



*Communication towers inside Monteverde Cloud Forest Biological Preserve*

## ***AMPHIBIANS IN THE MINE***

“Amphibians were here when the dinosaurs were here, and they survived the age of mammals. If they’re checking out now, I think it is significant.”

- David Wake, Director of the Museum of Vertebrate Zoology, University of California, Berkeley, 1990

**They are ancient animals** with abilities to survive beyond belief. They live both in water and on land. They can breathe through their skin. They can regenerate limbs and organs. They don’t get cancer. They have been around for 365 million years, and have survived four mass extinctions during the history of life on Earth. Yet today, they are disappearing more rapidly than any other class of animals. By their death, they are screaming: *Turn off your cell phones! Now, before it is too late!*

Even before cell phones, the proliferation of radio and TV towers, radar stations, and communication antennas in the 1960s, 1970s and 1980s began killing off these most hardy, well-adapted, and important forms of life.

- The northern leopard frog, *Rana pipiens* – the North American green frog that croaked from every marsh, pond and creek when I was growing up -- was already extremely rare by the end of the 1980s.

- In the Colorado and Wyoming Rocky Mountains, boreal toads used to be so numerous that, in the words of Paul Corn of the United States Fish and Wildlife Service, “You had to kick them out of the way as you were walking down the trail.” By 1990 they were difficult to find at all.

- Boreal chorus frogs on the shores of Lake Superior, once innumerable, were extremely rare by 1990.

- In the 1970s David Wake could turn up eighty or more salamanders under the bark of a single log in a pine forest near Oaxaca, Mexico. In the early 1980s he returned and was able to find maybe one or two after searching the forest all day.

- Until 1979 frogs were abundant and diverse at the University of São Paulo’s field station at Boracea, Brazil, according to Stanley Rand of the Smithsonian Tropical Research Institute. But when he returned in 1982, of thirty common frog species, six had disappeared entirely and seven had decreased in number drastically.

- In 1974 Michael Tyler of Adelaide, Australia discovered a new frog species that brooded its young in its stomach. It lived in a 100-square-kilometer area in the Conondale Ranges, 60 kilometers north of Brisbane, and was so common that he could collect a hundred in a single night. By 1980 it was extinct.

- The golden toad lived only in a 320-acre stunted forest in Costa Rica’s supposedly pristine, protected Monteverde Cloud Forest Preserve. In the early 1980s Marc Hayes of the University of Miami typically counted 500 to 700 males at one of the species’ breeding sites. After 1984 that site never had more than a dozen males. At another site Martha Crump observed a thousand males in 1987, but only one in 1988 and another single male frog in 1989. Today the species is extinct.

In 1990, when I began researching this magical class of vertebrates, there were not many amphibians left in all of Europe. Out of more than five thousand known species

worldwide, about a dozen were doing well.

By the time I wrote *Microwaving Our Planet* in 1996, every species of frog and toad in Yosemite National Park had become scarce. Seventy-five species of the colorful harlequin frogs that once lived near streams in the tropics of the Western Hemisphere from Costa Rica to Bolivia had not been seen in a decade. Of the 50 species of frogs that once inhabited the Monteverde Cloud Forest Preserve, 20 were already extinct.

Similar population crashes were occurring in North, Central and South America, Europe, and Australia. Only in Africa and Asia, when I wrote that book, were amphibians doing well. That has since changed. On March 15, 2023, a team of 19 American scientists published a paper titled “Continent-wide recent emergence of a global pathogen in African amphibians.” Amphibians, say the authors, were doing fine on the dark continent until about the year 2000 -- which coincidentally is when telecommunications companies began lighting up that continent with cell phone signals in earnest.

A couple of years earlier, in December 1997, I had published an article titled “The Informationization of the Third World.” I quoted President Clinton, who had lamented that “More than half the world’s people are a two days’ walk from a telephone.” I highlighted Bangladesh, where there were plans to bring cell phones to 40,000 of the country’s 68,000 villages over the next four years. In Africa, where several countries still had less than one conventional phone per one thousand people, some two dozen countries were introducing cellular systems. The debate, in the world’s press, was about what this would do to the traditional village, and whether this was a desirable thing from a cultural point of view. I took a broader view:

*“An even more important question is what will happen to nature? Can nature survive at all in a distanceless world? I think the answer, if ecologists and environmentalists brought their knowledge to bear, would be a resounding no. Biodiversity depends on distance. What is not often acknowledged is that cultural diversity also depends on distance, and that culture is nature-based. Local dialects, and local handicrafts, and local dress, and local economies, and local varieties of crops, and local varieties of plants and animals -- i.e. local ecosystems -- depend on the village’s being a two days’ walk from a telephone. The most basic reason for the disappearance of species is that very few of them can withstand the global exploitation that must come when there is instantaneous transportation and communication.”*

And then there is the radiation. The effects of microwave radiation in Africa, as cell towers began serving larger numbers of its residents, are now apparent: amphibians have been disappearing all over the continent. This has been blamed on a type of fungus called *Batrachochytrium dendrobatidis* (*Bd*), rare in Africa prior to the year 2000. But whether it is the fungus that is killing frogs, toads and salamanders, or whether it is the radiation that is killing them, and that is allowing a fungus to grow in their devitalized bodies, is a question no one is asking. For example, why, in Cameroon, where 83 percent of the population own mobile phones, and four cell phone providers cover a lot of the country, is the fungus found in 17 percent of all amphibians collected -- while in neighboring Equatorial Guinea, where only 40 percent of the population own mobile phones and there are no cell towers except in the coastal city of Bata, there is zero fungus? Why, in South Africa, where 90 percent of the population own mobile phones, and coverage is good in most of the country, is the fungus found in 23 percent of amphibians collected -- while in neighboring Mozambique, where only 43 percent of the population has a mobile phone, zero fungus has been found among the amphibians collected? Could it be because cell phones are still useless in much of northern Mozambique, and that is where all the amphibians in that country have been collected: Mount Mabu, Mount Namuli, Mount Ribáuè, and Balama?

Most of the suggested explanations for the global die-off make little sense. Climate change is being widely blamed, yet scientists looking for an association of population crashes with temperature or other weather factors have found none. Why, worldwide, are amphibians declining faster at high altitudes than at lower elevations where the climate is warmer? Could it be because the higher elevations receive more radiation, and because many antennas are found on mountains? Scientists have found no evidence that fish or non-native amphibians have caused native amphibians to go extinct. Land use change does not explain sudden population crashes in pristine protected areas. Pesticide use does not correlate with the population declines.

These inconsistencies seem to be escaping the scientists who are looking for answers. They are escaping them because they have a terrific blind spot: they do not see the radiation at all, it does not exist for them.

The single most rapid and catastrophic crash in amphibian populations occurred in the year 1988 in the Monteverde Cloud Forest Biological Preserve in Costa Rica, a location that has long puzzled scientists because it is strictly protected and supposedly untouched and pristine. This is what I thought as well until I began to do

research for this article. I just found out, to my astonishment, that right in the middle of this two-square-mile preserve, on top of a hill called Cerro Amigos (“Friends Hill”), is an antenna farm called Las Torres (“The Towers”). A photo of the top of that hill is at the top of this article. As of 2012, there were 17 radio, TV, cell phone, and other types of communication towers on that hill, a few of them dating from the 1970s and 1980s. I am making inquiries to try to pin down what was added in 1988. If you live in Costa Rica and know some of this history, please contact me.

## **More Connected Means More Vulnerable**

**“Is It a Hazard to Be Healthy?”** asked Dr. D. B. Armstrong in the *Boston Medical and Surgical Journal* in 1918. If you were undernourished, physically handicapped, anemic, or tuberculous, you were much less likely to get influenza and much less likely to die from it if you did. The vast majority of people who died from the Spanish influenza were pregnant women and healthy young adults. Doctors were seriously discussing whether they were actually giving their patients a death sentence by advising them to keep fit!

Amphibians are dying for the same reason. What is completely neglected in the sciences of biology, medicine and ecology, is our electrical connection to earth and sky. As I discuss in chapter 9 of my book, *The Invisible Rainbow*, we are all part of the global electrical circuit that courses through the sky above us, flows down to earth on atmospheric ions and raindrops, enters the tops of our heads into our bodies, flows through our meridians, exits into the earth through the soles of our feet, travels along the surface of the earth, and flows back up to the sky on lightning bolts during thunderstorms. Those of us who are most vital and have the strongest connection to earth and sky -- healthy, vigorous young adults and pregnant women -- died in the largest numbers in the 1918 flu, which was caused not by a virus but by the use of enormously powerful VLF radio stations by the United States when it entered the First World War. The same thing happened in 1889 (introduction of AC electricity), 1957 (first construction of civil defense radars), and 1968 (first constellation of military satellites).

*“In each case—in 1889, 1918, 1957, and 1968—the electrical envelope of the earth, to which we are all attached by invisible strings, was suddenly and profoundly disturbed. Those for whom this attachment was strongest, whose roots were most vital, whose life’s rhythms were tuned most closely to the accustomed pulsations of our planet -- in other words, vigorous, healthy young adults, and pregnant women -- those were the individuals who most suffered and died. Like an orchestra whose*

*conductor has suddenly gone mad, their organs, their living instruments, no longer knew how to play."*

Salamanders, toads and frogs have more vitality than other forms of life. The density of their strings -- their meridians -- that connect them to earth and sky is greater. It is why they rarely (and salamanders never) get cancer: both their external and internal communication systems are too strong for their cells to escape control. It is why frogs can partially regenerate lost limbs, and salamanders can regenerate them completely. It is why salamanders can even regenerate their heart -- and do it within hours -- if half of it is cut out -- an astounding fact discovered by Dr. Robert O. Becker and written about in chapter 10 of his classic book, *The Body Electric*.

It is also why amphibians are dying out. Animals with such a strong connection to Earth's orchestra -- who are so attuned to it that they have survived for 365 million years -- cannot withstand the chaos that we have superimposed on it during the past half century and more -- the chaos that we have injected into the living circuitry with our radio and TV stations, our radar facilities, our cell phones and cell towers, and our satellites.

It is why, in 1996, when parades of cell towers were marching from coast to coast in the United States, and sprouting at tourist destinations, mutant frogs were turning up by the thousands in pristine lakes, streams and forests in at least 32 states. Their deformed legs, extra legs, missing legs, missing eyes, misplaced eyes, misshapen tails, and whole body deformities frightened school children out on field trips.

It is why developing frog embryos and tadpoles exposed by researchers in Moscow in the late 1990s to a (wired) personal computer developed severe malformations including anencephaly (absence of a brain), absence of a heart, lack of limbs, and other deformities that are incompatible with life.

It is why, when tadpoles were kept for two months in a tank on an apartment's terrace in Valladolid, Spain, 140 meters from a cell tower, 90 percent of them died, versus only 4 percent mortality in an identical tank that was shielded from radio waves.

It is why wireless technology, which has placed a source of lethal radiation into the hands of almost every man, woman and child on earth, is such an emergency and must come rapidly to an end if we are to save our planet and the millions of other species who are still trying to share it with us. The frogs and salamanders are telling

us that it is not a matter of choice, and it is not a matter of how far from our heads we hold our phones. It is a matter of their survival and ours.

## Selected Bibliography

- Balmori, Alfonso. The incidence of electromagnetic pollution on the amphibian decline: Is this an important piece of the puzzle? *Toxicological & Environmental Chemistry* 88(2): 287-299 (2006).
- Balmori, Alfonso. Mobile phone mast effects on common frog (*Rana temporaria*) tadpole: The city turned into a laboratory. *Electromagnetic Biology and Medicine* 29: 31-35 (2010).
- Becker, Robert O. and Gary Selden. *The Body Electric* (NY: William Morrow 1985).
- Berger, Lee, Rick Speare, Peter Daszak, et al. Chytridiomycosis causes amphibian mortality associated with population declines in the rain forests of Australia and Central America. *Proceedings of the National Academy of Sciences* 95: 9-31-9036 (1998).
- Berger, Lee, Alexandra A. Roberts, Jamie Voyles, et al. History and recent progress on chytridiomycosis in amphibians. *Fungal Ecology* 19: 89-99 (2016).
- Bittek, Jason. Half of all amphibian species at risk of extinction. *National Geographic*, May 8, 2019.
- Blaustein, Andrew R. and Pieter TJ Johnson. The complexity of deformed amphibians. *Frontiers in Ecology and the Environment* 1(2): 87-94 (2003).
- Collins, James P. Amphibian decline and extinction: What we know and what we need to learn. *Diseases of Aquatic Organisms* 92: 93-99 (2010).
- Drost, Charles A. and Gary M. Fellers. Collapse of a regional frog fauna in the Yosemite area of the California Sierra Nevada, USA. *Conservation Biology* 10(2): 414-425 (1996).
- Firstenberg, Arthur. The Informationization of the Third World. *No Place To Hide* 1(3): 1-2 (Dec. 1997).
- Firstenberg, Arthur. *Microwaving Our Planet: The Environmental Impact of the Wireless Revolution* (NY: Cellular Phone Task Force 1996, 1997).
- Firstenberg, Arthur. *The Invisible Rainbow: A History of Electricity and Life* (White River Junction, VT: Chelsea Green 2020, 560 pages).
- Ghose, Sonia L., Tiffany A. Yap, Allison Q. Byrne, et al. Continent-wide recent emergence of a global pathogen in African amphibians. *Frontiers in Conservation Science* 4: 1069490 (2023).
- González-del-Piiego, Pamela, Robert P. Freckleton, David P. Edwards, et al. Phylogenetic and trait-based prediction of extinction risk for data-deficient amphibians. *Current Biology* 29: 1557-1563 (2019).
- Hoperskaya, O.A., L.A. Belkova, M.E. Bogdanov, and S.G. Denisov. The action of the "Gamma-7N" device on biological objects exposed to radiation from personal computers. In *Electromagnetic Fields and Human Health: Proceedings of the Second International Conference, Moscow, Sept. 20-24, 1999*, pp. 354-355, Abstract.
- Houlahan, Jeff E., C. Scott Findlay et al. Quantitative evidence for global amphibian population declines. *Nature* 404: 752-755 (2000).
- Laurance, William F. Global warming and amphibian extinctions in eastern Australia. *Australian Ecology* 33: 1-9 (2008).
- Lips, Karen R., Patricia A. Burrowes, Joseph R. Mendelson III, and Gabriela Parra-Olea. Amphibian declines in Latin America: Widespread population declines, extinctions, and impacts. *Biotropica* 37(2): 163-165 (2005).
- McCallum, Malcolm L. Amphibian decline or extinction? Current declines dwarf background extinction rate. *Journal of Herpetology* 41(3): 483-491 (2007).
- Norris, Scott. Ghosts in our midst: Coming to terms with amphibian extinctions. *BioScience* 57(4): 311-316 (2007).

Pound, J. Alan and Martha I. Crump. Amphibian declines and climate disturbance: The case of the golden toad and the harlequin frog. *Conservation Biology* 8(1): 72-85 (1994).

Rose, S. Meryl. *Regeneration* (NY: Appleton-Century-Crofts 1970).

Souder, William. An amphibian horror story. *New York Newsday*, Oct. 15, 1996, p. B19+.

Souder, William. Deformed frogs show rift among scientists. *Houston Chronicle*, Nov. 5, 1997, p. 4A.

Stuart, Simon N., Janice S. Chanson, Neil A. Cox, et al. Status and trends of amphibian declines and extinctions worldwide. *Scienceexpress*, October 14, 2004 (5 pages).

Toledo, Luís Felipe, Sergio Potsch de Carvalho-e-Silva, Ana Maria Paulino Telles de Carvalho-e-Silva, et al. A retrospective overview of amphibian declines in Brazil's Atlantic forest. *Biological Conservation* 277: 109845 (2023).

Vogt, Amanda. Mutant frogs spark a mega mystery scientists worry could be an early warning of environmental danger. *Chicago Tribune*, August 4, 1998, sec. 4, p. 3.

Vredenburg, Vance T., Ronald A. Knapp, Tate S. Tunstall and Cheryl J. Briggs. Dynamics of an emerging disease drive large-scale amphibian population extinctions. *Proceedings of the National Academy of Sciences* 107(21): 9689-9694 (2010).

Wake, David B. and Vance T. Vredenburg. Are we in the midst of the sixth mass extinction? A view from the world of amphibians. *Proceedings of the National Academy of Sciences* 105(Suppl. 1): 11466-11473 (2008).

Watson, Traci. Frogs falling silent across USA. *USA Today*, August 12, 1998, p. 3A.

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