



Dalla terra nasce l'acqua dall'acqua nasce l'anima...  
è fiume, è mare, è lago, stagno, ghiaccio e quant'altro...  
è dolce, salata, salmastra, è luogo presso cui ci si ferma e su cui si viaggia,  
è piacere e paura, nemica ed amica, è confine ed infinito,  
è cambiamento e immutabilità, ricordo ed oblio.  
(Dal libro *Frammenti*, VI-V sec. A.C.)

᾽Αριστον μὲν ὕδωρ

Greatest indeed is water

Pindar, Olymp. 1, 1

## Introduction and conference objectives

The conference, with a clear inter- and cross-disciplinary approach, aims to address the theme "Aqva" from multiple points of view, through interventions and contributions by experts from different disciplinary fields: hydraulics and hydrology, chemistry, marine ecology, economics, geopolitics, history, literature, art history, urban planning, and medicine. It will include both plenary lectures and thematic seminars of a more general nature, also open to people from outside the University, along with contributions of a more technical nature. Several talks by staff from the University of Padua will also be given.

## Day 1 - Monday, 6<sup>th</sup> February, 2023

### *Morning session*

9:10-9:30 - Welcome address and opening

Daniela Mapelli – Rector, University of Padua

Francesca Da Porto - Vice-Rector for Sustainability, University of Padua

Andrea Rinaldo - Chairman, University of Padua

**Chair: Silvia Gross, University of Padua**

9:30-10:10 - Opening lecture

Philip Ball, science writer, London, UK

### *Why water is weird*

Water is the most familiar and ubiquitous liquid on our planet, but it is like no other liquid. Many of its properties are peculiar, a strangeness that persists when it freezes to ice. These so-called anomalies are precisely what



make it so important in our planetary environment, especially in the way water functions as the “matrix of life”. I will explore the molecular origins of water's weirdness, and discuss what these properties imply for the possibilities of life on other worlds.

Chair: Elena Canadelli, University of Padua

10:10-10:45

Paola Viganò – EPFL, Lausanne, Switzerland

#### *Water designs*

Over the past 20 years, water urbanism has helped build new alliances between environmental sciences, hydraulic engineering, architecture, urban and landscape design. But beyond a widening of the “design” traditional boundaries and a more conscious reading of the rationalizations that have transformed the territory over time, what has occurred is an ontological and ethical shift that concerns the territory as a subject and water as one of its fundamental agents of design. I will face this shift, starting from the projects and research that I have developed in recent years in Europe.

Chair: Carlo Fumian, University of Padua

10:45-11:10

Giulia Simone - Department of Political Science, Law and International Studies, University of Padua, Italy

#### *The Hydraulic Engineering School at the University of Padua (in Italian)*

The «Scuola di applicazione per ingegneri» was founded in 1876 with the character and degree of a university institute, capable of conferring the diploma of civil engineer, which enabled the management of hydraulic constructions, as well as civil, rural, and mechanical constructions. Hydraulics immediately acquired considerable importance in Padua, so much so that Domenico Turazza, a pupil of Pietro Paleocapa (recognized master of the Venetian school of hydraulics) was chosen as the first director of the Institute. In addition to Turazza, one of the highest authorities operating in Padua in the field of Hydraulics was Gustavo Bucchia, nephew of Paleocapa himself, several times a government consultant for the hydrological planning of the territory. At the turn of the nineteenth and twentieth centuries, the Padua School of Hydraulic Engineering recorded important developments in the field of research, so much so that in 1910 it attracted substantial funding from the Venice Water Authority («Magistrato alle Acque»), which allowed the creation of two new Institutes: Electrotechnics and, precisely, Hydraulics. After the First World War, fervent research was conducted at the chairs of River hydraulics (later Inland navigation) and Hydrography, with particular reference to the experiments conducted at Villa Pisani in Stra, where the Experimental hydraulic institute was operating.

11:10-11:30 Coffee break

Chair: Andrea Rinaldo, University of Padua

11:30-12:05

Marino Gatto, Politecnico di Milano, Italy

#### *Ecology and dynamics of water-related diseases*



Water-related diseases encompass a broad spectrum of pathologies that are linked to water either because contaminated water is used for drinking or preparing food (e.g. cholera, typhoid), or because water bodies are the habitat of vectors transmitting the disease (e.g. malaria, dengue, schistosomiasis). The related burden of disease is quite high. For instance, unsafe water sources are responsible for 1.2 million deaths each year. Understanding the ecology of pathogens and vectors is fundamental to describing the dynamics of the diseases via appropriate modelling, which also accounts for the hydrology of water bodies. Examples of spatial and temporal dynamical models of some epidemics are provided.

**Chair: Marino Gatto, Politecnico di Milano**

12:05-12:30

Laura Airoidi – Department of Biology, University of Padua, Italy

### *Nature-based solutions for living waterfronts*

Marine waterfronts are a vital but often forgotten component of our cities. As we strive for a more sustainable future, it is imperative that we better design, manage, and conserve our waterfronts for both humans and nature. I will offer examples of “nature-based” approaches that can support biodiversity values, ecosystem functioning, socio-ecological resilience and human wellbeing. I will also explore the management and societal challenges to biodiversity optimization constrained by human use, and highlight research gaps to increase the short-and long-term success of conservation and rehabilitation efforts in marine urban areas.

**Chair: Andrea Rinaldo, University of Padua**

12:30-12:50

Cristina Scarpel- 2F Water Venture, Padua, Italy

### *The importance of a data driven decision in the managing processes of aqueduct and sewer*

Monitoring of water leakages and of water networks is a fundamental issue to be addressed for a more sustainable and rational water resources management. In this framework, the two companies 2f Water Venture and BM Tecnologie Industriali offer advanced technologies and services to the 250 water utilities of the Italian market. 2f specializes in water loss engineering using new technologies such as satellite technology, whereas BM deals with the massive monitoring of water and sewer networks and with the digitization of integrated water service processes. By this approaches, also supported by data experts, a more efficient management of water utilities towards data driven decisions is accomplished.

13:00-14:00 Lunch

## **Monday, 6<sup>th</sup> February, 2023**

### *Afternoon session*

**Chair: Andrea Rinaldo, University of Padua**

14:00-14:40

Nicola Di Cosmo – Institute for Advanced Studies, Princeton, United States

### *Floods and political change in early modern China: the case of Liaodong*



The paper examines the devastating flood of the Liaodong peninsula, in northeastern China, in the early seventeenth century. This case study, by looking at local management, government intervention and the response of people to the flood, analyzes critical aspects of water disasters in traditional China. The Little Ice Age will be the climatic backdrop, with a comparative analysis of its effects in China and Europe. Finally, the paper will focus on the economic and political context of the flood, and the subsequent invasion of the region by the Manchus as a stepping stone towards their conquest of China, which they ruled until 1911.

14:40-15:05

Marco Marani, Department of Department of Civil, Environmental and Architectural Engineering, University of Padua, Italy

### *Extremes in Water Science, and Beyond*

Extreme events in the Earth system involving the water cycle, such as floods, droughts, and storms, have been key determinants of the well-being of human societies throughout history. Understanding and quantifying such extremes is now more important than ever, as we prepare for an accelerating climatic change over the next century. Here, past changes in the frequency of extreme rainfall events, hurricanes, droughts, and storm surges will be examined, illustrating what can be learned from long observational datasets: "The future is not what it used to be", and therefore we cannot assume it will be a faithful repetition of the past. Rather, we must learn how to best use observations from the past to understand current and impending change. Finally, mathematical models used to quantitatively describe extremes in water science are having an impact beyond the field in which they originated, and are now being used to estimate the frequency of extremes in other disciplines, as in the case of large epidemics.

Chair: **Andrea Rinaldo, University of Padua**

15:05-15:40

Paolo Dodorico - Department of Environmental Science, Policy, & Management, UC Berkeley, United States

### *The dilemma of sustainable water and food security: How to reconcile the rights of nature with human needs*

The increasing water demand by human societies raises concerns on the extent to which it is possible to feed the world with the limited freshwater resources of the planet. The emergent competition for water between human uses and environmental needs limits the development of suitable water security scenarios for a sustainable future. Human appropriation of water resources is for large part instrumental to the enjoyment of human rights to food. To what extent can such rights be reconciled with the rights of nature? Here we show how humanity is placing unprecedented pressure on the global agricultural system and its water resources, while reshaping the patterns of water dependency through teleconnections between consumers and production areas. Multiple value scenarios are incorporated into a planetary water security model to evaluate the trade-off among water-related social values, including non-anthropocentric values for environmental flows, the water requirements of the human right to food, and the economic value of water to commercial enterprise. Through a suite of ecohydrological and socio-environmental analyses we evaluate the biophysical and social justice limits to the sustainable use of water resources through a variety of perspectives accounting for hydrologic constraints, environmental needs, livelihoods, food security, and water tenure.

Chair: **Andrea Rinaldo, University of Padua**

15:40-16:05

Amos Maritan, Department of Physics and Astronomy, University of Padua, Italy

### *Optimality and Scaling in Living Matter*



Living systems are characterized by the recurrent emergence of patterns/regularities independent of their biological/physiological details. In ecological communities species interact forming networks with typical topological structures. Power-law distributions and long-range correlations are pervasive and can be found both at the level of single organisms and at the community level. The most challenging goal in ecology is to grasp how general trends and behaviors emerge in spite of such complexity. Forests represent one of the most complex systems with a high degree of structural and functional diversity: in the tropics, there often are hundreds of coexisting plant species with different habitats and thousands of consumers, each of them with interspecific relationships with plant species. This leads to a multitude of interconnected food webs and complex fluxes of matter and energy. We demonstrate an astounding simplicity underlying the apparent bewildering complexity of forests. Our starting point is based on optimization/variational principles and scaling analysis from statistical physics for understanding and making predictions that are in accord with empirical data.

16:10-16:30 Coffee break

Chair: Silvia Gross, University of Padua

16:30-16:55

Sara Bogialli, Department of Chemical Sciences, University of Padua, Italy

*Emerging contaminants: challenging in the water risk assessment and management*

The description of the quality of the environment needs information as more complete and reliable as possible. There is an unavoidable time gap between gaining this information and policy actions for the environmental protection. Within this time lap, several cases of contamination related to the so called emerging contaminants gained policy and media attention. Recently, some new trends in the monitoring approach have become more common among stakeholders involved in the risk management of water analysis. The adoption of the Water Safety Plans is spurring the integration between the available analytical tools and the “decision making” actions. Although advancement in chemical analysis seems to fit with both aims and approaches used for environmental risk management, there is a necessity to embed a trans-disciplinary knowledge. Indeed, it is clear that the chemical snapshot of a possible contamination is not exhaustive, and inter-sectoral expertise is necessary to correctly understand the health risks. Several case studies are presented to show the potential and critical issues of new tools and strategies for the prevention.

Chair: Giovanni Luigi Fontana, University of Padua

16.55-17.15

Andrea Rubin – Responsabile Reti, Acqua e Fognatura AcegasApsAmga S.p.A., Italy

*Padova, città delle acque: passato, presente e futuro della gestione del bene più importante*

Cosa si nasconde dietro al semplice gesto di aprire un rubinetto d'acqua?

Padova ha sempre avuto un rapporto esistenziale con la risorsa idrica: lo stesso nome della città, deriva da Padus, che significa fiume. L'importanza dell'acqua per la vita ha portato la comunità ad avere, fin dall'antichità, una lungimirante gestione dell'intero ciclo idrico. Dal passato abbiamo acquisito l'esperienza che ci porta oggi, in qualità di Gestori del servizio idrico del territorio, a mettere in campo le più importanti innovazioni tecnologiche e la migliore ricerca applicata per tutelare la risorsa e operare con un approccio circolare, per assicurare alle generazioni presenti, ma soprattutto a quelle future, un'acqua buona e sicura, una città anti-fragile protetta dagli effetti dei mutamenti climatici, e di garantire la qualità e la continuità del servizio ai cittadini.





18:00-18:45 Visit to Palazzo del Bo for the speakers of the conference

20:00 Social Dinner at Caffè Pedrocchi, via VIII Febbraio, Padua

## Day 2 - Tuesday, 7<sup>th</sup> February, 2023

### *Morning session*

Chair: **Andrea Rinaldo, University of Padua**

9:00-9:40 – Opening lecture

Georgia Destouni – Department of Physical Geography, Stockholm University, Sweden

### *Water, climate and society - interplaying systems in change*

We think about and feel climate change largely through changed water conditions on land, where we all live. For example, through more frequent, intense, long-lasting floods and droughts. Various societal developments along with climate change also affect water quality, with accumulation of legacy sources and for-ever chemicals making it more difficult to mitigate and prevent further water pollution. How do water quantity and quality conditions and their extremes change along with changes in climate, society, and their interactions with the terrestrial water system? Is the terrestrial water cycle evolving to faster or slower fluxes? Do changes in climate and human uses of land and water drive wetter or drier conditions around the world? This talk is about the interplay of water, climate and societal changes.

Chair: **Mauro Varotto, University of Padua**

9:40-10:15

Francesco Vallerani, UNESCO Chair «Water, Heritage and Sustainable Development», Università Ca' Foscari di Venezia, Venice, Italy

### *Waterscapes as cultural representations: narrating and painting hydraulic memories*

The control and management of water flows are among the most significant human activities aimed at transforming the natural environment. The main goal of this contribution is to develop a further examination of the intriguing interaction between waterscapes and its representations. According to the methods developed within the humanistic geography, individual perceptions and emotional relationships with waterscapes are investigated to shed light on the involvement with everyday places and practices. Literary texts and paintings have really adequate chances to improve the analysis and interpretation of what is understood as “watery sense of place”. This fondness for waterscapes allows to develop the concept of hydrophilia that could be defined as an ancestral attraction where physiological mechanisms of sight, smell and hearing interact with moods, emotions and meanings.

10:20-10:40 Coffee break

Chair: **Carlo Fumian, University of Padua**

10:40-11:05



Gianpiero Brunetta - Department of Literature and Language Studies, University of Padua, Italy

*L'acqua sullo schermo: centotrenta anni da protagonista (in Italian)*

L'acqua fa irruzione sullo schermo quasi da officiante battesimale nella serata che segna l'atto di nascita del cinema. Da questo momento fino ad oggi, per molti registi è una presenza costante e necessaria, una fonte di vita e di morte, una protagonista a più dimensioni spazio-temporali: un microcosmo che in una goccia racchiude un mondo o un mondo vero e proprio, un continente familiare e sconosciuto, che unisce e separa, un elemento multifunzionale, benefico e distruttivo, che incute paura, incita alla sfida e trasmette serenità. Nel corso del tempo l'acqua con la sua presenza o assenza assume funzioni mitopoietiche, simboliche, tragiche, drammatiche, comiche, ctonie, salvifiche, psicanalitiche, profetiche, apocalittiche...

Chair: Silvia Gross, University of Padua

11:05-11:30

Giovanna Cavazzini – Department of Industrial Engineering, University of Padua, Italy

*The multiple shapes of water as a renewable energy source*

The nexus between water, food and energy is the subject of a worldwide debate nowadays. While the strong correlation between water and food is widely recognized, the synergies between water and energy are more intense and multifaceted than expected. I will present the multiple shapes of water as a renewable energy source and how the enhancement of the water-energy synergy can create a more resilient and sustainable society.

Chair: Giovanni Luigi Fontana, University of Padua

11:30-11:55

Ambrogio Fassina – Department of Medicine, University of Padua, Italy

*Water, health and medicine: an insight*

In this planet life is water-dependent for the building of cells and their functioning. If we do not have a regular daily intake (3 liters for males, 2.2 liters for females), from liquid and food, we are going to face serious consequences in short time. All this has been immediately recognised by all living creatures since the beginning, but humans have developed different handling of water for healing and health benefit.

12:00-12:30

*WaterMusic*

Claude Debussy, Gabriel Fauré, and Ottorino Respighi, lyrics by Charles Baudelaire, Gabriele D'Annunzio, and Paul Verlaine.

Maddalena De Biasi, Soprano, M° Aldo Orvieto, piano

Maddalena De Biasi, is one of the most promising new voices in Italian opera. Versatile artist, ranging with intelligence and curiosity from the sacred repertoire to the profane, from ancient music to contemporary, will be accompanied on the piano by Maestro Aldo Orvieto. Maddalena De Biasi will present a refined "immersion" in some of the most touching chamber lyrics by Debussy, Fauré and Respighi dedicated to the theme of water on texts by D'Annunzio, Baudelaire, Verlaine.

12:30 Closure of the meeting