




SURFACE TENSION

THE FUTURE OF WATER

RALPH BORLAND, MICHAEL JOHN GORMAN,
BRUCE MISSTEAR, JANE WITHERS



PUBLISHED BY: SCIENCE GALLERY,
PEARSE STREET,
TRINITY COLLEGE, DUBLIN 2, IRELAND
T: **+353 (0)1 896 4091**
E: **INFO@SCIENCEGALLERY.COM**

ISBN: 978-0-95589574-6

All rights reserved. No part of this publication may be reproduced in any form by any electronic or mechanical means, including photocopy, recording or information storage without written consent from the publisher.

©SCIENCE GALLERY

All work remains © of its respective author(s)



SURFACE **TENSION**

THE FUTURE OF WATER

RALPH BORLAND, MICHAEL JOHN GORMAN,
BRUCE MISSTEAR, JANE WITHERS

CONTENTS

SURFACE TENSION INTRODUCTION	02
SURFACE TENSION INTERVIEWS	04
SOURCE (DUBLIN) FIELD OF WATER MARY COBLE	14
POUCH OLIVIA DECARIS	16
WATER WEAR KIMMIT SAYERS, BRIAN CORCORAN, ANDREW CLARKE, LAR BOLAND	18
USING SUNLIGHT TO CLEAN WATER LAURENCE GILL	20
AQUA-NU FILTER WATER BOTTLE AQUA-NU FILTRATION SYSTEMS	22
THE SEA CHAIR PROJECT KIEREN JONES, ALEXANDER GROVES, AZUSA MURAKAMI	26
PROTEI 002 PROTEI	28
DESIGNING CONSEQUENCES YONG JIEYU	30
DRINK LOCAL WATER... WHATEVER IT IS COLIN HART	32
THE VIRTUAL WATER PROJECT TIMM KEKERITZ	36
HIDDEN MATTHEW COSTELLO	38
BOTTLED WASTE HAL WATTS	40
POWERTREKK myFC AB	42
HYDROGENY EVELINA DOMNITCH, DMITRY GELFAND	44
UNDERWATER NOISE OF RAIN LANE HALL, LISA MOLINE	46
WATER ATLAS OF DUBLIN KATIE HOLTEN	50
HIGHWATERLINE EVE MOSHER	52
TSUNAMI STONES KO SASAKI	54
SMART WATER FRANCESCO CALABRESE, JER HAYES, TOM LEAHY, EMANUELE RAGNOLI	56
TELE-PRESENT WATER DAVID BOWEN	58
BASIN LANE HALL, LISA MOLINE	60
EVENT HORIZON PETROC SESTI	64
BIT.FALL JULIUS POPP	66
HYDROCORDIAN DI MAINSTONE	68
THE PROBLEM WITH THE PLAYPUMP RALPH BORLAND	70
WATER LAB SCIENCE GALLERY	72
URBAN WATER NEEDS: CAN WE KEEP UP? MATTHEW LAWS, HAL WATTS	76
WATERWISE: WASHING FUTURES RUTH DOYLE, ANNA DAVIES, CHRIS JUDGE	78
ARCHIVE OF VATNAJÖKULL KATIE PATERSON	80
LOS ANGELES 'HYDROSCAPE' RORY HARMER	82
PREPAID WATER METER EFTEQ	84
THE SWIMMER FERGAL McCARTHY	88
WATER CONVERSATIONS: PAANI BACHAO ANNA MACLEOD, CAROL HUMMEL	90
HOLY WELLS: HEALING WATERS RONAN FOLEY	92
WATER CATCHERS KAY WESTHUES	94
UNTITLED (MIST) TAEGON KIM	96
SCREENING WALL THOMAS MARCUSSON, CATHERINE HIGHAM, EMMA CRITCHLEY,	98
KIM COLLMER, DANIEL CLAUZIER, PAUL PRUDENCE	

SURFACE TENSION

THE FUTURE OF WATER



██████████ The future of water is the subject of tension. Water is both disposable and sacred, a muse for artists and a necessity for life. It is a source of healing and a source of conflict. The earth has abundant water, but only a very small proportion is available for human use, and a smaller amount still is clean enough to drink. The nearly 7 billion people on the planet rely on the same 1% of all available freshwater as every previous generation. Can the earth's natural systems sustain this, and how should water be managed – as a commodity, or as a public good?

██████████ Life is inextricably bound up with water, to such an extent that the discovery of water on other planets or moons immediately prompts speculation regarding extraterrestrial organisms. Human civilisations critically depend not only on readily available sources of fresh water, but also on the great oceanic conveyor belt – the currents which are critical to climate and the circulation of natural species. The ancient philosopher Thales believed that everything in the world was made of water. Aristotle had it as one of the four fundamental elements, along with earth, air and fire. Only recently have we discovered that water is not an irreducible primary material but made up of hydrogen and oxygen, a very odd substance that actually gets lighter when it freezes; something we take utterly for granted, from the Titanic to a gin and tonic, but which is an utterly bizarre way for a material to behave.

██████████ In a fundamental sense, we are all water-bearers. 75% of the body weight of a newborn infant is made up of water, decreasing to 57% in an adult as we are gradually desiccated. According to the United Nations, 'water is indispensable for leading a life in human dignity and is necessary for the realization of other rights'. And we eat and wear far more water than we drink. Reduction of the 'virtual water' required to create our foods and clothing through rethinking our agricultural processes will be critical in tackling the very serious challenges of scarcity in the next two decades.

While access to safe drinking water appears to be improving globally, in the developing world, the privatisation of water has been the cause of social unrest. In the Middle East, access to water is used as a weapon in political conflict. Emerging 'blue technologies' promise to increase the amount of clean water available to us, but where the problem of water scarcity is a political rather than a technological problem, what instruments will we use to fix it? What new technological and cultural forms will we need to acquire to cope with a water-scarce future?

██████████ SURFACE TENSION brings together artists, designers, engineers and scientists to explore the future of water, playing on its physical properties, its role in living, political and economic systems, and the ways in which it can be harnessed, cleaned and distributed. The multiplicity of perspectives offered by the exhibition reflects the nature of water itself – fluid and shifting, overflowing its boundaries and in continual flux.

██████████ We would like to extend our warmest thanks to our fellow curators Jane Withers and Bruce Misstear for all their work and support in bringing this project to life. We would also like to thank the Science Gallery team, our students at the Trinity College Dublin Idea Translation Lab, our partners in the StudioLab Framework 7 project within which this project has been developed, and our sponsors the EPA and Discover Science and Engineering for their support and engagement.

MICHAEL JOHN GORMAN ██████████
DIRECTOR, SCIENCE GALLERY ██████████

RALPH BORLAND ██████████
CURATOR ██████████

RALPH BORLAND

CURATOR INTERVIEW

RALPH BORLAND IS AN ARTIST AND DESIGNER WHO HAS RECENTLY COMPLETED HIS PhD IN THE SCHOOL OF ENGINEERING AT TRINITY COLLEGE DUBLIN.

There are a number of objects in the exhibition related to developing world access to water – could you say a little about this selection?

Some of these exhibits reflect the problem of limited access to clean drinking water in rural areas of the developing world, and the use of simple technologies to address this: Laurence Gill from Trinity College Dublin's solar disinfection device (p. 20), for example, which uses the sun to sterilise water, or Water for Life's exhibit on their work with hand pumps in Uganda (p. 18). These exhibits show some of the small-scale, practical engineering works being carried out, in this case by Irish institutions, to help improve people's access to clean water in rural areas where they have no mains access to water. But these exhibits represent only part of the story of access to water in the developing world. The *Prepaid water meter* from South Africa (p. 84) represents another part of the story of water access in the developing world – where people in poor urban areas in the developing world have access to mains supply of water, but cannot afford to pay for it. State and private water suppliers in South Africa install prepaid water meters and other 'water management devices' to restrict people's access to water to a legally required minimum, above which they need to pay upfront for more. Prepaid meters have been the subject of intense and protracted legal battles in South Africa in the context of people's 'right to water' where they are unable to pay for it.

You also have an exhibit of your own on the show concerning another water technology in the developing world, the *PlayPump*. What does this exhibit have to say about access to water as an issue in the developing world?

My piece, *The Problem with the PlayPump* (p.70), describes the difference between the way a technology for providing access to water in Southern Africa was perceived by audiences to the project, and by its users. The *PlayPump*, a children's roundabout which pumps water, was very successful as an image and as a story-telling object, attracting a great deal of funding and support, but didn't work as well on the ground as existing technologies for pumping water – such as the humble hand pump featured in Water for Life's exhibit. There is clearly a desire amongst the first world public to support projects which provide help to people in the developing world – but relying on support from these audiences can skew the direction of development. A recent article in The Guardian newspaper, for example, noted that a 'key development goal to halve the number of people without access to basic sanitation by 2015 will be missed because donor countries have diverted aid money away from 'unsexy' water projects, according to the World Bank and the charity WaterAid'. Our intention with *Water for Life's* display on hand pumps, for example, is to show that something humble and hidden – the rubber seals inside a hand pump – may make a big difference to the ability of a technology to keep on providing clean water, even if this doesn't seem as 'sexy' as projects like the *PlayPump*.

■■■■■■ You've highlighted one type of relationship here between developing world and first world. What other relationships do you see between these examples from developing world contexts, and the water issues facing first world audiences to this exhibition?

■■■■■■ One issue that will be of immediate concern to Irish audiences in particular, is that of metering and payment for water – for the first time, the installation of household water meters, and water charges, are set to become law in Ireland. Water management devices such as the prepaid water meter are a step further than metering – the idea of remotely managing a household's water consumption, as these water management devices do, is I think regarded as something like science fiction here, but it's a lived reality in many other countries. Prepaid water meters, incidentally, were found to be illegal in the United Kingdom, as a public health risk – and we should ask why there is this difference between the rights of first world citizens and developing world citizens in their access to water. Paying for water is an emotive issue: some proponents see it as a legitimate way of managing the use of a scarce resource, but it also ignites anxieties over how turning water into a for-profit commodity might unfairly restrict people's access to it. Technologies such as the prepaid meter are often pioneered in the developing world, and then make their way into the first world, so we should learn from the experiences of people on the ground already subject to these technologies.

■■■■■■ What would you say are the most pressing issues around access to water, particularly in the developing world?

■■■■■■ I would say, from my limited research, that managing the maintenance of water technologies in rural areas of the developing world seems to be the biggest problem in ensuring people's continual access to water. You can install a great hand pump, but if it breaks, as it will, and no-one in the community is able to fix it, you're back to square one. That was one reason why the *PlayPump* attracted so much interest – it has billboards on its water tank, and the income from renting the billboards was meant to pay a central maintenance team to come out to fix the pump. But as the prepaid water meter illustrates, providing water in the developing world is not just about remote rural areas – the urban poor is an ever growing demographic. Here I think effective governance and provision of services is the really crucial area, and this is not just a technical but a political issue. Are governments prepared to extend water networks to the poor, and to fund and maintain them, even where recipients are unlikely to be able to pay? When it comes to these questions, we are really engaging with a global issue, and one of ever-increasing intensity – how can we manage our use of water, while addressing inequalities in access to it, and what are the best mechanisms, both technological and political, for doing so?

BRUCE MISSTEAR

CURATOR INTERVIEW

BRUCE MISSTEAR IS AN ASSOCIATE PROFESSOR IN THE SCHOOL OF ENGINEERING AT TRINITY COLLEGE DUBLIN.

How does the earth's water cycle work, and how have our ideas about it developed over time?

The world's rivers pour billions of cubic metres of water into the sea each year, so why doesn't the sea fill up and overflow onto the land? The ancients certainly pondered this question, as they stood on the banks of the great rivers that formed the basis of our earliest civilisations – the annual flood of the Nile alone resulted in some 80 cubic kilometres of water discharging into the Mediterranean Sea. One ingenious theory was that water escaped from the sea bed through submarine tunnels into the base of mountains; the earth's heat then caused this water to evaporate and rise up to the summit of the mountains, which were believed to be hollow, before condensing and discharging as rivers and springs. Trinity's library collection includes a famous 17th century book by Athanasius Kircher propounding this theory. We now know that the hydrological cycle does not work in this way. Rather, it is the energy of the sun that drives the process, with water leaving the sea by evaporation – not by submarine tunnels – and then condensing to form the clouds that produce our rainfall. When this rainfall falls to earth, it infiltrates into the soil where it is consumed by plants. Surplus water either flows overland to rivers and lakes, or percolates downwards to form groundwater. Groundwater, which is my particular research topic, is an important part of the water cycle, as it too moves, albeit very slowly in comparison to surface water, and eventually discharges to rivers, lakes and the sea. Although it is 'out of sight and often out of mind', groundwater makes up 97% of the world's fresh water – leaving aside the polar icecaps – with only 3% in rivers, lakes and in the atmosphere. In certain parts of the world, vast withdrawals of water have led to depletion of groundwater reserves.

Fresh water for drinking might seem like one of most important uses of water – but what are the main pressures on our sources of fresh water?

Human beings are mainly composed of water and we must drink water each day to live – ‘Water is life’ indeed – with increasing demands as our world population grows. The expected future water consumption in urban areas in 2030 is shown by a piece of graphic art on the exhibition, made out of sponges: *Urban Water Needs: Can we keep up?* (p.76) Aside from its domestic use, it is perhaps less well known that most of the world’s fresh water – roughly 70% – is in fact used in agriculture, for the production of our food. As our café menu shows, everyday food and drink items can involve huge amounts of water in their production – 1,000 litres of water for a cup of coffee or more than 15,000 litres for a kilogram of beef! And much of the water that is consumed by agriculture is in the dryer areas of the globe. Other uses of water include water for industry, energy (hydropower, wave energy, geothermal) and recreation. Around 20% of all fresh water abstractions are for industrial or hydropower purposes (this figure increases up to 60% in high-income countries). The water footprint of everyday foods and products is the subject of the *VirtualWater* iPhone application (p. 36), whilst the *Hidden* (p. 38) display explores how product design can reduce the water footprint. Whilst the total rainfall which falls on our planet may be sufficient to meet our water needs, the problem is that this rainfall is not evenly distributed. One projection is that by 2050 there could be as many as 4 billion people living in countries that experience major water shortages. Increasing populations who live in areas of marginal land are especially vulnerable to the impacts of drought, whereas people living in river floodplains and in low-lying coastal areas are at risk from flooding. And we should remember that two of the common predictions of climate change modellers are increased frequency of droughts and floods in the future – the *HighWaterLine* (p. 52) exhibit shows a chalk line drawn on a street in Manhattan illustrating one prediction of future flood levels. It is possible that these resource and population pressures will lead to increased conflict over water, to add to our already considerable historical legacy – one author has compiled a list of 180 water conflicts,

ranging from water being used as a military tool in Sumeria in the 3rd millennium BC to recent disputes between farmers and animal herders in West Africa. The *Basin* (p. 60) exhibit is a blackboard with a chalked flowchart recording the politics that affect water resources in the 21st century.

Besides its importance to humans, what is water’s significance to the larger populations on the planet: to plant and animal life and the natural environment?

One consequence of the intensive use of water for people, agriculture or industry is pollution. In many developing countries, the majority of waste is untreated and can pollute surface waters and groundwaters. Intensive irrigation for food production allied to poor land drainage has led to extensive land salinisation problems in North Africa and South Asia. In parts of Europe and North America, industrialisation and intensive agriculture have caused significant pollution problems. There is an increasing need to protect our water resources, not just from the point of view of safeguarding water for our own domestic and other needs, but also to protect our environment. So far, I have talked mainly about water for people. However, the hydrological cycle also sustains our ecosystems. Our rivers flow during droughts because of groundwater baseflow. In Ireland we have unique ecosystems within bogs, fens and turloughs that depend on water. We need to balance meeting our human water needs with the water needs of the biosphere.

JANE WITHERS

CURATOR INTERVIEW

JANE WITHERS IS A DESIGN CONSULTANT,
WRITER AND CURATOR OF EXHIBITIONS
INCLUDING '1% WATER AND OUR FUTURE'.

Some of the works in this exhibition refer to sacred or particular cultural relationships to water from the past – Ronan Foley’s project to document holy wells in Ireland, for example (p. 92). What is the significance to the ‘future of water’ of these past traditions and human relationships to water?

What’s interesting about many vernacular ideas about water is the importance water had in most cultures globally – it had a symbolic importance that was clearly also linked to practical importance. So you have mythologies, rituals and religious ideas that helped to protect and connect us to water and helped us understand it and I think one of the problems is that we’ve really lost this connection. Since industrialisation we have taken water for granted as ‘H₂O’, clear, clean stuff that comes out of taps, and we’re surprised when it doesn’t always behave as we want it to. There’s a wonderful quote by D.H. Lawrence: ‘Water is H₂O, hydrogen two parts, oxygen one, but there is also a third thing that makes it water and nobody knows what it is’. It is this sense of mystery, even reverence for water that is missing today, and perhaps has something to do with the way we use and abuse it? Past mythologies about water are often an important reminder of our relationship to water: every culture has its flood stories, for example, with warnings about the destructive force of water whether one thinks of the Bible and Noah’s Ark or, in Hindu mythology, Lord Vishnu appearing as a fish to save humanity from the floods. *Tsunami Stones* (p. 54) are a good reminder of this, that one can make a warning for future generations; or Indian step wells, inverted pyramids that fill with ground water and monsoon rains, which were largely put out of use under British rule. Several have recently been successfully restored. They serve as practical sources of water, as religious and social spaces and also as playgrounds for children. They are at the centre of the community in so many ways, and that also helps protect the communal water resource. We’ve lost an intrinsic understanding of water that we may have had in the past, and this is something that we can regain, to understand its place in our world and on the planet better. Perhaps through this we would treat it more responsibly and sustainably in the future – and perhaps more pleurably too.

■■■■■■■■ You've mentioned children playing in step wells, and about recovering a pleasurable relationship to water. Some of our exhibits deal with water for play, water as an aesthetic inspiration. Could you say a little more about the pleasure of water?

■■■■■■■■ Well, you could say that since we've made water invisible, piped invisibly into our lives, this is something else that we've lost. Bathing now typically takes place alone in clinical boxes with hard shiny hygienic surfaces, whereas we used to go to the bath-house, which functioned as a social space like the pub or coffee bar, and which from historic accounts and illustrations - whether of Roman baths, Ottoman hamams or spas in the 17th century - looked like a lot of fun! We've forgotten that people used to gather around water, bathe together and enjoy water together. We have also pretty much lost the belief in the healing powers of water that used to be at the heart of the Spa – Salus Per Aqua or healing through water. This of course also links to the Irish holy wells documented in Ronan Foley's project (p. 92).

■■■■■■■■ A number of the works on the show involved engaging people in conversation about water – Eve Mosher's *HighWaterLine* (p. 52), Anna MacLeod and Carol Hummel's *Water Conversations* (p. 90) or Mary Coble's piece *Source (Dublin)* (p. 14) for example. Could you say more about the relationship of narratives, of stories and conversations, to water?

■■■■■■■■ Yes, I think that one of the issues is that we don't talk much about it today; we ignore it, and become distanced from it. It's interesting that as Kay Westhues documents in *Water Catchers* (p. 94), people who have water on tap will travel to an artesian well to collect groundwater in a kind of ancient ritual; and in Ronan Foley's documentation of holy wells, we can see that these strong ideas about the magical properties of water have persisted. These are a live part of our history that has been handed down, probably often verbally. Conversation flows like water or dries up, brooks 'babble'... And there's the Aboriginal idea of 'song lines', which are sung and walked journeys punctuated by natural phenomena such as water sources – a conversation around water and how man survives. Most cultures have their water conversations and stories. These artists in the exhibition may be bringing this to life and making it relevant again. It's through conversation that you can get people to engage with ideas. With Eve Mosher's work it's rather a magical idea, to draw a line across our streets and through our lives and have us engage with issues like climate change that might otherwise remain quite abstract and distinct. In Katie Patterson's work (p. 80), which is quite like engaging a glacier in conversation, or at least listening to the sound of a glacier, she uses a 21st century technology to bring you something so ancient and historic. Conversations such as these can connect the past and the future. The other aspects of where the past can be relevant to the future is in the water know how and technologies that we've lost. I mentioned step wells earlier – there are also all sorts of vernacular technologies for rain harvesting that we have forgotten about. Or the association between terracotta and water, for example, which cools water through evaporation, is an ancient one, and some designers are beginning to pick up on it again today and use it in new ways. A lot of vernacular ideas and practices around water have been lost but could be as relevant today as ever.

ALAN RICE & KATIE GILLIGAN

IDEA TRANSLATION LAB STUDENT INTERVIEWS

■ The Idea Translation Lab (ITL), based on a course of the same name at Harvard University, is a broad curriculum course for undergraduate students at Trinity College Dublin delivered by Science Gallery. In the course, students design projects along a theme, using a multidisciplinary innovation process. Professor David Edwards, the founder of ITL at Harvard, hosts summer workshops for students at the art-science space Le Laboratoire in Paris. The ITL course additionally feeds into a three year European Framework 7 project Studiolab, which Science Gallery coordinates with a range of partners including Le Laboratoire in Paris, Royal College of Art in London, Ars Electronica in Linz and MediaLab Prado in Madrid. Science Gallery caught up with ITL Dublin students Alan Rice and Katie Gilligan to ask about their experiences of the course at Science Gallery and the summer workshops.

■ You have both just taken part in the ITL course at Science Gallery and completed a weeklong workshop in Paris, both on the theme ‘the future of water’. What was your experience of the course and what stands out for you?

AR: For me, the course was very inspiring. By the end of the workshop in Paris, I was entirely convinced I could tackle an issue and make a difference. I think it was the diversity of speakers and individuals we got to meet, both during the course and then later in Paris, that led me to feel that way: scientists and engineers, artists and designers and venture capitalists, lawyers and entrepreneurs, all from different backgrounds with their own advice and insights. It became apparent that everyone has something valuable they can contribute. The course highlighted not only that collaboration between scientists and artists leads to a better end product but also to never lose sight of the user, the person who will interact with your idea, and how you can serve them best.

KG: On a practical level this course provided a solid grounding in teamwork, presentation skills, research, environmental awareness and the exploration of an exciting new domain where the first shockwaves of the art-science collision in Ireland are being felt. On a personal level, unlike many of the courses I have previously studied, the scope of this course reached farther than

I ever anticipated. Alongside the education in environmental awareness, water-related issues and communication skills that the course included, I have received experience in business, law, social awareness, advertising and many other diverse fields. I have been privileged to meet and learn from experts and other students from around the world who have convinced me that among other things, one dedicated individual, with an idea that they truly believe in, is enough to make a change. The ability to start a business, change a social norm, invent a new product, improve an existing one, or pursue a ridiculous dream are all achievable goals.

Could you tell me about the projects you worked on and the inspiration behind them?

AR: Katie and I were working on a project called *Leaucate*, a campaign to reduce bottled water consumption in Dublin City. Using a refillable bottle, a person can go into one of a network of participating cafés across the city and have their bottle filled with tap water for free, with no purchase required. A discount applies if they make a purchase, leading to increased foot traffic and sales for the café. The inspiration for this idea came from the amount of waste generated by plastic bottles, of which a large amount is not recycled, and the significant amount of water used in their production. We felt that this unnecessary and wasteful practice needs to change, and began to investigate alternatives. We found that Irish tap water is of excellent drinking quality and planned to somehow highlight public drinking fountains around the city, which people could use to refill their bottles. To our surprise we found that public drinking fountains no longer exist in the city, and so we decided to create a network of supply points in cafes in their place.

KG: We were shocked with the amount of water that is wasted with each plastic bottle sale in Ireland: for a bottle of 500ml, over 4.2 litres of water are required in its collection, manufacturing and distribution. This figure is shocking especially considering the availability of clean, free water here in Dublin. Instead of embarking upon a campaign to install public drinking fountains around the city of Dublin, where surprisingly none currently exist, our group decided to tap into the availability of water from private outlets around the city.


The idea is that *Leaucate* branded bottles and stickers will be recognised in participating cafés and restaurants around the city, where individuals can refill for free with the added bonus of discounts and special offers. The participating outlets will be easily located using the Leaucate website and a smartphone application. Benefits to the outlets are numerous, including increased advertising, business and foot traffic alongside an environmentally friendly image. In essence the campaign is a win-win programme for customers and outlets alike.

Has your work on these projects changed your opinions about the issues affecting water? Does anything in particular stand out for you?

AR: My opinion has most definitely changed. It became apparent that water, a resource I once considered infinite, is actually finite and extremely valuable. What stood out for me was the massive divide between water-use in developed and developing countries. The contrast of the daily struggle for clean drinking water in the developing world and the wastefulness and inefficiency found in developed countries is an issue we should tackle both at home and abroad.

KG: Absolutely. No amount of research or education on water conservation, waste and wise water management can compete with the eye-opening experience of this course. Exploring the causes and solutions around water problems and critically analysing some of the current water-related establishments, services and attitudes highlights water issues in a unique way. People underestimate the huge role that water plays in their lives on levels that they can't even imagine. The fact that water is used for sanitation, leisure, and is 90% of our biological make up was old news to me but not the use of water in services, in manufacturing of jeans, cars, houses, paint, jewellery, the production of food, in medicine, transport, sport and so on – the list is endless. Turning off the tap when we brush our teeth isn't enough. We have to tackle all of these areas of water use and waste, not just the ones that are easy to tap in to and turn off.

drink



Almost 98% of the planet's water is in our seas and oceans. Less than 1% of the remaining fresh water on earth is readily accessible to humans (or 0.007% of the total water on the planet). The majority of that water is used in agriculture and industry, which leaves only a tiny proportion for that most vital function, water to drink. This section of the catalogue highlights projects that call attention to the scarcity and value of drinking water, and our relationship to it, or suggest means of acquiring it.



Photo Detail: **Chris Gregory**



SOURCE (DUBLIN) FIELD OF WATER

MARY COBLE

For *Source (Dublin)*, the artist Mary Coble will collect samples of tap water from over 100 residential and commercial sites across Dublin to create a water archive, or *Field of Water*, in Science Gallery. In a one-day performance that mimes the near Sisyphian acts of daily water collection in the developing world, Coble will lift and pour these samples into a fountain that continuously filters the water. At the end of the performance, water from all over the city, now in this central source, will be available to gallery visitors to drink for the rest of the exhibition period. *Source (Dublin)* is the continuation of a project, first run in Washington DC in 2010, which aims to raise social awareness about water quality and availability in local and global communities. Through the process of water collection, Coble engages communities in conversations that address the economic, ecological and health issues related to the commercialisation and commoditisation of water. Where does your local water come from and how far do you trust its reported quality? Who has access to pure water? How long will local and global water supplies last? What are the costs – financially and ethically – of bottling and transporting water?

POUCH

OLIVIA DECARIS

█ *Pouch* proposes an innovative way to consume water. Inspired by a cow's udder, it is a malleable carafe that allows the user to fill his or her glass with water – or whichever liquid the pouch has been filled with – by pulling and squeezing the product's tip. When positioned next to a faucet, *Pouch* invites the user to consider their consumption of water, drawn carefully from it rather than running freely. *Pouch* is made from food-grade liquid silicone, which is tasteless, sustainable, and temperature resistant. It conforms to health and safety regulations and is produced through a process of rotational moulding, which allows the creation of a very thin layer of material that will expand when filled with liquid. The silicone pouch expands and contracts as it is filled with water, offering the user a new sensorial experience with 'the free element' enclosed and transformed by the *Pouch*.



Photo Detail:
Olivia Decaris



WATER WEAR

KIMMIT SAYERS, BRIAN CORCORAN
ANDREW CLARKE, LAR BOLAND

█ The simple, manually operated suction hand-pump provides an essential lifeline for millions of people around the world, especially in developing countries. However, broken and poorly performing pumps are a common sight, and limited resources often mean that their maintenance is neglected. Until now, this vital device has undergone relatively little design analysis. For example, small solid particles contained in the water can act as abrasives as the suction pump draws groundwater to the surface. Over time, this wears down the seal resulting in women and young children, who typically collect water, expending a lot of physical energy and time on the task of water collection. Research into more durable pump seals is currently being conducted in Ireland in collaboration with Ugandan researchers. This research forms one part of the 'Water is Life' project, the overall aim of which is to conduct research that supports sustainable water resource management as a catalyst for sustainable economic and social development in the Makondo area of rural Uganda. *Water Wear* allows visitors to operate a pump and experience the workload that young arms must endure. Accompanying video screens show both the real world setting for the pump in Uganda and the research work in the laboratory in Ireland testing new seals.



Photo Detail:
Lar Boland





Photo Detail:
Colin Price



USING SUNLIGHT TO CLEAN WATER

LAURENCE GILL

Water-related diseases account for the majority of premature deaths in sub-Saharan Africa and other developing parts of the world which, in many cases, could be alleviated by the provision of an adequate supply of water for both drinking and washing. In such situations there are often neither the finances nor the resources to construct and maintain the types of water treatment processes used in more industrialised countries which tend to be both energy and chemical intensive. Sunlight can be used to destroy disease-causing pathogens in polluted drinking water, with ultraviolet radiation and solar heat disrupting their metabolism and cellular structures. This project demonstrates the principle of a continuous flow solar disinfection and arsenic removal system technology that has been developed in Trinity College Dublin to produce clean water supplies at a village-scale in developing countries. The basic principle of the system involves water flowing through a transparent pipe at the focal point of a compound parabolic reflector, optimally angled beneath the pipe for maximum sunlight capture.



Photo Detail:
Peter Evers




AQUA-NU FILTER WATER BOTTLE

AQUA-NU FILTRATION SYSTEMS

■ SURFACE TENSION: THE FUTURE OF WATER marks the global introduction of the Aqua-Nu reusable microbial-free ceramic filter water bottle for personal use. *Aqua-Nu Filtration Systems'* ceramic membrane filter is a disruptive innovation with global potential for supplying cost-effective, safe and pure drinking water in a wide range of consumer, humanitarian and industrial applications. The Irish company's Ultra High Unassisted Flow Rate ceramic filter achieves unrivalled removal of life-threatening microbial culture, without any usage compromise or prohibitive cost. It is the first filter with an unassisted flow rate of up to 1.2 litres of water per minute that removes 99.9999% of harmful microbes such as *Cryptosporidium*. Aqua-Nu's flow and filter rate has been independently tested and certified, and the flow rate is up to 700 times faster than the closest rival product in ceramics today. The Aqua-Nu membrane filtration technology is the result of six years of research and development into non-chemical based ceramics and original anti-microbial treatment systems. The ceramic has worldwide importance as a global standard in water purity and safety given its low unit cost-to-performance ratio, flow rate and microbe clear rate.

dirty



Our oceans are home to enormous floating islands of plastic, the accumulated pollution of the earth's human population. Calamities such as the recent Deepwater Horizon spill have leaked millions of barrels of crude oil into the seas. On land, pharmaceutical drugs that have entered our water cycle and are resistant to conventional filtering may influence our health and physical development. The works in this section suggest ways in which we could clean our oceans and, more darkly, ways to prepare ourselves for the effects which pollutants in our water supply may have on our bodies in the future.



Photo Detail:
The Sea Chair Project



THE SEA CHAIR PROJECT

KIEREN JONES
ALEXANDER GROVES
AZUSA MURAKAMI

■■■■■ A ‘plastic soup’ of waste floats in the Pacific Ocean. Growing at an alarming rate, it is already double the area of the United States. This plastic waste doesn’t sink and it takes thousands of years to degrade. Plastic fragments include a large amount of nurdles, plastic pellets about 2mm in diameter that are the virgin raw material for injection moulding. These nurdles can be found littered on almost every shoreline in the world, and the United Nations estimates that there are 13,000 nurdles floating in every square mile of the ocean. How can we solve the problem of accumulating plastic in our oceans? *The Sea Chair Project* aims to turn a retired fishing trawler into a plastic chair factory, fishing the plastic from the polluted seas and beaches around the South West coast of the UK. With the EU unveiling plans to pay fisherman for plastic by-catch, and advances in the development of nets for collecting plastics with minimal damage to marine wildlife, a floating factory ship that recycles this marine waste into sea chairs would support fishing communities and make use of their rich and diverse skill sets. Integral to this plan is the ‘Nurdler’, a hand-powered water pump that sorts micro plastic from larger and denser materials and collects washed up plastic from the shore.



Photo Detail:
Cesar Harada



PROTEI 002

PROTEI

Oil spills destroy wildlife, human health, and have serious effects on the economy. Despite billions of dollars being invested into new technologies for the management of oil spills, they are still incredibly difficult to contain and treat. Oil from a spill drifts downwind, following surface currents. One technique to manage this drift is to use skimmers – repurposed fishing boats that contain and absorb the oil. Despite being mobilised in their hundreds, skimmers absorb a relatively small proportion of oil from a spill. Protei have come up with a way to optimise the process using existing technology and an innovative open source design. *Protei_002* is a prototype for a fleet of low-cost, articulated, DIY, semi-autonomous oil-collecting sailboats. The full-sized boat pulls a sorbent boom, which absorbs oil off the top of water near spill sites. It is the first sailboat that can catch winds from both sides and can therefore sail upwind and intercept the oil sheens as they travel downwind. It can be controlled remotely and so does not endanger the health of operators. It can travel long distances from shore, work continuously during the day or night, and is much cheaper than existing skimming technologies. It is open source, making it possible for individuals to tailor the design to different functions, and to collaborate on its development.



Photo Detail:
Yong Jieyu

DESIGNING CONSEQUENCES

YONG JIEYU

Conditions + Consequences = Social Evolution. *Designing Consequences* is a proposition for design to take on the role of forecaster and communicator. Three works by the artist Yong Jieyu take the particular example of chemical changes in our water as their subject. By investigating the effects of chemically altered water on our environment and bodies, a series of 'future objects' have been projected and designed. The *Umbilical Cord Filter* is a response to scientific studies that have found hundreds of disruptive chemicals in mothers' bodies. What happens when we need to filter ourselves to keep our babies safe? *Activated Carbon Ice Cubes* are designed to absorb impurities in your glass of water. And *Precocious Matryoshka Dolls* are designed to help ease the discussion of issues arising from precocious puberty caused by estrogen & other chemical pollutants in water. All three objects propose scenarios and ask questions about the consequences of our industrial development on the natural world, and on our own health and security.



Photo Detail:
The Social House



DRINK LOCAL WATER... WHATEVER IT IS

COLIN HART

— In this piece of provocative public art, designer Colin Hart has taken water from a Dublin canal to be cleaned through a filtration system provided by Caraquill Water in Science Gallery for exhibition visitors to drink. He has also placed an advertisement for an imagined, future bottled-water company at the canal, directing passers-by to Science Gallery. In cities around the world, water is already captured, cleaned and redistributed from sewerage and grey water. In Singapore, NEWater is a brand of drinking water produced by the country's Public Utilities Board from reclaimed water. First attempted in 1974, the scheme closed after a year, and was only relaunched in 2000. There are now four NEWater plants in Singapore. Water is getting scarce and will inevitably become expensive. At some point in the near future we are going to have to resort to less than palatable ways to acquire drinking water. How far will we go in future to get clean water? Try some fresh Dublin Canal Water if you dare!

hidden

Water contains more than is visible to the eye – and water may be present even where we can't see it. We can derive energy from water, through age-old technologies such as water mills that harness the kinetic energy of running water, or more recently through extracting hydrogen for fuel. Objects that don't look watery may still contain 'embodied' water – the water that it took to produce them. Embodied or 'virtual' water hidden in the products of agriculture and industry has a much greater impact on our water resources than the water we consume through drinking.

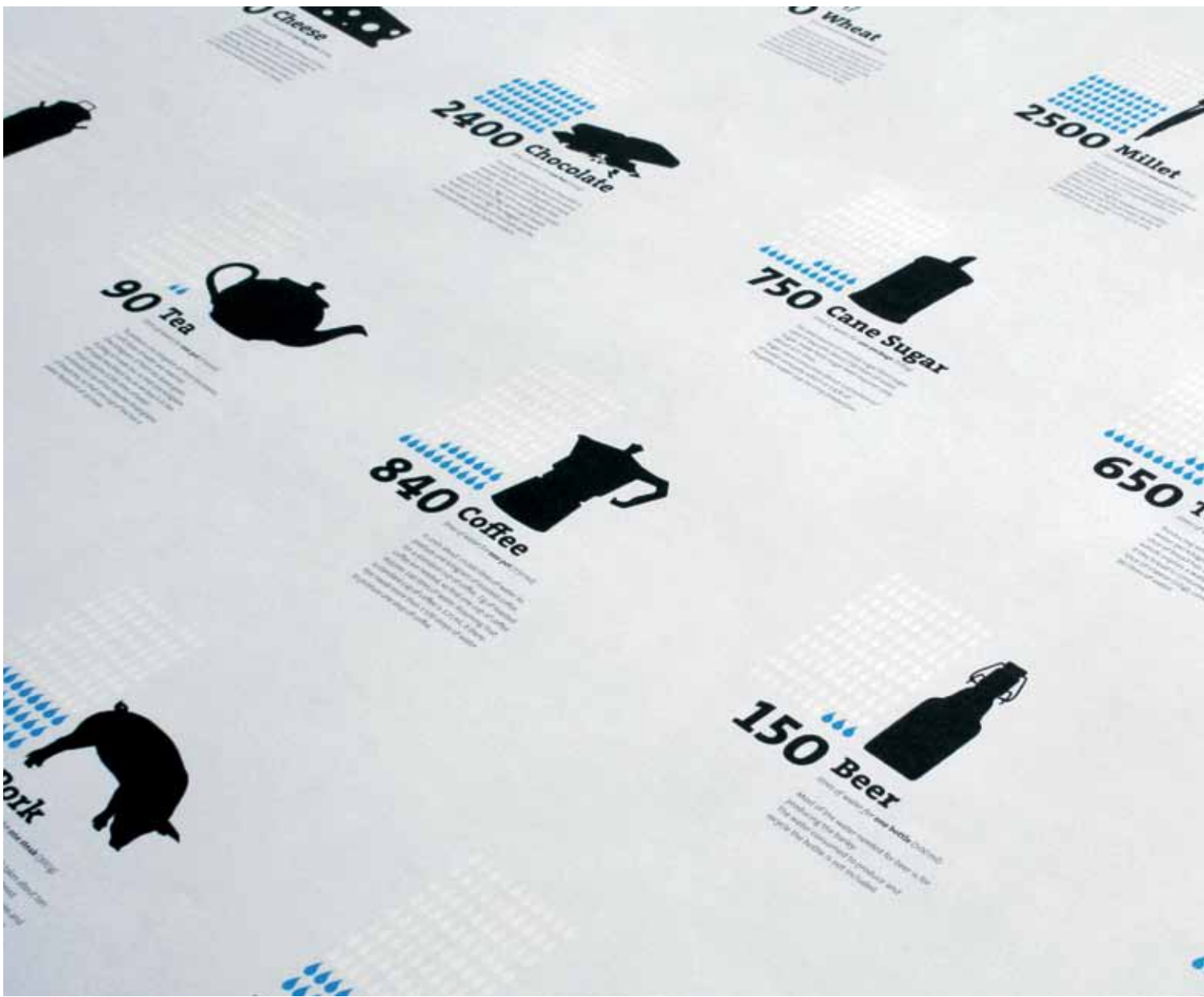


Photo Detail:
Timm Kekeritz



THE VIRTUAL WATER PROJECT

TIMM KEKERITZ

People use large amounts of water for drinking, cooking and washing, and even more for producing things such as food, paper, cotton clothes, and almost every other physical product. Usually, the amount of freshwater that goes into making a product – its virtual water content – far exceeds the amount contained in it at the end of the process. The water footprint of a person, company or nation is not unlike their ecological footprint. It is defined as the total volume of freshwater that is used to produce the commodities, goods and services that they consume. Based on data gathered by Hoeckstra et al. on the water footprints of nations, designer Timm Kekeritz created a set of infographics to make the issue of virtual water and the water footprint perceivable. In collaboration with his colleague Frank Rausch, the *Virtual Water* iOS app was created in 2010. Its design is minimalistic, using only silhouettes and elegant typography, and featuring the elegant typefaces, TheSans and TheSerif by Luc(as) de Groot. The design has become popular worldwide, published in newspapers, magazines, websites and blogs around the globe.



Photo Detail:
Matthew Costello



HIDDEN

MATTHEW COSTELLO

■ In Ireland and the UK, the average person uses 150 litres of water per day, which includes not only the water we drink, but that which we use for washing, in the toilet, or for watering plants. Yet, if we consider the 'virtual' or embodied water used to produce the goods and food we consume, our daily average is much closer to 3,400 litres of water per person per day. This 'hidden' water accounts for nearly 96% of our daily consumption! *Hidden* explores the virtual water present in manufactured goods and industrial materials. It includes a set of glass vessels designed to communicate the differing amounts of water required to produce a range of industrial materials. The stopper in each bottle is manufactured from a different material: steel, aluminium, epoxy, glass and ceramic. The vessels are sized to contain the amount of water used to produce that bottle's cap. Prototypes for goods that use less water are another output of the project. An alarm clock and smoke detector have been redesigned in cork and ceramic: materials that use less water than the usual plastic and metal from which these products are manufactured. They demonstrate the possibility for reducing the amount of water hidden in our everyday goods.

BOTTLED WASTE

HAL WATTS

How much energy goes into creating a 1 litre bottle of water? On average, its 'embodied' energy is up around the 5 megajoule mark - this is more than 1,000 times the energy embodied in a litre of tap water.

Consisting of a series of gearings, a small pump and a brake, *Bottled Waste* attempts to make this issue tangible by making visitors supply the energy required to produce a litre of either bottled or tap water. The user must turn the pump handle for approximately 3 hours to pump one litre of bottled water, meaning that they will have supplied the amount of energy embodied in that bottled water. By moving a clutch and the handle, the pump can be set to tap water mode. It pumps faster and the brake is disengaged meaning that the user can pump a litre in under 20 minutes, using 1,000 times less energy.

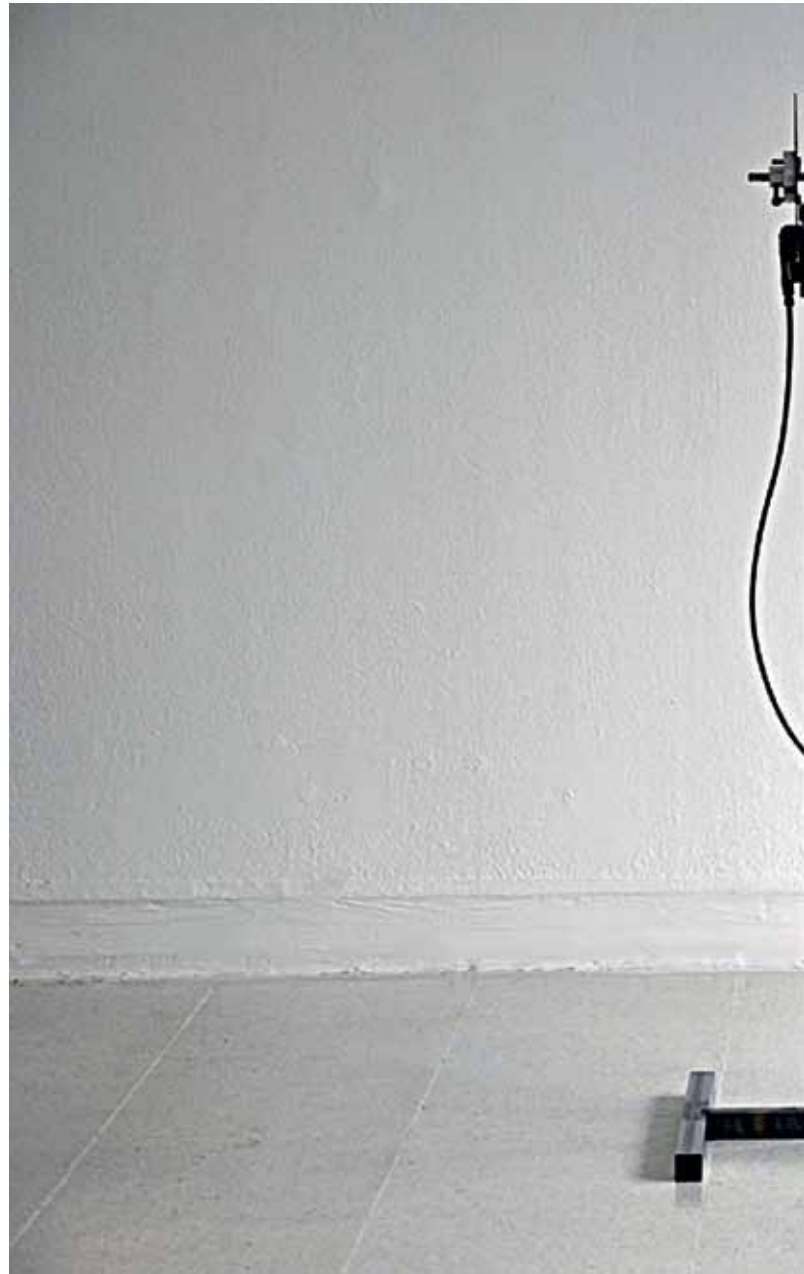


Photo Detail:
Hal Watts





Photo Detail:
Jonas Kullman



POWER TREKK

myFC AB



PowerTrekK is a pocket-size, lightweight charger for users who spend time away from the electrical grid. Providing instant power anywhere, *PowerTrekK* uses advanced fuel cell technology which cleanly and efficiently converts hydrogen into electricity. With its rugged, waterproof casing and robust technology on the inside, *PowerTrekK* is designed to match demanding requirements. *PowerTrekK* is both a portable battery pack and fuel cell. The portable battery pack can be operated on its own as a ready source of power or storage buffer for the fuel cell. The fuel cell enables instant charging from a depleted battery state without ever needing a wall charge. Users simply insert a fuel pack and add water. To charge portable devices – for example mobile phones, cameras and GPS devices – users connect a device to *PowerTrekK* via a USB port. *PowerTrekK* was developed by myFC, a Swedish fuel cell technology company that develops solutions for powering portable electronics. Having secured numerous patents around proprietary shape-flexible fuel cell systems with record high power density, *PowerTrekK* is the first commercial portable charger using myFC technology. Since the hydrogen fuel can be supplied from several alternative sources, the system is ‘flexifuel’. The chemistry process is safe and eco-friendly, and the only by-product from the fuel cell is a little water vapour.

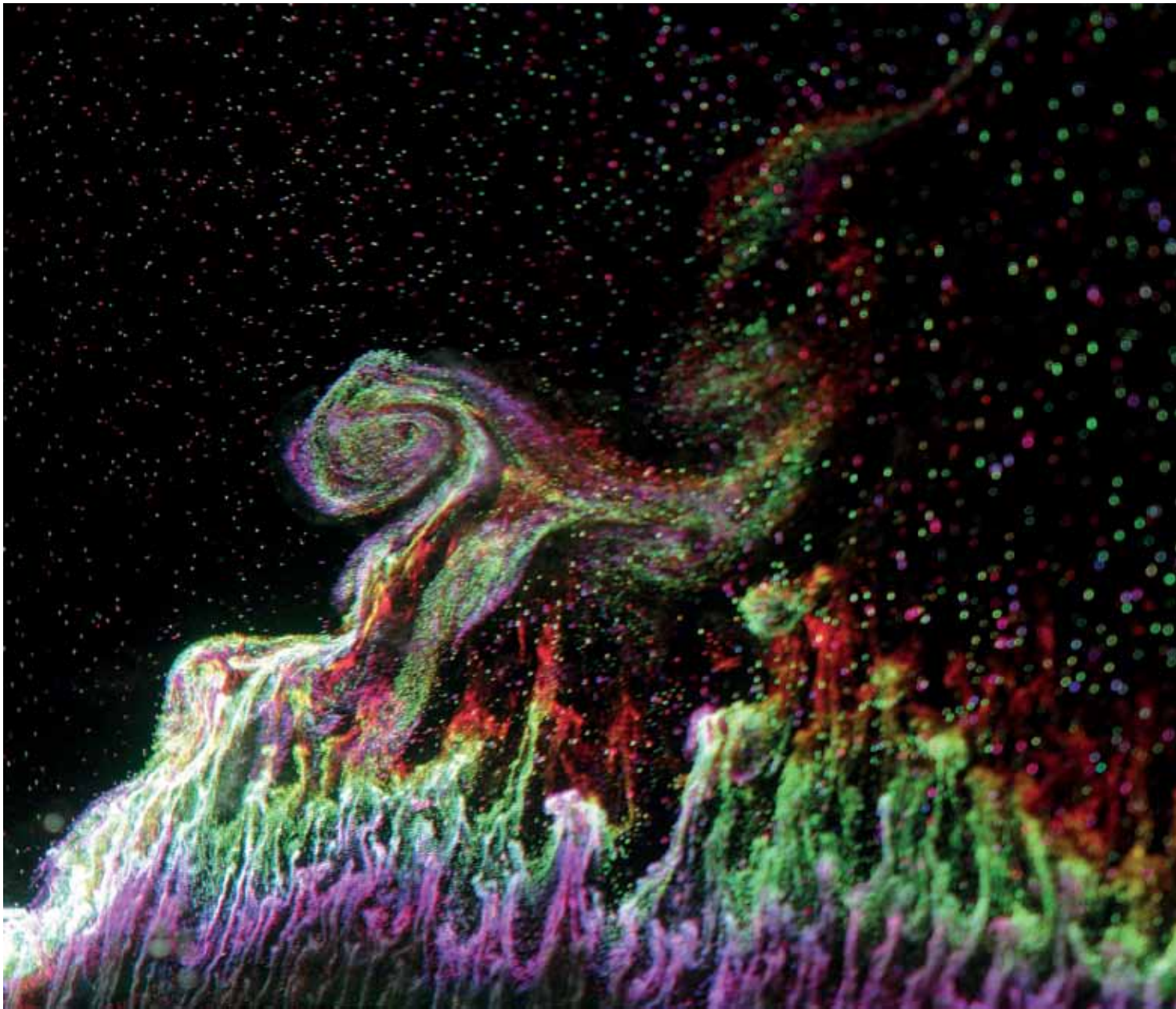


Photo Detail:
Evelina Domnitch & Dmitry Gelfand



HYDROGENY

EVELINA DOMNITCH,
DMITRY GELFAND

■ Nature's simplest atom and mother of all matter, hydrogen, feeds the stars as well as interlaces the molecules of their biological descendants - to whom it ultimately whispers the secrets of quantum reality. Emanating from an array of electrodes at the bottom of a water-filled chamber, strings and strata of hydrogen bubbles slowly rise to the surface. A white laser sheet illuminates the bubble trajectories as it breaks up into its constituent spectrum of colours. Some researchers presume that these nanobubbles of dissolved gas are the carriers of water's magnetic 'memory', enabling electromagnetic fields to saturate its innards for hours and even days after their initial appearance. In the seas and oceans, the lingering presence of electromagnetic fields photonically imparted by sunlight triggers the electrolysis responsible for most of Earth's hydrogen. An essential form of photosynthesis, solar water splitting is the cleanest and most efficient means imaginable for generating and storing energy. *Hydrogeny* continues Evelina and Dmitry's work in constructing art installations that offer ever-transforming phenomena for the viewer's observation. 'The immediacy of this experience', write the artists, 'allows the observer to transcend the illusory distinction between scientific discovery and perceptual expansion'.

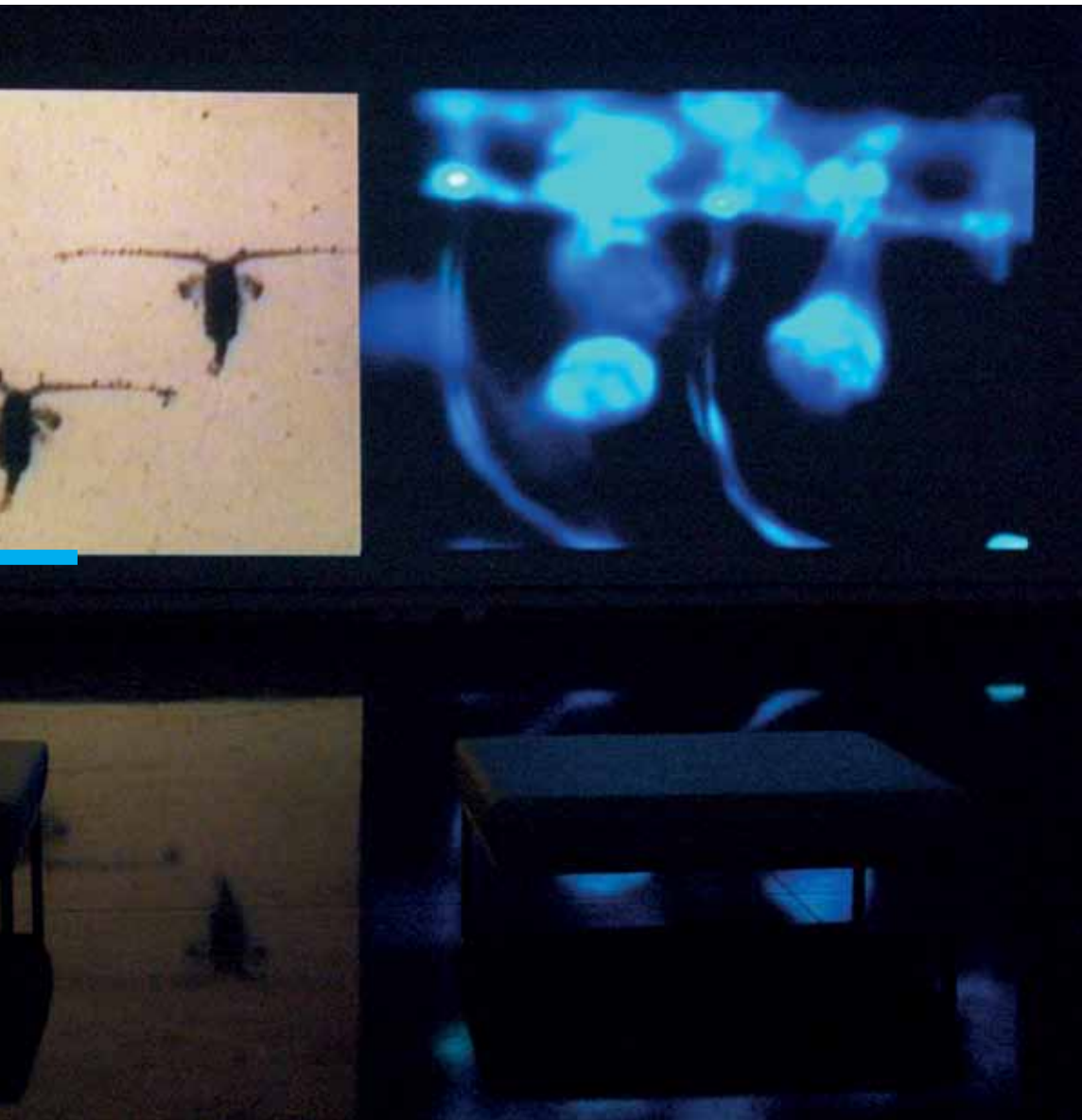
UNDERWATER NOISE OF RAIN

LANE HALL, LISA MOLINE

— *Underwater Noise of Rain* is a video and sound installation. Its subject is plankton and zooplankton (primarily freshwater Copepods), bellwether organisms whose populations are indicators of the health of our ecosystem. *Underwater Noise of Rain* uses explorations of scale to allow otherwise-invisible water animals to occupy the same corporeal space as the viewer, radically repositioning the human in relation to the nearly invisible water creatures. What is tiny becomes monumental, monstrous, and haunting. The artwork explores issues of scale and representation of invisible nature. Composed of connected fragments, the installation inverts relationships between microcosm and macrocosm. The source of the film and video footage is the archive of Dr. Rudi Strickler, biologist and Distinguished Professor at the University of Wisconsin-Milwaukee's Water Institute.




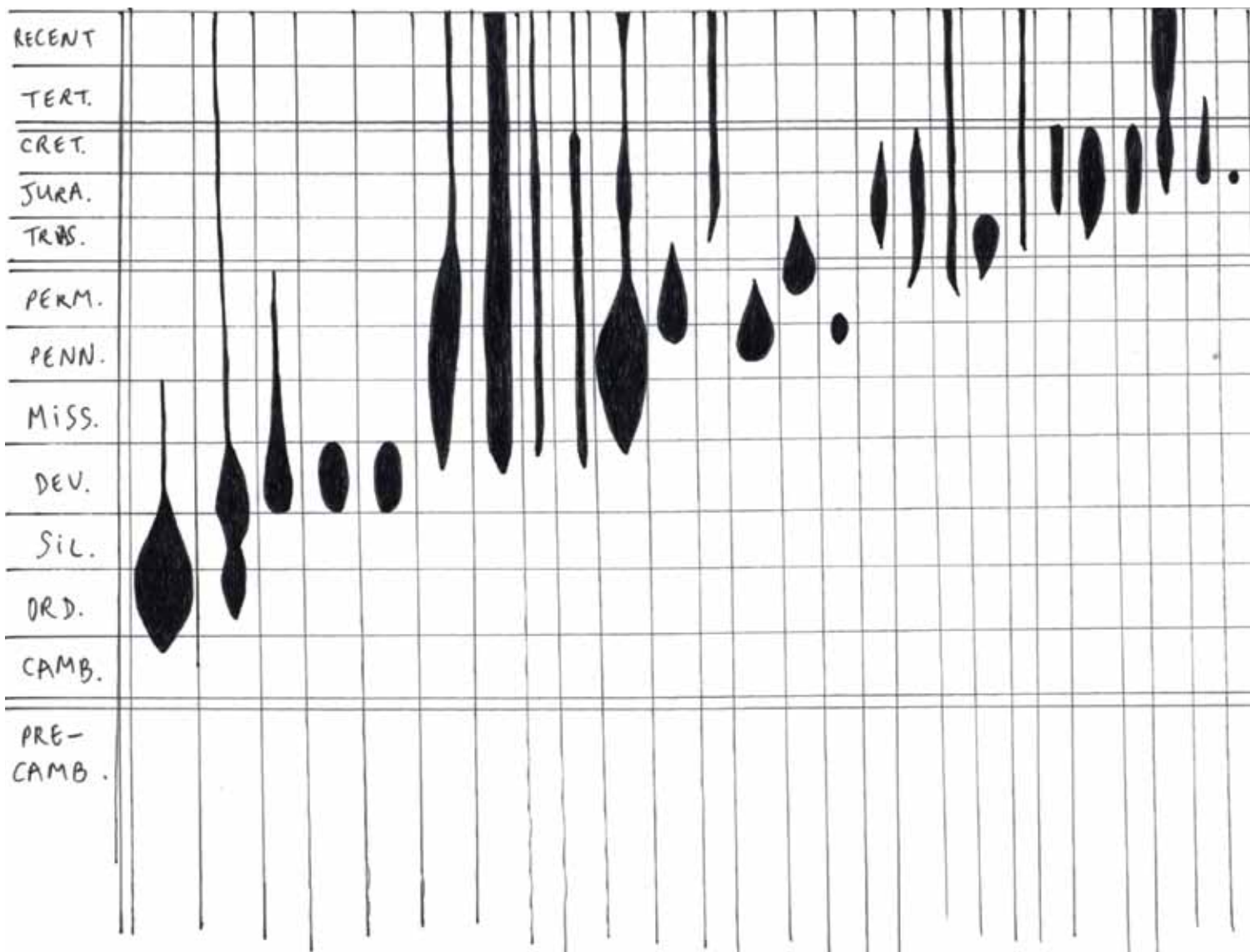
Photo Detail:
Lane Hall



map

Some of the works in this exhibition explore and map the flow of water, through our cities and through the wider water cycle. Understanding how water is used in urban areas can help us to manage and conserve it. Mapping the presence of modern and ancient waterways where we live and work could help us venerate and respect it; and projecting the movement of water forward in time could alert us to the risks our habitats face from rising sea levels, pollution and overuse.







WATER ATLAS OF DUBLIN

KATIE HOLTEN

Water Atlas of Dublin presents an alternative map of the city, one that is not confined by physical and political boundaries. Instead, the atlas explores innumerable invisible aspects such as food and water networks, cloud formation, insect paths, weed dispersal, and geological foundations. It is a collection of maps, of facts, of versions of place – a compendium of views. *Water Atlas of Dublin* maps the contours of water within the city of Dublin – combining drawings with historical, factual information and anecdotal, remembered data, as well as found diagrams, photographs, and texts. The atlas investigates how we conceive of and perceive water within the city. As such, it will help expand our understanding of Dublin as one integrated, natural system. ‘No two people,’ Rebecca Solnit writes, ‘live in the same city’. Dublin is in practice infinite.



Photo Detail:
Hose Cedeno



HIGH WATERLINE DUBLIN

EVE MOSHER

HighWaterLine Dublin is an interactive exploration of the effects of climate change on the future of Dublin. Based on the 2007 project, *HighWaterLine* in New York City, the project looks at scientific data on the increased flooding associated with climate change, and creates a real world intervention. For *HighWaterLine* in New York, Eve Mosher drew a chalk line through the city 10 feet above sea-level, indicating the zone already at risk of flooding – a risk that has increased with global warming. There are already areas of Brooklyn, NY that are uninsurable due to this increased likelihood of flooding. In Dublin, the artist, working with local youth and communities, will research, map and then draw the flood zone along the banks of the Liffey, using the act as an opportunity for conversation with residents about climate change, its effects, and the steps we might take to address climate change and global warming. The project seeks to reach a broad and diverse audience by literally taking the discussion to the streets that will actually feel the greatest impact of flooding, and drawing attention through an artistic and highly visible intervention.



Photo Detail:
Ko Sasaki



TSUNAMI STONES

KO SASAKI

Imposing, tall stones that date back hundreds of years are installed along the North East coastline of Japan, serving as warnings, information points, and grim reminders of the danger and destructive force of tsunamis. Sometimes as tall as 10 feet, these 'tsunami stones' carried inscriptions that insured important information about tsunamis was transmitted from one generation to the next. Many instructed people to immediately flee to higher ground in the event of a strong earthquake. Some indicated places that were at a safe distance from a tsunami's reach. Others bore details of the death and destruction caused by past tsunamis. For centuries, the stones have warned people of these dangers, influencing their response to tsunamis and even affecting where villages were built. Although they have since been replaced by more technological warning and defence systems, they persist as reminders of the effect tsunamis have had on Japan's history.

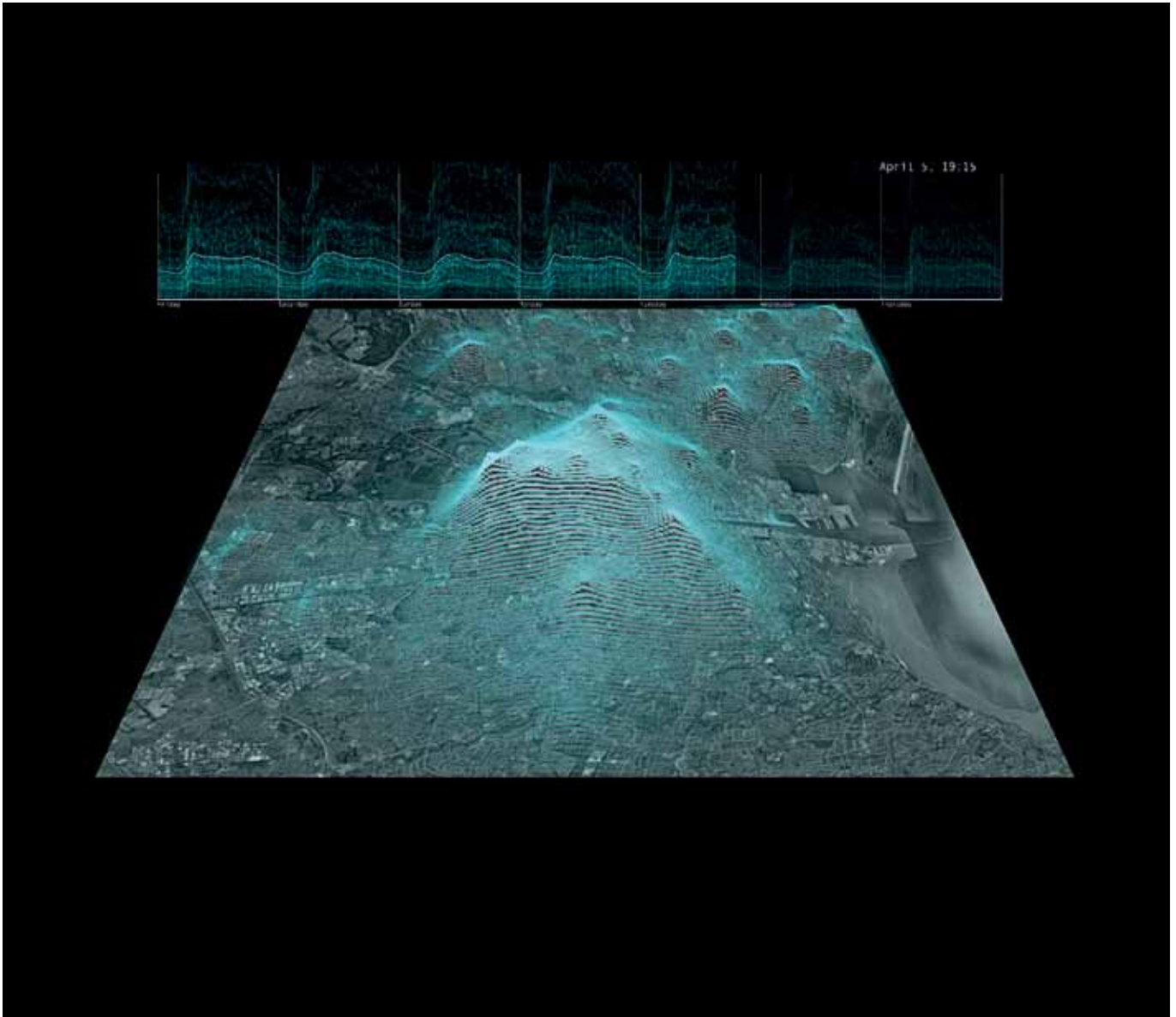
SMARTER WATER

IBM, DUBLIN CITY COUNCIL

FRANCESCO CALABRESE, JER HAYES, TOM LEAHY, EMANUELE RAGNOLI

■ Managing a city's water infrastructure presents significant challenges.

Similar in extent to electricity infrastructure, it intends to connect to every house and property. By 2030, it is expected that 60 percent of the world's population, or nearly five billion people, will live in cities, putting an overwhelming strain on already overburdened water infrastructure. Much of a city's water infrastructure runs underground, out of sight of the average person. With the support of Dublin City Council, this installation maps data from the water network system in ways that allow visitors to see how water is used through a city infrastructure at different times when demand varies. Differences between working days and non-working days will be shown in order to highlight the impact of people on the city's water throughout a typical workday – 'a day in the life of a water distribution network'. The installation is one of the outputs of a set of ongoing projects between Dublin City Council and the IBM Dublin Research Lab as part of the Creative Dublin Alliance Smart Dublin Initiative, making Dublin a City where creativity and innovation thrive.



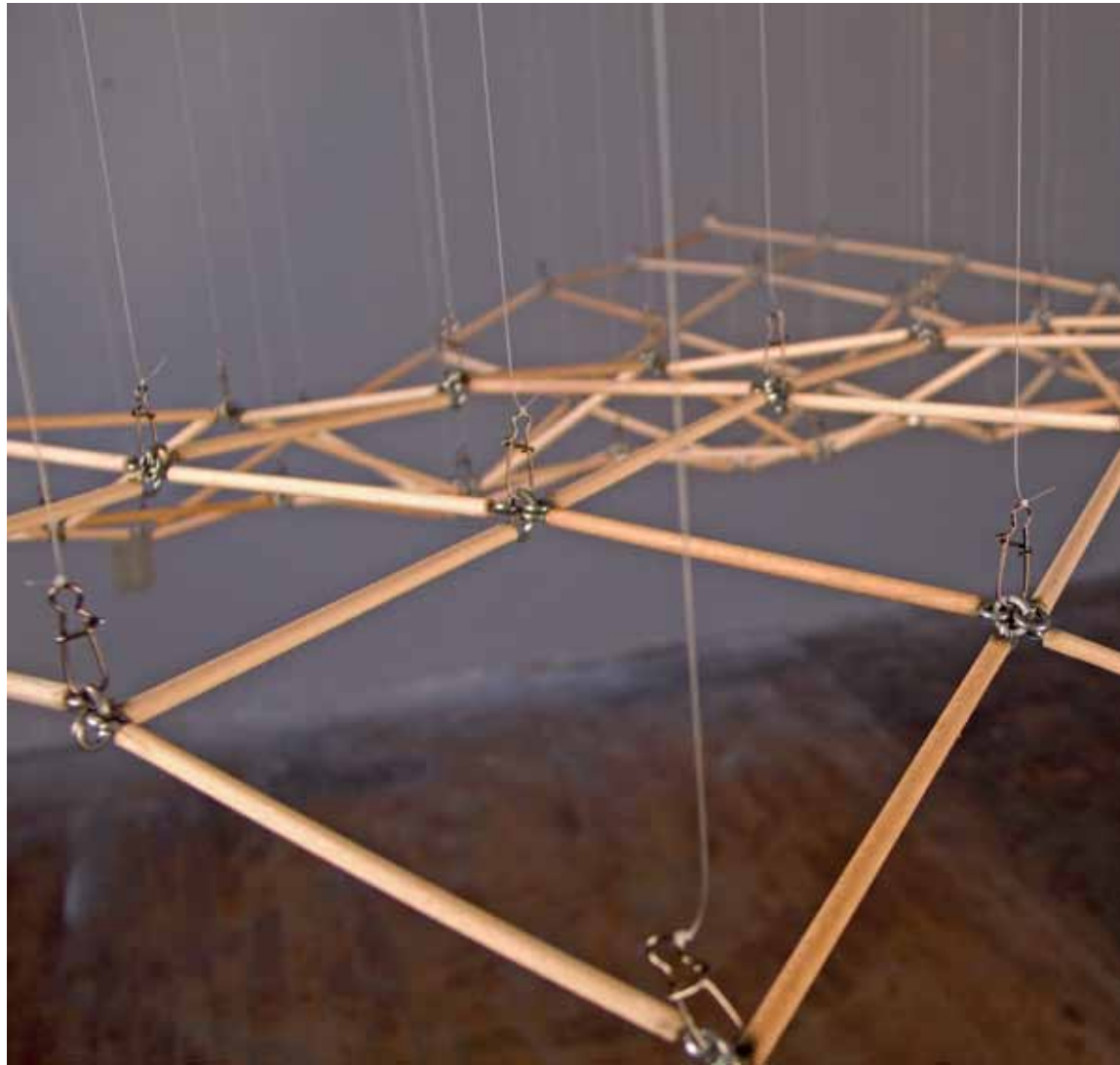
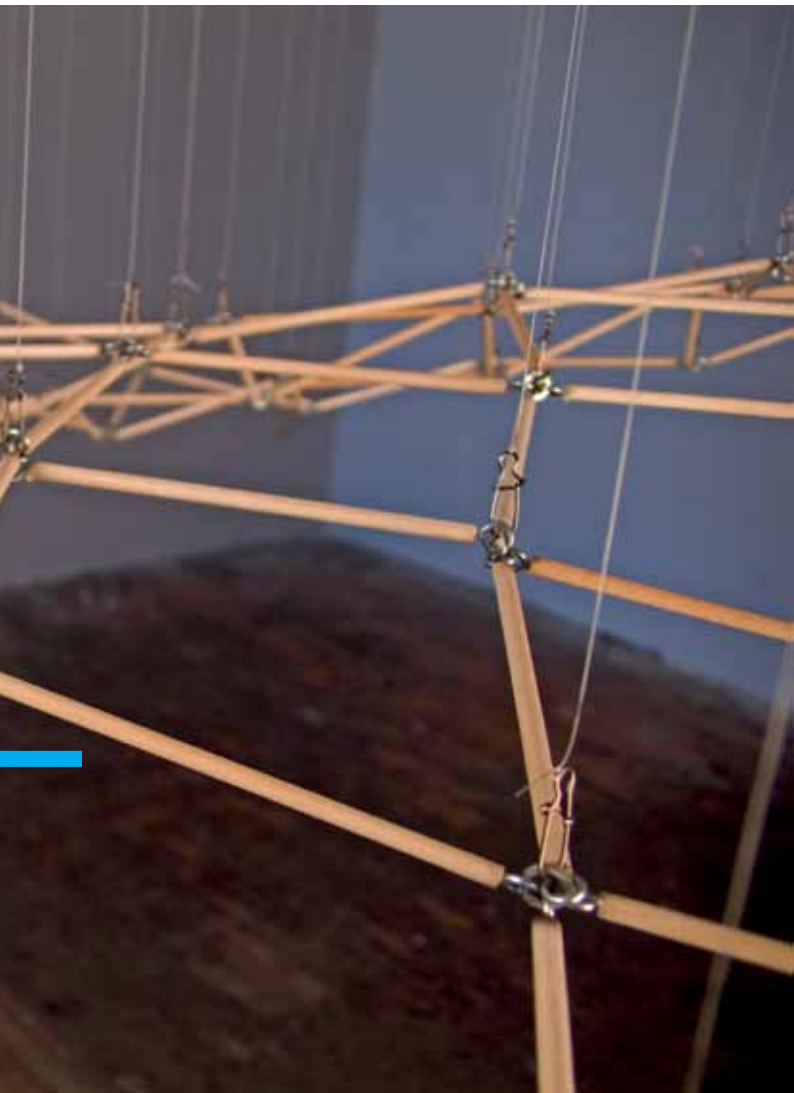


Photo Detail:
David Bowen



TELE- PRESENT WATER

DAVID BOWEN

— This installation draws information from the intensity and movement of water, and uses it to recreate that movement in a remote location, here at Science Gallery. Wave data is being collected and updated from National Oceanic and Atmospheric Administration data buoy station 51003. This station was originally moored 205 nautical miles Southwest of Honolulu in the Pacific. The last report from its moored position was received on April 25th, 2011 and then it went adrift. The buoy is still transmitting valid observation data but its exact location is now unknown. It collects information on wave intensity and frequency, which is scaled and transferred to the mechanical grid structure. The result is a simulation of the physical effects caused by the movement of water from this distant unknown location.

BASIN

LANE HALL, LISA MOLINE

— *Basin* is a mural-scale blackboard with a chalked flowchart recording the perils and politics that confront water resources in the 21st century. Water issues are diagrammatically mapped with an intention to display deep interconnectivity from the local and regional to the global in a form both authoritative and ephemeral: erased, re-written, reconfigured. *Basin* was originally created as part of the exhibition 'Watershed: Art, Activism and Community Engagement', organised by Nicholas Lampert and Raoul Deal to highlight issues surrounding water, society, politics and art in the Milwaukee area. As such, *Basin* emphasises issues pertinent to the Great Lakes region. For SURFACE TENSION: FUTURE OF WATER, Hall and Moline have recast the flowchart to include issues that specifically impact Ireland and Dublin, as well as the European Union, such as specific invasive species threats, and the effects of climate change, urban growth and decaying water infrastructure on Dublin's water supply.



Photo Detail:
Justin Kunesch



play

Water's unique aesthetic properties and its possibilities for metaphor make it a source of fascination to artists and designers. The ephemerality of water and its ungovernability – slipping its bounds, and changing state – make it a rich field for play. Water surging in vortices and waves inspires awe, while both children and adults love getting wet and squelchy in it. As a vital resource, water is associated with joy and celebration, and many cultures make pleasurable play around it.






Photo Detail:
Petroc Sesti



EVENT HORIZON

PETROC SESTI

Event Horizon is one of a series of sculptures by artist Petroc Sesti in which a vortex appears to have been captured in a glass vessel. A whirlpool spirals inside a giant bell jar, suspended in perpetual motion. Sesti creates his vortex sculptures such as *Event Horizon*, *Vanishing Point* and *Perpetual Void* using optic oil, which has the appearance of water. A hidden motor inside the sculpture's plinth activates the vortex. Philip Romero, author of *The Art Imperative - The Secret Power of Art*, describes Sesti's work as pushing the boundaries of art and science, and going beyond both: 'It looks strangely new and feels oddly familiar.... Sesti rivets our brain's attention and kindles our need to explore the object. Once captured by the aura of the object we find something within it that releases us from its seductive grasp. This work confounds cognition and kindles curiosity. This is an art of subtle motion and intense emotion, of stillness and transcendence, of violence and silence, of time contained and time frozen. Sesti's work is an irresistible invitation to the body, brain, and imagination. By tickling our brain's ability to mirror itself in the object, Sesti succeeds in seducing the viewer into a world of speculation and anxiety.'

BIT.FALL

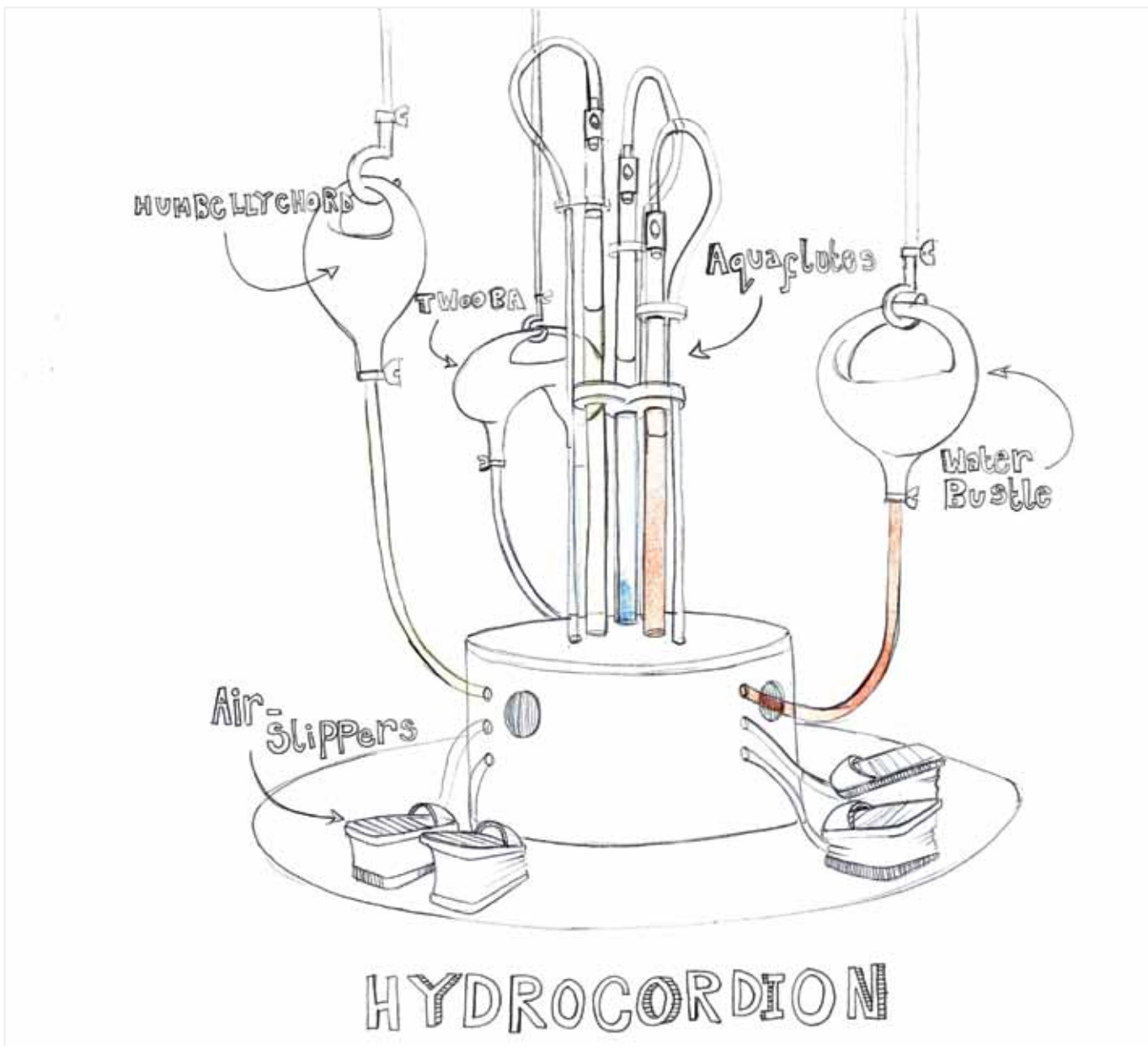
JULIUS POPP

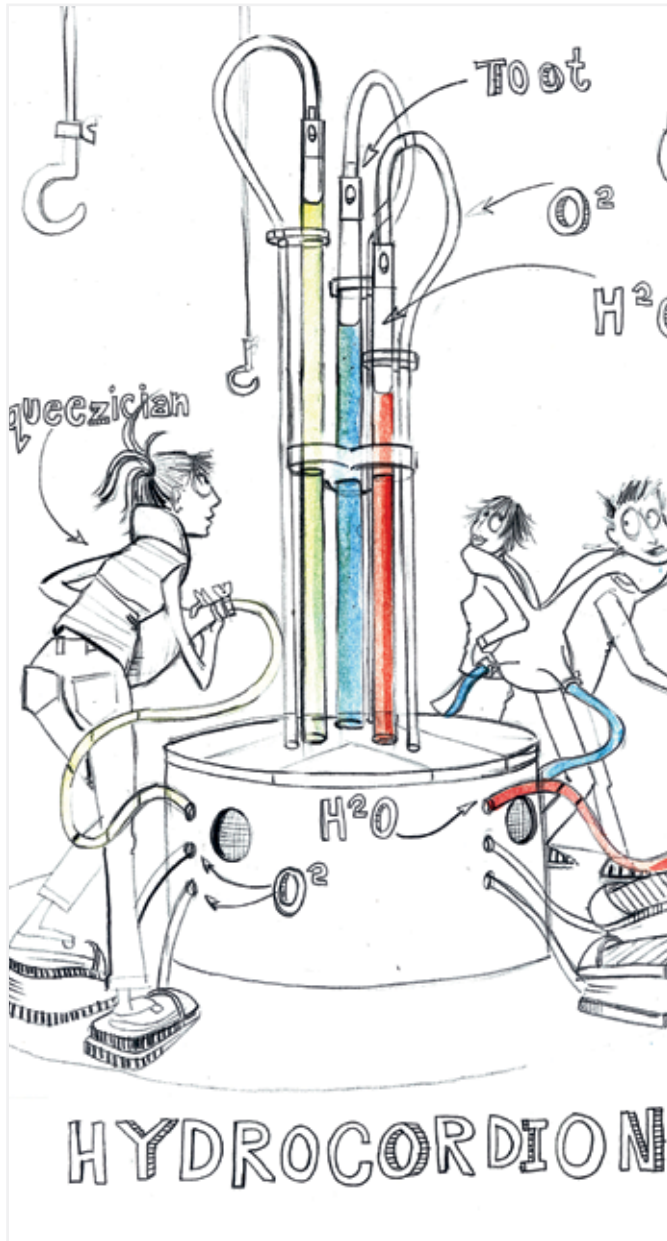
█ The speed at which information is sourced, exchanged and updated in our modern society is almost inconceivable, and more ephemeral than ever before. The work *BIT.FALL* translates this abstract process into an experience for the senses and is a metaphor for these contemporary currents of information. In *BIT.FALL*, information is represented by words generated by a computer program, based on a statistical algorithm. The program filters relevant terms from the current stream of news on the internet, and transmits the values to the control unit of *BIT.FALL*. In a split second, *BIT.FALL* releases hundreds of drops at specific intervals, creating a 'waterfall' of words. Each drop of water thus becomes a liquid and transient 'pixel' or 'bit', the smallest unit of information. *BIT.FALL* combines two distinct circulation systems – circulation in nature (through its own laws, such as gravity) and circulation in culture (through the degrees of social attention as recorded by statistics). Water, an amorphous medium, becomes a carrier of cultural information that is only perceptible for a split second and then disappears again. This aspect of *BIT.FALL* refers to the ephemeral nature of cultural information and values: while we do perceive them, we are truly unable to 'grasp' them.



Photo Detail:
Julius Popp







HYDRO- CORDION

DI MAINSTONE

■ The *Hydrocordion* is a playful musical device that invites visitors to become 'squeezeicians' and compose soundscapes through the manipulation of air and water. Like a church organ, this instrument releases sound by the propulsion of air into pipes via air-slippers, which are installed around its circumference. To release a tune, squeezeicians must commence a vigorous slipper-jig, thus providing a continual supply of air to each of the cylindrical aqua-flutes at the *Hydrocordion's* centre. Our liquiphiles' job does not stop there – simultaneously, they must attach a water bustle to their body and squeeze the liquid from the rubberised sack into the central aqua-flutes to change the frequency of the sounds. From afar, the audience will see these transparent water columns filling and draining as the wearable water-bustles are compressed and released. The sounds that they will hear will be a mixture of digitised harmonies, combined with samples of sploshings and water-drips, which will be harvested in real time, thus creating a bespoke musical experience for squeezeicians and audience alike.



Photo Detail:
Ralph Borland



THE PROBLEM WITH THE PLAYPUMP

RALPH BORLAND

█ In 2007, while opening the US National Design Awards in New York, then First Lady Laura Bush praised the *PlayPump*, a children's roundabout which pumps water, as an example of 'the difference sustainable designs can make'. Invented in South Africa in the early 1990s, the *PlayPump* system is a children's roundabout that drives a borehole pump, which pumps water to an elevated water tank. The tank bears billboards, whose rental is intended to fund the maintenance of the pump. The project received much international support as an 'appropriate technology' for developing world use, winning awards and attracting large-scale funding, culminating in 2006 in a collective pledge of US\$60 million from government and private institutions in the United States. But soon afterwards a series of critical reports on the *PlayPump* surfaced, casting into doubt the claims for its success... *The Problem with the PlayPump* documents the difference between the way the *PlayPump* has been represented to first world audiences and how it has functioned on the ground in Southern Africa. The installation draws on the artist's research for his PhD thesis 'Radical Plumbers and *PlayPumps* – Objects in development', framing the way in which objects intended for developing world use, but supported by first world audiences, may be advanced more by their appeal to these audiences than for their value to developing world users.



Photo Detail:
Ruža Leko



WATER LAB

SCIENCE GALLERY

Surface Tension's *Water Lab* is where you can experience, learn and participate in tests all about and with water: its constituents and contaminants, its properties and pollutants from drinking water to groundwater! Calculate how much water you have in your body and how much water you use and waste every day. Discover how you can desalinate water and make it good enough to drink. Take a close-up look at the life forms in your drinking water using phase contrast microscopy. Explore the major role of plants in the hydrological cycle and the importance of evaporation, as seen at a molecular level in the tiny stomata of leaves. Discover the intricacies of groundwater mapping. And find out why add salt to the water when boiling your potatoes? Why does water make a good solvent and how is that water and oil don't mix? Water lab investigates the sometimes mysterious properties of this unique molecule in all its states.

predict

What is the future of water? Around the world, there is increasing pressure placed on our reserves of water for human use. What new practices may people have to adopt to cope with a water-scarce future? How will water be managed, and what will it cost? In some countries, water that has already passed through our bodies is already cleaned and redistributed for drinking and other uses – how might this practice increase, and what other useful substances might we extract from it?

URBAN WATER NEEDS: CAN WE KEEP UP?

MATTHEW LAWS, HAL WATTS

Responding to a challenge by 'Visualising.org' to produce compelling visualisations of urban water data for World Water Day, Hal Watts and Matthew Laws designed a world map with land masses made entirely out of cheap kitchen sponges. Combining analytical precision with an artistic approach, they then poured water on to each country in amounts proportional to its expected urban water consumption in 2030. Elegantly literal, the sponges grow in height according to how thirsty the country will be, generating a stark topography of future needs for urban domestic water. It is estimated that by 2030, 60% of the planet's population will live in cities. This presents unique challenges to water supplies and infrastructures, and will require creatively tailored solutions. As Laws and Watts write, 'While this will have little impact on some countries, others will need to develop large new infrastructures. Some countries will be able to afford this more easily than others.' *Urban Water Needs: Can We Keep Up?* won a runner-up prize in Visualising.org's competition.







Photo Detail:
Chris Judge

WATERWISE: WASHING FUTURES

RUTH DOYLE, ANNA DAVIES, CHRIS JUDGE

How might our washing habits evolve in the future to meet the challenges of sustainability? Nearly 40% of the water we use goes towards our personal washing (showering, bathing and washing our teeth). *WaterWise* invites us to step into the year 2050 and imagine more sustainable washing routines through the use of advanced technologies and water systems supported by alternative cultural norms and water regulations. Three future scenarios are presented, designed using an innovative ‘visioning’ research process involving key stakeholders in the water sector. Depicted by Dublin-based illustrator Chris Judge, the scenarios use bold and playful illustrations, referencing graphic novel and instructional manual styles. Drawing on emerging and envisioned societal and technological trends, *WaterWise* encourages critical reflection on our washing routines and how we approach sustainability problems. It is based on the premise that a sustainable future will require not only technological innovations but also cultural and personal changes. Might we adapt our washing behaviour according to natural weather fluctuations as depicted in the ‘Aqua Adapt’ scenario? Could we be attracted to the high-tech waterless washing solutions presented in the ‘De-Waterise’ scenario? How might we respond to the realities of the resource constrained world in the ‘Water Control’ scenario? Visitors are asked to rate the elements in each scenario which appeal to them. In this way they contribute to the iterative nature of the scenario design process, helping to shape policy recommendations for sustainable water consumption.

ARCHIVE OF VATNA- JÖKULL KATIE PATERSON

Glaciers represent the largest reservoir of freshwater on the planet – some 70% of all the freshwater on earth. Many go through seasonal cycles, storing water during one season and releasing it during the next. Plants, animals, and one third of the human population depend on this meltwater for their freshwater supply. For her project, *Archive of Vatnajökull (the sound of)*, artist Katie Patterson installed an underwater microphone in Jökulsárlón lagoon, an outlet glacial lagoon of Vatnajökull, filled with icebergs. This microphone was connected to an amplifier and a mobile phone, creating a live phone-line to the glacier. The glacier's phone number - 07757001122 - could be called from any telephone in the world, and would put the listener through to Vatnajökull. In the archive of this work exhibited at Science Gallery, a book of telephone numbers that dialled Vatnajökull is displayed along with a sound recording of the live phone line to the glacier.



Photo Detail: **Katie Paterson**,
Courtesy Haunch of Venison London





Photo Detail:
Rory Harmer



LOS ANGELES HYDROSCAPE

RORY HARMER

■ Situated on Venice Beach, *Los Angeles Hydroscape* is an architectural proposition restoring Abbott Kinney's pleasure beach coastline with a playful pier that evolves with its surroundings, changing through dynamic interaction with humans and the natural world. It is split into two main functions: a floating desalination park and a land-based waste-water management system. The power of the waves and the energy of the sun are harnessed to turn salt water into drinking water; nature's very own alchemy. The salt water of our oceans can be converted to freshwater that is suitable for human consumption or irrigation. Desalination, which removes salt and other minerals from sea water, does not depend on rainfall, and so is of particular interest to coastal regions where freshwater is limited. *Los Angeles Hydroscape* attempts to unite the process of desalination with the interaction and excitement of the sea. It forms a relationship of education, responsibility and ultimately pleasure. It embraces nature, highlighting the bond we have with our ecosystem in order to survive. Stitching together land, sea, and the community, it provides a floating pleasure park as a new focal point for an enigmatic seafront.



Photo Detail: **Courtesy of Efteq**


PREPAID WATER METER

EFTEQ

■ The Efteq Intelligent Water Meter is an example of a ‘water management device’ or ‘prepaid meter’ from South Africa. Prepaid meters have been installed by municipalities and other water providers in many parts of South Africa since the 1990s. These meters can be programmed to release set amounts of water to control daily consumption. Prepaid meters are so-called because they require prepayment by the user, who can access water up to their credit limit using an electronic tag. Efteq notes that their meter has ‘an optional Lifeline feature’. This feature is a reflection of the South African government’s commitment to provide a minimum amount of water free to poor communities. The amount of water that should be provided free to poor users, as well as the use of prepaid meters in general, has been the subject of contention in South Africa. Civil society groups such as the Anti Privatisation Forum (APF) have mobilized communities to resist the installation of prepaid water and electricity meters, sometimes destroying or bypassing the meters. In 2008 the High Courts in South Africa, in a case brought by the APF and affiliated groups, declared the use of prepaid water meters illegal, and raised the amount of water that the state needed to supply free to users. On appeal by the state to the Constitutional Court, this judgment was subsequently overturned, and prepaid meters continue to be used in South Africa. The prepaid water meter is an object that speaks both to the apparent need to ration and manage water carefully in the face of scarcity, and to water’s increasing status as a commodity. Access to water may be restricted by a person’s ability to pay for it – in tension with the notion of access to water as a human right, or of ‘common ownership’ of water.

reflect

Water is a source of healing, of contemplation, and reflection. It plays a role in religion and in sacred ceremonies, from the Holy Wells of Ireland to the Step Wells of India. People still seek out and venerate particular sources of natural water, valuing it for reasons that go beyond its cleanliness or purity. Water cycles through the world and through us, joining our bodies with the rest of the world through water. Water is justly venerated for all that it brings to us and the rest of the planet.



THE SWIMMER

FERGAL McCARTHY

■ In the original *The Swimmer* – a 1968 Burt Lancaster movie based on a John Cheever story – the main character swims home across a county through ‘a river of sapphire pools’, the backyard pools of his neighbours and friends. Working with Nicky Gogan at Stillfilms, the artist Fergal McCarthy has re-enacted this basic premise in Dublin by swimming through the city from south to north. Starting at the Joyce Tower in Sandycove, McCarthy crossed Dublin following a pathway of public and private pools, canals, the River Liffey, and finally the Irish Sea before finishing at the Martello Tower on Howth Head. The film documents Dublin’s aquatic environment in 2011, a landscape that will radically alter in the years ahead. The artist has always had a fascination with swimming pools, lakes, hot tubs, rivers and the concept of bathing in general, and continuously seeks out new and unique places to swim. He credits Berlin as the city which offers a wealth of swimming options like no other, and considers what it might be like to have access to a similar experience in Dublin.



Photo Detail:
Andreas Petterson





Photo Detail:
Ondi McMaster

WATER CONVERSATIONS: PAANI BACHAO!

ANNA MACLEOD, CAROL HUMMEL

Water Conversations is an ongoing project that posits a ubiquitous poster image from Dublin into public spaces in varying global locations to examine attitudes to water as an element for life. Initially inspired by a 'conserve water' image produced by Dublin City Council and shown on LED screens on the major traffic arteries into Dublin City during January and February of 2010, the 'Paani Bachao' (Hindi for 'save water') poster image seeks to explore the agency of an image operating in public spaces across diverse communities, and provide a locus for transcultural discursive exchange about an essential global question. This single image ignited countless discussions and conversations in a diverse range of locations and communities, all around the issue of water conservation. In the project, water becomes an emotive tool to discuss personal histories and innovative ideas associated with water. The public interventions of the 'Paani Bachao' poster are continually reconfigured and informed by the specifics of the location, be it an academic forum, public street, water pumping station, or artisan colony.



Photo Detail:
Connell Foley



HOLY WELLS: HEALING WATERS

RONAN FOLEY

— The value and meaning of water is central to many cultures. While access to clean water is central to the management of future human health, water also has much older ritual connections to healing and wellness. In Ireland, one particular form which has the capacity to link our pagan past and our healing future is the holy well. Irish holy wells, often referred to in texts and on maps as Tobar Naofa or Tobar Beannaithe, have functioned as important landmarks in the Irish countryside since the pre-Christian era. Originally associated with pagan nature worship, the new Christian church in Ireland annexed them for their own purposes and even now there are around 3,000 examples left across the island of Ireland. They are part of Ireland's cultural heritage and are still visited and used daily as sites of spiritual retreat, healing and wellness. Yet many holy wells are at risk and may not survive into the future. They were extensively documented in the 1930s by the Irish Folklore Commission who recorded rituals, reputed cures and legends associated with the wells. Tests of water from some holy wells show that, as with spa water, important minerals are often present, including sulphur, magnesium, iron, potassium and even lithium.

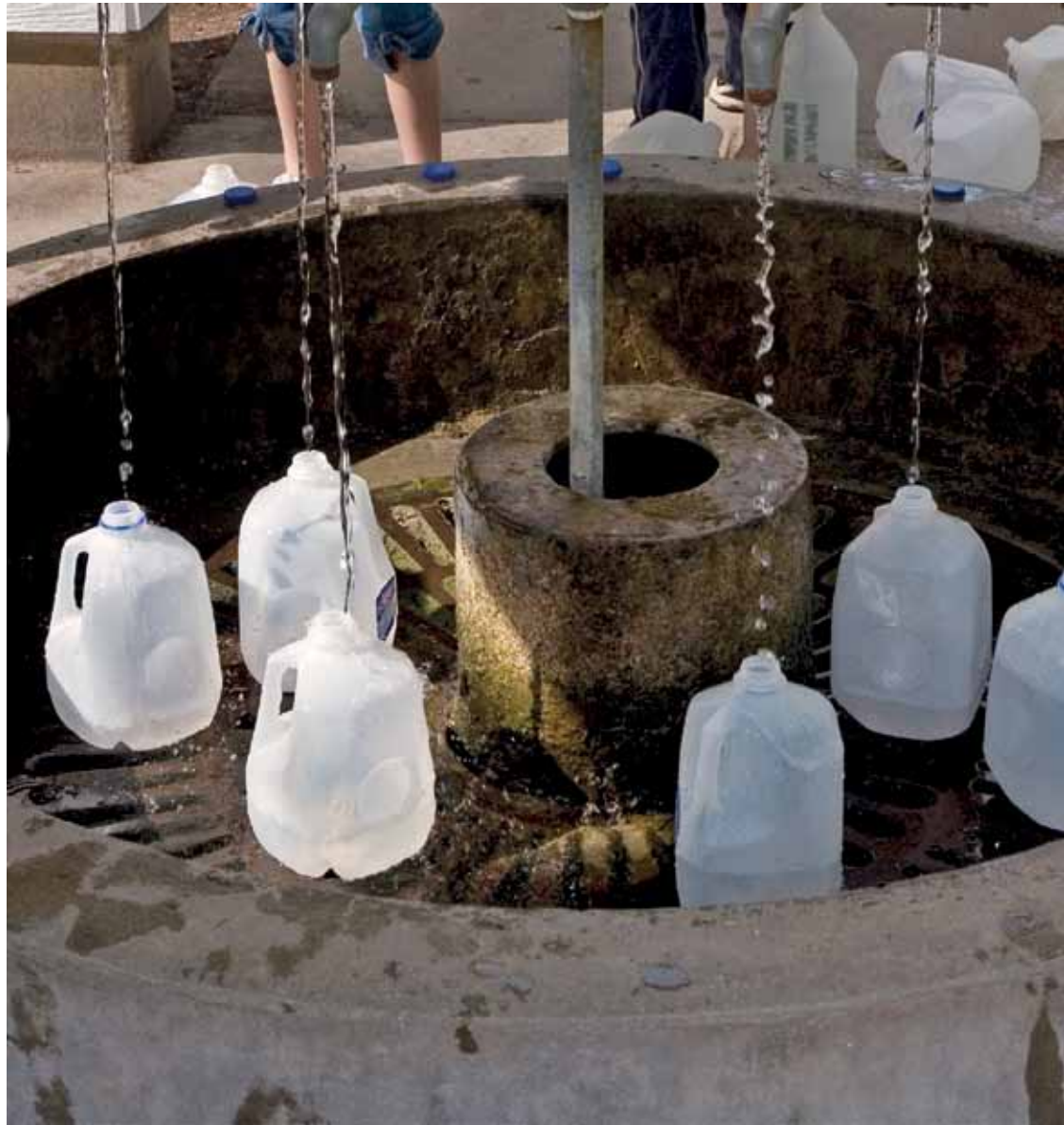


Photo Detail:
Kay Westhues



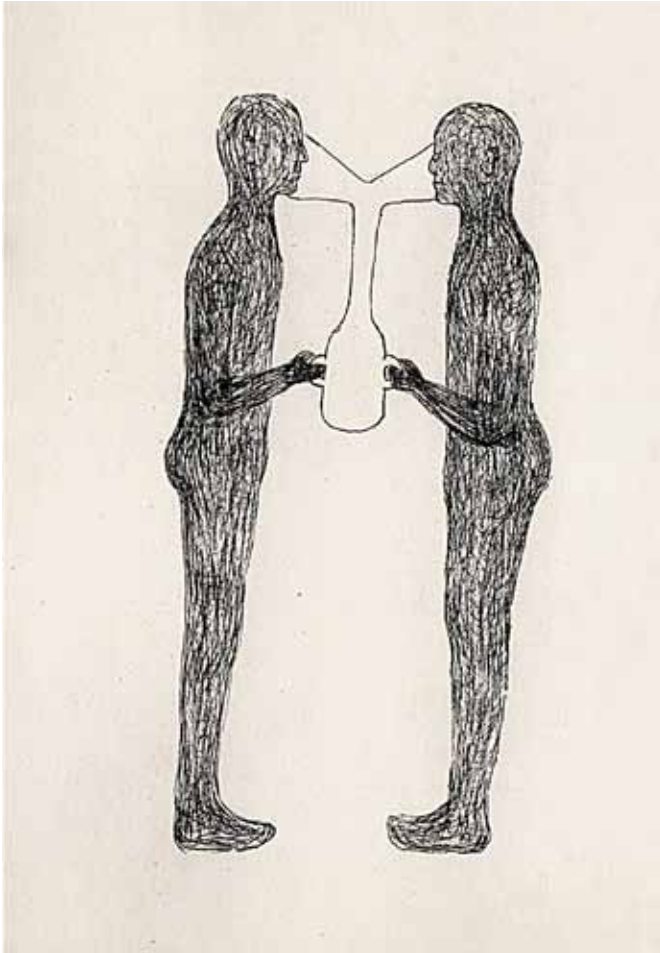
WATER CATCHERS

KAY WESTHUES

Water Catchers portrays people gathering water from various artesian wells in the Midwest United States. Artesian wells are fed from a confined aquifer containing groundwater that is pressurized and flows upwards, without need for a pump. These wells are filtered naturally and in some cases have been flowing for thousands of years. They are a surviving remnant of the public commons and often mark very early human settlements. Some visitors to the wells make the trip simply because they like the taste of well water; for others it is a family tradition. Some gather water because they do not have access to good water in their homes. This video emphasises the repetitiveness of this task – the viewer observes many people performing the same activity in different locations and in different weather conditions. It also alludes to the ritual nature of this ancient practice of gathering water. The act of retrieving water from a well connects us with the past and with an elemental human need. In the industrialised world, we are so accustomed to using water that is separated from its local ecosystem that we often forget about its intrinsic value to life.



Photo Detail:
Kim Taegon



UNTITLED (MIST)

TAEGRON KIM

— In this work, the artist Taegon Kim explores the difficulty he has in communicating with people he does not know well. This self-described 'affliction' has led him to create objects that allow alternative means of communication and connection. Untitled (Mist), is a device for two people to share their breath. It plays on the connection all people share through the air we breathe. The apparatus is designed to reveal too the water vapour or 'mist' carried on the breath. Kim's desire is to view the exchange that happens between two people, in this shared vessel for their breath, within which water vapour condenses. Breath is laden with water; the loss of water from the body through breathing can be close to a litre a day. In this device, water and air form the connective, elemental bridge between two individuals. Can this intimate exchange bring people closer together? In a world in which water becomes more scarce will our water-laden breath become a unique personal commodity?

SCREENING WALL

THIS HEART OF ICE THOMAS MARCUSSON ██████████

STILL LIFE CATHERINE HIGHAM ██████████

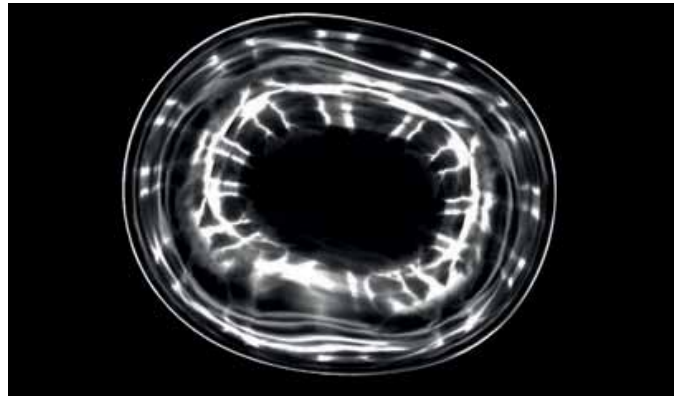
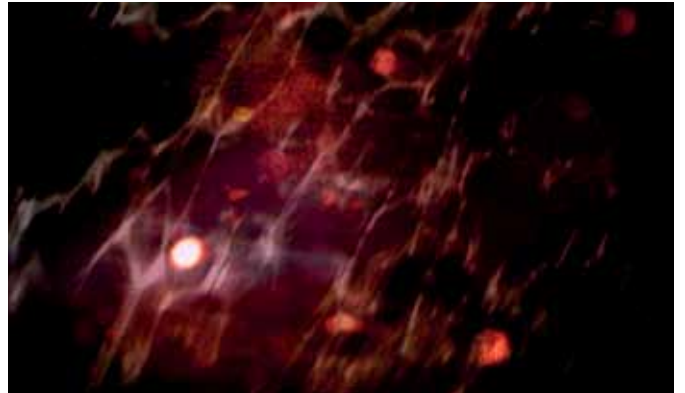
SINGLE SHARED BREATH EMMA CRITCHLEY ██████████

THE LIGHTHOUSE KIM COLLMER ██████████

THE DELUGE DANIEL CLAUZIER ██████████

HYDRO-ACOUSTIC STUDY PAUL PRUDENCE ██████████

██████████ *Screening Wall* shows several short video works inspired by water, in a tableau of digital picture frames. The dreamlike qualities of water are drawn out in Daniel Clauzier's *The Deluge*, which shows a slowly flooding still life. As the water rises, the candle goes out, objects float away, and the tablecloth billows. Referencing 17th century Dutch painting, and especially the theme of vanitas, the work shows water as both a source of fascination, and of destruction. Kim Collmer's *The Lighthouse* draws the viewer through a meditative haze. It begins with a panorama of the horizon, tracing the perimeter of a lighthouse, before descending into underwater abstraction: 'we go deeper into the structure of water as well as into ourselves, we become the 'lighthouse''. Emma Critchley's *Single Shared Breath*, in which two submerged figures breathe into one another's mouths, plays on the underwater space as one the human body can only temporarily inhabit, a fragile, transitory space. Thomas Marcusson's *Ice Heart*, a beating, melting heart made of ice, alludes to 'the fragile existence and vitality of ice in a world where the polar ice caps are slowly diminishing through a cyclical process'. Other works take in water as the subject of scientific research. Catherine Higham's *Still Life* is a compilation of hundreds of still images of creeks around her home in Western Australia, tracking changes in water quality. Paul Prudence's *Hydro-Acoustic Study* uses real-time algorithmic sound analysis techniques to create a simulated watery environment that responds to sound. The work speculates on future possibilities for the effects of sonic frequencies on water.



SURFACE TENSION CREDITS

SOURCE (DUBLIN): FIELD OF WATER

Howard Connelly, Mick Kelly, Community members of Dublin;
Photograph copyright the artist, Courtesy Conner Contemporary
Art.

POUCH

Lee company, Studio DuHo

WATER WEAR

Irish Department of Foreign Affairs; Higher Education Authority;
Dundalk Institute of Technology; Dublin City University

USING SUNLIGHT TO CLEAN WATER

The Irish Research Council for Science, Engineering &
Technology

PROTEI 002

Open Sailing, V2_ Institute for the Unstable Media, DNV,
Amorphica, RandomWalks, Hofman and Zonen, TED,
TEDxMidAtlantic, Kaag Watersport Academy, Creole.com,
Goldsmiths University, MIT Public Service Center, HTS
Consulting, LA Bucket Team Brigade, Suzette Toledano Becker

DRINK LOCAL WATER...WHATEVER IT IS

Caraquill water, Co. Meath

THE VIRTUAL WATER PROJECT

Frank Rausch of Raureif

HIDDEN

Royal College of Art, London; Imperial College London

POWER TREKK

SiGNa Chemistry

HYDROGENY

SNS REAAL Foundation, Amsterdam Funds for the Arts, CORDIS

WATER ATLAS OF DUBLIN

The Arts Council of Ireland

SMARTER WATER

Francesco Calabrese, Jer Hayes, and Emanuele Ragnoli are with
IBM; Tom Leahy is with Dublin City Council

EVENT HORIZON

Text by Philip Romero, Shizaru gallery

HYDROCORDION

Louis McCallum, Nanda Khaorapapong, Richard Shed, David
Gauthier, Ulrik A Hogrebe, Jacek Barcikowski, q-Media, Queen
Mary University of London, Engineering and Physical Sciences
Research Council, EPSRC

THE PROBLEM WITH THE PLAYPUMP

National Research Foundation (South Africa), The Oppenheimer
Memorial Trust, Linda Doyle

WATER LAB

Colin Darby, Micron Optical; Mike Jones and Mike Williams,
School of Natural sciences, TCD; Patsy Greene, School of
Chemistry, TCD; Siobhan Mc Bennett in Biology Teaching
Centre, TCD

URBAN WATER NEEDS: CAN WE KEEP UP?

Luke Bennett

WATERWISE: WASHING FUTURES

Environmental Protection Agency Ireland

ARCHIVE OF VATNAJÖKULL (THE SOUND OF)

Courtesy Haunch of Venison London

THE SWIMMER

Directed by Nicky Gogan; Produced by Still Films; Orlebar Brown

WATER CONVERSATIONS: PAANI BACHAO

Dublin Institute of Technology. The image for the Paani Bachao poster was drawn by Kshitish Dass.

WATER CATCHERS

Indiana Arts Commission, National Endowment for the Arts (USA), Fiddler's Hearth Public House

STILL LIFE

Country Arts WA, Australian Government Regional Arts Fund; SymbioticA for the opportunity to undertake research on their project 'Adaptation'.

THE LIGHTHOUSE

Sound by Jeff McGroary

THE DELUGE

Hervé Jolly

SURFACE TENSION CURATORS

RALPH BORLAND

Ralph Borland recently completed his PhD in the School of Engineering at Trinity College Dublin, examining the field of 'design for the developing world'. Combining research into science and technology with a practice as an artist and designer – his undergraduate degree is in Fine Art – Ralph is interested in how technologies intended for users in one place, particularly in the developing world, may be used to communicate to audiences in others: how technologies may act as story-telling devices or characters in a narrative, as well as functional objects.

MICHAEL JOHN GORMAN

Michael John Gorman is the Founding Director of Science Gallery Trinity College Dublin. He has led the development of Science Gallery since 2007. His publications include Buckminster Fuller: Designing for Mobility (Skira/Rizzoli, 2005), A Mysterious Masterpiece: The World of the Linder Gallery, with Lawrence Weschler and others Alias 2009, and many articles on aspects of the relationship between art and science in journals including Leonardo, Nature and Science.

BRUCE MISSTEAR

Bruce Misstear is an Associate Professor in the School of Engineering in Trinity College Dublin. Over the last 30 years he has carried out water projects in several developing countries, including Nigeria, Sudan, Oman, Pakistan and Burma, as well as many projects in Ireland and the UK. He is currently involved in a major research project concerned with pollutant pathways in Irish river catchments; he is also part of the Water is Life project team researching different aspects of rural water supply in a region in southwest Uganda. Bruce is the author or co-author of over a 100 publications on water and environmental engineering, including an international text book on water wells.

JANE WITHERS

Jane Withers is a design consultant, curator and writer based in London. She has written several books on design and architecture and regularly teaches and speaks on design internationally. Alongside establishing her own design consultancy, she has curated critically acclaimed exhibitions including '1% Water and our Future' at Z33, Belgium, 'In Praise of Shadows: new lighting design' at the Victoria & Albert Museum and she is currently working on 'Wonderwater', a series of projects and events around water for World Design Capital Helsinki 2012.

ACKNOWLEDGMENTS

SURFACE TENSION RESEARCHER [REDACTED] [REDACTED] RALPH BORLAND
SURFACE TENSION EXHIBITION BUILD [REDACTED] [REDACTED] RUSSELWORKS
SURFACE TENSION INFOGRAPHICS [REDACTED] [REDACTED] DETAIL. DESIGN STUDIO
SURFACE TENSION CATALOGUE [REDACTED] [REDACTED] RUŽA LEKO

THANK YOU: FERGUS KEANE, ESB ENERGY [REDACTED]
INTERNATIONAL; BUILDINGS OFFICE, TCD; [REDACTED]
CATHAL ENNIS, CARAQUILL WATER, CO.MEATH [REDACTED]

SURFACE TENSION PARTNERS & SUPPORTERS

FOUNDING PARTNER

wellcometrust

SCIENCE CIRCLE

DELL

Google™

ICON
A Symbol of Excellence

PACCAR

FOUNDING PATRONS

DR. MARTIN NAUGHTON

DR. BEATE SCHULER

GOVERNMENT SUPPORT



An Roinn Fiontar, Trádála agus Fostaíochta
Department of Enterprise, Trade and Employment



An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht



CORPORATE FRIENDS

BORD NA MÓNA

BT

CPL

INTEL

MEDIA PARTNER



THE IRISH TIMES
irishtimes.com

SURFACE TENSION SUPPORTERS

wellcometrust




Discover
Science + Engineering



MicronOptical.com
Microscope & Imaging Specialists

SCIENCE GALLERY IS AN INITIATIVE OF TRINITY COLLEGE DUBLIN

SCIENCE GALLERY – an initiative of Trinity College Dublin, is a dynamic new cultural space at the interface between the university and the city, developing exhibitions and events at the boundary between science, emerging technology, art and design. Targetting an audience of young adults aged 15-30, Science Gallery aims to ignite a passion for science, technology and innovation through engaging exhibitions and events on themes ranging from Music and the Body and The Future of Water to Hack the City and the Science of Fashion. Since opening in 2008 over 750,000 visitors have engaged in programmes that bring science into dialogue with the arts and design, and give curious young adults a taste of the excitement of cutting edge research and innovation in a friendly, sociable environment. Never before has there been such broad consensus that completely new approaches to traditional problems are required, and that we need to cultivate a generation of creative, agile thinkers and doers, able to bring together insights from diverse disciplines and to move between science and art and between business and technology. Science Gallery is a creative platform that brings together artists, scientists, designers, engineers and entrepreneurs in new conversations.



SURFACE TENSION [REDACTED]

THE FUTURE OF WATER [REDACTED]

MICHAEL JOHN GORMAN [REDACTED]

RALPH BORLAND [REDACTED]

BRUCE MISSTEAR [REDACTED]

JANE WITHERS [REDACTED]

PUBLISHED BY SCIENCE GALLERY [REDACTED]

Trinity College, Dublin 2, Ireland [REDACTED]

T: +353 (0)1 896 4091 [REDACTED]

E: info@sciencegallery.com [REDACTED]

ISBN: 978-0-95589574-6 [REDACTED]

All rights reserved. No part of this publication may be reproduced in any form by any electronic or mechanical means, including [REDACTED] photocopy, recording or information storage without written [REDACTED] consent from the publisher. [REDACTED]

©SCIENCE GALLERY [REDACTED]

All work remains © of its respective author(s) [REDACTED]

600 litres

AT ROUGHLY 10 LITRES PER A4 SHEET, THE VIRTUAL WATER CONTENT OF JUST THE PAPER USED IN THIS COPY OF THE CATALOGUE IS APPROXIMATELY 600 LITRES. CALCULATION COURTESY OF TIMM KEKERITZ, [HTTP://VIRTUALWATER.EU](http://VIRTUALWATER.EU)

