



## **FINALISTS 2015**

STOCKHOLM  
JUNIOR  
WATER  
PRIZE

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# The Stockholm Junior Water Prize

Each year, the Stockholm Junior Water Prize congregates young scientists and innovators from around the world who have created new solutions to the planet's growing water challenges. Each of the finalists represented in Stockholm are the champions of their national competition and have been selected as winners from thousands of entries for their outstanding work.

This year we are proud to host the 19th annual competition and welcome the winners of national competitions from 29 countries:

Argentina, Australia, Bangladesh, Belarus, Canada, Chile, China, Cyprus, Finland, France, Germany, Hungary, Israel, Italy, Japan, Latvia, Mexico, The Netherlands, Nigeria, Norway, Republic of South Korea, Russian Federation, Singapore, South Africa, Sweden, Turkey, Ukraine, United Kingdom and United States.

The Stockholm Junior Water Prize competition proves that brilliant young minds can find

inspiration in unlikely places. They see opportunity and hope where others find challenges and have developed cost-efficient and immediate solutions, applicable the world over. In this catalogue, you can learn more about the innovative research and inventions that earned each of the finalists a place to compete for this international honor. All the finalists are invited to Stockholm for the special opportunity to meet with present leaders of the global water community and to make life-long friendships with likeminded from around the world who share the passion for water and science.

This visit includes the chance to receive the international prize from H.R.H. Crown Princess Victoria of Sweden during an exciting award ceremony which will be held this year on Tuesday August 25th at the Grand Hotel in Stockholm. World Water Week participants have the opportunity to meet this next generation of water leaders by visiting their poster exhibition at the school yard outside the conference area at the Stockholm City Conference Center.

## The international jury

The competitions' International Jury includes experts within the field of water who appoint the winner of the international final by committee consensus. The decision is based on the finalists' written report, a short presentation of their display material and three rounds of interviews. The jury members are appointed by Stockholm International Water Institute Board. All members of the jury has extensive experience and represents a wide range of disciplines from natural to social sciences in order to ensure all projects are equally reviewed and judged.

### The 2015 International Jury Members

- Dr Fredrik Moberg (Chair), Sweden
- Dr Jo Burgess, South Africa
- Ms Belinda Abraham, Canada
- Ms Danka Thalmeinerova, Sweden
- Prof Yoshihisa Shimizu, Japan
- Mr Michael Fields, USA
- Prof Krishna R. Pagilla , USA

## ABOUT THE STOCKHOLM JUNIOR WATER PRIZE COMPETITION

The competition is open to young people between the age of 15 and 20 who have conducted water-related projects at local, regional, national or global levels with environmental, scientific, social and/or technological impor-

ance. The aim of the competition is to increase awareness, interest and knowledge of water and the environment. The international winner will receive a USD 15,000 award and a prize sculpture, the winner's school receives USD

5,000 and the winner of the Diploma of Excellence USD 3,000. H.R.H. Crown Princess Victoria of Sweden is the Patron of the Stockholm Junior Water Prize and Xylem Inc. is the global sponsor.

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## ARGENTINA

### Riverbanks and water quality in the river Chimehuín • Walter Eduardo Aigo, Patricio Martín Arce & Joaquín Antú Porma

Riverbank samplings were carried out through vegetation transects on five sites of the river Chimehuín from its source to near the mouth. In those places water quality was also analyzed. We made Physic-chemical and biological analysis (temperature, pH, oxygen, alkalinity and nitrates) where we used macroinvertebrates as indicators of water quality. In general the river has banks with vegetation along almost its entire course, except for in urban areas where it has been partially modified. In these areas we observed water quality changes. We propose recommendations for restoration and conservation of riverbanks.

## AUSTRALIA

### The effect of nitrate levels on the growth of *Anabaena circinalis* • William Tsai

An excessive amount of nitrate in wastewater discharged can pose various environmental, economic, and health implications. The aim was to investigate whether nitrates were abundant in effluent discharge from wastewater treatment plants across South-East Queensland, Australia, and subsequent impacts on *Anabaena circinalis* growth (species that has toxigenic Harmful Algal blooms). Although nitrate levels exceeded guidelines for prevention of eutrophication, however, these levels did not have a significant impact on the growth of Algae. Re-evaluation of regulated nitrate levels may thus be needed.

## BANGLADESH

### Aqua processor – Integrated water reuse system

• Labib Tazwar Rahman, Navid Haider, Sheikh Rifayet Daiyan Srijon

The delegation from Bangladesh propose a low-cost, efficient, and user-friendly incorporated recycling system for rainwater and household grey-water (used in sinks, shower and washing purposes) which address the issue of excessive ground water depletion in Dhaka. Through quantitative, qualitative, and economic assessment the research conducted by the delegation yielded that treatment of the two water sources can simultaneously be run in a very small area at the basement of each urban building to successfully cut down annual groundwater dependence by half.

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## BELARUS

### Household and biotechnological methods to reduce the pollution of waters by alkyl sulfates •

Tatsiana Pasko & Anna Kotikova

Domestic waste (for ex. domestic septic tanks) is an important source of alkyl sulfate to the environment. We have developed, tested, and offered a simple way to use soap economically. These methods are easy to use, environmentally friendly, cost-effective, and take into account savings in both soap and water. Also, we have developed a biotechnological method of microbial purification using our own detected bacteria and developed biological product based on it. Sharing household and biotechnological methods can significantly reduce the environmental pollution by alkyl sulfates of domestic origin.

### Identification of Carbamazepine Degraders • Nicole Zhao

Carbamazepine (CBZ) is a recalcitrant pollutant that enters natural water systems via human excretion and wastewater treatment plant effluents causing environmental and health concerns. Through a series of isolation and selection pressure experiments using a continuous enrichment system, a microbe found in the Great Lakes basin, *Microbacterium oxydans*, was found to be capable of degrading CBZ. The use of naturally occurring microorganisms for bioremediation can be a cost-effective and an environmentally-sustainable solution to address CBZ pollution.

## CANADA

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## CHINA

### A UAV design for water resource protection based on chlorophyll retrieval model • Shuai Ke

In order to monitor water quality and protect water resource, I developed a monitoring system based on Hong Yu Unmanned Aircraft Vehicle (UAV).

With Chlorophyll a as indicator, a quantitative relationship between UAV monitoring spectrum features and Chlorophyll a content was established, and has been successfully applied in Wuhan urban area and source water area of Middle Route of south-to-north water diversion project of China.

A comprehensive analysis reveals that Hong Yu UAV monitoring system has great prospects for its application in water resource protection.

## CHILE

### Antarctic fungus helps improve water use efficiency in agriculture • Katherine Araya & Katya Urqueta

Plants of romaine lettuce *Lactuca sativa* L. were, inoculated with *Phaeosphaeria microscopica* fungi, isolated from the root of Antarctic plant *Colobanthus quitensis*. Results after cultivation under water stress conditions show that the associated symbiosis enabled lettuce production using less water.

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CYPRUS

### Flash flood prevention system

• Neophytos Fikardou & Evdokia Charalambous

Flash floods are a growing problem for areas with short intense rainfall patterns. Large volumes of surface water carry with them debris that block traditional drains. This project introduces the idea of combining side drain inlets, the process of sedimentation, garbage disposal units, and water triggered sensors to eliminate the problem of blocked storm drains and therefore reduce the risk of flooding. The project includes a collection of ideas involving a side inlet, a collection box, a water detector and a garbage disposal. The aim is to quickly remove water from the streets in order to prevent floods and more correctly flash floods.

FINLAND

### Investigating wellwater quality by liquid scintillation counting and potentiometric determination • Riki Oura

I wanted to find out how much radon is present in well water in Kirkkonummi area (40km west from Helsinki), check the quality (fluoride and pH) and find out whether people know the condition of their drinking water. National limits were exceeded in 30 per cent of radon and 20 per cent of fluoride samples. 20 per cent had lower pH than the national limit. Voluntary control of well water does not work well enough in practice since well owners are not aware of the potential health risks. Well water quality checks should be made compulsory or the municipalities should provide the well water quality tests for free.

### Bubble alarm versus surfactants • Quentin Meyer, Elodie Leroy & Arthur Boulay

When a water drop falls on the water, we can hear a particular sound. We realized that it is an air bubble vibration that gives this sound. We showed that the vibration frequency depends on the surfactant concentration of the liquid where the bubble is. As the surfactant can do environmental damage, we used our results to develop an innovative method for measuring the surfactant concentration of wastewater. This method is more environmentally friendly than the existing ones, and its playful side contributes to raise awareness to a wide public.

FRANCE

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## HUNGARY

### The Secrets of Drinking Water – How to Combat Polyethylene Terephthalate • Tamás Gergely Iványi, Márton Czikkely & Tamás Márkus

Our research started from the realisation that the yearly growth in discarded polyethylene terephthalate bottles combined with misbeliefs about tap water will lead to an ecological catastrophe. We have proven the negative characteristics of PET in our experiments. We monitored the journey of water and its treatment in Budapest from the Danube to the consumers and ascertained its excellent quality. We proposed four easily implementable ways to diminish the dumping of used PET into the environment.

## GERMANY

### Microplastics – A growing problem • Julia Henrike Freund

In my project I investigated the adsorptive properties of microplastics. Through my experiments I have shown that non-polar substances are indeed firmly adsorbed to plastic in aqueous solution while they are detached in the presence of animal oils. On the practical side I tried to transfer my findings to the filtration of waste water in sewage plants. The aim was to decide whether these interactions can be used to improve the efficiency of filters for a retention of microplastics. I developed a model system and integrated it into the flow process chart of a sewage plant.

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## ISRAEL

### Prevention and biological treatment of oil spills • Chen Zamostianu, Stanislav Reznikov & Rotem Ben David

Oil spills occur frequently and cause enormous ecological damages on land and at sea. We developed a solution based on an oil digesting bacteria and nutrients for treating land oil affected areas and large leaks from tankers. We also designed and built a model of detection and classification system of tankers leaks and of sealing of holes by floating balls in case of small leaks. Preliminary laboratory tests and examination of the method's cost show a great promise for development of efficient methods of treatment of oil spills and limitation of the damages caused by pollution.

ITALY

**Water, chemistry and... Scusés! • Tommaso Liut,  
Arianna Gurisatti & Alessandro Pecile**

Our project is an environmental study about a beautiful but forgotten area in our region: the Scusés basin. It is a little lake formed by the confluence of two streams and situated in a very quiet area. We determined the physical and chemical parameters of its water taking monthly measurements for a year; we also identified and catalogued the benthonic organisms, the water-plants, and the vegetation along the banks. The data we collected showed some critical aspects, so we decided to make our results known to the local population and to ask the administrators for some improving actions.

**To protect our golden spring – A lesson from a  
Japanese goddess • Mayu Nakagawa, Amauchi  
Daiju & Yuki Matsui**

Are you aware of soil's contribution to our environment? We researched how the Goddess of the Earth supports our water circulation. The name of one of our Japanese goddesses is "HAKE". Acid rain has deteriorated not only lakes, rivers, and groundwater but also forests. The soil of "HAKE" was found to protect the water environment from acid rain by our scientific research. SHE gives us an exceptional Spring in our city (whose Japanese name, "Koganei" means "golden spring"). We insist that we should be aware of the buffering actions of soils and work with HER to protect our environment.

JAPAN

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## MEXICO

### Removal and detection of fluoride by developing a filtration system of activated carbon impregnated • Guillermo Gael Wells Abascal & Ana Laura Martínez Pacheco

There are many water treatment methods to eliminate fluoride but these methods are expensive for Mexico and other developing countries. This project creates a simple treatment to remove fluoride concentrations in underground water and suggests an implementation of an inexpensive and efficient method to quantify fluoride. The study was divided in two stages. Stage one considered experimentation with AC impregnated+salts. Stage two considered the proposal of an equation to determinate fluoride concentrations. AC + sea salt removed 96.7 per cent; the equations can determinate a wide range of fluoride concentrations.

## LATVIA

### Various types of household wastewater treatment from nitrogen compounds and their efficiency • Miks Ozols

The project deals with the efficiency of various types of household wastewater treatment from nitrogen compounds. The aim of the work is to determine and compare the efficiency of various types of wastewater treatment. The conclusion of the research is that the most efficient type of household wastewater treatment for private houses is the treatment with the industrially manufactured biological treatment system with biologically active sludge, which can reduce the concentration of ammonium nitrogen up to 91,9 per cent, which allows to drain the treated wastewater further in the environment.

## LATVIA

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# THE NETHERLANDS

## Blue battery • Eline Jagtenberg, Lotte van der Velde & Mei Nelissen

We have proven that it's possible to generate electrical power combining reverse electro dialysis (RED) with a bipolar membrane and the use of acid, base, and salt. The bipolar membrane transforms H<sup>+</sup> (acid) and OH<sup>-</sup> (base), into water while generating electricity. Solar/wind energy will be reversed into chemical energy, using electro dialysis. When needed, chemical energy is transformed into electrical energy, using RED. After this, the concentrated acid and base will be diluted and used again for ED. These liquids don't need to be renewed and they make it possible to store sustainable energy.

## Midtsjoevann – A sustainable lake? • Tomine Victoria Hillier & Torbjørg Venstad

Midtsjoevann is a lake, a public swimming area, and a nature reserve close to the city Ski. Therefore, we wanted to examine how surrounding farmers' fields have effected the water quality of Midtsjoevann. We took water samples and analysed them. We were in contact with a local authority that told us about different initiatives undertaken to ensure the water quality. The results showed us that the water quality changed in relation to the weather and season, and not that much due to the fields. The main reasons were that the topography was very flat and the initiatives from the farmers.

# NORWAY

# NIGERIA

## Alternative and sustainable energy source (biomass and biogas) • Abdulmalik Ibrahim Danyar, Shehu Kabir Mustapha & Abubakar Makki Salihu

Present work highlights the biomass and biogas from flowers of *Calotropis procera*. The biomass of flowers that was evaluated for different seasons show a maximum fresh biomass of 799.10 gm in the summer season. The dried biomass of *Calotropis procera* flowers was subjected to non-polar (petroleum ether 60-80) and polar (methanol) solvent extraction to check its extractibilities. The total extractive yield was found maximum in monsoons, 4.5 per cent (petroleum ether extract) and 27.9 per cent (methanol extract). The flower biomass of *Calotropis procera* can, therefore, be exploited as a potential source of bioenergy. In this project, the biomass of *Calotropis procera* and biogas that was produced from solid residues of *calotropis procera* were used as energy source in thermic power plant due to its high level of organic constituents.

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## RUSSIAN FEDERATION

### Quality of water objects of the State Nenets nature reserve • Maria Markova

Petroleum products enter the mainstream of Pechora River and Korovinskoe lip (Barents Sea) from the emergency well located at Nenets Nature Reserve. The project investigates water quality by bioindication methods and develops recommendations for avoiding oil products transferring to water objects. Wide-spreading of *Potamometum pectinati* community along with Woodiwiss-Yakovlev procedure indices gives evidence of water ecosystems eutrophication. Our recommendations provide an opportunity to take action for dam restoration and to decrease oil product emission into water objects of Nenets Nature Reserve.

## REPUBLIC OF KOREA

### Phosphate recovery from livestock wastewater using Iron Oxide Nanotubes (INTs) •

Min Seok Kim & Kibum Park

Hoengseong County of South Korea, where Korean Minjok Leadership Academy is located, is the hub of Korean livestock industries. While Hoengseong is famous for milk production, it is suffering from eutrophication – severe algae bloom – due to influx of livestock wastewater into the water environment. This project aims to prevent eutrophication by developing Iron oxide nanotubes to not only remove phosphate (the main factor of eutrophication) but also to retrieve it for further industrial use.

### Wastepaper as a low-cost adsorbent for removal of heavy metal ions • Jaron Yu Kit Yong,

Daniel Yan Loong Ong  
& Glen Vintario

Heavy metal pollution is a serious environmental concern worldwide. In this study, the ability of wastepaper in adsorbing copper (II), lead (II), and zinc ions was studied. The results show that the maximum adsorption capacities of wastepaper for all the three metal ions were higher than that of activated carbon. When used as filtration media for various types of filter (simple column, ceramic and continuous upflow), wastepaper was able to remove at least 85 per cent, 95 per cent, and 40 per cent of metal ions respectively. Wastepaper has the potential to be used as an adsorbent to purify water polluted with metal ions.

## SINGAPORE

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## SOUTH AFRICA

**Water demand and water conservation management** • Camilla Mmabatho Mashele, Hlengi Hlulani Makumbila & Nhlonipho Edgar Nukeri

Our project is about a water conservation method which can minimize or control water wastage in our school, community, and country. To solve the problem, we have designed a simple and accurate model/devise which uses a level sensor and a cell phone to discharge the required amount of water accurately. A cell phone can be used from a distance to open and close the water flow. A person can call cell phone A to open, call cell phone B to close, or setting an alarm for both cell phones in order to open and close at the specific time.

## SWEDEN

**The mass balance of Storglaciären** • Michael Nyirenda

In this report a comprehensive mass balance experiment was conducted on Storglaciären in order to create a model of how global warming could be affecting the Earth's glaciers. The accumulation, ablation, and net value for the year 2014 were calculated by measuring the snow's density and depth. As expected, the net value for Storglaciären this year proved to be negative. Earlier hydraulic measurements conducted on a nearby stream connected to Storglaciären, the Tarfalajäkka, were used in this report to further support the acquired results.

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## UKRAINE

### Overwater robot for radiation survey and mapping "Radscout MK.3" •

**Oleksandr Makhnov**

Over the past century, human usage of nuclear technologies has created a new ecological problem—radioisotopes pollution. To prevent radioactive substances getting inside the human body through food and drinks you need to have a constant control of potential sources of radiation-polluted water. We have developed and tested a new scientific instrument: it is an overwater robot, a self-propelled platform with radiation-sensible detector and GPS module onboard. The device is capable of creating maps of radiation pollution and performing gamma-ray spectrometry.

## TURKEY

### Specific adsorption capacity of natural/ synthetic materials in separation of waste oil from water • Mehmet Ikiz & Yunus Emre Bozkurt

Today, waste oils are one of the main causes of water pollution and it is an important issue to refine-recycle them. In our project, we aimed to determine the efficacy of the ingredients used for this purpose. We chose particularly waste synthetic adsorbents that can be used in recycling of waste oils. Then, we performed experiments in order to determine the availability of these adsorbents in adsorption of domestic waste oils from water.

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## UNITED KINGDOM

### Fish out of thin air • Renatus Groothoff & Sebastian Groothoff

Tomorrow's oceans could be void of fish if the fishing industry continues unsustainable harvesting. While industrial fishing is also damaging the ocean ecosystem, aquaculture is also causing ecological harm as 50 per cent of the feed used by fish farms is derived from wild fish. We hypothesised that using photosynthesis and bacterial nitrogen fixation in an aquaponic system we could harvest the four main elements of all biological molecules directly from the air or water turning these into fish protein.

### Novel renewable filter for heavy metal removal • Perry Alagappan

Rapid advances in technology in the 21st century have resulted in the recent and significant rise of electronic waste, which contains highly toxic heavy metals such as mercury, cadmium, and lead. These heavy metals frequently leak into water sources, thus posing a dire threat to us. The problem with existing heavy metal filters is that none of them are readily renewable. Leveraging the power of nanotechnology, a fully regenerable, sustainable, efficient, and first-of-its-kind filter has been created that can remove over 99 per cent of heavy metal contaminants from drinking and industrial wastewater.

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Let's Solve Water



Unilever

With a portfolio of brands and products used by millions of consumers every day, Unilever has a unique opportunity to create change and, through working with partners, develop solutions to help address some of the world's most pressing water-related challenges. For example our hand dishwash brand, Sunlight, is working to identify solutions that help liberate the time women currently spend collecting water every day. Through multi-sector collaborations we aim to explore how we can advance the solutions as a key driver of women's empowerment and global development. **That's why Unilever is supporting World Water Week.**



We invite you to attend our panel discussion: **Water for Women, Monday at 16:00 – 17:30, Room FH 300.**

## 2014 STOCKHOLM JUNIOR WATER PRIZE WINNER



Hayley Todesco, Canada, receiving the 2014 Stockholm Junior Water Prize from H.R.H. Crown Princess Victoria.



The 2014 Diploma of Excellence was awarded to Orawan Thasanabenjukul, Pannawat Peanjad and Natthanicha Jairungs from Thailand.

Photos: Cecilia Östhammar, Exray

# STOCKHOLM JUNIOR WATER PRIZE WINNERS

- 2014 | Hayley Todesco, Canada  
“Waste to Water: Biodegrading Naphthenic Acids using Novel Sand Filters”
- 2013 | Naomi Estay & Omayra Toro, Chile  
“Psychiobacter: Antarctic Co-operation on Bioremediation of Oil-Contaminated Waters”
- 2012 | Luigi Marshall Cham, Jun Yong Nicholas Lim and Tian Ting Carrie-Anne Ng, Singapore  
“Investigation of the Use of Sodium-Activated Bentonite Clay in the Removal and Recovery of Non-Ionic Surfactants from Wastewater”
- 2011 | Alison Bick, USA  
“Development and Evaluation of a Microfluidic Co-Flow Device to Determine Water Quality”
- 2010 | Alexandre Allard and Danny Luong, Canada  
“Research on Biodegradation of the Plastic Polyesterene”
- 2009 | Ceren Burçak Dag, Turkey  
“A Solution to Energy-Based Water Contamination: Rain as an Alternative Environmentally Friendly Energy Source”
- 2008 | Joyce Chai, USA  
“Modelling the Toxic Effects of Silver Nanoparticles Under Varying Environmental Conditions”
- 2007 | Adriana Alcántara Ruiz, Dalia Graciela Díaz Gómez and Carlos Hernández Mejía, Mexico  
“Elimination of Pb(II) From Water Via Bio-Adsorption Using Eggshells”
- 2006 | Wang Hao, Xiao Yi and Weng Jie, China  
“Application Research and Practice of a Comprehensive Technology for Restoring Urban River Channels Ecologically”

- 2005 | Pontso Moletsane, Motebele Moshodi and Sechaba Ramabenyane, South Africa  
“Nocturnal Hydro Minimiser”
- 2004 | Tsutomu Kawahira, Daisuke Sunakawa and Kaori Yamaguti, Japan  
“The Organic Fertilizer – an Alternative to Commercial Fertilizers”
- 2003 | Claire Reid, South Africa  
“Water Wise Reel Gardening”
- 2002 | Katherine Holt, USA  
“Cleaning the Chesapeake Bay with Oysters”
- 2001 | Magnus Isacson, Johan Nilvebrant and Rasmus Öman, Sweden  
“Removal of Metal Ions from Leachate”
- 2000 | Ashley Mulroy, USA  
“Correlating Residual Antibiotic Contamination in Public Water to the Drug Resistance of Escherichia Coli”
- 1999 | Rosa Lozano, Elisabeth Pozo and Rocío Ruiz, Spain  
“Echinoderms as Biological Indicators of Water Quality in the Alborán Sea Coast”
- 1998 | Robert Franke, Germany  
“The Aquakat – a Solar-Driven Reactor for the Decontamination of Industrial Wastewater”
- 1997 | Stephen Tinnin, USA  
“Changes in Development, Sperm Activity and Reproduction Across a 105 Exposure Range in *Lytechinus Variegatus* Gametes Exposed to Pesticides in Marine Media”

## Do you want to be part of the Stockholm Junior Water Prize?

If you are interested in leading a national competition in your country or would like to learn more about sponsorship opportunities for the Stockholm Junior Water Prize, please contact [ania.andersch@siwi.org](mailto:ania.andersch@siwi.org).

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