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“Promoting the professional and scientific interests of members to safeguard the public interest in the application of chemical sciences in water-related industries.”

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Apps on Tap!

The water footprint concept was introduced by Arjen Hoekstra et al in their study, Water Footprint of Nations, published in 2006 (1). The concept is an analogue to the ecological footprint, but indicates water use instead of land use. The water footprint is an indicator of water use that looks at both the direct and indirect water use of a consumer or producer. Focus was initially on water consumed during food production but has since been extended to a wider range of goods and services (2,3).

Your individual water footprint relates directly to the freshwater required to produce the goods and services consumed by you. You can use a water footprint calculator to assess your own unique water footprint. For example, the following online calculator can be used to estimate the water requirements per unit of product, according to country of residence:
<http://aquapath-project.eu/calculator/calculator.html>

The ‘virtual’ water footprint of a person, company or nation on the other hand is defined as the total volume of freshwater that is used to produce the commodities, goods and services consumed by the person, company or nation. The adjective ‘virtual’ refers to the fact that most of the water used to produce a product is not contained in the product. The real-water content of products is generally negligible when compared to the virtual-water content. The following calculator provides a rough estimate of daily water consumption based on personal needs:
<https://www.easycalculation.com/other/water-footprint-calculator.php>

While the following calculator is more fun to play with despite having a US bias (to use, scroll down to Discover your water footprint now): <https://moonfarmer.com/work/water-footprint-calculator>



For water conservation tips see the National Geographic for suggestions:

<http://www.nationalgeographic.com/environment/freshwater/water-conservation-tips/>

There are also several apps available to help you save water:

<https://www.cnet.com/how-to/5-apps-to-help-you-save-water/>

If you find working with these figures becomes too much of a worry, you can always chill out to the relaxing sounds of water:

<https://www.rainrainapp.com> —by *Adrian Clark*

References: 1. http://waterfootprint.org/media/downloads/Hoekstra_and_Chapagain_2007.pdf 2. <http://waterfootprint.org/media/downloads/Hoekstra-2008-WaterFootprintFood.pdf> 3. http://waterfootprint.org/media/downloads/TheWaterFootprintAssessmentManual_2.pdf

Water Factoid—in the UK, 3,123 million litres of treated water are lost through leaks each day, equivalent to 1,249 Olympic swimming pools



Famous Water Quotes



“Pure water is the world’s first and foremost medicine” -Slovakian proverb

“Water and air, the two essential fluids on which all life depends, have become global garbage cans”
-Jacques-Yves Cousteau

“You can’t cross the sea merely by standing and staring at the water” - Rabindranath Tagore

Running Events and Water—Tilele’s Athens Experience

In November 2017, I had the opportunity to run the Athens Marathon along with 15,000 other keen and nervous runners. This marathon is iconic because the route follows parts of the original course ran by the Greek legend Pheidippides, a messenger from Ancient Greece. Most people are familiar with the story that Pheidippides died after delivering his message, but few people know that just a few days before his final run, Pheidippides had run 150 miles to and from Sparta to rally the troops which helped the Athenians to their victory.

The Athens Marathon is said to be one of the hardest courses because it has approximately 21Km of uphill running. Needless to say, the flat terrain and mild temperatures in Cambridge are not ideal for preparing for such a course, but with knowledge comes understanding. From my long training runs, I learnt the importance of water intake before, during and after the runs. There were 15 water stations along the marathon course and water stations at the start and finish. I took a 500mL bottle at each station which means that I used up 8.5 litres of water and 17 water bottles! During the run, I’d take a few sips from each bottle and pour the rest over my head as this was my version of replicating Cambridge-like temperatures. However, the number of water bottles that I alone used makes me now think about a blog article by Charlie Watson, a marathon runner from London, titled “Should races be making more of an effort to be environmentally friendly?”. To put things into context, the Athens Marathon organisers provided 363,000 500mL water bottles; 61,000 500mL isotonic drinks; 520 2-litre Coca-Cola bottles; 19,500 bananas; 16,000 energy gels; 25,000 energy bars; and 300 portaloos.



In his book, ‘Waterlogged: The Serious Problem of Overhydration in Endurance Sports - Human Kinetics, 2012’, Sports scientist Professor Tim Noakes discusses how, contrary to popular belief, over-hydration is more life threatening than dehydration in the running world. Interestingly, up until the 1970s, marathon runners were discouraged from drinking a lot of water during races in case it slowed them down. He also discusses how this changed in 1976 when the Academy of Sciences Conference on the Marathon held their event in New York. Although the link between water and marathon performance was not stated explicitly, information was presented at this conference on the medicinal benefits of fluid intake to prevent heatstroke when running. In ‘The 100 Greatest Days in New York Sports’, Stuart Miller discusses another important fact from 1976: before the conference, the first New York City Marathon (now the world’s largest marathon) was held. This marathon attracted 2090 runners including 58 women, both of which were record marathon attendances. The running field was stacked with well-educated scientists and health experts; a fact which promptly endorsed marathon running.

My full Athens Marathon story and an explanation for the wrist guard in the photo is available on my sister’s running blog: <https://chifunochanga.com/2017/11/25/athens-the-original-marathon-part-1/>. If anyone would like to ask me anything about my running or the Athens Marathon course, they can email me at tilele.ts@gmail.com. To conclude, here are some words from Emil Zátopek (1922 – 2000), a Czech long-distance runner “if you want to run, run a mile. If you want to experience a different life, run a marathon”. - **by Tilele Stevens**

Water & Health Workshop

The Water Science Forum held a successful Water and Health Workshop in collaboration with the Sensors for Water Interest Group at the Exhibition and Conference Centre, University of the West of England, Bristol on 31st January. The UWE Institute of Bio-Sensing Technology (IBST) kindly hosted the event. WSF and SWIG proposed four speakers each, with the focus of the presentations on advances in monitoring the microbiological quality of drinking water and bathing waters, including new developments in rapid diagnostic methods and at-site testing. The jointly-organised event attracted 52 delegates reflecting the range of RSC and SWIG interests and achieved its aim of providing excellent opportunities for discussion and networking, with water utilities and academia well-represented, along with equipment developers and analytical services.



From L-R: Rosa Richards & Prof Richard Luxton (SWIG), Natasha Page & Adrian Clark (WSF Committee)

An introduction to the day's programme was given by Professor Richard Luxton, Chairman of SWIG, and Director of IBST. Adrian Clark, WSF lead organiser, gave a brief background to WSF and welcomed the opportunity to collaborate with SWIG. The opening Keynote presentation was given by Professor Nigel Silman of Public Health England, Porton Down. Prof Silman, drew on his worldwide experience of waterborne diseases to describe waterborne pathogens and the diseases caused, providing fascinating first-hand experience of the difficulties in remote testing of water quality in resource poor countries. He also highlighted the need for improved response to emerging pathogens such as legionella and *Mycobacterium chimera* before giving his views on what rapid diagnostics needs to offer in order to help control waterborne diseases. Elise Maynard of the Water Management Society opened her presentation on New Rapid Microbiological Techniques for the Detection of Legionella with an introduction to the WMS Rapid Microbiology Industry Liaison Group and described their work in spreading greater understanding of new diagnostic techniques. She outlined the requirements of the new ISO testing standards for

legionella before going on to review of the features and benefits of laboratory test methods, including PCR, IMS, ATP, MALDI-ToF and MPN. Robert Pitchers, WRC presented Novel Microbiological Monitoring Techniques for Water Quality by describing findings from the recently-completed EC-funded Aquavalens project. This 5-year project, involving 38 partners, researched a selection of techniques designed to improve water industry operations, with particular focus on extraction methods to improve pathogen recovery. The final presentation of the morning on *E.coli* Detection at Remote Sites was given by Dr Stephen Gundry, founder of Brightwater Diagnostics. His company have developed a new, low-cost aquaCHECK365 test to enable non-technical staff to carry out an MPN test for *E.coli* in the field. A video demonstration was shown and the company is now actively seeking partners for commercial development.

There was an opportunity over lunch to visit exhibitor displays by Chelsea Technologies Group, Hach Lange, Lovibond, Palintest, and the Water Management Society. Natasha Page, our Press Secretary, who assisted Adrian in organising the event, ran an exhibition stand promoting future WSF activities and membership.

Dr Katherine Fish, Sheffield University gave the first presentation of the afternoon on Biofilms and Drinking Water Quality. Results were presented of some ground-breaking research which is being undertaken using a full-scale water distribution system test facility, in order to provide a better understanding of how drinking water distribution system biofilms have differing impacts on water quality according to changes in environmental conditions. James Sorensen, British Geological Survey described The Application of Fluorescent Measurement in Water Monitoring. He was able to demonstrate that a modified fluorescent probe under development with CTG Ltd can be used to predict the presence and extent of faecal contamination during point sampling of drinking water sources gathered from the developing world. Positive correlations were also demonstrated between fluorescent intensity and both *E.coli* and total microbial counts via telemetered data gathered in at a UK utility. The importance of Making the Most of Data to Benefit Public Health was emphasised by Steve Markham, Marquis & Lord who promoted proficiency in use of open source (free) software (particularly R). Ian Leahy Palintest gave the final presentation, Screening Bathing Water Quality at the Point of Use, using a new water test kit. A prototype has been developed with University of Plymouth spin-out Molendotech Ltd to detect *E.coli* and other gram negative bacteria using a portable incubator and quantifiable colorimetric assay based on a modified enzymatic assay.

Presentations from the Workshop have been posted on the [WSF Past Events](#) and SWIG members websites. - **by Adrian Clark**

WSF Events—Keep up to date with our future events on the RSC event website

<http://www.rsc.org/Membership/Networking/InterestGroups/WaterScience/ForthcomingEvents.asp>

Assessing the risk of plant protection products for the aquatic environment workshop

Thursday 5 July 2018, Fera Science Ltd, Sand Hutton, UK



WSF committee member Prof Gary Fones will be speaking on passive sampling for monitoring plant protection products in the aquatic environment

Book your place here— <https://www.soci.org/news/agrisciences/assessing-the-risk-of-plant-protection-products-for-the-aquatic-environment-event-preview>

Indo-UK workshop on monitoring and analysis strategies for anthropogenic pollutants in environmental and waste waters

12-15 November 2018 | Royal Orchid Convention Centre, Bangalore, India

We are inviting Early Career Researchers from the UK and India to apply to attend this Newton Fund/Royal Society of Chemistry workshop.

The application form can be downloaded at: <http://www.hutton.ac.uk/events/indo-uk-workshop-2018> and should be sent to lesley.blyth@hutton.ac.uk before the deadline of 20th July 2018.



In the News

[Leak detection that is out of this world— WWT](#)

Satellite imagery methods are increasingly being used for leak detection.

[Genetic hack makes plants use 25 percent less water— Seeker](#)

Scientists have reduced the water requirement for tobacco plants by altering a single gene.

[Scientists found an alternative to water chlorination— Phys.org](#)

Researchers show the use of sodium ferrate and electrolysis as a potential for disinfection of water.

[Artificial Sweeteners are used to track water pollution—Scientific American](#)

Sucralose is shown to be a useful tracer for wastewater pollution.

[Tiny membrane key to safe drinking water — Science Daily](#)

Graphair, a form of graphene is being used at Sydney Harbour to produce safe clean drinking water in one filtration step.

[What is the 'raw water' trend? It could kill you, health experts say — USA Today](#)

Negative health impacts discussed of the raw, untreated spring water trend growing across parts of USA.

[Drug waste flushed into World's freshwater ecosystems to rise 65% by 2050— Ecowatch](#)

International research team have created a model to predict concentrations and hotspots of pharmaceuticals in waterways.

Journal Papers of Interest (all open access)

[Calibration and field evaluation of the Chemcatcher® passive sampler for monitoring metaldehyde in surface water](#)

[Partial renewal of granular activated carbon biofilters for improved drinking water treatment](#)

[Effects of ortho- and polyphosphates on lead speciation in drinking water](#)

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WSF Newsletter— If you have any items of interest or stories for the newsletter please email us at—rscwsf@gmail.com

Driving innovation in water & waste analysis methods event

Day one of this event outlined the recent renaissance and subsequent progress of the Standing Committee of Analysts (SCA). Experts from each analytical area presented their recent method developments, including details of the new methods soon to be issued. It is hoped that this will invite a wider industry participation in the future direction of the method working groups,, and that industry will help to provide some funding for this key expert participation.

The SCA UK Blue Books are considered unique in that they are effectively national standards and are freely available via the Internet (See: - <https://www.gov.uk/government/publications/standing-committee-of-analysts-sca-blue-books> and <http://www.standingcommitteeofanalysts.co.uk/>). Over 230 are available. SCA methods can be developed more quickly in order to address new regulations, in comparison to equivalent CEN and ISO standards (typically 4 – 5 years), as many other countries are involved with the development of such methods.

Senior representatives from all the UK water and waste regulators (DWI, EA, UKAS) presented their vision of the future of regulation. They covered the important topic of how the SCA, with industry support, can provide free on-line methods that keep pace with the increasing depth and breadth of regulations, whilst achieving some very low and challenging detection limits. The associated sampling challenges are also being addressed.

Day two of the event focused on the challenges and opportunities for the water laboratory in the 21st Century, moving away from traditional end of pipe testing and assurance towards a dynamic, end to end catchment and risk-based environment. Three broad topic areas were covered: (1) rapid method development and its successful delivery both within the laboratory and also on operational sites – focused on areas of key customer needs; (2) optimisation of the existing analytical environments and methods, protecting customer confidence whilst also improving efficiency, and (3) data issues and their explanation to non-technical clients and customers. This key area is often overlooked!

The water laboratory and on-site testing have played a central role in the protection of public health and the environment for many years. Results from water laboratories have underpinned the identification and delivery of essential improvements to water and environmental quality – that customers have noticed, and that crucially have helped underpin customer confidence.

However, the customer, operational and regulatory environment within which the water laboratory operates is changing fast – with greater focus on dynamic system wide risk management, customer acceptability and legitimacy. This is at the same time that the water industry transitions from large capital schemes to lower cost and impact totex and operational solutions. -

by Clive Thompson



WWEM 2018

It is planned to rerun parts of the above event at WWEM 2018 at Telford on 21st Nov - <https://www.ilmexhibitions.com/wwem/>

Long Term Service Award

At the last Water Science Forum committee meeting on 16th January at Burlington House, Adrian Clark was awarded a Water Science Forum award for service to the committee. Adrian joined the committee on 1st January 2011 and has now served his two full terms. He remains a corresponding member and continues to support the work of the WSF committee.

From L-R: Helen Keenan, Adrian Clark

International Standards Committee on Water Quality

Several members of the committee of the Water Science Forum attended the recent meeting of the International Standards committee on water quality, ISO/TC147, which was held in Edinburgh. This committee specialises in developing standardised methods for assessing the quality of all types of water; these include not only modern instrumental methods but also radiological, microbiological and biological methods.

There are also groups covering terminology and sampling. Many of the methods developed via ISO/TC147 have also been published as full European standards and adopted in clauses of the Water Framework Directive.

In terms of chemical analysis, the committee held meetings to discuss the drafting of analytical standards for the determination of parameters diverse as TOC, COD, turbidity, cyanide, alkylmercury, microcystins, chloroalkanes, pharmaceuticals and perfluorinated alkyl substances (PFAS) in waters. Over 100 experts from around the world attended the meeting representing countries including Canada, USA, Australia, South Africa, India, Japan, South Korea as well as many European countries.

As well as a full work programme there was some time for networking and meeting new friends, with the organisation of a conference dinner and opening reception held in Edinburgh Castle. The event being officially opened by Roseanna Cunningham (MSP) Cabinet Scottish Secretary for Environment, Climate Change and Land Reform. - **by Roger Wellings & Ian Barnabas**

The full portfolio of published standards can be inspected on the ISO website at: <https://www.iso.org/committee/52834/x/catalogue/>



From L-R: Dr Ulrich Borchers (IWW), Mr Peter Jones (Scottish Water), (Dr Richard Allan - The James Hutton Institute)

Water Science Forum bursaries

Water Science Forum bursaries have helped support research across a number of subjects. If you are interested in applying for our Water Science Forum Bursaries, up to £2000 is available per applicant for both the Alan Tetlow and Water Science Bursary. They are open to all WSF members from any country and the money available can be used for a wide range of activities including conferences, research, lab visits and research projects across a range of topics including water quality.

Contact: Hon Sec, RSC Water Science Forum, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

See our website for more information: <http://www.rsc.org/Membership/Networking/InterestGroups/WaterScience/bursaries.asp>

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The views expressed in the newsletter are those of the authors and do not necessarily represent the views of the RSC, the Water Science Forum or the author's organisation.



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Water Science Forum are now on Twitter and Linked In. Please join us and become a group member by following the links provided below. We welcome your involvement with posts and conversations on all water related topics.



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