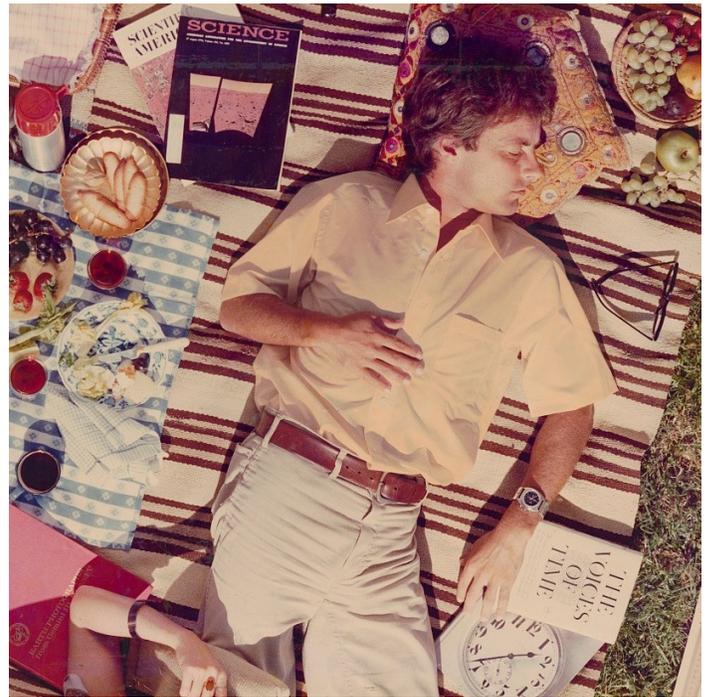


# Powers of Ten

By Eric Schuldenfrei

“Powers of Ten” by Charles and Ray Eames organizes a wide range of scientific material into a single visual narrative. Beginning with a scene of a picnic, the camera moves ten times further away every ten seconds until it reaches the edge of the known universe, and then the journey reverses, moving into the neutron and proton of a nucleus, the smallest unit of matter known to scientists at the time. Having been widely screened in science classes across America, “Powers of Ten” continues to reach a significant audience today.

The process of taking “Powers of Ten” from an initial test in 1963, to a full-length version in 1968, into the final work in 1977 demonstrates how the idea evolved over time. First screened during a conference of one thousand physicists, the film made a considerable impact on how science was visualized by demonstrating how different fields of science interrelate: from astrophysics to molecular biology, from the macro to the micro. Subsequent lectures by the Eameses revealed that “Powers of Ten” was created to serve a wide range of purposes. During a 1970 lecture at Harvard University, the Eameses presented the film in vastly different terms, relating ecology to economics. Beyond the educational subject matter, the film serves as a means of persuasion. Charles introduced “Powers of Ten” indirectly, framing a growing environmental concern: “We know that we’re fouling our nest, but the discovery of knowing that we’re fouling our nest is a terribly important thing. But a great moment when it happened, because for years and years and years we didn’t know it was happening. It comes at a time when also it’s true that there are no villains. It’s very difficult to put your finger on any kind of a villain at this moment.”<sup>1</sup> Without a clearly identifiable culprit to blame for ecological problems, the entire population was at fault. The Eameses established the problem at the collective level, one that could only be addressed through better public understanding and concerted action. Charles continued by focusing on the moral issues: “Or rather, there are no innocents. Is it Con Edison or General Motors? Who is General Motors? General Motors are all the stockholders, it’s Harvard University, it’s the Rockefeller Foundation and then something happens. You’ve got to think; people, trustees of institutions, begin to take trusteeship seriously.”<sup>2</sup> Spoken moments before screening “Powers of Ten,” this introduction placed the audience in a position where they could not neglect their societal



*An image from the opening scene of the film shows a picnicker napping on a blanket in a park. Courtesy Library of Congress Prints & Photographs Online Collection.*

obligations or accountability. Charles concluded, “In the light of this we know that we’re all going to have to fall back and regroup. Falling back may even mean, in some respects cutting into gross national product maybe – standard of living, one would hardly think so. Then we want to look at this situation with a kind of a real perspective.”<sup>3</sup> Directly after referring to “a real perspective,” the Eameses screened the 1968 version of “Powers of Ten,” allowing the audience to acquire a wider understanding of the universe in order to examine the issues raised in his preamble. The introduction redefined “Powers of Ten” from being a straightforward scientific film into a larger campaign on ecological issues. Connecting it to the greatest problems they saw occurring throughout the world, they distilled the message to the need for greater collective responsibility for the environment by altering the audience’s perception of the planet.<sup>4</sup>

As an environmental film, certain moments within the 1968 version of “Powers of Ten” gain greater meaning. The visual depiction of Earth against the vast emptiness of space reveals that it is the sole option for supporting life. Given the Eameses’ lengthy introduction to the film at Harvard, it is clear that ecological issues were not a minor concern. They used iconic photographs taken by NASA and repositioned them in support of the nascent environmental movement, demonstrating the extreme isolation and vulnerability of Earth floating in space.

Charles used the Harvard lecture to encourage a return to humanitarian principles by questioning the current direction and measurement of success in the US. The lecture comprised a diagnosis of the nation while presenting another possible way forward. Though Americans had experienced decades of unprecedented wealth as the country developed into a global superpower, the film sought to remind audiences that economic achievements also produced unintended consequences. The Eameses believed a realignment of values was in order and used "Powers of Ten" to express an alternate manner of thinking.

The final version of "Powers of Ten" emphasizes the ecological issues introduced during the Harvard lecture. "Powers of Ten: A Film Dealing with the Relative Size of Things in the Universe, and the Effect of Adding Another Zero" starts on the shore of Lake Michigan near Soldier Field in Chicago. Lake Michigan is significant to the Eameses, symbolizing the delicate balance between industrial production and fragile ecosystems. As Charles proclaimed, "We wanted cars and television sets and appliances and each of us thought he was the only one wanting that. Our dreams have come true at the expense of Lake Michigan."<sup>5</sup> After Earth becomes a distant speck that disappears into the empty vastness of space, the voiceover announces, "We pause to start back home. This lonely scene – the galaxies like dust – is what most of space looks like. This emptiness is normal. The richness of our own neighbourhood is the exception."<sup>6</sup> With this added reflection, the 1977 version of "Powers of Ten" reemphasizes the message of the Harvard lecture. The Eameses provide a temporal and philosophical pause before heading "home" again. The camera then zooms into the picnicker's hand, through the epidermal tissue, entering blood cells, atoms, and finally the atomic nucleus, which "holds the heredity of the man in the coiled coils of DNA."<sup>7</sup> At the micro end of the spectrum, the film concludes with an acknowledgement that there is a limit to current knowledge and research must continue, with the narrator stating, "As a single proton fills our scene we reach the edge of present understanding."<sup>8</sup>

The Eameses viewed their scientific films as capable of containing coded messages. Inserting hidden meanings into the films, they expected that the audience would pick up on the subtle clues. The Eameses sought to convey a first-hand account of knowledge in the form of what they termed a primary

experience. In a lecture, Charles used the example of moving seamlessly from a proton to the far edge of space in "Powers of Ten," saying, "The great advantage to such an experience, or to presenting that kind of an idea along with coded messages, is that once you feel it as an experience then you can bring all your past experience to bear on that idea and use that to meet anything else that you encounter, rather than using it in a speciality."<sup>9</sup> Within the simple, expository system of the structure of the film they inserted another level of logic. The overt message within each film is not seen as the sole message, but a component of an overarching agenda redefining how film could be applied.

<sup>1</sup> Eames, Charles. "Norton Lecture One." *Harvard Norton Lecture Series*. Cambridge, MA: Eames Office Archives, October 26, 1970.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Benjamin Bennett-Carpenter writes about *Powers of Ten* as a classic memento mori or vanitas painting, complete with fruit, a bottle of wine, the remains of a meal, numerous books, as well as the man's watch and a clock as indicators of the limits of existence for mortals. See Bennett-Carpenter, Benjamin. *Moving Memento Mori Pictures: Documentary, Mortality, and Transformation in Three Films* PhD dissertation, Catholic University of America, Washington D.C., 2008.

<sup>5</sup> Bowman, Anthony. "Charles Eames: The Designer as Renaissance Man." *America Illustrated*. Washington: Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Box 105, Folder 10, October 19, 1971, 7.

<sup>6</sup> *Powers of Ten*. Directed by Charles and Ray Eames. 1977

<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Eames, Charles. "Norton Lecture Four." *Harvard Norton Lecture Series*. Cambridge, MA: Eames Office Archives, March 15, 1971.

*The views expressed in this essay are those of the author and do not necessarily represent the views of the Library of Congress.*

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