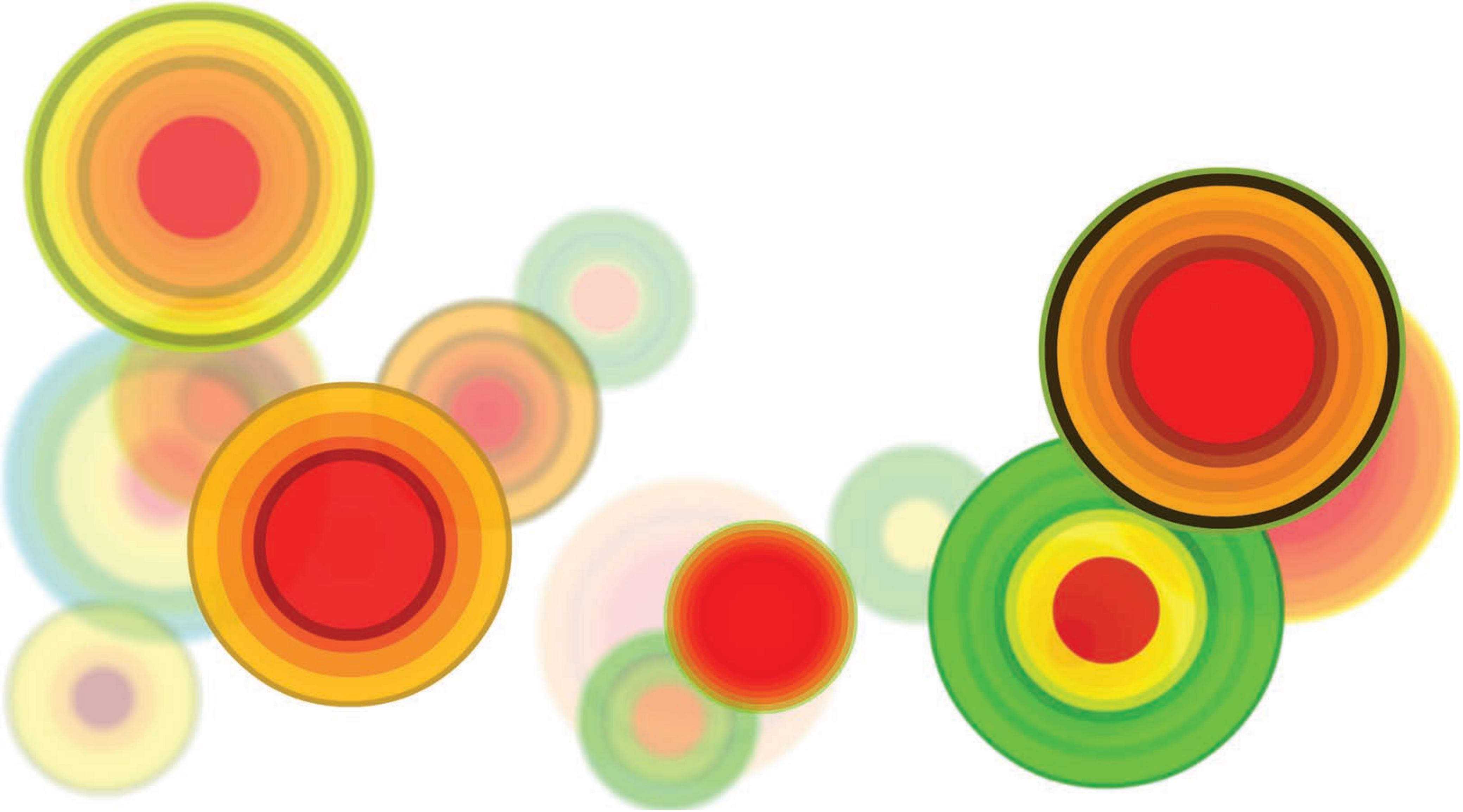

KEN GOLDBERG, SANJAY KRISHNAN,
FERNANDA VIÉGAS
AND MARTIN WATTENBERG

Bloom

Text by JoAnne Northrup

Most Californians aged thirty or older can tell you where they were and what they were doing when the 1989 Loma Prieta earthquake hit. I had just started graduate school at the University of Southern California, and I remember calling a friend in San Francisco while the quake was still underway. She described her immediate experience of undulating streets and sidewalks, surfing the seismic waves, and struggling to stay upright. The catastrophic results of the quake included loss of human life and the collapse of the Nimitz Freeway in Oakland. How on earth can a seismic event like this be translated into an experience that, instead of being traumatic and frightening, is life affirming? The artist, roboticist, and University of California, Berkeley, engineering professor Ken Goldberg has been thinking about this for almost twenty years.

In 1997, Goldberg conceived of using a live seismic-data feed to activate an artwork he called *mementomori*. He met with colleagues at the UC Berkeley Seismological Lab to request access to the seismometer that continuously measures the Earth's motion on the Hayward Fault. After a series of conversations where he assured them he would respect the data, they agreed. With an economy of means and in monochrome, Goldberg transformed the seismic data into a live display that resembles the readings of an electrocardiogram—in essence, the data represents the beating and dynamic shifts of the Earth's heart. There are emotional memories connected to such an interface—sitting with a loved one at the hospital, watching the trace go up and down measuring the heart's electrical activity. These are not necessarily happy memories. The title of the work is derived from the Latin phrase meaning, "Remember that you

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will die." In art history, a *memento mori* is an artwork designed to remind the viewer of their mortality and of the shortness and fragility of human life.

One year later Goldberg collaborated with Randall Packer, Gregory Kuhn, and Wojciech Matusik to create *Mori*, a live acoustic installation based on the seismic data source. Commissioned by the InterCommunications Center in Tokyo, *Mori* appeared in that institution's 1999 Biennale. The seismometer captured the movements of the Hayward Fault and converted these readings into digital signals transmitted continuously via the Internet to an acoustic installation. That installation was then included in an Independent Curators International exhibit that traveled to six galleries and museums across the United States.

I experienced this installation when it was on view in 2001 at the Walter and McBean Galleries at the San Francisco Art Institute. I remember being in the gallery, walking up a curved ramp into a darkened enclosure, and looking over a railing onto a screen that broadcast a visual representation of the seismic activity. Lying on my back in the space, I felt as though I had ventured into the Earth's womb and was able to experience tectonic shifts as they occurred in real time, translated into rumbling sound waves. Composer Packer used natural sounds like thunder, lightning, and waterfalls to covey the story, with speakers mounted right underneath the floor so that you could feel the sound in your bones. The installation provided a compelling ambient experience, but also it conveyed a hint of threat. After all, it's very groovy to take part in an immersive art installation, but this one pointed out the real consequences of living in a state where earthquakes were an accepted part of everyday life. What if the Big One hit while you were inside *Mori*? The dark viewpoint at the foundation of Mori was perceived by critic Reena Jana of *Artforum* who wrote, "The fragility of life is one theme sounded by this disturbing, meditative work."

In 2006, to mark the centenary of the 1906 San Francisco earthquake, Goldberg collaborated with Muriel Maffre, a principal dancer in the San Francisco Ballet, to create a third variation in this series of artworks. It was performed on 4 April 2006 at the War Memorial Opera House one hundred years after the 1906 Earthquake. The score was composed for *Mori* by Packer, triggered by real-time seismic data. Maffre improvised as no one could predict the precise sound in advance.

All three of the works in this series: *mementomori*, *Mori*, and *Ballet Mori* share associations of *memento mori*: warning, rebuke, reminder of mortality, monochrome, the grave, death, and decay. Goldberg described the mood by quoting Shemp from the Three Stooges, "The morbid, the merrier."

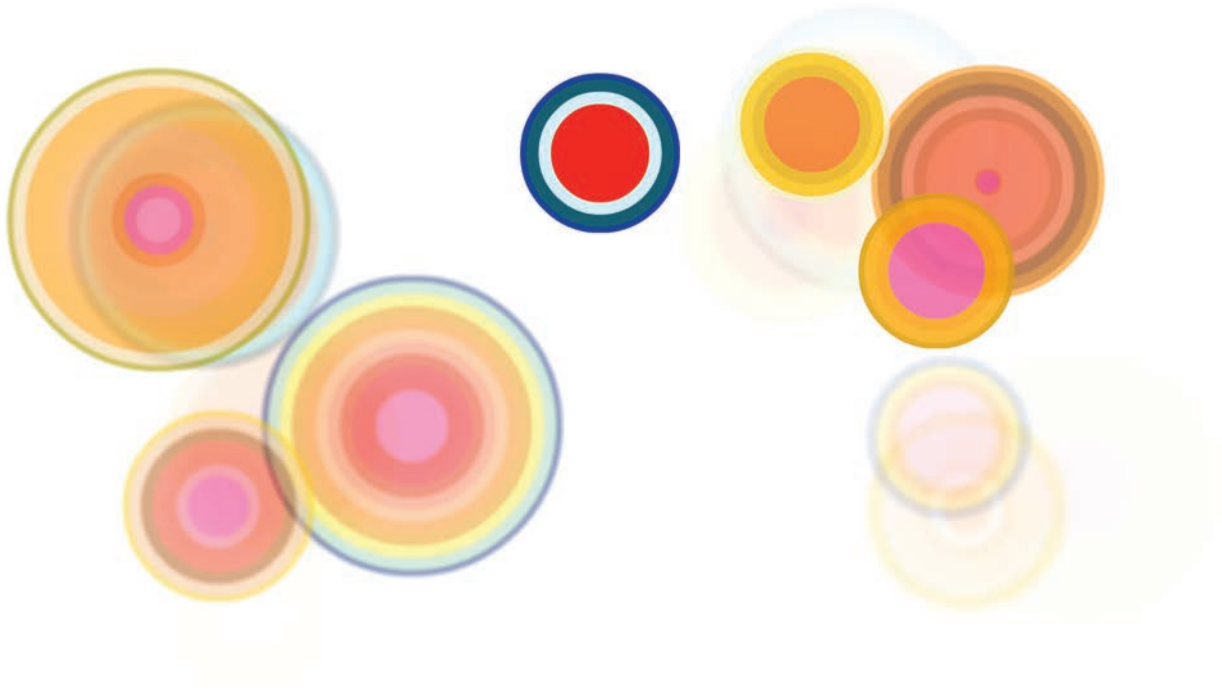
Bloom incorporates the same seismic data as the precedents. The mood of the piece was decidedly upbeat, exuberant, colorful and playful—replacing pessimism with optimism. The blooms resemble the representations of earthquake magnitude found on maps. As Goldberg describes it:

In this Internet-based earthwork, minute movements of the Hayward Fault in California are detected by a seismograph, transmitted continuously via the Internet, and processed to generate an evolving field of circular blooms. The size and position of each bloom is based on real-time changes in the Earth's motion, measured as a vertical velocity continuously updated from the seismometer. The horizontal position of blooms is based on time, their vertical position is based on magnitude of the second derivative (rate of change), and their size is based on the time between extremum. Large movements create large blooms; small jitters create tiny buds.

Goldberg and his collaborators, Fernanda Viégas and Martin Wattenberg—data visualization specialists known for their extraordinary *Wind Map*—and UC Berkeley Ph.D. student Sanjay Krishnan worked to perfect the design and reliability of the system. In 2013, a new version was commissioned and purchased by the Nevada Museum of Art for its permanent collection. This immersive installation is constantly changing. The motion beneath the Earth's surface is imperceptible to us, until a major seismic event occurs. *Bloom* makes these shifts and changes visible.

The two most salient features of *Bloom* are its scale—it is viewed as a large, wall-sized projection in a designated gallery—and its beauty. The first thing we perceive is beauty; next, we perceive the colors; and finally, after reading the explanatory text, we perceive the data.

For those who are less engaged with the making of art history and more scientifically oriented, the blooms can be described by these mathematical equations: If $z(t)$ is the measured z-velocity at time t, then whenever $z'(t) = 0$, we plot Bloom $(t+1)$ with radius $r(t+1)$ at position $(t+1, y(t+1))$, where $y(t+1) = A\,z''(t)$, and $r(t+1) = B\,|z(t)|$.



Or, instead, consider Ecclesiastes' statement, "All flesh is grass."

"All organic material returns to the Earth," explains Goldberg. "The seismic signal is a representation and reminder of this organic substrate, so I thought: let's use it to trigger the growth of forms." *Bloom* makes the invisible visible; but that doesn't explain the heart and soul of this artwork, which looks into the face of the forces of death and destruction and still finds reason to live, to celebrate—what we might call technological sublime. The shifting, appearing and disappearing blooms suggest life or seasonal cycles, connecting the work to the classic *vanitas* Dutch floral still-life paintings of the Baroque era.

"Now I think more about flowers than skulls," says Goldberg at fifty, married and with two daughters, one named Blooma.

Goldberg's series continues the tradition of the Earthwork, an artwork created in dialogue with the natural world. *Bloom* engenders a profound connection to the Earth and an enhanced understanding of the shifting, settling, and the disruptions that are hidden from view. Like Robert Smithson's *Spiral Jetty* and Walter de Maria's *Lightening Field*, this Internet-based Earthwork — see http://goldberg.berkeley.edu/art/Bloom—provides a live connection to the environment and the natural world that has the potential to suddenly erupt, without a moment's notice.