

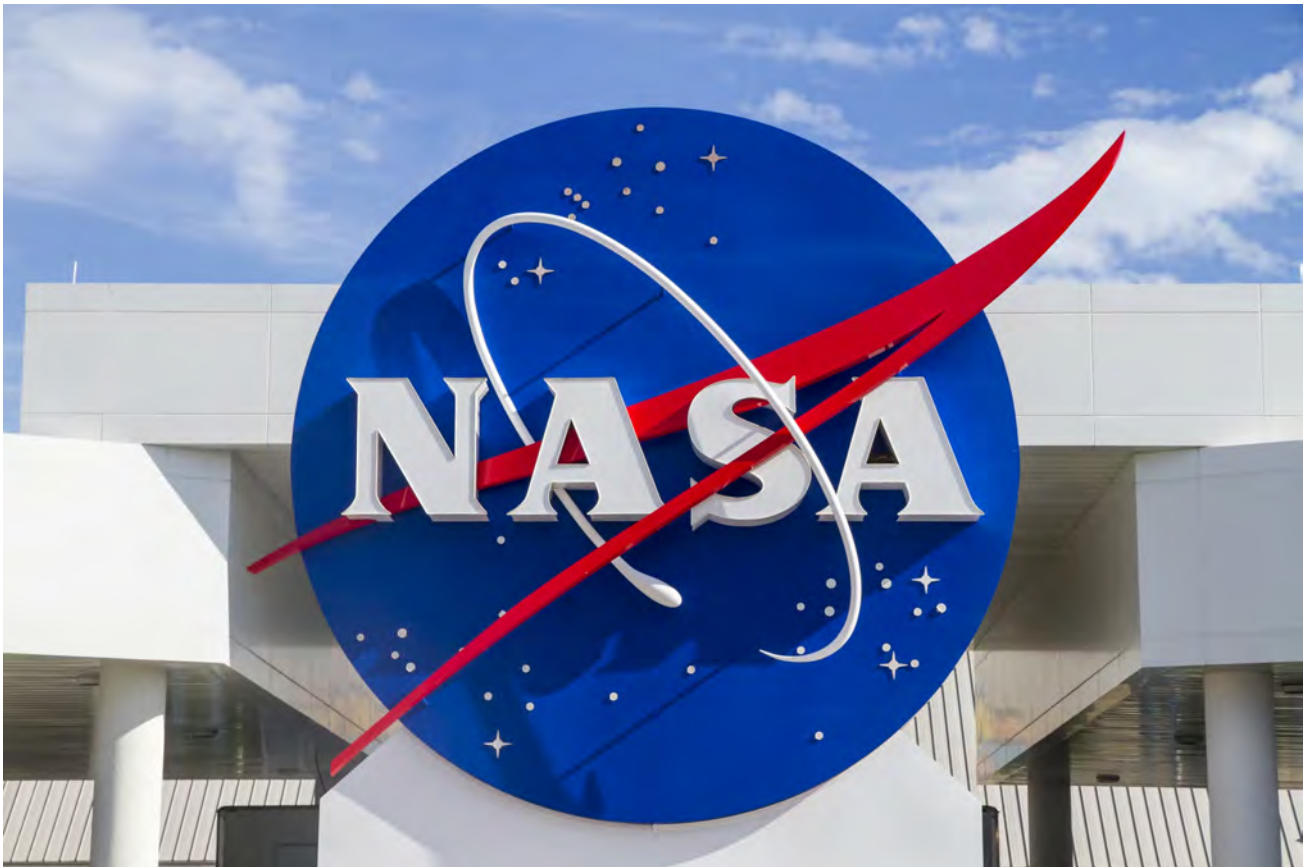


# Carl Sagan

On this day 26 years ago (on 20 Dec 1996) one of the outstanding secular thinkers and ambassadors for science died much too soon from complications of a rare bone marrow disease at the age of 62. Carl Edward Sagan was born on 9 Nov 1934 in New York City to a Ukrainian immigrant father. He enrolled at the University of Chicago at the age of 16, earned a Masters in Physics there in 1956, followed by his PhD in Astronomy and Astrophysics at the age of 26 in 1960. A few useful biographical sources used for this article: [1] [2] [3] [4] [5]

## 1 His Scientific Career in a Nutshell

- Sagan started teaching at Harvard in 1962, but then took up the tenured position of Director for the Laboratory for Planetary Studies and the Associate Director of the Center for Radio Physics and Space Research at Cornell University in 1968, where he would spend most of his career. He became full professor in 1971
- He made several significant scientific contributions, like
  - The first greenhouse models for Venus' atmosphere
  - A series of papers on the organic chemistry of Jupiter's atmosphere
  - Explanations for the seasonal changes on Mars
  - Helping to lay the groundwork for two new scientific disciplines (planetary science and exobiology)
- As an advisor to NASA he played a leading role in the American Space Program and was involved in the design and management of several missions:
  - The Mariner 2 mission (to Venus)
  - The Mariner 9 and Viking missions (to Mars)
  - The Voyager mission (to the outer solar system)
  - The Galileo mission (to Jupiter)
- He was a strong advocate of sceptical inquiry and the scientific method
- In 1980 he was the co-founder and first President of The Planetary Society, an international non-profit for space exploration [6]



[Image credit: dreamstime]

## 2 Science Educator and Ambassador

- However, Sagan became more well-known as a **science educator and science ambassador**, often described as "the scientist who made the Universe clearer to the ordinary person" [2]. He was probably the most well-known scientist in the world
  - Hundreds of popular articles
  - Several popular books
  - Appearing regularly in Time Magazine and making the cover on 20 Oct 1980. The magazine called him "America's most effective salesman of science" [1]
  - Appearing regularly on TV
- **Cosmos**
  - His biggest fame probably came from the TV Series "Cosmos: A Personal Voyage" which he presented (and wrote with his wife, Ann Druyen) [7]
  - This 13-part series started airing in October 1980 and was hugely popular
  - It won 2 Emmys and a Peabody Award
  - It was broadcast in more than 60 countries and watched by more than 500 million people
  - Here is a clip of the final scene of the final episode of Cosmos:  
["We Speak for Earth"- Carl Sagan's Final COSMOS Scene +1990 Update!](#)
  - A companion book to the series was also published in 1980. This book had a big personal impact on me in the 1980s
- **The Pale Blue Dot**
  - "The Pale Blue Dot" was an iconic image, speech and book

- In 1970 NASA instructed Voyager 1 to turn its camera on earth, on Sagan's request. It resulted in one of the most famous pictures of the planet, which became known as the “Pale Blue Dot”
- Sagan used that as title for a book in 1994 and made a very famous speech about it at Cornell University that same year as part of a lecture called “The Age of Exploration”
- Please have a look at this short video clip of the speech, it is exceptional:  
[Carl Sagan's Pale Blue Dot OFFICIAL](#)
- Here is another great Sagan video clip targeted at the public, in which he explains how Eratosthenes proved the earth was round and calculated its circumference quite accurately in Alexandria in the third century BCE:  
[Carl Sagan - Cosmos - Eratosthenes](#). It is quite ironic that millennia later, with far more knowledge and better technology there are a growing number of flat-earthers today (see Carl's warning about this in Section 5.2 below)



[Image credit: dreamstime]

- Carl's status as “famous scientist” did not always sit well with many other, arguably more accomplished scientists. In 1992 he was one of 60 nominees for the prestigious National Academy of Sciences. In the end he was not elected as a member due to a majority view that he did not accomplish enough with his own research [3]

### 3 A Secular Thinker

- Carl Sagan was clearly a secular thinker of note, as evidenced by many of his books and interviews. It is especially clear in one of his last books (“*The Demon-Haunted World: Science As a Candle in the Dark*”)
- At the same time, he was always very polite, respectful and non-confrontational about religion. I suspect this was partly due to his personality, but also in a strategic sense that if he wanted to reach a largely religious American audience as a science educator he could not afford to alienate them
- He rejected the “atheist” label, while he was comfortable with the “agnostic” label [8]
  - Based on the following definition of atheism he used: “An atheist is someone who knows there is no God”
  - At the same time he asserted that there was nothing even approaching adequate evidence for the existence of a god, so he suggested people only make up their minds either way, once there is evidence
  - His window confirmed that he regarded himself as an agnostic

- These are purely terminology technicalities, he was totally secular
- If one works with his definitions, then “agnostic” is the only sensible option. However, there are other definitions today, and Section 1.1 of this CSF article deals with this terminology in a little more depth: [Does it take Faith to be Secular? - The CSF](#)

## 4 Today

- In 2014 the Smithsonian Magazine argued that in the two decades since his death, no-one did (or “will ever”) match his talent as “gatekeeper of scientific credibility” [3]
- The Carl Sagan Center for Research was established at Cornell University in 2014. Today there are more than 100 scientists working there “Leading the Search for Life and Intelligence Beyond Earth” [9]
- He was fascinated by finding other life forms in the universe and even in our own galaxy. He once calculated “that there could be about one million technological, communicative civilizations in our galaxy alone” [3]. As time passes and astronomy progresses, it looks like that was possibly more of a personal obsession
- Ann Druyen (Carl’s widow) is the founder and chair of the Carl Sagan portal, which sets out to continue science education and his legacy: [Home - The Carl Sagan Portal](#)

## 5 Books and Quotes

### 5.1 Noteworthy Books

- *The Cosmic Connection* (1973)
- *Cosmos* (1980)
- *Shadows of Forgotten Ancestors: A Search for Who We Are* (co-authored with his wife in 1993)
- *The Pale Blue Dot* (1994)
- *The Demon-Haunted World: Science As a Candle in the Dark* (1995)



[Image credit: dreamstime]

## 5.2 A few good quotes from “The Demon-Haunted World: Science as a Candle in the Dark”

- On American decline, which seems rather prophetic 27 years later [10]:

*“I have a foreboding of an America in my children’s or grandchildren’s time — when the United States is a service and information economy; when nearly all the manufacturing industries have slipped away to other countries; when awesome technological powers are in the hands of a very few, and no one representing the public interest can even grasp the issues; when the people have lost the ability to set their own agendas or knowledgeably question those in authority; when, clutching our crystals and nervously consulting our horoscopes, our critical faculties in decline, unable to distinguish between what feels good and what’s true, we slide, almost without noticing, back into superstition and darkness... most evident in the slow decay of substantive content in the enormously influential media, the 30 second sound bites (now down to 10 seconds or less), lowest common denominator programming, credulous presentations on pseudoscience and superstition, but especially a kind of celebration of ignorance...”*

- “We’ve arranged a global civilization in which most crucial elements . . . profoundly depend on science and technology. We have also arranged things so that almost no one understands science and technology. This is a prescription for disaster. We might get away with it for a while, but sooner or later this combustible mixture of ignorance and power is going to blow up in our faces.” [p. 26]
- “I worry that, especially as the Millennium edges near, pseudoscience and superstition will seem year by year more tempting, the siren song of unreason more sonorous and attractive. Where have we heard it before? Whenever our ethnic or national prejudices are aroused, in times of scarcity, during challenges to self-esteem or nerve, when we agonize about our diminished cosmic place and purpose, or when fanaticism is bubbling up around us—then, habits of thought familiar from ages past reach for the controls. The candle flame gutters. Its little pool of light trembles. Darkness gathers. The demons begin to stir.” [p. 26-27]
- “No contemporary religion and no New Age belief seems to me to take sufficient account of the grandeur, magnificence, subtlety and intricacy of the Universe revealed by science.” [p. 35]
- “Now, what’s the difference between an invisible, incorporeal, floating dragon who spits heatless fire and no dragon at all? If there is no way to disprove my contention, no conceivable experiment that would count against it, what does it mean to say that my dragon exists? Your inability to invalidate my hypothesis is not at all the same thing as proving it true. Claims that cannot be tested, assertions immune to disproof are veridically worthless, whatever value they may have in inspiring us or in exciting our sense of wonder. What I’m asking you to do comes down to believing, in the absence of evidence, on my say-so.” [p. 171]
- “The question is not whether we *like* the conclusion that emerges out of a train of reasoning, but whether the conclusion *follows* from the premise or starting point and whether that premise is true.” [p. 210]
- *He dedicated a whole chapter to his famous Baloney Detection Kit. Here is an excerpt from it [Chapter: “The Fine Art of Baloney Detection”]*

### Excerpt from “The Fine Art of Baloney Detection”

“What skeptical thinking boils down to is the means to construct, and to understand, a reasoned argument and—especially important—to recognize a fallacious or fraudulent argument. The question is not whether we like the conclusion that emerges out of a train of reasoning, but whether the conclusion follows from the premise or starting point and whether that premise is true. Among the tools:

- Wherever possible there must be independent confirmation of the “facts.”
- Encourage substantive debate on the evidence by knowledgeable proponents of all points of view.
- Arguments from authority carry little weight—“authorities” have made mistakes in the past. They will do so again in the future. Perhaps a better way to say it is that in science there are no authorities; at most, there are experts.

- Spin more than one hypothesis. If there's something to be explained, think of all the different ways in which it could be explained. Then think of tests by which you might systematically disprove each of the alternatives. What survives, the hypothesis that resists disproof in this Darwinian selection among "multiple working hypotheses," has a much better chance of being the right answer than if you had simply run with the first idea that caught your fancy.
- Try not to get overly attached to a hypothesis just because it's yours. It's only a way station in the pursuit of knowledge. Ask yourself why you like the idea. Compare it fairly with the alternatives. See if you can find reasons for rejecting it. If you don't, others will.
- Quantify. If whatever it is you're explaining has some measure, some numerical quantity attached to it, you'll be much better able to discriminate among competing hypotheses. What is vague and qualitative is open to many explanations. Of course there are truths to be sought in the many qualitative issues we are obliged to confront, but finding them is more challenging.
- If there's a chain of argument, every link in the chain must work (including the premise)—not just most of them.
- Occam's Razor. This convenient rule-of-thumb urges us when faced with two hypotheses that explain the data equally well to choose the simpler.
- Always ask whether the hypothesis can be, at least in principle, falsified. Propositions that are untestable, unfalsifiable, are not worth much. Consider the grand idea that our Universe and everything in it is just an elementary particle—an electron, say—in a much bigger Cosmos. But if we can never acquire information from outside our Universe, is not the idea incapable of disproof? You must be able to check assertions out. Inveterate skeptics must be given the chance to follow your reasoning, to duplicate your experiments and see if they get the same result."

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### Next Secular Thinkers Article

Russell Blackford (by JJ Brits), scheduled for 3 Feb 2023

#### SOURCES

- [1] <https://www.space.com/15994-carl-sagan.html>
- [2] <https://solarsystem.nasa.gov/people/660/carl-sagan-1934-1996/>
- [3] [Why Carl Sagan is Truly Irreplaceable](#)
- [4] <https://www.britannica.com/biography/Carl-Sagan>
- [5] [Carl Sagan](#)
- [6] [The Planetary Society](#)
- [7] [Cosmos: A Personal Voyage](#)
- [8] [Perspective | Carl Sagan denied being an atheist. So what did he believe? \[Part 1\]](#)
- [9] [Carl Sagan Center](#)
- [10] [Carl Sagan Predicts the Decline of America: Unable to Know "What's True," We Will Slide, "Without Noticing, Back into Superstition & Darkness" \(1995\)](#)