Ocean X

Prudence Roberts

This is the story of one of Terry Toedtemeier's most distinctive photographs, its place in his career, and how the image made it out into the world.[1] The print, and the many books and periodicals in which it has been reproduced, are testament to the way in which so many of Terry's images can be viewed, with equal appreciation by art audiences and hard-core scientists.

It is also a story of serendipity and coincidence. Terry was no stranger to these. As his wife, I saw many astonishing and wonderful things in my travels with him, including a fully preserved cougar skeleton deep in a lava tube cave; an eagle that rose from the road in front of us with a squirming rattler in its talons; a seemingly bottomless rift in the Idaho Badlands; and an ancient and famed cactus crashing to the ground in front of him in the Huntington Gardens when no one else was around. Throughout such adventures, in his art and in his life, Terry had the good fortune to be guided by both intuition and intellect. From his childhood, exploring the rocks and creeks in his own Portland neighborhood, he knew that the most meaningful forms of beauty and mystery were to be found in the natural world. He majored in geology at Oregon State University, but was never interested in a career in extractive industries. He studied drawing in college, but he had already found photography while still in high school. His cameras, and he had many, were really the expressive tools he needed. He loved both the technical and aesthetic aspects of camera bodies and lenses—the more specialized, the better—and the alchemy of the dark room. I suspect his red-green colorblindness was responsible for his acute perceptions of form, texture, and contrast. In his printing, he favored subtlety and quietude over drama. Similarly, he was not drawn to the grand vista or the expected "best general view."

Terry created *Ocean X* (fig. 1) in 1978, at a turning point in his career. He was moving away from his handheld 35mm Leica to larger format cameras and was concluding his foray into infrared photography. Since he had graduated from college in 1969, he had been making quirky images of Portland, of family and friends, and of landscapes quickly glimpsed from a moving car. These photographs placed him firmly within the prevailing aesthetic of such artists as Garry Winogrand and Lee Friedlander, among others. But his own collecting and his teaching of photo history at Pacific Northwest College of Art had put him in touch with earlier visions of what a photograph could be. By this time, too, he had begun his departure from

Blue Sky, the cooperative, non-profit photography gallery he cofounded in 1975. His growing awareness of nineteenth-century Western landscape photographers—in particular, Carleton Watkins, William Henry Jackson, and Timothy O'Sullivan—was leading him back to the landscape, to geology, and to a more studied sort of imagery.

In the early 1980s, Terry embarked on the massive project that would engross him for the rest of his life—a project that combined art and science in pretty much equal measure. His goal was to create a photographic record documenting the history of basalt formations in a geologic territory defined by the Basin and Range country of the Pacific Northwest. Whenever he set out for the Owyhee Canyon Lands, the lava fields and Pleistocene lakebeds of eastern Oregon, the Columbia River Gorge, or the sea caves and headlands along the Oregon coast, he had spent many hours studying his topographical maps, whose twists and turns he read the way others might read a thrilling mystery. By the time he packed his car with ice chests for food and film, camera equipment, and maps, he was in search of a specific form of basalt outcropping or a particular landscape he suspected he would find. As long as the weather and the light cooperated, he was rarely disappointed.

Ocean X is a prelude to this later, more heavily researched work. But it is not about rock at all, and it is not an image he anticipated finding. Instead, it is a simple composition depicting two waves crossing at the edge of the Pacific Ocean, one of four exposures Terry quickly made as he stood atop a driftwood log, camera and shutter release in hand. Over the years, the photograph has acquired various titles: *Ocean X; Waves in Shallow Water, Manzanita, Oregon*; *Oblique Interaction of Two Shallow Solitary Waterwaves*; and finally, *Soliton in Shallow Water* and *Soliton, Oregon Coast*. Judging from his correspondence and my conversations with him, it was a difficult print to make, and he struggled to find a proper balance between the sheen of the lead-gray water, the highlights on the wave's crests, and the nuances of the cloudy horizon. Of all his many hundreds of prints, it is probably his best known. The reasons have less to do with the spare and elegant composition and the moodiness of its stormy light than with the phenomenon Terry had captured, whose scientific name I suspect he didn't know at the time, but whose beauty he immediately apprehended. As he later wrote, "Though I am fond of the water most of my photographs are of rock. I love the beauty of nature and am pleased that one of my photographs can be useful in illustrating a story of one of the great many phenomena we have been privileged to observe."[2]

As far as I can tell, *Ocean X* first appeared, without a credit line, in a calendar published in 1979 by the Trojan Decommissioning Alliance, a group of activists opposing nuclear power plants in Oregon. Mathematician Patrick Weidman saw the calendar, which happened to be turned to the month featuring Terry's image, on a kitchen wall in Los Angeles. He realized its significance, and contacted his friend Harvey Segur, who was elated to find an illustration of the very mathematical model he was working on. Segur identified in the image a spectacular example of a soliton, a nonlinear wave. Not only had Terry captured this marvelous occurrence, he had done it at a perfect moment in the history of science.

Now a professor of Applied Mathematics at the University of Colorado, Boulder, Segur recently summarized soliton

Figure 1. Terry Toedtemeier (1947–2008), *Ocean X*, 1978. Platinum-developed gelatin silver print, gold and selenium toned, 5½ × 8¾ in. Estate of Terry Toedtemeier, Collection of Prudence Roberts. Courtesy PDX CONTEMPORARY ART, Portland, OR

research for me and noted how Terry's photograph "magically" fits into its history. This discussion recalled to me Terry's own way of talking about his photographs, which usually tended to make more sense to geologists than to art audiences. Segur explained:

> In the mid 1890s, Dutch mathematicians Diederik Korteweg and Gustav de Vries worked out a new theory for how waves of large amplitude behave in shallow water, where the water's depth is much less than the distance between successive wave crests. The waves in Terry's photo are examples of such waves, and their amplitudes are large enough that a nonlinear theory is needed to predict them accurately. The mathematical model that Korteweg and De Vries developed, the eponymous KdV equation, is a nonlinear model. Although their theory was known to some coastal engineers and oceanographers, it was for a long time mostly ignored because it was too hard to solve.
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> In the mid 1960s, two American mathematicians/physicists, Martin Kruskal and Norman Zabusky, were working on a different problem with no obvious connection to water waves. But their problem had nonlinear waves, and after a lot of hard work, they were able to write down a nonlinear mathematical model to describe them. They did not realize it at the time, but the model that they constructed is the model of Korteweg and De Vries. In fact, they had never heard of the KdV equation but had stumbled onto it.
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> Because their model was nonlinear, Kruskal and Zabusky had little hope of solving it exactly, but these two and their collaborators were very capable mathematicians, and they were able to establish several properties that automatically went with any solution of their model. One of these important properties was the admission into the model of solitary waves. Usually one thinks of waves in terms of a "wavetrain," a long chain of crests and troughs that is uniform in space as it travels along. A solitary wave is different, consisting of a single crest riding on an otherwise flat background. Zabusky and Kruskal showed that two of these solitary waves can interact with each other in a remarkable way: they simply move *through* each other and come out on the other side. The amplitude of the wave on each side of the interaction remains the same; the direction of each wave is unchanged; and its speed of propagation is unchanged. The only long-term effect is that the waves' positions have shifted somewhat because of their interaction. The phenomenon made Kruskal and Zabusky think of the behavior of elementary particles in quantum physics—electrons, phonons, Fermions, Bosons—so they called their solitary waves "solitons."
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> Here is where Terry's photo fits into this story, with almost magical accuracy. Look at his photo, and you see a giant X pattern, with some other kinds of waves further out at sea, and with some much smaller waves in the region of the X. Ignore the other waves, and concentrate on the X. The X has four arms, each of which can be viewed as a solitary wave: it's a single wave crest, with no visible trough; each arm

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is remarkably straight. The X pattern is actually two solitary waves, moving in two different directions, and they are interacting with each other in the middle of the X.

Take a ruler; lay it down on the picture so that it lines up next to one of the arms. As you go across the region of interaction, observe that the ruler is lying next to the arm on one side of the interaction region, but it is separated from the arm on the other side. The ruler is parallel to the arms on each side, but while touching the arm on one side it is separated by a small fixed distance from the arm on the other side. This is *the shift in position of each wave from where it would have been without the interaction*, as predicted by the KdV theory. Terry’s photograph shows that this unusual equation describes a naturally occurring physical process. So it’s not just mathematics, it’s also physics that can exhibit the magical properties of the KdV equation.[3]

Segur was the first mathematician to find Terry and ask if he could reproduce the image in a forthcoming book. One request led to another and another. Over the next three decades, as Terry’s work became better known and as his reputation as an artist grew, he sold some prints of the photograph. It also acquired a scientific history, showing up alongside page-long equations and graphs and text written in French, Danish, Japanese, German, and English. Most of the authors contacted Terry for permission to use *Ocean X*; he granted this free of charge in exchange for a copy of the publication. For reasons known only to Terry, he filed these materials, along with the related letters, faxes, and printed e-mails, next to his books on Indian cookery.

He always intended to go back to the darkroom and make another pass at printing the image, to extract more information from the sky and from what one of his correspondents termed the “saddle wave region.” But despite the promises he sometimes made himself to “fire up that negative,” he never did. Like most artists I’ve known, he was caught up in new projects and rarely revisited earlier ones.

His curatorial work and his research into photographic history were taking up more of his time; he was especially engrossed in *Wild Beauty*, his masterly photographic history of the Columbia River Gorge. (The exhibition at the Portland Art Museum would open in 2008, accompanied by a book of the same name.) Further, the world of photography had changed.

His favorite paper, Agfa Portriga, was no longer available. By 2004, however, Terry had seen good, high-quality archival pigment prints made from digital files and understood the powerful capabilities of digital editing software. That year, he started to work with Phil Bard, a photographer and Photoshop wizard, who ran Cirrus Digital Imaging, a world-renowned atelier. Phil scanned Terry's negatives and, working with him, was able to match the tonalities and range of his gelatin silver prints exactly. *Ocean X* was the first image they tackled. When a successful print appeared, according to Phil, Terry lay on his back, laughing with joy and kicking his legs in the air. He never went back to the darkroom, and *Ocean X* entered its second life.

1 This essay is a slightly abridged version of Prudence Roberts' contribution to the exhibition catalogue *Sun, Shadows, Stone: The Photography of Terry Toedtemeier* (Tacoma, Wash.: Tacoma Art Museum, 2018), which also includes an annotated bibliography of the many publications in which the photograph *Ocean X* is reproduced. Our thanks to both Prudence Roberts and the Tacoma Art Museum for permission to reproduce the essay here. —Ed.

2 Terry Toedtemeier to A. Sizmann, 16 October 1997.

3 Harvey Segur, personal email to the author, 29 December 2017.

Prudence Roberts is an art historian and writer. She retired from Portland Community College, where she taught art history and was the Director of the Helzer Art Gallery from 2001–2018. Roberts previously was Curator of American Art at the Portland Art Museum, where she focused on the museum's American and regional collections and on early American museology. She serves as Secretary of the board of Crow's Shadow Institute of the Arts, Pendleton, and is also on the board of the Multnomah County Cultural Coalition. Her most recent essays have looked at the work of Ryan Burkhardt, Amy Bay and at the founding and 25-year history of Crow's Shadow.