

## BRAIN STORMING THE FOURTH STATE OF WATER

Victoria Vesna, Department of Design | Media Arts, University of California Los Angeles, CA 90095, U.S.A.) E-mail: <vv@ucla.edu>

Submitted: <leave for Editor to date>

### Abstract

The author uses the idea of the ‘fourth phase of water’ as a metaphor for the collective shift of consciousness taking place in part due to the advancement of communication technologies. As an artist she puts forward an idea which some would interpret as a preposterous – that the extreme weather we are experiencing globally is not simply a result of climate change humans have contributed to, but a complex interaction and reaction with natural systems that are cyclically destructive when in process of change. She discusses this idea of social upheavals being part of this process of change in dialogue with scientists, humanists and artists in *Brain Storming* sessions initiated with neuroscientist Mark Cohen.

This paper is part of the *Leonardo Water is in the Air* workshop, June 2012.

Keywords: fourth phase, brainstorming, neuroscience, extreme weather.

The water you touch in a river is the last of that which has passed and the first of which is coming. This it is with time present.

—Leonardo da Vinci

The water we use today has been circulating throughout our planet before the inception of life and it is here to sustain humanity for the rest of time. Working with nanoscientists, I came to a realization that water, although ubiquitous and the source of life, is one of the least understood molecules, as Philp Ball so beautifully explains in his essay “Water is Weird” [1]. The water molecule has been for me, as for many others, not only a mirror for reflecting, but also the seed of an inspiration which led to the creation of an installation consisting of four *Water Bowls*, each signifying a pressing issue with water and each half full or half empty depending on your point of view: *drop ~ sound ~ moon ~ oil*. The piece premiered in Shanghai (2006), which seemed appropriate as China faces some critical dangers with water pollution and drought [2]. Being in such a densely populated country where collective action is obvious and powerful, I experienced and sensed that my artwork, my being on this planet is but a drop. But I also felt my mental drop as part of an ocean of creative people and, if connected to that body of water, it has potential to become a powerful brainstorm. To quote eco-artists Helen and Newton Harrison, I understood that “we are really

important and really insignificant” and that our existence is part of a larger ecosystem beyond our planet, that it is fractal in nature. This is known by scientists who delve into the molecular layers of life such as Richard Feynman who said many years ago that: “for successful technology, reality must take precedence over public relations, for nature cannot be fooled”. [3] So my work shifted to thinking how I may create an interface to the many artists, scientists, environmentalists who work with water. After going with the flow and submerging myself in the liquid, projecting and engulfing in vapor and coming to a standstill in ice, I discovered the fourth state of water which is essentially an intermediate. Being in between has always been the place where I find the most creativity and meet the most amazing souls who like residing in this space so this idea rang true and became a source of inspiration.

The “fourth state of water” was introduced to me by scientist Massimo Antognozzi who I met during my residency at the Nanoscience & Quantum Information Centre in Bristol, UK. He pointed me to a talk that was online by bioengineer Gerald Pollack and forwarded me a paper that he authored on the subject [4]. As usual in my interaction with scientific information, much of it was very abstract and esoteric, but I had a keen sense that there was something important happening here. My intuition was that it is important for us to think of water differently and that perhaps if we see the possibility of another way of seeing we may collectively change our molecular state of being. Or perhaps we already are in the process of a consciousness shift and this may be the reason for all the upheavals in our environments?

Last year (2011), as extreme weather raged around the world, I traveled more than ever and was surrounded by people working with water. I was in between LA, NY and Hong Kong and logged many hours on the plane -- practically living out of my suitcase. There were moments when I felt like my life movement was reflecting the storms around the world. In retrospect, when I retraced my path, I realized that I was on a whirlwind tour of world ports and islands – all cultural centers with surrounding water. I understood that there is something more going on in relation to our collective turbulence and that this is reflected in water. And all along, like everyone else, I was witnessing the endless reports of storms, tornados, flash

floods and other extreme weather patterns. Somehow I was lucky to escape being in the midst of these unfortunate events, but they certainly influenced my thinking and approach to working with water. When approached by curator Dobra Denegri to propose an exhibition for the Contemporary Art Center in Torun, I jumped on the opportunity and saw Japan as the epicenter of the concept. The physical exhibition was conceived as a node that would extend out to an interactive website and a symposium that took place on World Water day, March 22<sup>nd</sup>, 2012. [5]

### Half Empty: Liquid, Vapor, Ice

In 2011, on March 3<sup>rd</sup>, a 8.9-magnitude earthquake—one the strongest ever recorded—struck off of Japan’s coast. This could have been the worst disaster of 2011 but it was the tsunami it triggered that would cause the most lasting damage. The surge of water reached 30 feet high and traveled further than three miles inland and more than 15,000 people were killed by the earthquake and subsequent tsunami. But it was the nuclear meltdown caused by the tsunami that some think the world could ultimately come to view Fukushima as being worse than Chernobyl. It was equally a disaster of human made technologies and bureaucracies. The water contaminated with nuclear materials is at the heart of this disaster that has yet to be resolved and yet it was also the cooling water that saved the nuclear plant from really blowing up.

I visited Japan six months after the disaster, to start collaboration with Takashi Ikegami, a physicist who is an expert in artificial life and has great interest in working with artists. His work with the oil droplet in water seemed so perfect in relation to the situation Japan was facing, even though he was looking at tracing the movement of self-organized criticality on a micro level. At his lab I met Mizuki Oka who worked with Yasuhiro Hashimoto, both software engineers who visualized twitter feeds of social networks as water droplets. I saw this work as the macro view of the self-organized criticality Ikegami was looking at in the droplet. Looking over the dimmed night skyline of Tokyo, with only a third of the lights on, it became clear to me that artists and scientists from Japan carry the message of hope with the ever so sublime aesthetic and love for water that is at the heart of the Japanese culture. Machiko Kushara, a long time colleague of mine, introduced

me to scientist Hideo Iwasaki and there I met Shiho Fukuhara who showed me the work she did with Georg Tremmel that fit so well in the evolving conceptual framework. That year I exhibited *Water Bowls* in a large group exhibition "Value of Water" at the Cathedral of St John the Divine in NY. There I was impressed by a work of Japanese Nobuho Nagasawa whose work with the moon I found moving and subtle. In Los Angeles I asked a former student from Japan, Gil Kuno to show his dramatic work with projection on vapor. At the center of the "Fourth State of Water: Micro to Macro", I had the Japanese artists and scientists addressing the various states and points of view and together they comprised the important message of Japan. [6]

In the fall of 2011, I spent three months in another important island in Asia – Hong Kong. My daughter Gia now lives in China so it was not a small event when a disaster hit a nearby province. Nearly 200 people were killed and 100 reported missing during floods in southern and eastern China that summer with heavy rainfall in June followed by the worse recorded drought in 50 years, affecting at least 13 provinces according to the ministry. Reports suggest that more than 1.6 million people were evacuated and over 8000 houses were destroyed. In the province of Zhejiang more than 4.4 million people were affected by the flooding.

Nearby in Thailand, where my other daughter Aleksa was traveling at the time, they experienced the death toll from the worst flooding in half a century, that inundated large swathes of Bangkok, its densely populated capital. The waters first began to rise in July, and the flooding continued through December. Hundreds of people were killed as a result of the floods, and more than 12 million people were affected and the financial cost has been astronomical. The World Bank reported that month the damages could reach as high as \$45 billion—making it one of the costliest disasters in recent history.

### **Australia**

Living in Asia at the time made me more conscious of Australia that had its share of torrential floods and is suffering from drought. Floodwaters in Australia's Queensland state created havoc in at least 22 cities and towns throughout the region grappling with several weeks of devastating rains. Roger Malina did an email introduction to Suzon Fuks, who is working on the *Water Wheel* project, and

we started discussion on how we could work together. She has not only contributed a piece to the show but also coordinated her symposium with the one I was organizing on World Water day, March 22<sup>nd</sup>. We are yet to meet in person.

Meanwhile, a widespread drought across Kenya, Somalia, Ethiopia, Eritrea and Djibouti over the summer laid waste to food and water supplies across the region, sparking the worst famine in decades. Somalia, already a failed state at the best of times, was the hardest hit. The famine worsened in September as the United Nations reported that half the country was in need of emergency aid and at the time estimated that as many as 30,000 children have died as a result.

### **USA**

Back home in the USA, it seemed as if one severe weather pattern after another was sweeping through the Midwest. Unusual and severe weather events that in total caused the country \$35 billion in damages and killed more than hundreds of people. Numerous tornadoes, flooding, a drought and a blizzard have all combined to at times cripple regions of the United States. On April 27, more than 300 tornadoes—four of those reaching the highest level on the tornado severity scale—ripped through the Southeast, leveling whole towns and killing hundreds of people. The unprecedented tornado outbreak was quickly followed a month later, on May 22, by another level five tornado in Joplin, Missouri that wiped out the town and killed over a hundred people. Add to that a devastating winter blizzard in the Midwest, Hurricane Irene on the East Coast and a massive drought across the South, and 2011 becomes one of the worst years for natural disaster in United States history.

Last year, Brazil was not spared from the rage of water -- death toll from flooding and mudslides in the southeastern Brazilian state of Rio de Janeiro was close to a thousand.

Turning back to Europe, we saw floods throughout continent in 2011 – severe flooding in Northern Italy in November and, according to the German weather service, the drought during the spring of 2011 was the worst ever measured. Farmers have had to shoulder the consequences of both heavy storms and drought. In France, the prefecture of the department of Meuse, in the northeast of the country, in a communiqué May 25, ordered urgent draconian measures to reduce water consumption, warning that

the region's water reserves were on the brink of collapse. Another consequence of the drought is the plummeting of French river levels that puts the 44 nuclear power plants installed along riverbanks at risk [7].

Zbigniew Kundzewicz, a leading climate scientist warned recently that Europe should take action over increasing drought and floods, stressing that some climate change trends were clear despite variations in predictions. "Climate change will pose two major water challenges in Europe: increasing water stress in southern Europe and increasing floods elsewhere," he stated during a workshop organized by the UN Economic Commission on Europe. "Current water management practices may be inadequate to reduce adverse impacts of climate change." Kundzewicz believes that southern Europe would be more affected than northern Europe, with evidence already of hotter weather and longer drought leading to water shortages, harm to agriculture, a 20 to 50 percent decrease in hydro-electric power and denser water pollution [8].

If we move down south to Spain, the situation gets more extreme by the day and is being described as a national crisis. Scientists say that Southern Europe and especially parts of southeast Spain are drying rapidly to near-desert conditions, a process that some experts call "Africanization" that is accelerated by tourist resort development and water-thirsty crops. During my visit to Barcelona, I was joined in this project by Esther Moñivas who did extensive research on artists working with water and helped curate. There I also reconnected with Mana Salehi who was inspired with this approach and created a piece on Lake Orumiyeh in Iran – she brings to our attention water body many of us are unaware of, in a land that is subjected to repeated social and political troubles. The salt concentration in this lake is roughly 4 times the natural seawater and due to drought and increased demands for agricultural water in the lake's basin, the salinity of the lake has risen even higher during recent years, and large areas of the lake bed have been desiccated. As a result the fishery has been degraded.

In Portugal, severe extreme drought is creating a crisis in addition to its 78-billion euro bailout from the European Union and International Monetary Fund. In the parched southern Alentejo region - the country's poorest - villagers in several places are already holding Novenas,

acts of religious devotion at which prayers are recited and sung for nine nights in a row to obtain divine intervention.

### Half Full: Fourth State

At the same time that these extreme weather patterns were taking place on our planet, social upheavals were happening around the planet starting with the Arab Spring and moving into the Occupy Wall street movement. These human storms are like tsunamis of collective changes that are not unlike or independent of the planetary shifts. I am not able to prove this using the existing scientific methods because I am not trained to be a scientist; I work with my intuition, which tells me strongly via my sixth, and seventh senses that these are not unrelated events. We are witnessing and participating in tectonic shifts in our lives and will wake up one day with a very different world. People everywhere are sensing this and re-connecting to the natural systems through nanotechnology and bio-mimicry and advances in complexity and artificial multi-sensor systems and robotics. Social network technologies are moving memes as fast as the financial markets are trading money around the world. Nature is trashing us around, waking us up from a dream like a drunkard being sobered with a splash of cold water.

I could write a volume if I continued<sup>2</sup>, enumerating the extreme weird weather patterns as well as the endless social upheavals and financial disasters of the past year. Assuming that I made my point, let me turn to why I think the glass could be half full and how we are moving towards a fourth phase of water – a new collective consciousness that may give us hope in relation to our Spaceship Earth. Destruction is wide but the number of artists, scientists, humanists, environmentalists and people of every day professions doing good is higher than ever. I use the fourth phase of water as a metaphor for a new consciousness that is emerging in the midst of this turmoil.

Exploring the fourth phase of water provides a different way to look at chemistry, biology and physics. “If you don’t understand the behavior of water,” says Pollack, “you can’t understand how a cell works.” At the beginning of this century, the human genome was decoded but now we know that we have the alphabet and not the language. When one connects the research of the human genome and human microbe projects with the advances in nano and biotech, it is clear that a new methodology has to

emerge. Perhaps better understanding of water, the molecule of life is what will bring us to a new way of thinking and being that is more empathetic and compassionate. Once we understand that we are truly part of a larger eco system that goes beyond our planet, we will discover a new state of being. To explore these ideas that some would call preposterous, I started a series of *Brain Storming* sessions together with neuroscientist Mark Cohen. The idea is to bring together great open minds from many different disciplines and connect our brains to collectively explore our brain vibrations. To date there have been four sessions with neuroscientists, engineers, nanotechnologist and artists. Initially we focus together on concepts but the goal is to design EEG headsets that measure and visualize collective vibrations. Connecting weather patterns to human behavior is not a new idea in art, poetry and literature but it is something to be explored in neuroscience and not in isolation of a laboratory but in dialogue. And so we Brain Storm the Storms. [9].

### References and Notes

1. Philip Ball, “Why Water is Weird” reprinted in the Fourth State of Water catalog, Gdansk, Poland, 2012. A video lecture of this paper can be accessed at the Fourth State of Water symposium site: <http://cnsi.ctrl.ucla.edu/streaming/art-sci/3222012-ball>
2. The show Code Blue: Confluence Of Currents (3rd Beijing Int'l Millennium Dialogue) curated by Zhang Ga and Timothy Dreckrey, 2006. Millenium Art Museum, Shanghai, China.
3. Rogers' Commission Report into the Challenger Crash Appendix F - *Personal Observations on Reliability of Shuttle* (June 1986)  
<http://history.nasa.gov/rogersrep/v2appf.htm>
4. Dr. Gerald Pollack is a professor of bioengineering at University of Washington who has developed a theory of water in which it is not liquid. A video of his lecture on the subject can be seen here: <http://cnsi.ctrl.ucla.edu/streaming/art-sci/3222012-pallack>
5. More about the exhibition and the website can be found here: <http://csw.torun.pl/exhibitions/exhibitions-db/the-fourth-state-of-water-from-micro-to-macro>  
Water Bodies: <http://waterbodies.org>
6. The Value of Water: Sustaining a Green Planet was curated by artist Fredricka Foster at the Cathedral of St John the Divine in New York city. Among artists presented were Bill Viola, Mark Rothko, Ray Charles, Jenny Holzer. More info: <http://stjohndivine.org/VOW2.html>.

There is a vibrant cultural and environmental movement in New York which I tapped into while teaching at the New School. Almost exactly a year before the show opened, together with my colleagues there, I helped organize a series of events for Water Week and hosted a symposium on artists who are actively addressing this issue. <http://www.newschool.edu/events/waterweek/subpage.aspx?id=61738>.

7. Reuters is the source for most of the information on natural disasters that I recite in the text.

8. Zbigniew W. Kundzewicz, PhD, DSc is Professor of Earth Sciences (since 1993) and Deputy Director for Research, and Head of Laboratory of Climate and Water Resources in the Research Centre of Agricultural and Forest Environment, Polish Academy of Sciences, Poznań (RCAFE PAS), Poland. Also associated with the Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany. Coordinating Lead Author of Chapter 13 (Europe) in IPCC (Intergovernmental Panel on Climate Change) WG2 TAR (Climate Change - Impacts, Adaptation, Vulnerabilities); Chapter 3 (Freshwater resources and their management) in IPCC WG2 AR4; IPCC Technical Paper on Climate Change and Water; and Chapter 4 of the IPCC Special Report on Extremes; hence part of the inner circle of the IPCC (2007 Nobel Peace Prize laureate). Member of the Advisory Board on the Environment (including Climate Change) of the European Union Seventh Framework Programme. Editor-in-Chief of scientific bi-monthly „*Hydrological Sciences Journal*” (Wallingford, Oxfordshire, UK). Author of 334 publications. Principal research interest and expertise: extreme hydrological events, climate change impacts, sustainable development. State orders: Golden Cross of Merit (Poland), Knight’s Cross of Polonia Restituta Order (Poland). Great Golden Seal of the City of Poznań (Poland). Other awards: Tison Award of IAHS (1987) and two awards of Polish Academy of Sciences. Source: <http://www.isrl.poznan.pl/index.php/en/component/content/article/88>.

9. Brain Storming premiered in February 2012 at the Beall gallery of Art + Technology in Irvine. The first session happened during the opening reception on February 5th. Participants included neuroscientist Mark Cohen, computer scientist Ramesh Jain, nanoscientist James Gimzewski, artist director David Familian, UCI CTSA artist and Dean Joseph S. Lewis III. The second session on February 25<sup>th</sup>, included Linda Weintraub, author/ecologist/historian; Ellen Levy, author/artist; Siddharth Ramakrishnan, neuroscientist. Third on May 5th: same participants as the first with artist Connie Samaras. The fourth session was at Luminy Science Park in Marseille hosted by neurobiologist Constance Hammond and participants were James Gimzewski, sociologist Samuel Boreuil, anthropologist Nicolas Mai and science historian Anne Lovell.