

BOOKS *et al.*

SCIENCE FICTION

A movie monster evolves, fed by fear

Godzilla's extraordinary growth over time mirrors an increase in Anthropocene angst

By Nathaniel J. Dominy^{1,2} and Ryan Calsbeck²

It would be a mistake to dismiss *Godzilla: King of the Monsters* as mindless pap or escapist fantasy. It is the 35th film in a series stretching to 1954, easily the longest in world cinema history. This fact alone invites scholarly attention, for icons are always a reflection of their times, and few have enjoyed such longevity.

The franchise began in direct response to "Castle Bravo," a U.S. thermonuclear weapon test conducted on 1 March 1954 at Bikini Atoll in the Marshall Islands. The Bravo shot yielded 15 megatons of TNT—some 2.5 times more than expected—and produced dangerous levels of radioactive

fallout for hundreds of miles. As a result, tainted tuna (and the idiom *genshi maguro*, "atomic tuna") entered Japanese households, and 23 crewmembers of the Japanese tuna trawler *Daigo Fukuryū Maru* suffered acute radiation sickness.

In Japan, the incident was viewed as yet another U.S. nuclear attack on civilians, and strident antinuclear peace movements sprouted across the country. It was in this fraught context, and amid substantial anti-American sentiment, that Godzilla was introduced in October 1954.

The film, *Gojira*—a portmanteau of the Japanese words *gorira* ("gorilla") and *kujira* ("whale")—portrays Godzilla as both the victim and embodiment of American H-bomb testing. The tests destroyed the creature's deep-water ecosystem, and in turn, the creature destroys the ur-

ban infrastructure of Tokyo. The indiscriminate nature of this destruction at night is a stark and unmistakable reference to the "saturation bombing" of Japanese cities during the spring and summer of 1945 (1).

In her landmark essay, "The imagination of disaster" (2), the cultural critic Susan Sontag attributes the success of *Gojira* to the aesthetics of this destruction, the peculiar beauty of Godzilla wreaking havoc and making a mess. Yet Godzilla has endured in our collective imaginations even as other oversized movie monsters from the 1950s have faded from memory.

The cultural historian William Tsutsui (3) attributes this lasting success to the ever-shifting metaphor behind Godzilla and his proclivity for toppling buildings and destroying cities. What began as a

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Godzilla: King of the Monsters
Michael Dougherty, director
Warner Bros., 2019.
132 minutes

As the existential threats facing humanity grow, cooperation will be key to our survival.

pointed antinuclear fable has since evolved into a broader allegory for human folly and our reckless disregard for the natural environment.

Tellingly, it is left to the films' dour paleobiologists—from Kyohei Yamane (Takashi Shimura) in *Gojira* to Emma Russell (Vera Farmiga) in the upcoming film—to deliver the bad news. “Our world is changing,” warns Russell in a trailer for *King of the Monsters*. “The mass extinction we feared has already begun, and we are the cause, we are the infection.” This elegy to pre-Anthropocene biodiversity speaks to the deep time perspective that informs our understanding of Godzilla, and it warrants further interrogation.

equation, where the response to selection “R” is the product of the heritability (h^2) of a given trait and the strength of selection. If we assume that $h^2 = 0.55$ for body size—a reasonable estimate according to quantitative genetic studies of lizards (7, 8)—then the observed increase in Godzilla’s body size would require a total strength of selection of 4.89 SD. To put this number in context, the median value of natural selection documented in a review of more than 2500 estimates in the wild was 0.16 (9). Godzilla, it seems, has been subject to a selective pressure 30 times greater than that of typical natural systems.

All of this is silly conjecture, of course—Godzilla is a commercial enterprise, and the films are responding to market forces. Yet still we wondered, what agent of natural selection could act so swiftly and at such high intensity?

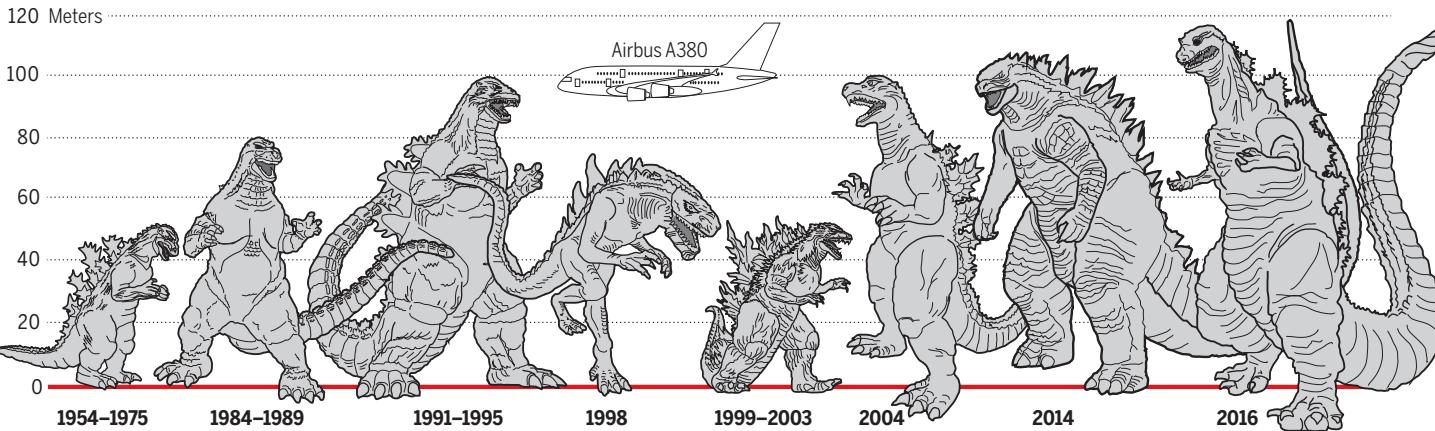
is used as a proxy for humanity’s collective anxieties, it is perhaps unsurprising to see that there is a positive and robust correlation between the growth of Godzilla and that of the American military [coefficient of determination (r^2) = 0.74].

In 1965, Sontag asserted that a great enough disaster cancels all enmities and calls for collective action in the service of self-preservation. Indeed, Godzilla’s near invincibility almost always eventually leads humanity to the realization that they must work together to defeat it (except, of course, when the creature becomes an unlikely ally, but that is another story). The monster is thus more than a metaphor; it is a fable with a lesson for our times.

Now is the time for cooperation—across countries, across disciplines, and across party lines. It is our only hope of mitigating the dire existential threats we face today. ■

Cultural anxiety and the evolution of a metaphorical monster

Godzilla has grown significantly since its debut, doubling in size in films produced between 1954 and 1991, a period defined by Cold War tensions and geopolitical instability in the Persian Gulf. Following a return to a more diminutive stature during a period of relative tranquility, it has resumed its rapid growth alongside an uptick in global strife.



THE “EVOLUTIONARY BIOLOGY” OF GODZILLA is a topic of enduring interest among devotees, with numerous fan pages and forums dedicated to the subject. If we accept Godzilla as a ceratosaurid dinosaur (4) and Lazarus taxon (5)—a species thought to have gone extinct, only to be rediscovered later—then it represents a sensational example of evolutionary stasis, second only to coelacanths among vertebrates. Yet, the creature’s recent morphological change has been dramatic.

Godzilla has doubled in size since 1954. This rate of increase far exceeds that of ceratosaurids during the Jurassic, which was exceptional (6). The rate of change rules out genetic drift as the primary cause. It is more consistent with strong natural selection.

The strength of this selective pressure can be estimated by using the breeder’s

SONTAG ARGUED that our taste for disaster films is constant and unchanging. On the contrary, we suggest that Godzilla is evolving in response to a spike in humanity’s collective anxiety. Whether reacting to geopolitical instability, a perceived threat from terrorists, or simply fear of “the other,” many democracies are electing nationalist leaders, strengthening borders, and bolstering their military presence around the world.

Making matters worse, a 2003 Pentagon report that forecasted the effects of climate change on water and food security predicted raised tensions and international conflict because of forced migrations (10). The idea that climate change is now the “mother of all security problems” (11) has scarcely dissipated since. Today, the U.S. Department of Defense views climate change as both an “accelerator of instability” and a “threat multiplier” (12). If U.S. military spending

REFERENCES AND NOTES

1. Y. Tanaka, *Asia-Pacific J.* **3**, 1 (2005).
2. S. Sontag, *Commentary* **40**, 42 (1965).
3. W. Tsutsui, *Godzilla on My Mind: Fifty Years of the King of Monsters* (Palgrave Macmillan, 2004).
4. K. Carpenter, in *The Official Godzilla Compendium*, J. D. Lees, M. Cerasini, Eds. (Random House, 1998), pp. 102–106.
5. D. Jablonski, *Science* **231**, 129 (1986).
6. R. B. J. Benson *et al.*, *PLOS Biol.* **12**, e1001853 (2014).
7. J. S. Tsuji, R. B. Huey, F. H. van Berkum, T. Garland, R. G. Shaw, *Evol. Ecol.* **3**, 240 (1989).
8. G. Sorci, J. G. Swallow, T. Garland, J. Clobert, *Physiol. Zool.* **68**, 698 (1995).
9. J. G. Kingsolver *et al.*, *Am. Nat.* **157**, 245 (2001).
10. P. Schwartz, D. Randall, *An Abrupt Climate Change Scenario and Its Implications for United States National Security* (Global Business Network, 2003).
11. J. Powers, *Time*, 6 November 2015.
12. B. Le Shier, J. Stanish, *Issue Brief: The National Security Impacts of Climate Change* (Environmental and Energy Study Institute, 2017).

10.1126/science.aax5394

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Science 364 (6443), 840-841.
DOI: 10.1126/science.aax5394

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