian ceremony plays a part in the film's climax. Fellow critic Andrew Gordon goes further, highlighting the consensus amongst contemporary critics like Pauline Kael and Stanley Kauffman that *Close Encounters* is 'essentially a religious film.' Whilst, according to Ruppersbrug, casting aliens as deistic figures was not uncommon, Gordon criticises Spielberg's religious metaphor as 'an unchallenging faith for the simple-hearted and the simple-minded' lacking in social awareness, echoing Sontag's moral simplicity argument.[75]

Regardless of these critics, *Close Encounters* was quickly popular with alien enthusiasts across the country, with the exception of Carl Sagan. By the time of the film's release in late 1977, Sagan was likely the most well-known SETI expert in the country, and so was invited to see the film as part of an interview with the *Washington Post*. Ever the scientist, Sagan complained that the film 'doesn't even represent a plausible scenario' and did not mention noticing any social message. He did, however, appear to enjoy the connections between Speilberg's extraterrestrials, who communicate through music, and the Voyager record, that wished to communicate with extraterrestrials partly through music. This aspect, coupled with the scenes of international cooperation between scientists, linguists and musicians, suggest that Spielberg may have taken inspiration from the Voyager message.

Science fiction and science fact

Sagan's criticisms of *Close Encounters* pose the question of the relationship between science fiction and science fact. As explored in the previous chapter, Sagan was involved in SETI throughout his career, an area of scientific research that originated in the 1950s. While theories on extraterrestrial life have existed for hundreds of years, it wasn't until the mid-twentieth century that, as SETI scholar Michael Michaud puts it, 'thinking about extraterrestrials…evolved

[74] Ruppersburg, "The Alien Messiah," 161.
[75] Gordon, Andrew. "Close Encounters: The Gospel According to Steven Spielberg." *Literature/Film Quarterly* 8 no. 3 (1980): 156.

from metaphysical speculation to scientifically testable hypotheses'.[76] It is precisely this scientific quality that differentiates SETI from pseudoscientific understandings of extraterrestrials. Sagan and Drake represent the view that, considering the enormity of the universe, the likelihood that humans are the only intelligent species ever to evolve is small. This was the concept underpinning Drake's seminal equation and remains the motivating force behind SETI. The pseudoscientific understanding centres on the idea that aliens not only exist but have already visited Earth, is more frequently expounded in science fiction and is often tied up with conspiracy theories about UFOs, government cover-ups and shady cabals. This is the field that Sagan bemoans in *Close Encounters* and has gone on to criticise in various published works.[77]

Operating under this scientific distance, in his work Sagan expounded a particularly optimistic interpretation of what advanced extraterrestrial life could be like, and how the human race could potentially benefit from exposure to them. Fellow Voyager collaborator Jon Lomberg summarised Sagan's hopeful estimation of alien civilisation as 'the Cosmic Perspective', a philosophical world-view that pervaded his professional, political and personal opinions.[78] The concept is dependent on the idea that advanced civilisations currently exist somewhere in the universe, and therefore our intra-human conflicts are inconsequential in comparison with the potential inter-planetary interactions with said civilisations. An indicative example of Sagan's philosophy is *Cosmos*, the educational science-based TV show he with fellow Voyager collaborator Ann Druyan in 1980. Throughout the show, Sagan takes on the role of an observer of Earth, replete with his own spaceship, taking stock of humanity. In the final episode of the series he concludes that 'ethnic, religious or national identifications are a little difficult to support when we see our planet as a fragile blue crescent fading to become an inconspicuous point of light against the bastion of the stars.' Instead, Sagan argues, humanity needs 'a new

[76] Michaud, Michael. *Contact with Alien Civilizations: Our Hopes and Fears about Encountering Extraterrestrials.* New York: Springer, 2006.
[77] Sagan, *The Cosmic Connection*, 199-207; Sagan, Carl, and Thornton Page. *UFO's: A Scientific Debate*. Ithaca: Cornell University Press, 1972.
[78] Lomberg, Jon. "Becoming Galactic". *YouTube*, 18 Jun 2013, https://www.youtube.com/watch?v=bYhAEJ5tHl4 [Accessed 14 Oct 2019].

consciousness' of Earth as 'a single organism' because, to an alien visitor, our differences are 'trivial' compared to our similarities.[79]

Sagan's Cosmic Perspective is perhaps best exemplified by *Pale Blue Dot,* his penultimate and arguably most famous written work. Sagan's 1994 work attempts to forecast a scenario where humanity becomes an interplanetary species, and, in a foreword to a posthumous edition, is described by Ann Druyan as an 'intersection between science and spirituality'. This description is perhaps most valid in the first chapter, where Sagan describes the titular pale blue dot, a 1990 photo of Earth taken by Voyager from over six billion kilometres away. From this distance Earth is barely visible, 'a lonely speck in the great enveloping cosmic darkness', in Sagan's words. Sagan uses the scientific fact of Earth's cosmic insignificance to argue against human chauvinism and assumed supremacy on the basis of race, sex, sexuality or religion: 'the delusion that we have some privileged position in the Universe [is] challenged by this point of pale light'.[80]

However, considering the apparent influence of Sagan's Cosmic Perspective, it is important to critique this world view as a social philosophy rather than a scientific stance. In this instance, it is useful to lift the division between science fiction and science fact, as Sagan's Cosmic Perspective arguably mimics a number of the aforementioned science fiction tropes. His hopes to rise above national identifications are indicative of Sontag's 'UN fantasy', and the metaphor of Earth as a 'single organism' is reminiscent of points made by science fiction critic Scott Sanders, who argued in 1977 that science fiction anonymises the individual in favour of the collective.[81] Furthermore, his criticism of *Close Encounters* notwithstanding, his optimistic embrace of potential extraterrestrial encounters aligns with how film's protagonists receive the alien visitors.

[79] *Cosmos*. "Who Speaks for Earth?" 13. Directed by Adrian Malone. Written by Carl Sagan, Ann Druyan and Steve Soter. *PBS*, 21 Dec 1980.
[80] Sagan, Carl. *Pale Blue Dot: A Vision of the Human Future in Space*. New York: Ballantine Books, 1994, 7.
[81] Sanders, Scott. "Invisible Men and Women: The Disappearance of Character in Science Fiction." *Science Fiction Studies* 4, no.1 (1977): 14-24.

This connection raises the question of the relationship between Sagan's SETI work and religion, which has been explored by a number of theologians. The relationship between religion and science explored by the historian of science and theology Jacques Arnould, who highlighted that both religion and science 'have often led humankind to question their own identity' and that, in both fields, 'the Other helps to define the Self.'[82] Writing in 1985, theologian Thomas Lessl went even further in connecting the two institutions, claiming that 'scientific rhetoric satisfies religious impulses', and, using Sagan's work as evidence, argued that the popular science approach championed, if not invented, by Sagan in the *Cosmos* TV show serves two purposes: 'the practical purpose of maintaining the privileged status of science in society and the religious purpose of grounding faith in an unimpeachable body of knowledge.'[83] Most notably for this thesis, the work of Carl Sagan and Frank Drake has been connected to a theistic epistemology by theologian Ted Peters. Beginning with Drake's research, Peters posits two models for human understandings of extraterrestrials, the 'celestial saviour model' — that 'science is salvific, and heavenly science would be even more salvific than Earth's science,' — and the 'alien enemy model', akin to Sontag's analogy that extraterrestrials in science fiction unite humanity against a common enemy.[84] Peters' argument is that, by hoping to find and contact alien life, SETI scientists like Sagan and Drake are picturing the celestial saviour model and that any belief in benevolent advanced beings beyond our planet is not science but merely 'practicing theology without a license.'[85]

From their own accounts of their faith, it appears Drake would be more open to these comparisons than Sagan. Drake was raised Baptist Christian but recanted his religion before reaching adulthood. He did, however, acknowledge the influence of religion on his life and work: speaking in 1990, he said that 'a strong influence on me, and I think on a lot of SETI

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[82] Arnould, Jacques. "Does Extraterrestrial Intelligent Life Threaten Religion and Philosophy?" *Theology and Science* 6, no. 4 (2008): 449.
[83] Lessl, Thomas M. "Science and the sacred Cosmos: The ideological rhetoric of Carl Sagan." *Quarterly Journal of Speech* 71, no. 2 (1985): 176.
[84] Peters, Ted. "The implications of the discovery of extra-terrestrial life for religion." *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 369, no. 1936 (2011): 649.
[85] Peters, Ted. "Projecting Earth on to Heaven: The Hopes of Frank Drake and the Fears of Stephen Hawking." *Theology and Science* 15, no. 2 (2017): 161.

people, was the extensive exposure to fundamentalist religion'.[86] Sagan would likely have been less charitable. He was an outspoken agnostic throughout his life, would often debate religious leaders and refused prayers on his deathbed.[87] He once reportedly convinced a preacher to abandon his faith and teach Darwinian evolution.[88] In fact, in distinguishing science from religion, Sagan raises another sociological issue surrounding his perceptions of science. In a 1981 interview with *U.S. Catholic* magazine, Sagan and journalist Edward Watkin debated the role of faith in contemporary American society. When Watkin posited that religion satisfies 'the deep human need for transcendence' more fully than science, Sagan disagreed, claiming that a scientific view of the world is necessarily best for analysing the human condition because it is the product of Darwinian evolution, or, in his words: 'our scientific way of viewing the world has been selected because it works.'[89]

By connecting scientific thinking with evolution, Sagan is necessarily connecting religious thinking to primitivism, privileging the Western canon of science and technology above alternative non-scientific philosophies. Subaltern historian Dipesh Chakrabarty noted a similarly problematic approach in historical scholarship. In his recent book *Provincialising Europe,* Chakrabarty criticises historians relying on axioms developed in Western historical traditions when telling subaltern histories. He points out that, for many (if not the majority) of societies around the world, gods, spirits and their worship are 'social facts', that 'the question of being human involves the question of being with gods and spirits'.[90] I argue that Chakrabarty's criticism is just as relevant to sociological perspectives as historical research, and that Sagan's views on religion, consciously or unconsciously, are indicative of Western paternalism that has its roots in colonialism. Furthermore, that Sagan does not problematise his views on science and

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[86] Drake, quoted in Swift, David W. *Seti Pioneers: Scientists Talk About Their Search For Extraterrestrial Intelligence*. Tucson: University of Arizona Press, 1990, 57.
[87] Adler, Jerry. "Unbeliever's Quest". *Newsweek*, 30 Mar 1997, https://www.newsweek.com/unbelievers-quest-170478 [Accessed 14 Oct 2019].
[88] Druyan, Ann. "Does Science Need to be Popularised?" In Yervant Terzian and Elizabeth Bilson eds. *Carl Sagan's Universe*, pp.163-169. Cambridge: Cambridge University Press, 1997, 166.
[89] Watkins, Edward. "God and Carl Sagan: Is the cosmos big enough for both of them?" *U.S. Catholic* 46, no.5 (1981): 23.
[90] Chakrabarty, Dipesh. *Provincializing Europe : postcolonial thought and historical difference*. Princeton, N.J.: Princeton University Press, 2000, 16.

religion is indicative of moral simplicity and a lack of social criticism, identified by Sontag in contemporary science fiction.

Similar colonial legacies have been highlighted in Sagan's perceptions of extraterrestrials. Like Peters above, artist and political writer Trevor Paglen also analysed Sagan and Drake's various SETI projects, including the Voyager message, to posit conceptions of extraterrestrials. In his 2013 article, Paglen argues Sagan's SETI projects envisage an 'alien-stranger...an extraterrestrial that is not human, but which shares many characteristics with humans (roughly similar senses, language, capacity for abstract and symbolic thought...).'[91] This is opposed to the 'alien-alien', something 'truly and radically nonhuman, with few if any overlaps in communication strategies, thought and sense experience'.[92] Paglen argues that any attempt to communicate with extraterrestrials assumes that communication is possible, and therefore the intended recipient is necessarily the alien-stranger. Paglen then argues that the alien-stranger assumption 'recapitulates some of the more troubling legacies of humanism, echoing the French *mission civilisatrice*, used to justify European colonial rule in the late nineteenth and early twentieth centuries, or even the more recent US 'liberations' of Afghanistan and Iraq.'[93]

Conclusion: one audience

I argue that the confluence of all of these arguments is that conceptions of extraterrestrials in this time were necessarily influenced by sociological perspectives, thereby rendering the difference between the two Voyager audiences almost negligible. The intended audience for the Voyager message was both consciously and subconsciously human, meaning decisions made with regards to either audience are subject to the message team's socio-political biases. This chapter has explored some of these biases, with relation to Judeo-Christian influences and colonial legacies, alongside the moral simplicity and minimal social criticism identified by Susan Sontag. In conclusion, I would argue that the decisions indicated in the subsequent chapters have

[91] Paglen, "Friends Of Space," 14.
[92] Paglen, "Friends of Space," 15.
[93] Paglen, "Friends of Space," 16.

socio-political motivations and implications, even (and perhaps especially) those that are made with regards to the alien audience.

Chapter 3: 'all worlds'?

To the makers of music, all worlds, all times.
United States of America, Planet Earth.[94]

Now that the context of the immediate political environments and the philosophical context of the participants have been discussed I can begin discussing the message itself, and how it relates to these contexts. To that end, the next two chapters will explore two goals that the core Voyager team — and, to a certain extent, their academic advisors and NASA — hoped to achieve with their interstellar message: representing the diversity of life on Earth and portraying a positive image of the human race. This chapter focuses on the first goal and explores why the team wished to portray humanity as diverse, how they pursued this goal and to what extent they were successful. Building on the previous chapters, all of these factors are discussed in relation to relevant socio-political contexts.

The message creation process

Before beginning, however, I should emphasise the casual, fluctuating nature of the message creation process. At no point in the process was there a singular statement of intention; the goals of the project, what to include and what to exclude are choices that were apparently made sporadically. As a result, the above two goals have been determined through analysis of the team's methods and the final record content. Diversity, for example, is not mentioned in Jon Lomberg's discussion of the image section and only briefly mentioned in Ann Druyan's account of the sounds section. However, the pursuit of diversity is frequently raised by Sagan when summarising the project and by Tim Ferris in discussing the music section, and so I suggest it should be seen as a concerted goal. Furthermore, in their recollections of the process team members change their stances on decisions and mention new goals not discussed at the time. To navigate these inconsistencies, I will consult four key sources that mention the identification of these goals: the book *Murmurs of the Earth*, published in 1978; interviews with some of the

[94] The message engraved on the final Voyager message. Sagan, *Murmurs*, 40.

collaborators by musicologists Stephanie Nelson and Larry Polansky in 1991; an article written by Tim Ferris in the *New Yorker* in 2017; and my interview with Ferris in September 2019. In comparing these accounts inconsistencies and contradictions will become apparent, the implications of which I will explore where possible.

I suggest the reason for these inconsistencies is a somewhat casual approach to the project, lacking critical self-reflection and any attempt at empiricism. In the various accounts of the process, team members make no claim to objectivity in curating this representation of humanity, in fact their accounts are reminiscent of the almost artistic interpretation of the human race identified in creating the Pioneer plaques. In our September interview, Tim Ferris likened selecting items for the record to a piece of creative expression, and critics should be dismissed because 'anyone who creates anything knows someone will throw a tomato at it.'[95] Ferris in particular demonstrates this subjectivity by making one of his music selection criteria the inclusion of 'good music'. In 1978, he argued 'nothing should be included out of mere dutiful concerns' and in both the 1991 and 2019 interviews, Ferris went on to stress the importance of making 'a good record', made up of 'good music'.[96] Ferris was not alone: in what Sagan referred to 'the first coherent statement [on] organising principles for the diversity of human music' musical advisor Robert Brown supported subjectivity, asking 'If we don't send things we passionately care for, why send them at all?'[97] Of course, as Voyager music critics Nelson and Polansky point out, the idea of 'good music' is 'problematically untestable and unconsensual.'[98] This much is apparent from how, according to Ferris' 2017 *New Yorker* article, Ann Druyan suggested Chuck Berry's *Johnny B. Goode* which Sagan called 'awful'.[99] Furthermore, the issue of this subjectivity is that, as Nelson and Polansky point out, it fails to biases of 'personal history, race, class, gender, and everything else that makes human beings different from one another'.[100]

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[95] Ferris, Personal interview.
[96] Ferris, *Murmurs*, 168; Ferris, Personal interview; Nelson and Polansky. "The Music of the Voyager Interstellar Record," 366.
[97] Brown, Robert. "Robert Brown's Recommendations on Music Repertoire." In *Murmurs*, 253, 254.
[98] Nelson and Polansky. "The Music Of The Voyager Interstellar Record," 366.
[99] Ferris, "How The Voyager Golden Record Was Made," *The New Yorker*.
[100] Nelson and Polansky. "The Music of the Voyager Interstellar Record," 366.

Contrast this with another project collating international cultural heritage undertaken in the same year: the UNESCO World Heritage List. Between June 27th and July 1st, 1977, representatives from fifteen UN member states convened in Paris for the first session of the Intergovernmental Committee for the Protection of The World Cultural and Natural Heritage. The session was intended to establish standards to determine 'outstanding universal value' in heritage sites around the world. Member states could submit sites for consideration, and the committee would select from these to produce a World Heritage List. The conference report highlighted the debates on inclusion criteria, the determination of 'outstanding universal value' and how to ensure equal geographic distribution of sites.[101] As a practice of enshrining international cultural heritage, the World Heritage committee is an appropriate parallel to the Voyager message process.[102] Comparing these two contemporary processes reveals that the casual and subjective approach to the representation of diversity is not necessarily the norm for its time, but instead a choice made by Sagan and the Voyager team.

Defining diversity

This subjectivity notwithstanding, from accounts in *Murmurs* it appears that the representation of diversity was a goal from the outset of the project. Frank Drake explained that the team learned a lesson from responses to the Pioneer plaques and admitted that said message was created by 'a very limited group of humans – in fact, three humans – and thus was neither representative of the human race as a whole nor perhaps as informative as it could be'.[103] The implication appears to be that Sagan's recruitment of Druyan, Ferris, Lomberg and the academic advisors was in an effort to diversify their team. Furthermore, Sagan mentions that from early on in the process

[101] United Nations Educational Scientific and Cultural Organisation, Intergovernmental Committee for the Protection of The World Cultural and Natural Heritage, *First Session Final Report*, CC-77/CONF.OOl/9 (17 Oct 1977), available from https://whc.unesco.org/archive/1977/cc-77-conf001-9_en.pdf [Accessed 22 Dec 2019].
[102] Unfortunately, there is not space here to discuss UNESCO's own socio-political biases in creating the World Heritage list. Fortunately, this has been the subject of a much larger body of literature than the Voyager record. See: Scholze, Marko. "Arrested heritage: the politics of inscription into the UNESCO World heritage list: the case of Agadez in Niger." *Journal of Material Culture* 13, no. 2 (2008): 215-231; Cleere, Henry. "The uneasy bedfellows: universality and cultural heritage." In R Layton, P Stone and J Thomas eds. *Destruction and Conservation of Cultural Property*, pp. 38-45. London: Routledge, 2003; Meskell, Lynn. "Transacting UNESCO World Heritage: gifts and exchanges on a global stage." *Social Anthropology* 23, no. 1 (2015): 3-21.
[103] Drake, *Murmurs,* 59.

content selection was made 'in an attempt to be as fair and representative as possible in terms of geographical, ethnic and cultural distribution.'[104] The goal is perhaps best and most frequently articulated by Tim Ferris, who claims one of his two criteria for selecting music was that 'contributions from a wide range of cultures should be included, not just music familiar to the society that launched the spacecraft'.[105]

However, these descriptions already imply that the team's definition of diversity was restricted to cultural diversity. That being said, there are three instances in which the team reference other forms of diversity. Firstly, Ann Druyan wished to show 'a long overdue gesture of respect' to non-anthropocentric diversity of life on Earth in collecting the sounds. Secondly, in recording the greetings, Carl Sagan and Linda Salzman had hoped that 'half of the voices could be male and half female, in order to reflect the distribution of sexes on the planet Earth.'[106] Thirdly, Tim Ferris claimed in the 1991 interview with Nelson and Polansky that he had a third criterion for choosing music in representing 'economic diversity'. By this, Ferris alluded to 'the fact that there are cultures within cultures…that they could have chosen either a Gershwin piece or a blues piece by a poor black man as a representative of a certain period of American musical culture.'[107]

However, the final record content seems to emphasise that these other three forms of diversity were not pursued to the same extent as cultural diversity. The pursuit of non-human diversity is somewhat apparent: 27.4% of the image selections are dedicated to animals and celestial or terrestrial phenomena, and the beginning of Druyan's sound essay included humpback whale songs mixed with the greetings from UN ambassadors to honour these 'intelligent co-residents of Earth'.[108] Then again, as Druyan is herself aware, her sound selection 'vastly overemphasizes the last few thousand years at the expense of the millions that preceded them in the chronicle of our species'; of the nineteen tracks in the twelve-minute sound essay, over half feature humans and

[104] Sagan, *Murmurs*, 21.
[105] Ferris, *Murmurs*, 162.
[106] Sagan, *Murmurs*, 24.
[107] Nelson and Polansky, "The Music of the Voyager Interstellar Message", 365.
[108] Druyan, *Murmurs*, 151.

human technologies.[109] Economic diversity is also a hazy category. The goal is not mentioned in *Murmurs*, where Ferris plainly stated his selection criteria, and the above definition is apparently derived from the only arguable example of economic diversity: Blind Willie Johnson's *Dark Was the Night*, which could just as easily be explained as racial diversity. As practically every country is only represented by one submission, there are no further examples of the 'cultures within cultures'.

The case that the team pursued gender diversity is much harder to make. There is a minor symbolic gesture of goodwill to female equality in the image section: Image 52, 'Diagram of Vertebrate Evolution' featured a reproduction of the Pioneer plaque images, and while the original image had the man's hand raised in greeting, the Voyager's reproduction the woman was waving instead.[110] Otherwise, the record content demonstrates bias towards its male subjects. With regards to images, the subject's gender was clear in thirty-eight of the sixty-six images that displayed humans.[111] Of this number, images that depicted only male subjects (42.1% of gendered images) far outnumbered those that depicted only female subjects (18.4%). Even in depictions of female biological processes women were marginalised, such as with the representation of childbirth in Image 33, in which the male doctor and baby are visible, but the woman is obscured by perspective. Female representation in the musical selections was even poorer. In the description of the twenty-seven songs in *Murmurs*, thirteen listed the gender of the performer and ten listed the gender of the composer. Of these, women made up just over a quarter (30.7%) of the performers and none of the composers. Other than these examples, the

[109] Druyan, *Murmurs*, 153.
[110] This is apparently intentional as the image caption concludes with '*Pace*, feminists.' Lomberg, *Murmurs*, 100.
[111] There are three instances where the subject's gender is clear in the description but is not visible in the photo. This includes Image 70 (Mountain climber), where the subject is not clearly visible but the description acknowledges their gender, and Image 117 and 118, scans of a speech by President Jimmy Carter and acknowledgements of various U.S. political representatives, the genders of which are apparent from our contextual knowledge but not physically depicted. These images are not included in the statistics.

Furthermore, I acknowledge that visual representations of gender are culturally and temporally bound, and therefore visually judging a subject's gender is inevitably subjective. Wherever possible I have used the photograph descriptions provided by Jon Lomberg to reinforce visual assumptions. I appreciate that this is imperfect strategy and reinforces binary gender constructs, however I believe it is permissible here as there is no suggestion that the team attempted to represent non-binary genders in the content. This factor is discussed further below and in Chapter 4.

team makes no mention of pursuing any other form of diversity, and the content suggests they were not a concern. In terms of sexual diversity, there is no indication of anything other than heterosexuality and binary genders. There is an argument to be made that, by including Blind Willie Johnson, Tim Ferris was able to represent the disabled community of Earth, however this is not noted in any of the above accounts.

I suggest this lack of attention to non-cultural diversities is a product of the team's socio-economic contexts. As explored in the previous chapters, despite marked social change, minority groups were marginalised across the country. Indeed, women and homosexual people were directly marginalised as a result of the actions of NASA, discussed further in the following chapter on exclusions. This marginalisation is partly indicated by the scholarly climate the team were operating in: while I have found no literature reviews on the evolving definition of 'diversity', *Google's* Ngram viewer indicates sexual or gender diversity were (and still are) far less discussed than cultural or ethnic diversity in both academic and popular publications at the time (Fig.2).

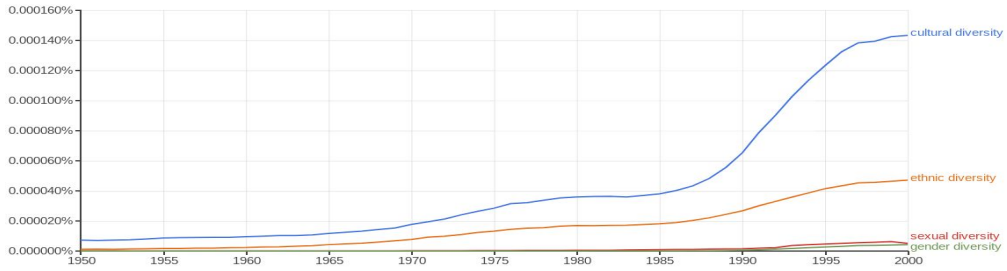

Fig.2: data on the usage of four different types of diversity from 1950 to 2000.[112]

Nuance and awareness

The lack of attention regarding these diversities becomes more apparent when compared to the awareness and nuance the team displayed in discussing cultural diversity. For example, in discussing the music, Tim Ferris seemed particularly aware of how the West tended to marginalise non-Western cultural traditions. 'The Western world,' Ferris stated in *Murmurs*,

[112] Supposedly derived from millions of digitised books, though Google does not provide statistics on how large their sample size is. "Google Books Ngram Viewer." *Google* https://bit.ly/2Ni2jx4 [Accessed 29 Oct 2019].

'finds it convenient, in this season of its predominance, to imagine that because our voices speak most loudly, nobody else has much to say.'[113] The effort to promote these quieter voices is revealed in the aforementioned letter containing music suggestions from the advisor Robert Brown, Director of the Centre for World Music in Berkeley, California. The letter referred to a particular selection that Sagan had suggested which Brown saw as an 'attempt to evoke the spirit of the [Mexican] Indian past'. Brown encouraged Sagan to abandon this suggestion, apparently a modern reinterpretation of traditional music, in favour of something 'from the living traditions of Indian music in Central or South America'.[114] Indeed, there are other examples in which the team attempt to consciously avoid cultural appropriation in favour of authentic cultural representation. The supposed 'economic diversity' debate regarding George Gershwin's *Summertime* resulted in the decision that 'black tradition in America has been a major, if not the principal, source of important indigenous American music and should be presented without encumberment' of white artists.[115] As a result of this decision, none of the four American pieces included were written or performed by white musicians. In another instance, Sagan questioned including *The Young Peddler* sung by Nicolai Gedda to represent Russia, as 'Gedda was a Scandinavian, born of White Russian Parents. Was he a true exponent of Russian folk music?'[116]

In fact, accounts from *Murmurs* suggest that authentic and diverse representations was of such priority that intelligibility was sacrificed in favour of cultural diversity. With regards to greetings, Sagan argued that 'the message in its fundamental sense was to be from all of mankind; therefore it should include greetings in the languages of at least a large proportion of mankind.'[117] However, Linda Salzman admitted that sending one or two languages with an accompanying 'Rosetta Stone' would have 'given extraterrestrials a better chance of understanding the words precisely'. Salzman quickly conceded that selecting one or two languages would have raised the 'thorny question' of which languages to send, then claimed that the team were 'principally concerned with the needs of people on Earth' and, as a result,

[113] Ferris, *Murmurs,* 187.
[114] Brown, *Murmurs*, 254.
[115] Sagan, *Murmurs*, 18.
[116] Sagan, *Murmurs,* 21.
[117] Sagan, *Murmurs*, 23.

sacrificed the communicative ability of the record by instead including as many of the world's most spoken languages as possible.[118]

This dedication to diversity is also implied by Sagan's recruitment of ethnomusicologists and world music experts like Alan Lomax and Robert Brown. It is particularly important to introduce Alan Lomax, as, according to Sagan, he recommended most of the non-Western pieces chosen for the record.[119] Lomax was an ethnomusicologist who 'devoted his life to recording the ethnic music of the world and to saving it from obscurity and neglect'.[120] Lomax was also a folklorist, and perhaps best known for his contributions to the collection and recording of traditional music, both in America and abroad.[121] Sagan was apparently particularly impressed with Lomax's Cantometrics Project, a thirty-year effort to produce a classification system to identify a global relationship between music and culture. Perhaps Lomax's belief in 'a taxonomy of the world's musical cultures' intrigued Sagan because it chimed with his Cosmic Perspective belief in national socio-cultural unity.[122]

Inconsistency and bias

This dedication notwithstanding, the team's pursuit of cultural diversity was not an in depth, self-critical approach. While cultural diversity is better represented than the previously mentioned diversities, an interrogation of their methods and analysis of the contents reveals the message still favours white Westerners. This is partly due to the allowance of subjective criteria in selecting content, thanks to which the team were willing to forgo the very authentic diverse representation they were so concerned with preserving. Above, I highlighted Sagan's concern that including Nicolai Gedda's *The Young Peddler* would not be an adequate representation of Russian culture. In an effort to find a more appropriate example of Russian culture, the team contacted the USSR for a suggestion of a culturally appropriate choice. The resulting

[118] Salzman, *Murmurs*, 132.
[119] Sagan, *Murmurs*, 16.
[120] Sagan, *Murmurs*, 15.
[121] Filene, Benjamin. "'Our Singing Country': John and Alan Lomax, Leadbelly, and the Construction of an American Past." *American Quarterly* 43, no. 4 (1991): 602-624; Cohen, Ronald D. "Bill Malone, Alan Lomax, and the Origins of Country Music." *The Journal of American Folklore* 127, no. 504 (2014): 126-139.
[122] Sagan, *Murmurs*, 16.

recommendation from the Soviets was a piece called *Moscow Nights*, described by Sagan as 'the blandest, least controversial and also least interesting music imaginable'.[123] He was not alone: Ferris at the time called the choice as 'derivative' and in 1991 'a hideous song'.[124] Then Alan Lomax suggested an alternative: the Georgian folk song *Tchakrulo*, which Sagan described as 'a splendid piece' and selected it for the final record in favour of the Russian suggestion.[125] This suggests that, regardless of the supposed criteria for the message, 'good music' was preferable to representation.

It is worth pausing here to note the treatment of the Soviet Union on the record. The above example indicates that, despite estimations that *détente* ended in 1974, US-Soviet cooperation was still active amongst the scientific community in 1977. It is not clear who the Soviet advisors were or how they were contacted – Sagan does not mention and when I asked Ferris in our September interview he said he was not aware – but there is a possibility that the avenues of communication opened up during the Apollo-Soyuz project were used. Then again, that Sagan and his team communicated with the USSR does not mean that the Soviets were well represented. The above example indicates that, when it came to Russian music, American experts like Lomax were adhered to over Soviet officials. Furthermore, while the USSR is represented by as many music selections as the US, three of those were from Soviet states other than Russia (Georgia, Azerbaijan, Bulgaria) and the only Russian exponent was Stravinsky, who allegedly claimed in 1933 that he 'loathe[d] all communism…the execrable Soviet monster'.[126] Intentional or not, the representation of America's political enemy was unequal and arguably ideologically subversive.

Even the team's more empirical pursuits of cultural diversity have problematic elements under the surface. For one, their trust in 'world music' experts like Robert Brown opened the door to troubling legacies of Western paternalism. While world music was originally 'a benign and

[123] Sagan, *Murmurs*, 21.
[124] Ferris, *Murmurs*, 163; Nelson and Polansky, "The Music Of The Voyager Interstellar Record," 366.
[125] Sagan, *Murmurs*, 21.
[126] Stravinsky, quoted in Craft, Robert. "'Jews and Geniuses': An Exchange." *New York Review of Books,* 15 Jun 1989.

hopeful term' coined by Robert Brown in the 1960s, separating the study of 'music' and 'world music' effectively reinforced the cultural divide between coloniser and colonised, according to music scholars Steven Feld and Sarah Weiss.[127] Furthermore, while it is not necessary to understand the complexities of Lomax's Cantometrics Project for the purposes of this thesis, it is important to clarify that Cantometrics attracted criticism for its uneven geographical distribution and subjective classification systems, favouring Western regions that Lomax was more familiar with.[128] That a problematic taxonomy of world cultures created by an American folklorist was one of the underlying philosophies behind the music selection process is important in understanding potential geographic biases.

The decision to include the world's most spoken languages has also been problematised. Firstly, as linguistic anthropologist David Samuels argued in 2005, this concept privileged 'national rather than linguistic representation': languages that are most widely spoken are not necessarily indicative of the diversity of linguistic structures and sounds. As a result, 'thousands of minority languages were not included.'[129] Indeed, writing on the intersection between cultural heritage and diversity, Peter Bridgewater, Salvatore Arico & John Scott point out that 67% of the world's ethno-linguistic groups come from 'indigenous' communities, which represent only 5% of the population of the world.[130]

Secondly, the intention to represent the largest proportion of the world's population resulted in multiple languages from specific high-population regions. Asia alone was represented by thirty languages, 54.5% of the total, half of which came just from China and India. The Indian

[127] In the 1960s and 70s, this division in terms was exploited by the commercial music industry, leading to a rise in non-Western recordings marketed to Western audiences. No doubt this commercialisation played an intrinsic part in what non-Western music was readily available to the Voyager team, and therefore what music was considered for selection, but this factor is the subject for another, more extensive study. Feld, Steven. "A Sweet Lullaby for World Music." *Public Culture* 12, no. 1 (2000): 146; Weiss, Sarah. "Listening to the world but hearing ourselves: Hybridity and perceptions of authenticity in world music." *Ethnomusicology* 58, no. 3 (2014): 508.

[128] For a dedicated discussion of the project and criticisms, see: Savage, Patrick E. "Alan Lomax's Cantometrics Project: a comprehensive review." *Music & Science* 1 (2018): 1-3.

[129] Samuels, David. "Alien tongues." In Debbora Battaglia ed. *E.T. Culture. Anthropology in Outerspaces*, pp. 94-129. London: Duke University Press, 2005, 111.

[130] Bridgewater, Peter, Salvatore Arico, and John Scott. "Biological diversity and cultural diversity: The heritage of nature and culture through the looking glass of multilateral agreements." *International Journal of Heritage Studies* 13, no. 4-5 (2007): 407.

subcontinent alone provided 18% of all languages on the record, more indigenous languages than Africa and the Americas put together. On the other end of the spectrum, there were no indigenous North American or Oceanian languages represented.

Furthermore, a strategy that favoured widely spoken languages necessarily favoured the nations whose languages have been spread by conquest and violence. According to statistics arranged by Salzman and Sagan's assistant Shirley Arden, the included languages represented 87.1% of the world's population.[131] However, that figure was dependent on the inclusion of colonial languages, often at the expense of indigenous languages. This is evident from the list in *Murmurs* of 'partially represented' countries: those with one official language represented but others are not. There 61% of the countries were African countries whose colonial language was represented but their indigenous languages were not (Madagascar: French, not Malagasy; Tanzania: English, not Swahili).[132] This allows the citizens of sixty-seven former colonies to be 'represented' on the record. Not only does this rely on and propagate colonial legacies, but as David Samuels points out, it ignores dialects and creoles, the ways in which indigenous people reuse and appropriate colonial heritage.[133]

Conclusion: one world

This chapter has discussed the first goal of the Voyager message: representing the diversity of the human race. By exploring the methods and resultant product, I have suggested that the team were only directly concerned with representing cultural diversity. Furthermore, while they were apparently concerned with achieving authentic cultural representation, by not pursuing this empirically or self-critically their representation of diversity is little more than a gesture. However, it is important to highlight how this approach is indicative of the climate the team operated in. It appears that, in 1970s America, cultural diversity was referenced more than other forms of social diversity, and experts in non-Western music displayed Western biases and propagated colonial legacies. As a result, with regards to the time in which it was launched,

[131] Salzman, *Murmurs*, 143.
[132] Salzman, *Murmurs*, 147.
[133] Samuels, "Alien tongues", 111.

while the Voyager record may not be an accurate representation of the diversity of life on Earth it was to a certain extent an accurate depiction of white American academic perceptions of diversity.

Chapter 4: our best face to the cosmos

Is it a mistake to put our best face to the cosmos?

...why not a hopeful rather than a despairing view of humanity and its possible future?[134]

The second goal of the Voyager message, apparent in both the methodology and the final product, was to portray a positive image of humanity. This was achieved primarily by excluding elements of human nature and society thought to be negative, like violence and poverty, but also aspects whose representation might generate conflict, namely politics and religion. The fact of these exclusions builds on the previous chapter's suggestion that the team were not concerned with objectivity and empiricism, and the nature of what was excluded indicates the team employed a specific morality formed by their socio-cultural biases. By again comparing various accounts of and reflections on the message creation process with the final record content, this chapter will explore the team's conscious and subconscious exclusion criteria and also how NASA involved themselves in the process.

'War, disease, crime and poverty'

In the words of Jon Lomberg, the team 'reached a consensus' to not represent these four apparently negative elements.[135] The reasoning behind this, according to Lomberg, was the decision that, considering the message might be 'the only token of Earth the universe would have…the worst in us needn't be sent across the galaxy'.[136] The team did not deny the importance of such elements to the development of humanity — 'after all,' as Lomberg pointed out, 'more human beings have killed one another or starved to death than have written string quartets'.[137] Sagan also acknowledged that 'destruction is a characteristic aspect of what we are pleased to call human civilization', but similarly questioned the need to advertise this fact.[138] In

[134] Sagan, *Murmurs*, 40.
[135] Lomberg, *Murmurs*, 75.
[136] Lomberg, *Murmurs*, 76.
[137] Lomberg, *Murmurs*, 75.
[138] Sagan, *Murmurs*, 40.

fact, in our 2019 interview, Tim Ferris claimed the very importance of violence to humanity is precisely why it should be omitted. According to Ferris, 'conflict is inherent in biological evolution…[to any observer] the idea that there is such a thing as violence in a civilisation would not be surprising, would not be unique, and therefore not something to take up bandwidth.'[139]

Despite Lomberg's claim of consensus, Ann Druyan displayed reticence towards omitting violence from the Voyager message, and, as Sagan biographer Keay Davidson suggested, 'did her best to convince the group to send tougher-minded imagery'.[140] When Druyan and Ferris visited the Library of Congress' Archive of Recorded Sound to source options for the sound essay, one of the sounds proffered was the first field recording during battle: a First World War soldier commanding the launch of mustard-gas. Druyan claimed in *Murmurs* that the callousness of the soldier in the recording profoundly affected them and led her to question 'just exactly how realistic a picture of life on Earth [they] wished to convey.' The debate became, in Druyan's words, whether the Voyager message was to be 'a historical gesture or merely a social one?' [141] The final document did not feature the recording of the soldier, and in an interview this year Druyan praised the fact that humanity was 'united without conflict' on the record; she does not say how or why she was convinced to change her stance.[142]

Druyan's argument with the 'best face' approach was that categorisations of moral good and bad are not concrete, but subject to time and place. Conversely, the decision that carried appears to have relied on simplistic, immutable concepts of 'right' and 'wrong'. This is implied when the team discussed the Georgian contribution *Tchakrulo,* Alan Lomax's selection favoured over the Soviet recommendation of *Moscow Nights*. The team couldn't understand the lyrics of the song and were concerned that the folksong could have promoted an old-fashioned practice now no longer morally acceptable, such as bearbaiting. According to Tim Ferris in *Murmurs*, the team

[139] Ferris, Personal interview.
[140] Davidson, *Carl Sagan*, 308.
[141] Druyan, *Murmurs*, 152, 153.
[142] Druyan, Ann. "Dear Voyagers: How your Billion-year Journey Carries True Love." *National Geographic*, 10 Jul 2019 https://www.nationalgeographic.com/science/2019/07/dear-voyager-how-your-billion-year-journey-carries-true-love/ [Accessed 28 Dec 2019].

tracked down a Georgian speaker to translate, and when he told the team the song was about a peasant protest they 'jumped up with signs of relief', implying that, despite the popularity of the song amongst the team, were the song about bear-baiting it would have to be considered for exclusion.[143] There was no discussion of descriptive moral relativism here – that bear-baiting might have been morally acceptable in the time and society that created the song – instead the operative moral compass orients to an educated 1970s America, in which bear-baiting is inarguably 'wrong'.

This apparently simplistic binary morality is further implied by the very idea that one could remove all traces of conflict from a portrayal of humanity and is reminiscent of the moral simplicity Susan Sontag highlighted in contemporary science fiction. If, like Sagan, Ferris and Lomberg pointed out above, violence and religion are intricately weaved into the human experience, is it possible to remove *all* reference to it? For example, *Tchakrulo* was discovered to be about a peasant revolt against a tyrannical landlord, a story with implicit violence, and without war there would be no Great Wall of China, depicted in Image 83. Violence is further connected to the record through a slightly less predictable avenue: Kurt Waldheim, Secretary General of the UN whose words introduce the record, was revealed to have been an officer in a German Second World War unit that was guilty of war crimes. This inconsistency is made all the more stark considering Sagan explicitly mentions how the team debated (and decided against) 'whether to include music performed by alleged Nazi sympathisers'.[144] It is important to acknowledge that the team did not make this decision consciously: even the CIA was unaware of Waldheim's past activities until 1986.[145] However, it is a testament to difficulty of extricating violence and from a portrayal of humanity.

Whose 'best face'?

When other exclusions are taken into account, it appears that deciding what 'our best face' looks like is a complicated process without clear immutable morality. In fact, it appears these

[143] Interestingly, despite having a Georgian speaker in a recording studio, there is no greeting in Georgian on the record. Ferris, *Murmurs*, 166.
[144] Sagan, *Murmurs*, 19.
[145] Ruffner, Kevin C. "Kurt Waldheim and the Central Intelligence Agency." *Studies in Intelligence* (2003): 51-65.

exclusions were made to avoid representing conflict rather than negative aspects in an effort to appease the human audience. This approach is exemplified in the team's exclusion of political 'ideology' from the record. In justifying why the team omitted images of violence, Jon Lomberg gave some examples of violent images that could have been included — 'a picture of Hiroshima or My Lai'. While these images were already ineligible under the exclusion of violence, Lomberg explained they were further excluded because the team wished to 'avoid any sort of political statement' in the message. The reasoning behind this exclusion was, according to Lomberg, that these images 'seemed more an ideological statement than an integral part of an image of Earth.'[146] Much like with violence, however, politics remains on the record through association, particularly in reference to the Cold War. As is explored previously, the representation of the USSR can be read as a political statement, and two references to the cultural Cold War – Louis Armstrong and Germany – are well-represented. Indeed, the record itself, branded as it was with 'United States of America, Planet Earth', could be seen a statement of America's ideological supremacy, itself therefore a product of the cultural Cold War.

Beyond politics by association, the attempted exclusion of politics is, in itself, an ideological statement. This is a rather well-discussed issue for archival and critical heritage scholars; in the realm of archival theory, the idea that the archivist can or should be apolitical has largely been dispensed with. In 2017, David Wallace dated the concept of politically engaged archiving to at least 1970.[147] In that year, archivist Howard Zinn spoke to the Society of American Archivists, allegedly the most popular speech at the society's 34th conference. Speaking to a crowded room, Zinn argued that archivists 'buttress the existing social order and values' by not documenting the lives of 'the "lower" classes as well as the prominent'.[148] The team's particular contribution to 'the politics of the going order', as Zinn described it, was the exclusion of My Lai, the Vietnamese hamlet where American troops killed hundreds of unarmed civilians on March 16th, 1968. Trial lawyer Samuel Brenner has written on how the massacre was unreported until

[146] Lomberg, *Murmurs*, 76.
[147] Wallace, David. "Archives and Social Justice". In Terry Eastwood and Heather MacNeil eds. *Currents of Archival Thinking*, pp. 271-298. Denver: ABC CLIO, 2017, 280.
[148] Delgado, David J. "The 34th Annual Meeting of the Society of American Archivists." *The American Archivist* 34, no. 1 (1971): 45.

members of the military company responsible sent letters to President Nixon and the media a year after the fact, instigating protests, investigations and 'a sea change in American attitudes about the Vietnam conflict.' Brenner goes on to highlight how US officials attempted to repress and distract from images of My Lai to preserve the reputation of the American military and government, both at home and abroad.[149] The images being excluded from the Voyager record could be seen as a continuation of this policy.

This particular exclusion is indicative of the strength of the desire to portray the 'best face' of humanity. Excluding potentially 'provocative' references to Vietnam contravenes the team's supposedly united protest of the war in Vietnam, highlighted in the first chapter. This begs the question of why a positive impression of humankind was so important. Perhaps, much like the explanation for omitting female genitalia from the Pioneer plaques, Sagan was concerned that any reference to Vietnam would be rejected by NASA and possibly jeopardise the project as a whole. Tim Ferris claimed in our September interview that NASA has always been beholden to Congress as a federally funded agency.[150] An attempt to further disseminate images of an event already suppressed by the government would presumably put that funding at risk. Then again, perhaps the idea that this exclusion came from a miserly fear of economic sanctions is too cynical. There is also an argument to be made that, for both the message team and NASA, reimagining American identity with hope and optimism was an important aim. Bruce Murray, head of NASA subsidiary the Jet Propulsion Laboratory (JPL) and overseer of the Voyager mission as a whole, recollected a decade after the Voyager launch that at the time 'the old Apollo spirit' — the nationalist pride derived from the 1969 moon landings — was fading, and 'merging with a broader retreat of American self-expectations in the face of failures in Vietnam and at home.' As a result, he claimed that one aim of the Voyager mission was to reframe the national narrative to provide hope, to 'create the kind of future that JPL, and America, deserved.' [151] If, as I argue in Chapter 2, the aim of the Voyager message was akin to the aim of

[149] Brenner, Samuel. "I am a Bit Sickened: Examining Archetypes of Congressional War Crimes Oversight after My Lai and Abu Ghraib." *Military Law Review* 205, no. 1 (2010): 18.
[150] Ferris, Personal interview.
[151] Murray, Bruce C. "Voyager and the Grandest Tour Ever: Catching the Wave of the Century." *Engineering and Science* 52, no. 4 (1989): 22.

contemporary science fiction, then excluding references to divisive political events would be in an effort 'to distract [Americans] from terrors, real or anticipated', in Susan Sontag's words.[152]

Exclusion as marginalisation

Equally representative of the Voyager's socio-political perspectives is how the team's exclusions marginalised certain groups. Firstly, I argue the exclusion of religion was indicative of the team's bias towards atheism. In *Murmurs*, Jon Lomberg explained that 'if we'd included a picture of a cathedral, we felt we would also have to include one of a mosque, a synagogue, a lamasery, and so forth.'[153] Apparently, there simply wasn't enough space to equally represent all of Earth's religions. Much like with the exclusion of violence and politics, this solution invites its own problems. Yet again, this pervasive global phenomenon is deeply entwined in cultural monuments; there would be no Taj Mahal to fill Image 90 without Islam. Furthermore, this position reveals a number of inconsistencies in the message philosophy. Unlike with violence, where an inaccurate depiction is favourable, here an element of human culture is omitted because it could not be represented accurately enough. The decision is also inconsistent with a similar scenario in representing languages. As discussed previously in curating the greetings, Salzman admitted that including just one language would not be representative enough, but then the solution was to include as many languages as possible. With languages, trying to represent as many cultures as possible was 'fundamental' to the message, whereas attempts to represent as many religions as possible was described by Lomberg as 'merely a political sop to people on Earth'.[154] However, I would argue that this dichotomy of representation is derived more from the team's personal philosophies and socio-political context. Sagan and Frank Drake had both dispensed with religion in their personal lives and I could find no evidence of the other collaborators being actively religious, therefore, from their perspective, religion was not intrinsic to human life. As discussed in Chapter 2, this perspective privileged Western supremacy that, consciously or unconsciously, codes science and atheism as advanced and centrally religious societies as primitive.

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[152] Sontag, "The imagination of disaster," 42.
[153] Lomberg, *Murmurs*, 76.
[154] Lomberg, *Murmurs*, 76.

The idea that the exclusions were based on the team's personal experiences is supported by the absence of homosexuality from the record. This issue was raised in creating the sound essay, when Druyan and the team decided to include the sound of a kiss. However, Druyan mentioned in *Murmurs* that the team 'were under strict orders from NASA to keep [the kiss] heterosexual'.[155] Perhaps this was a by-product of the removal of politics; any mention of homosexuality in 1977 would certainly be a provocative statement for a heterosexual public, considering the politicisation of queer rights discussed Chapter 1. Or, perhaps it was a manifestation of the conservative views of NASA Director James Fletcher and the apparently ineffective social policies of NASA at the time. However, in my estimation the most likely reason for the exclusion of homosexuality is that it was not very present in the minds of the collaborators. After all, unlike with the exclusion of the religion, politics or violence, this exclusion passes without comment or debate.

This suggests that the elements considered unnecessary for inclusion are those that did not align to ideas of acceptability and appropriateness in American heteronormative patriarchal society. This possibility is further emphasised by NASA's second involvement in the message process: the exclusion of a full-body image of a nude man and pregnant woman (Fig.3). This was originally included in the pursuit of accurately portraying human reproduction but, when the final collection was brought to NASA for review, agency officials asked for it to be removed.

[155] Druyan, *Murmurs*, 157.

Fig.3: Photo of a nude man and pregnant woman,
barred from the Voyager record by NASA.[156]

In *Murmurs*, Sagan described being surprised, as they considered the photo 'extremely tasteful' with minimal 'prurient interest' and had taken pains to ensure it had not appeared in 'any publication that might be reasonably considered pornographic'. Still, according to Sagan, NASA 'made it clear to [the team] that sexual information of a particularly explicit character might have unpleasant repercussions back here on Earth.'[157] Representatives of NASA Gerald J. Mossinghoff and Herbert Rowe, legal counsel and Associate Administrator for External Affairs respectively, elaborated on the decision in a print interview in September, 1977. They apparently felt that 'some people might get the wrong idea from the picture' and that, despite the team's best efforts, some may still see the image as 'extremely erotic'.[158] This further suggests the argument from Chapter 2, that the extraterrestrial audience was not the focus of the record, and implies that the adverse reactions to the nudity of the Pioneer plaques confirmed to NASA that future SETI

[156] Sagan, *Murmurs*, 74.
[157] Sagan, *Murmurs,* 34.
[158] Wade, Nicholas. "NASA Bans Sex from Outer Space". *Science*, 16 Sep 1977.

projects should promote more conservative social views. These views are manifest in Rowe and Mossinghoff's claim that the image was not 'needed to tell the story' of humanity, effectively propagating a problematic view of pregnancy and pregnant women. Scholar of photography, Sandra Matthews, in her analysis of images of pregnancy, points out that 'being shielded from view, as pregnant women have most often been, implies a problematic social invisibility.'[159]

Conclusion: one face

This chapter has suggested that the Voyager team's second goal in creating the message was to portray the 'best face' of humanity: to eliminate negative connotations, leaving a positive image of the human race. However, inconsistencies in their methodology, combined with the impossibility of the task, resulted in a very specific conception of what a positive image looked like. Perhaps out of fear of government retribution, perhaps with the hope of reinvigorating American self-identity, the resultant message relied on widely accepted contemporary morality and obscured the political nature of 1970s America. Furthermore, in portraying 'our best face', Sagan and his team were necessarily choosing one face over a multitude of others. Much as with the understanding of diversity, the definition of 'best' reflected the accepted socio-political norms of their society.

[159] Matthews, Sandra. *Pregnant Pictures*. Routledge, 2000, xiii.

Chapter 5: deep impact?

Try it. Make your own list.
Or imagine: if you, as an alien, got this message,
what would you think?[160]

Having discussed the origins behind the Voyager message, the methods employed to put it together and the resultant product, the final way to determine the record's value as a representation of the human race is to explore its impact in two key ways. Firstly, the public reaction to the record in newspapers and periodicals, both after its launch and after the publication of *Murmurs*, which detailed the record creation process. By exploring this I hope to further contextualise the record by seeing how many issues raised in the previous two chapters were identified at the time of creation. Secondly, how the Voyager message has been referenced in the forty years since its launch in scholarly literature, art and entertainment, including looking at homages and reproductions of the project. In doing so, I will investigate the legacy of the project and how Carl Sagan's philosophy has impacted on SETI more broadly.

Voyager in the news

According to Sagan in *Murmurs*, the first public announcement regarding the record came from the UN, who publicised their participation in recording greetings in May, 1977, and the first public announcement of the music on the record was by the *Wall Street Journal* on July 26th, however an interview with Sagan from July 24th also mentioned the music.[161] From July onwards, newspapers across America and around the world were reporting on the Voyager message and its contents. My analysis is based on research of nine newspaper archives in four different languages. In these, I found forty-eight articles that made some reference to the

[160] Jonathan Eberhart in *Science News* on the Voyager record, quoted in Sagan, *Murmurs*, 38.
[161] I could not find any trace of this July 26th article, article in online searches of the *Wall Street Journal* archive, but according to Sagan it was by Jonathan Spivak and titled "Are Jovians Ready for Sweetest Music That Side of Heaven?" Sagan, *Murmurs*, 27, 35; Fleischer, Leonore. "Letter from New York." *Washington Post*, 24 Jul 1977.

Voyager message.[162] These articles spanned twenty-one newspapers from nine different countries, dating from before the Voyager launch in 1977 to 1998. The earliest publicly available article I could find was from July 3rd, 1977. Naturally, there are some limitations to my survey, mainly that I was restricted to digitised, publicly accessible content. Therefore, my observations are derived mainly from various large-scale national news sources at the time, including the *New York Times* and *Washington Post* in the US, the *Guardian* and *Observer* in the UK, *La Repubblica* in Italy and *ABC* in Spain. These publications supposedly catered to the majority of their populations, and so hopefully provide insight into general public reactions. I also made an effort to include non-Western publications where possible, such as the *Korea Times* and the *Papua New Guinea Post-Courier*, though I generally limited my search to articles written in English, Spanish and Italian.[163] Given more time I would extend my research to special interest or minority publications to get a better understanding of the reactions of marginalised groups.

The first common theme worth mentioning is the lack of detail on the message included in these articles. The majority of articles did not cite specific figures for the number of images and languages or minutes of music and sound included on the record. In fact, on average, half of the articles left out one or more sections of the record. Despite the fact that languages and music were apparently the first elements to be publicised, less than half of all articles mentioned that they are included in the message at all. Perhaps this vagueness was a concerted decision, seeing as the articles that do cite specific figures for the contents were frequently incorrect. The number of languages varied between fifty and sixty, the music from ninety to 120 minutes, and the number of images was variously cited as 116, 118 and, in one case, eleven.[164] At times the very format of the record changed between articles, being referred to in one article as a magnetic tape.[165] Even NASA's own press release from August 10th, 1977 contained an error: it cited the record containing sixty languages instead of fifty-five.[166] One might presume that, after the release of *Murmurs* in February, 1978, irregularities would clear up with the availability of one concrete

[162] See bibliography for a complete list of articles surveyed.
[163] Articles in Dutch were analysed via translation, thanks to my colleague Freek Torreman.
[164] "Hoy Empieza A Desarrollarse el Plan USA." *ABC Madrid*, 19 Aug 1977.
[165] "La Voyager II Rumbo a Jupiter." *ABC Madrid*, 21 Aug 1977.
[166] Panagakos, Nicholas. "Voyager will carry 'Earth Sounds' record" *NASA* 77-159, 10 Aug 1977.

account of the creation process, but this was not the case. One notable article, from *ABC Madrid* in 1989, falsely reports that Sagan had attempted to including a picture of active sexual intercourse on the record.[167]

The second notable theme across all articles is an almost complete absence of social criticism regarding the message's representation of the human race. This is particularly noticeable in American articles, none of which mention any of the issues raised in the preceding two chapters. This was part of the reason I extended my search to articles outside the US, though these added little evidence that the message was seen as an object with social implications. For example, I could find only one article that mentioned NASA's stipulation regarding the heterosexual kiss, in a Dutch newspaper from 1980.[168] This is despite the fact that twenty-five of the consulted articles were published after *Murmurs* was published, which contained this information. Marginally more articles mentioned NASA's exclusion of the nude image, but still only 10% of the total.[169] Only two articles reference how the message painted an idealised image of humanity, and none of the articles investigated how the record represented human diversity of race, gender, sexuality or otherwise.

The results of this research are surprising for two reasons. Firstly, they seem to contradict with scholars who have written about the Voyager record, who claim there was more public response than I could discover. In 1993, Stephanie Nelson and Larry Polansky off-handedly claim they have consulted many music scholars, all of whom have criticised the musical content of the record and in 2013, Trevor Paglen refers to various 'critiques of the Golden Record', apparently numerous enough to form two distinct categories.[170] Perhaps these writers were referring to scholarly critiques, of which there have been an increasing number in the forty years after the Voyager launched; at no point do they quote or cite these supposed critics. The second surprise is

[167] Nuñez, Maria Jesus. "El Voyager 2 culmina su singladura." *ABC Madrid*, 24 Aug 1989.
[168] Haagmans, Jos. "En de groeten van de aardbewoners...Een historische boodschap van de Voyager." *De Waarheid*, 3 Mar 1980.
[169] Wade, "NASA Bans Sex from Outer Space."; "Profligacy and Pornography." *New York Times*, 18 Sep 1977; Koolbergen, Michiel. "Hartelghe groenten aen iadereen." *Trouw*, 29 Feb 1980; Haagmans, "En de groeten van de aardbewoners."; Nuñez, "El Voyager 2 culmina su singladura."
[170] Nelson and Polansky, "The Music of the Voyager Interstellar Record," 367; Paglen, "Friends of Space," 18.

that there appears to be more social criticism of the Pioneer plaques five years earlier. My only speculation as to the second point is that the plaques, being restricted to one image, could be reproduced more easily in articles, thereby allowing them to spread further, gain more attention and, as a result, criticism. The Voyager message, on the other hand, in its more complex audio-visual format, must be described, and perhaps requires more concerted study and analysis to determine its representational ability.

What conclusions can be drawn from this survey? Firstly, I believe the lack of social criticism emphasises the conclusions I have drawn in the previous chapters: that minority social movements were still marginalised in the 1970s. The voices of diverse cultures, women and queer people were not featured in these national news articles because, despite being louder than perhaps ever before, they were still unheard. Secondly, I believe the lack of attention paid to the content of the record indicates that how the record represented humanity was not a concern to most observers. Interestingly, however, I do not believe this reveals a lack of concern for the project as a whole. On the contrary, in a way that replicated Sagan's Cosmic Perspective, I argue that the record took on a greater symbolic value as a representative of Earth in space, at which point the minutiae of its representation became unimportant.

Earth's ambassador

This replication of Sagan's philosophy is visible in the surveyed articles. For example, one further notable absence in these articles is any suggestion that the Voyager is intended for any audience other than potential extraterrestrials. Walter Shapiro's 1980 article in the *Washington Post* envisaged a scenario in which aliens discover the record and use it to find and conquer Earth.[171] Various writers criticised the anthropocentric assumptions made, or the lack of empiricism, suggesting that extraterrestrials would not be able to decipher the message.[172] Many of these articles questioned the point of creating the message in the first place, but none suggested there might be a purpose behind the message for its terrestrial audience. Even articles

[171] Shapiro, Walter. "Carl Sagan's Last Mistake." *Washington Post*, 28 Dec 1980.
[172] Spivak, Jonathan. "Messages to the Stars: Beethoven's 'Fifth' on a 100,000 Year Trip." *Washington Post*, 27 Jul 1977; Bishop, Jim. "Costly space search." *Press-Republican*, 10 May 1978; Schwartz, Amy E. "The Romance of Voyager." *Washington Post*, 24 Aug 1989;

that discussed the intersection between space exploration and terrestrial social politics make no reference to the potential social implications of this archive of humanity. This goes for John Wilford Nobles *New York Times* article about NASA and national identity and Michael Sheehan's *World Today* piece discussing the political ramifications of US-Soviet collaboration on science projects, neither of which mention the Golden Record at all.[173]

The implication, therefore, is that the Voyager message – and, to a great extent, the Voyager itself – was seen as primarily concerned with communication with extraterrestrials. This becomes more apparent when considering the lasting impact the Voyager record has had since its launch. The message appears to have captured imaginations across multiple disciplines and has been referenced and featured in countless works of art, literature, TV and film over the last forty-two years. Much like the above articles, many of these works operate under the assumption that aliens will discover the record. Some of these scenarios are comedic, like one April 1978 episode of the American TV show *Saturday Night Live*, in which Earth receives a return message from space: 'send more Chuck Berry'.[174] Other references, particularly in science fiction literature and films, predict a more apocalyptic possibility: *Star Trek: The Motion Picture* (1979), *Star Man* (1984) and *Battlefield Earth* (2002) are three examples of films in which warlike extraterrestrials use the record to find and attack Earth.[175]

In the above examples, humanity is directly opposed to extraterrestrials, the two sides become united monoliths rather than diverse collections of individuals. This resonates with the analyses of Susan Sontag and Ted Peters in Chapter 2, in which national and ideological divisions collapse in the face of the common alien enemy. I believe this approach discourages the viewing of the Voyager record as a collection of diverse cultures, instead framing it as a singular Earth ambassador to a singular Alien polity. As a result, *how* this ambassador represents humanity

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[173] Wilford, John Noble. "Space and the American Vision." *New York Times*, 5 Apr 1981; Sheehan, Michael. "Confidence-building in space." *World Today* 42, no. 3 (1986).
[174] *Saturday Night Live*, 22 April 1978.
[175] *Star Trek: The Motion Picture.* Directed by Robert Wise, USA: *Paramount*, 1978; *Star Man.* Directed by John Carpenter, USA: *Colombia Pictures*, 1984; *Battlefield Earth.* Directed by Roger Christian, USA: Warner Bros., 2002.

becomes unimportant. This therefore has the same function of Carl Sagan's Cosmic Perspective, in which the differences between humans become unimportant when compared to the differences between humans and nonhuman aliens.

Indeed, in other depictions of the Voyager in popular culture, the message is directly connected to Sagan's Cosmic Perspective philosophy. This is the case in the film *Men, Women and Children* (2012), which opens with a brief account of the Voyager message and goes on to reference Sagan's *Pale Blue Dot*.[176] The insignificance of humanity against the vastness of the universe is a recurring theme in the rest of the film. By focusing on the alien audience, and in replicating Sagan's philosophy, social and political criticism of the message methods and content is all but ignored. As a result, many of the references and homages to the Voyager message replicate the same problematic elements identified in Chapters 3 and 4. For example, the idea that Voyager is an idealised image of humankind is praised rather than problematised. This appears to be the case in *Men, Women and Children* and "The Warfare of Genghis Khan", a 2004 episode of the US political drama *The West Wing*, both of which portray Voyager as a positive human achievement in science and communication. In both cases this idealised image is contrasted with modern-day Earth, plagued in the former case by vapid, insignificant communication via the internet and in the latter case by potential nuclear destruction.[177]

Considering the Voyager as a historical source, how are historians to factor in this symbolic rendering? I argue that it indicates the desire to promote social unity, even at the expense of ignoring reality. By becoming synonymous with Sagan's Cosmic Perspective, the idea of the message broadened the perspective of its audience to the level of the universe, thus minimising the importance of human conflict, which in turn facilitated an escapism from contemporary socio-political division, much like Susan Sontag identified in science fiction of the 1950s and 60s. By creating an idealised image of humanity that aimed at breaking down divides of culture, the message was poised to become simultaneously an optimistic vision of what humanity *could be* and a nostalgic (though necessarily flawed) memory of what humanity *was*. This, I believe,

[176] *Men, Women and Children.* Directed by Jason Reitman, USA: *Paramount*, 2012.
[177] McCabe, Janet. *The West Wing*. Detroit: Wayne State University Press, 2013, 81.

suggests that the intention behind the Voyager record was more to do with the easing of conflict and tensions on Earth than communication with extraterrestrials.

This is not to say that all references to Voyager are lacking in social criticism. The record inspired Trevor Paglen, artist and political writer that critiqued Sagan's perceptions of extraterrestrials, to create his own message to the cosmos. Working with a team of artists and scientists in 2013, Paglen created *The Last Pictures,* a small gold disk encoded with a collection of one hundred images depicting a panoply of human experience, attached to the EchoStar XVI satellite and launched into Earth's orbit. Much like the Voyager message, the images depicted Earth's natural beauty and human architectural or artistic achievements but unlike Voyager, Paglen chose to show violence and politics (*64. Japanese Internment Camp, 32. Occupy Hong Kong)*.[178] Seemingly in direct response to how Sagan geared his message towards the contemporary human audience, Paglen made little effort to make *The Last Pictures* intelligible to potential extraterrestrial audiences. Instead it was framed as an art installation and acknowledged to be 'a very particular kind of document: one person's impressions about what the world might look like at this particular moment.'[179]

Perhaps Paglen acknowledges the partiality of his human archive to circumvent any potential criticisms regarding the diversity of his representation of humanity. Presumably, by only claiming to represent one perspective, he can be forgiven for favouring images of America and the West and recruiting a team of mostly white American men. *The Last Pictures* is not alone in this: others have taken the words of Jonathan Eberhart in this chapter's epigraph to heart and attempted to replicate the message. Unfortunately, the examples I found had been conducted by groups of a similar demography to the Voyager team, and each has favoured Western culture. Perhaps the most notable homage was the 'Your Record' project, run by the science entertainment platform *Science Friday.* In 2016, they invited their audience to submit what they

[178] A full list can be found at: Paglen, Trevor. "The Last Pictures." Journal of Visual Culture 12, no. 3 (2013): 508-514.
[179] Creative Time, "Trevor Paglen - The Last Pictures," *Vimeo* 16 Nov 2012 https://vimeo.com/53655801 [Accessed 27 Sep 2019].

would include on another Voyager record. Though they do not include a full account of their submissions, those listed on the website – including music by the UK band Pink Floyd and Martin Luther King Jr.'s 'I have a dream' speech – are entirely Western and almost entirely American in origin.

Conclusion: one Earth

These final examples suggest that even attempts to improve upon the original Voyager message are subject to the same issues of human representation raised in the previous chapters. However, I believe this is partly due to a lack of interest in the terrestrial social ramifications of the Voyager record. In my estimation, this is due to the project's connection to SETI and Carl Sagan's philosophy, framing the record as a scientific project rather than a heritage object with social and political implications for humanity. The Voyager has become the representative of one Earth, united in conflict, organised by a small, unrepresentative percentage of that Earth.

Conclusion

This thesis was an attempt to explore to what extent the Voyager interstellar message was (and is) a useful historical source for analysing America in the 1970s. To this end, Chapter 1 introduced the Voyager message, the team behind it and its socio-political climate. It indicated that these people and their environments were intrinsically political, defined as they were by large-scale failures in American bureaucracy and foreign policy, and complex and fluctuating US-Soviet relations. Furthermore, despite increasingly vocal minority movements, in many sectors of American public life and work still featured discrimination these minorities were marginalised and discriminated against. In Chapter 2, I explored the contemporary perception of extraterrestrials, both in the scientific community through SETI projects and in public consciousness through science fiction entertainment. Through this exploration I suggested that the concept of extraterrestrials employed by Carl Sagan was not objectively scientific but instead influenced by terrestrial socio-political concepts like Judeo-Christian and colonial legacies. However, due to a lack of social criticism and moral complexity, these influences go unchecked.

Chapter 3 and 4 then revealed some of the impact of these influences by exploring the goals of the record, determined by analysing the team's methods and the final content. Firstly, while it appeared that representing the diversity of the human race was a priority for Sagan and his co-creators, under closer inspection they were only concerned with cultural diversity, and even then, they and their advisors were guided by principles that privileged Western culture and marginalised non-Western cultures. Secondly, the team intended to portray only the positive elements of humanity by eliminating elements with negative connotations. However, I suggest that, rather than the removal of 'negative' themes, this approach was more an effort to remove conflict from the record, perhaps as a result of their divided socio-political environment. This approach necessarily favoured the 'politics of the going order', in the words of archivist Harold Zinn, and as a result marginalised women and minority sexualities.

Until this point, the value of the Voyager record as a historical source for America in 1977 was arguably poor: it did not represent the major social movements of the decade, nor the key political events, and its depiction of humanity was restricted and particular. However, the final chapter argued that, by ignoring or excluding these elements, the record is actually a rather accurate representation of white, middle-class experiences at the time. This was reinforced by the news reports on the record, strikingly few of which made any reference to the problematic elements identified in Chapters 3 and 4. Taking into account references to the Voyager in the forty years since its launch, I believe this indicates that the main function – and, perhaps, purpose – of the Voyager was to facilitate escapism from socio-political division.

What does this mean for the Voyager as a historical source? I argue that, while the record may not be an accurate depiction of the world in 1977, its lack of social criticism is a good indication of contemporary attitudes. The Voyager's rendering as an optimistic symbol of humanity in space is further indication that the record was created to facilitate escapism from a divisive socio-political climate. In conclusion, I argue that the Voyager record is a useful source for studying the philosophies and contexts of white middle-class America in the 1970s – the pervasive tensions they wished to avoid, and the conflicts they had the privilege to ignore – if not a useful source for the wider humanity at the time, which it professes to represent.

These problematic elements notwithstanding, this thesis is not intended as a condemnation of the Voyager message creators. In fact, I believe the final chapter reveals that Carl Sagan and his collaborators were more conscious of the social implications of their research than the majority of observers were. Instead, it is intended as a reminder that even apparently scientific and objective practices can have socio-political influences and impact, and that those who intend to represent groups in society, heritage professionals or otherwise, should be aware of their conscious and subconscious influences. That being said, had I more time and space I would have explored this goal further. I believe there is more to be learned from the Voyager message, particularly by deeply interrogating the creation process by consulting the participants' private papers held in archives in New York and California, and by conducting broader qualitative

research into the reception of the message at the time. I believe this work is valuable for the same reason I believe this thesis is valuable: as scientific progress enables the human race to stretch further beyond the boundaries of Earth, it is important to be conscious of exactly how we identify ourselves as a species, and this begins with interrogating Earth's ambassadors.

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Appendix

Record Contents: Languages

1. Sumerian
2. Greek
3. Portuguese
4. Cantonese
5. Akkadian
6. Russian
7. Thai
8. Arabic
9. Romanian
10. French
11. Burmese
12. Hebrew
13. Spanish
14. Indonesian
15. Kechua
16. Punjabi
17. Hittite
18. Bengali
19. Latin
20. Aramaic
21. Dutch
22. German
23. Urdu
24. Vietnamese
25. Turkish
26. Japanese
27. Hindi
28. Welsh
29. Italian
30. Sinhalese
31. Nguni
32. Sotho
33. Wu
34. Armenian
35. Korean
36. Polish
37. Nepali
38. Mandarin
39. Ila
40. Swedish
41. Nyanja
42. Gujarati
43. Ukranian
44. Persian
45. Serbian
46. Oriya
47. Luganda
48. Marathi
49. Amoy
50. Magyar
51. Telugu
52. Czech
53. Kannada
54. Rajasthani
55. English

Record Contents: Sounds

1. Music of The Spheres
2. Volcanoes, Earthquake, Thunder
3. Mud Pots
4. Wind, Rain, Surf
5. Crickets, Frogs
6. Birds, Hyena, Elephant
7. Chimpanzee
8. Wild Dog
9. Footsteps, Heartbeat, Laughter
10. Fire, Speech
11. The First Tools
12. Tame Dog
13. Herding Sheep, Blacksmith, Sawing
14. Tractor, Riveter
15. Morse Code, Ships
16. Horse and Cart
17. Train
18. Tractor, Bus, Auto
19. F-111 Flyby, Saturn 5 Lift-off
20. Kiss, Mother and Child
21. Life Signs, Pulsar

Record Contents: Music

1. Bach, Brandenburg Concerto No. 2 in F. First Movement, Munich Bach Orchestra, Karl Richter, conductor. 4:40
2. Java, court gamelan, "Kinds of Flowers," recorded by Robert Brown. 4:43

3. Senegal, percussion, recorded by Charles Duvelle. 2:08
4. Zaire, Pygmy girls' initiation song, recorded by Colin Turnbull. 0:56
5. Australia, Aborigine songs, "Morning Star" and "Devil Bird," recorded by Sandra LeBrun Holmes. 1:26
6. Mexico, "El Cascabel," performed by Lorenzo Barcelata and the Mariachi México. 3:14
7. "Johnny B. Goode," written and performed by Chuck Berry. 2:38
8. New Guinea, men's house song, recorded by Robert MacLennan. 1:20
9. Japan, shakuhachi, "Tsuru No Sugomori" ("Crane's Nest,") performed by Goro Yamaguchi. 4:51
10. Bach, "Gavotte en rondeaux" from the Partita No. 3 in E major for Violin, performed by Arthur Grumiaux. 2:55
11. Mozart, The Magic Flute, Queen of the Night aria, no. 14. Edda Moser, soprano. Bavarian State Opera, Munich, Wolfgang Sawallisch, conductor. 2:55
12. Georgian S.S.R., chorus, "Tchakrulo," collected by Radio Moscow. 2:18
13. Peru, panpipes and drum, collected by Casa de la Cultura, Lima. 0:52
14. "Melancholy Blues," performed by Louis Armstrong and his Hot Seven. 3:05
15. Azerbaijan S.S.R., bagpipes, recorded by Radio Moscow. 2:30
16. Stravinsky, Rite of Spring, Sacrificial Dance, Columbia Symphony Orchestra, Igor Stravinsky, conductor. 4:35
17. Bach, The Well-Tempered Clavier, Book 2, Prelude and Fugue in C, No.1. Glenn Gould, piano. 4:48
18. Beethoven, Fifth Symphony, First Movement, the Philharmonia Orchestra, Otto Klemperer, conductor. 7:20
19. Bulgaria, "Izlel je Delyo Hagdutin," sung by Valya Balkanska. 4:59
20. Navajo Indians, Night Chant, recorded by Willard Rhodes. 0:57
21. Holborne, Paueans, Galliards, Almains and Other Short Aeirs, "The Fairie Round," performed by David Munrow and the Early Music Consort of London. 1:17
22. Solomon Islands, panpipes, collected by the Solomon Islands Broadcasting Service. 1:12
23. Peru, wedding song, recorded by John Cohen. 0:38
24. China, ch'in, "Flowing Streams," performed by Kuan P'ing-hu. 7:37
25. India, raga, "Jaat Kahan Ho," sung by Surshri Kesar Bai Kerkar. 3:30
26. "Dark Was the Night," written and performed by Blind Willie Johnson. 3:15
27. Beethoven, String Quartet No. 13 in B flat, Opus 130, Cavatina, performed by Budapest String Quartet. 6:37

Record Contents: Images

1. Callibration Circle
2. Solar Location Map
3. Mathematical Definitions
4. Physical Unit Definitions
5. Solar System
6. Solar System
7. The Sun
8. Solar Spectrum
9. Mercury
10. Mars
11. Jupiter
12. Earth
13. Egypt With Atmospheric Makeup
14. DNA
15. DNA
16. DNA
17. Cell Division
18. Human Anatomy
19. Human Anatomy
20. Human Anatomy
21. Human Anatomy
22. Human Anatomy

23. Human Anatomy
24. Human Anatomy
25. Human Anatomy
26. Sex Organs
27. Conception
28. Conception
29. Fertilised Ovum
30. Fetus
31. Fetus
32. Silhouette Of Male And Female
33. Birth
34. Mother And Child
35. Father And Child
36. Group Of Children
37. Family Portrait And Silhouette
38. Family Portrait Silhouette
39. Diagram Of Continental Drift
40. Structure Of Earth
41. Heron Island
42. Seashore
43. Snake River And Grand Tetons
44. Sand Dunes
45. Monument Valley
46. Forest Scene With Mushrooms
47. Leaf
48. Fallen Leaves
49. Sequoia
50. Tree
51. Flying Insect
52. Diagram Of Vertebrate Evolution
53. Seashell
54. Dolphins
55. School Of Fish
56. Tree Toad
57. Crocodile
58. Eagle
59. Waterhole
60. Scientists And Chimpanzees
61. Bushmen Hunters
62. Bushmen Hunters Silhouettes
63. Man From Guatemala
64. Dancer From Bali
65. Andean Girls
66. Thai Craftsman
67. Elephant
68. Old Man From Turkey
69. Old Man In A Field
70. Mountain Climber
71. Gymnast
72. Olympic Sprinters
73. Japanese Schoolroom
74. Children With Globe
75. Cotton Harvest
76. Man With Grapes
77. Supermarket
78. Diver And Fish
79. Fishing Boats
80. Cooking Fish
81. Chinese Dinner Party
82. Demonstration Of Eating, Licking And Drinking
83. Great Wall Of China
84. Construction Scene (African)
85. Construction Scene (Amish)
86. House (Hut)
87. House (New England Frame)
88. House (Modern)
89. House Interior
90. Taj Mahal
91. English City (Oxford)
92. Boston From The Charles River
93. UN Building By Day
94. UN Building By Night
95. Sydney Opera House
96. Artisan With Drill
97. Factory Interior
98. Museum
99. X-ray Of A Hand
100. Woman With Microscope
101. Street Scene (Pakistan)
102. Street Scene
103. Highway
104. Golden Gate Bridge From Baker's Breach
105. Train
106. Airplane In Flight
107. Airport
108. Antarctic Sno-cat
109. Radio Telescope
110. Arecibo Observatory
111. Page From A Book
112. Astronaut In Space
113. Titan Centaur Launch
114. Sunset
115. String Quartet
116. Score Of Quartet And Violin