

Boiling frog

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A frog sitting on a saucepan handle

The **boiling frog** story is a widespread [anecdote](#) describing a [frog](#) slowly being [boiled alive](#). The premise is that if a frog is placed in boiling water, it will jump out, but if it is placed in cold water that is slowly heated, it will not perceive the danger and will be cooked to death. The story is often used as a [metaphor](#) for the inability of people to react to significant changes that occur gradually.^[1] According to contemporary biologists the premise of the story is not literally true; a frog submerged and gradually heated will jump out.^{[2][3]} However, some 19th-century experiments suggested that the underlying premise is true, provided the heating is sufficiently gradual.^{[4][5]}

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[\[edit\]](#)Cultural usage

If you drop a frog in a pot of boiling water, it will of course frantically try to clamber out. But if you place it gently in a pot of tepid water and turn the heat on low, it will float there quite placidly. As the water gradually heats up, the frog will sink into a tranquil stupor, exactly like one of us in a hot bath, and before long, with a smile on its face, it will unresistingly allow itself to be boiled to death.

Version of the story from [Daniel Quinn's](#) *[The Story of B](#)*

The boiling frog story is generally told in a [metaphorical](#) context, with the upshot being that people should make themselves aware of gradual change lest they suffer eventual undesirable consequences. This may be in support of a [slippery slope](#) argument. It is also used in business to illustrate the idea that change

needs to be gradual to be accepted.^{[1][6]} The expression "boiling frog syndrome" is sometimes used as shorthand for the metaphor.^[7]

The story has been retold many times and used to illustrate many different points. It has been used to warn about diverse phenomena, for example: in 1960 about sympathy towards the [Soviet Union](#) during the [Cold War](#),^[8] in 1980 about the impending collapse of civilization anticipated by [survivalists](#),^[9] in the 1990s about inaction in response to [climate change](#) and staying in [abusive relationships](#).^{[10][11]} It has also been used by [libertarians](#) to warn about slow erosion of [civil rights](#).^[6]

In the 1996 novel *The Story of B*, environmentalist author [Daniel Quinn](#) spends a chapter on the metaphor of the boiling frog, using it to describe human history, population growth and food surplus.^[12] [Pierce Brosnan](#)'s character Harry Dalton mentioned it in the 1997 disaster movie *Dante's Peak* in reference to the accumulating warning signs of the volcano's reawakening.^[13] [Al Gore](#) used a version of the story in his presentations and the 2006 movie *An Inconvenient Truth* to describe ignorance about [global warming](#). In his version the frog is rescued before it is harmed.^[14]

In [philosophy](#) the boiling frog story has been used as a way of explaining the [sorites paradox](#). This paradox describes a hypothetical heap of sand from which individual grains are removed one at a time, and asks if there is a specific point when it can no longer be defined as a heap.^[15]

[\[edit\]](#)Scientific background

Several experiments involving recording the reaction of frogs to slowly heated water took place in the 19th century. In 1869, while doing experiments searching for the location of the soul, German physiologist [Friedrich Goltz](#) demonstrated that a frog that has had its brain removed will remain in slowly heated water, but his intact frogs attempted to escape the water.^{[4][16]}

Other experiments showed that frogs did not attempt to escape gradually heated water. An 1872 experiment by Heinzmann demonstrated that a normal frog would not attempt to escape if the water was heated slowly enough,^[17] which was corroborated in 1875 by Fratscher.^[18]

Goltz raised the temperature of the water from 17.5°C to 56°C in about ten minutes, or 3.8°C per minute, in his experiment which prompted normal frogs to attempt to escape, whereas Heinzmann heated the frogs over the course of 90 minutes from about 21 °C to 37.5 °C, a rate of less than 0.2 °C per minute.^[4] One source from 1897 says, "in one experiment the temperature was raised at a rate of 0.002°C per second, and the frog was found dead at the end of 2½ hours without having moved."^[19]

In 1888 [William Thompson Sedgwick](#) explained the apparent contradiction between the results of these experiments as a consequence of different heating rates used in the experiments: "The truth appears to be that if the heating be sufficiently gradual, no reflex movements will be produced even in the normal frog ; if it be more rapid, yet take place at such a rate as to be fairly called 'gradual', it will not secure the repose of the normal frog under any circumstances".^[5]

Modern sources tend to dispute that the phenomenon is real. In 1995, Professor [Douglas Melton](#), of the [Harvard University](#) Biology department, said, "If you put a frog in boiling water, it won't jump out. It will die. If you put it in cold water, it will jump before it gets hot—they don't sit still for you." Dr. George R. Zug, curator of reptiles and amphibians at the [National Museum of Natural History](#), also rejected the suggestion, saying that "If a frog had a means of getting out, it certainly would get out."^[2]

In 2002 Dr. Victor H. Hutchison, Professor Emeritus of Zoology at the [University of Oklahoma](#), with a research interest in thermal relations of amphibians, said that "The legend is entirely incorrect!". He described how the [critical thermal maximum](#) for many frog species has been determined by contemporary research experiments: as the water is heated by about 2 °F, or 1.1 °C, per minute, the frog becomes increasingly active as it tries to escape, and eventually jumps out if the container allows it.^{[3][20]}

[\[edit\]](#)Commentary

Law professor and legal commentator [Eugene Volokh](#) commented in 2003 that regardless of the behavior of real frogs, the boiling frog story is useful as a [metaphor](#), comparing it to the metaphor of an [ostrich](#) with its [head in the sand](#).^[6] Economics Nobel laureate and *New York Times* [op-ed](#) writer [Paul Krugman](#) used the story as a metaphor in a July 2009 column, while pointing out that real frogs behave differently.^[21] Journalist [James Fallows](#) has been advocating since 2006 for people to stop retelling the story, describing it as a "stupid canard" and a "myth".^{[22][23]} But following Krugman's column, he declared "peace on the boiled frog front" and said that using the story is fine as long as you point out it's not literally true.^[24]

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[\[edit\]](#)References

- [^] ^a ^b ["Slow Boiled Frog"](#). *Snopes*. Retrieved 2009-06-02
- [^] ^a ^b ["Next Time, What Say We Boil a Consultant"](#). *Fast Company Issue 01*. October 1995. Retrieved 2006-03-10
- [^] ^a ^b ["The legend of the boiling frog is just a legend"](#) by Whit Gibbons, *Ecoviews*, November 18, 2002, retrieved January 6, 2008
- [^] ^a ^b ^c [Offerman 2010](#)
- [^] ^a ^b [Sedgwick 1888](#), p. 399
- [^] ^a ^b ^c [Volokh, Eugene](#) (2003). "The Mechanisms of the Slippery Slope". *Harvard Law Review* **116** (4): 1026–1137. doi:10.2307/1342743. JSTOR 1342743.
- [^] David Bolchover (March 26, 2005). ["What is ... 'boiling frog syndrome'?"](#). *The Times*. London
- [^] Trohan, Walter (6 June 1960). "Report from Washington". *Chicago Tribune*. p. 2. "The frog dropped into boiling water has sense to leap out, but the frog dropped into cold water can be cooked to death before he realizes he is in serious trouble. So it is with us Americans and our civilization in this mounting crisis. We must

beware of those who want to thaw the cold war out at any cost. We may be cooked before we realize what has happened."

9. [^](#) Quoted in Recchia, Camille (25 August 1980). "Area Survivalists Circle Wagons for Coming Armageddon; Survivalists Prepare to Ride Out Armageddon; Fearing Economic Chaos, Advocates Store Food, Buy Gold, Silver". *Washington Post*. p. C1. "That's what's happening to us. Things are getting worse and worse, so we don't really notice what's happening. Whatever happens will happen slowly, and we won't have time to jump out."
10. [^](#) Tickell, Crispin (1990). "Human Effects of Climate Change: Excerpts from a Lecture Given to the Society on 26 March 1990". *The Geographical Journal* **156** (3): 325–329 [p. 325]. doi:10.2307/635534. "This is not an experiment I wish to commend, but it has lessons for another animal—ourselves. If drastic change takes place abruptly, we notice and react to it. If it takes place gradually, over a few generations, we are hardly aware of it, and by the time that we are ready to react, it can be too late."
11. [^](#) Evans, Patricia (1996). *The Verbally Abusive Relationship: How To Recognize it and How to Respond*. Holbrook, MA: Adams Media. p. 111. ISBN 1-55850-582-2. "We are not inclined to notice gradual changes. This is how most partners adapt to verbal abuse. They slowly adapt until, like frog number two, they are living in an environment which is killing to their spirit."
12. [^](#) Quinn, Daniel (1996). "The Boiling Frog". *The Story of B*. ISBN 0-553-37901-1
13. [^](#) [Pierce Brosnan](#) (Star), [Roger Donaldson](#) (Director), [Leslie Bohem](#) (Writer) (1997). *Dante's Peak* (Motion picture). USA.
14. [^](#) [Al Gore](#) (Writer), [Davis Guggenheim](#) (Director) (2006). *An Inconvenient Truth* (Motion picture). USA.
15. [^](#) Goldstein, Laurence (2000). "How to boil a live frog". *Analysis* **60** (266): 170–178. doi:10.1111/1467-8284.00220. "The art of frog-boiling is an ancient one, and the correct procedure will emerge in the course of considering an ancient puzzle, the so-called 'Paradox of the Heap' or Sorites."
16. [^](#) [James Fallows](#) (21 July 2009). "[Guest-post wisdom on frogs](#)". *The Atlantic*. Retrieved 2009-07-22
17. [^](#) [Sedgwick 1888](#), p. 390
18. [^](#) [Sedgwick 1888](#), p. 394
19. [^](#) Edward Scripture, *The New Psychology* (1897): [1]. The original 1872 experiment was cited in: Sedgwick, "On the Variation of Reflex Excitability in the Frog induced by changes of Temperature," *Stud. Biol. Lab. Johns Hopkins University* (1882): 385. "in one experiment the temperature was raised at a rate of 0.002°C. per second, and the frog was found dead at the end of 2½ hours without having moved."
20. [^](#) "[Victor H. Hutchison - Department of Zoology, University of Oklahoma](#)". Retrieved 2009-06-24
21. [^](#) [Krugman, Paul](#) (2009-07-13). "[Boiling the Frog](#)". *The New York Times*. Retrieved 2010-04-26.
22. [^](#) [Fallows, James](#) (13 March 2007). "[The boiled-frog myth: stop the lying now!](#)". *The Atlantic*. Retrieved 2009-06-27.
23. [^](#) [Fallows, James](#) (16 September 2006). "[The boiled-frog myth: hey, really, knock it off!](#)". *The Atlantic*. Retrieved 2009-06-24.
24. [^](#) [Fallows, James](#) (July 13, 2009). "[Peace on the boiled frog front](#)". *The Atlantic*.

25. THE LEGEND OF THE BOILING FROG IS JUST A LEGEND

by Whit Gibbons

November 18, 2002

Recently I received a communication about frogs that emphasizes the importance of confirming conventional wisdom and offers a metaphor for the human response to environmental degradation.

The issue started with an email from Germany. As often happens in scientific inquiry, though the answer to the question was pretty straightforward, arriving at the answer was not. But the easy way out accepting what "everyone knows" more often than not simply perpetuates misinformation. Although finding an answer that destroys an urban myth or a commonly held belief may disappoint some people, we are better off knowing the truth.

Joe Pechmann at the University of New Orleans, who is a noted amphibian conservation biologist, received a query last month that read: "I am writing a weekly column for Die Zeit, Germany's major weekly paper, on scientific urban legends that my readers ask me about. Now you surely have heard the story of the boiling frog that is often told by consultants or activists: If you put a frog in boiling water, he will try to escape. If you put him in cold water and heat it gradually, the frog will remain in place until he's boiled, because that's the lesson, to him (and consequently to us) gradual change is not perceivable. Frankly, I don't buy this. But I am looking for professional advice (and I don't want to boil frogs). Can you help me with that question? Thanks! Christoph Droesser, Hamburg, Germany"

Joe was not sure what the answer was, so he referred Mr. Droesser to me. I also passed the buck, saying: "I have heard the anecdote many times and actually heard a Baptist preacher give a sermon in Mississippi in which he used the story of a big bullfrog in a bucket of water that was being heated. The situation was presented as an example of how gradual habituation to a devilish situation leads to acceptance of an even worse one. But with a real frog in real water, my bet is that when it began to get uncomfortable the frog would jump out if it could, long before the water started to boil. Nonetheless, consultants, activists, and others who are unaware of gradual environmental problems are responding in the way we like to think a frog acts rather than the way it does."

I went on to say, "Although I do not know a data-based answer myself, I am aware of experiments that have been done on responses of amphibians to thermal conditions. In some of the experiments the temperature was gradually raised, so I feel certain someone familiar with those studies would have an impression of what a frog would do as the water warmed up. I am sending your question to Dr. Victor Hutchison at the University of Oklahoma to see what he says. I would be interested to know also."

Vic's answer was as follows: "The legend is entirely incorrect! The 'critical thermal maxima' of many species of frogs have been determined by several investigators. In this procedure, the water in which a frog is submerged is heated gradually at about 2 degrees Fahrenheit per minute. As the temperature of the water is gradually increased, the frog will eventually become more and more active in attempts to escape the heated water. If the container size and opening allow the frog to jump out, it will do so." Naturally, if the frog were not allowed to escape it would eventually begin to show signs of heat stress, muscular spasms, heat rigor, and death.

So where does that leave us with the metaphor for the human response to environmental degradation? Well the idea that you can induce a frog to remain in boiling water if you start it off in cold water is not true biologically. But that does not diminish the need to keep an eye out for the gradual relaxation of environmental laws and regulations. The metaphor lies in the frog's ability to escape from the container: if there's no way out, then the frog's fate is a foregone conclusion.