The Chain Reaction

Humanitarian Solutions Worldwide

Newsletter 25 • December 15, 2017

Maria Stella Portelli Joins Chemists Without Borders' Board of Directors

BY MARIA STELLA PORTELLI AND RAY KRONQUIST

"*I'd like to introduce Maria Stella Portelli as our newest member of the Chemists Without Borders' Board of Directors. Stella is a Chemistry and Biology graduate from the University of Malta. She currently holds the position of a medical writer at a healthcare company and has previously worked as a research chemist in the pharmaceutical industry. However, it was during her studies that she contracted the travel bug. Amongst other places, it has taken her to India, Kenya, Colombia, Brazil and Peru, where she worked on various voluntary projects with different organizations. Her experience in NGOs extends even further. For 4 years, she was an active committee member of IAESTE Malta, where her roles varied from taking care of the internship exchange system to eventually leading the organization. She joined Chemists Without Borders in March 2017. Stella has already had a positive impact on our organization, and we look forward to her contributions in the years to come. Here are some of her ideas going forward.*"
- Ray, President of CWB

It's funny how the I-have-nothing-to-lose attitude that pushed me to email Chemists Without Borders landed me a golden volunteering opportunity.

Since my first email earlier this year, I have hopped on the Arsenic Project Team and joined Ray in his crusade against time. With innumerable emails and perfectly orchestrated Skype meetings to suit different time zones, I started to learn more and more about our organization, how it works, its strengths and its weaknesses.

Now, engaged in this new role, I would like to consolidate the strengths of our organization and repurpose them to rectify the shortcomings. This translates to three main personal points of focus which I would like to share with you:

What's Inside this Issue

Our Mission

Chemists Without Borders solves humanitarian problems by mobilizing the resources and expertise of the global chemistry community and its networks.

Our Vision

A global support network of volunteers providing mentoring, information and advice to ensure every person, everywhere, has affordable, consistent and persistent access to:

- Essential medicines and vaccines
- Sufficient safe water
- A sustainable energy supply
- Education in green chemistry and business which people can apply in their daily lives and teach to others
- Safe processes in work environments where chemical hazards exist
- Emergency support, including essential supplies and technology

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1. Community: more precisely its untapped potential. The staggering number of interesting people and ideas cannot go unnoticed. This sense of community is not just an asset for members, but for the whole organization.

2. Marketing: currently, Chemists Without Borders' image does not scrape the surface of the magnitude and value of the work being done. It's time to unveil the submerged portion of the iceberg!

3. Fundraising: our work can only sustain itself with a solid flow of incoming funds. Establishing this would solve a continuous struggle.

As interdependent as these three targets are, I believe that it is 'community' that holds the key. Unless we harness the energy of the community we won't be able to develop the organization to its full potential. I must admit, it is a long way to go. Nonetheless, with your contributions, your time and your inspiration, I am positive that together we can achieve all of this, and more.

I look forward to working with all of you.
-Stella

Making Humanitarian Projects Part of the University Academic Program

BY EHSANUL ALAM

I have been involved with Chemists Without Borders since 2015. In two years I have been able to learn a lot from the organization. The most exciting part of working for Chemists Without Borders is perhaps the fact that you get to share your ideas with people from different backgrounds and ages. One common thing among everyone that I have spoken with or met during these two years is that all of them have that inner fire burning to do something for the society that we live in and leave a better tomorrow for the future generations.

Being a Bangladeshi, I was obviously drawn towards the arsenic project headed by Ray Kronquist. Although it is a relatively young project, there are some noteworthy achievements made and more results are on the way. Our project manager in Bangladesh is Ms. Shahena Begum, who with her relentless work has been able to educate the children from the Sitakunda Upazilla high schools near Chittagong and supervise the construction of the two wells which now provide arsenic-free drinking water to more than 4000 children. A small number considering the fact that the number of people who are exposed to the dangers of arsenic poisoning is much larger. Now it is already the time to reach out to a wider community and hence to establish a process that it is self-sustaining and can be a model for the other parts of the country.

The Chemists Without Borders organization within these two years has been able to stand shoulder to shoulder by incorporating health education course for Agami, Rotary clubs (both in Bangladesh and the USA), and most importantly with the Asian University for Women in Chittagong. One way of fast tracking the project is to integrate the university students into different branches of the project.

YouthMappers from AUW mapping and testing a well for arsenic

I would like to now propose that universities in developing countries integrate projects such as the Chemists Without Borders Arsenic Project into their academic program. By actually working on a humanitarian problem and being responsible for a result, students learn things such as how to manage a project, how to gather ideas from one's teammates, how to persuade others to follow a course of action, how to attract resources such as money or technical advice, to accomplish a goal, etc. This kind of learning is missing when the academic work is just listening to lectures, study-

High school students learning how to map and test wells for arsenic

ing books and taking an exam on the material. For example, we have students at the Asian University for Women training high school students how to map and test wells for arsenic.

Course work can be prepared for the students to take up for the four years of their university time during which they will work under the supervision of the Project Manager or a Professor and address different aspects of the project. One group can work with assessing the socio-economic effect of the model and the other can work on developing a multi-media teaching material through which small children can be taught the importance of drinking safe water. The important factor here is to mobilize the ever enthusiastic youth of the country to solve a humanitarian crisis in a clean and self-sufficient manner.

To discuss such possibilities, contact Ehsanul Alam: alam@ttd.tu-darmstadt.de

Progress in developing a method for measuring arsenic in rice in Bangladesh

JULIAN TYSON, DEPARTMENT OF CHEMISTRY, UMASS AMHERST

All rice contains four bioavailable arsenic compounds: two inorganic oxyanions (arsenate and arenite), and the mono- and dimethyl derivatives of arsenate. The inorganic compounds are human carcinogens; the other two are not, but are not innocuous either. CWB hopes to be able to provide both consumers and producers with reliable information about the inorganic arsenic content of rice by a relatively inexpensive test-kit method based on quantifying the yellow/brown colored product of the reaction between arsenic hydride (arsine), generated by a suitable reaction in solution, and solid mercuric bromide on a test strip. The goal of our CWB project, which was featured in a UMass press release and short video (http://www.umass.edu/newsoffice/article/measuring-arsenic-bangladesh's-rice-crops), is to adapt the EZ test kit made by Hach for the determination of inorganic arsenic in water. There are four crucial stages in the process: (a) extraction of all of the inorganic arsenic from the rice into solution, (b) the generation of arsine, (c) its removal from solution, and (d) its reaction with the crystals on the test strip. Ideally, all of these processes should be 100% efficient.

In an earlier report (Newsletter #22), I indicated that reaction with sodium borohydride was the arsine generation reaction of choice, but that the rate of reaction needed to be slowed. Initial work with perforated gelatin capsules containing solid reagent looked promising, but these have been superseded by an agar gel in which borohydride is stabilized with sodium hydroxide solution. Our most recent work indicates that superior performance is obtained if the gel contains a small proportion of xanthan gum. Results with these X-BAGS (xanthan borohydride agar gels) have been presented in a chapter [1] in Mobilizing Chemistry Expertise To Solve Humanitarian Problems. The work was also mentioned in an article in Chemistry World, the monthly magazine of the Royal Society of Chemistry [2]. Students at a local high school (Four Rivers Charter School, Greenfield, MA) have been helping with the agar gel development, and undergraduates in a course-based research experience, associated with honors freshman chemistry, have shown that a double teabag functions a lot like an agar gel, opening up a new line of investigation. We are also looking closely at the test kits made by Industrial Test Systems, some of which have detection limits up to 30-times lower that that of our current test.

Problems still to be overcome are (a) the excessive foaming caused by the co-extracted matrix components and (b) the poor response of the test to low concentrations in solution due to the high dilution inherent in the extraction step. Finally, the method needs to be validated against a reliable instrumental procedure. As the work is being done by undergraduates and high school students, we will probably need another two semesters to complete

the project.

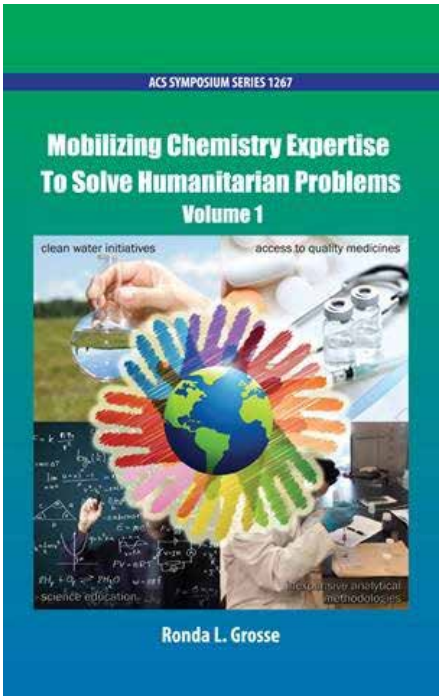
1. Julian Tyson, Ishtiaque Rafiyu and Nicholas Fragola, Development of a Test-Kit Method for the Determination of Inorganic Arsenic in Rice, Chapter 5, pp 63-81, in Mobilizing Chemistry Expertise To Solve Humanitarian Problems Volume 1, Editor(s): Ronda L. Grosse, Volume 1267, (web) October 23, 2017, DOI: 10.1021/bk-2017-1267.ch005.

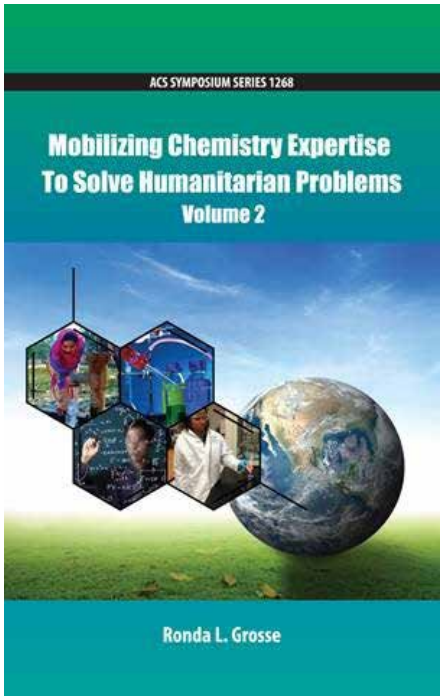
2. Hayley Bennett, "A poison in your pilau," Chemistry World, 22 August 2017, https://www.chemistryworld.com/feature/arsenic-and-rice-a-growing-problem/3007811.article

New Book Series Published

BY RONDA GROSSE

In partnership with the American Chemical Society, Chemists Without Borders compiled and contributed in large part to the book "Mobilizing Chemistry Expertise to Solve Humanitarian Problems". The digital book, published by Oxford University Press and the American Chemical Society (ACS), is now available in volumes 1 and 2. Print copies will be released in the spring. This book focuses on worldwide issues that may benefit from applying science, exploring ways in which chemists can uniquely contribute to providing solutions to humanitarian problems. CWB collaborated with several international universities and companies in working to mobilize the resources and expertise of the global chemistry community and its networks. The purpose of this book is to inform readers of ongoing work applying chemistry to help underrepresented communities. Topics covered include clean water initiatives, expanding access to quality medicines, science education, and advancements in inexpensive analytical methodologies that can be applied in developing countries. In most cases, utilization of local resources in country is key. Projects in progress or completed are summarized, and assessment of the far-reaching benefits of these efforts is provided. In addition, ideas toward addressing technical, logistical and cultural challenges are explained. Volume 1 covers targeted humanitarian aid projects in South Asia, South America, and Africa. Volume 2 reviews work related to chemistry education and analysis, with focus on Africa and Central America. CWB thanks all of the contributing authors who provided excellent overviews of humanitarian projects that require scientific expertise.





An Introduction from Kathleen Webb

BY KATHLEEN WEBB

There are two things that have interested me for as long as I can remember: science and service. I joined the U.S. Army at 18 and trained to be a medical laboratory technician. I remained in healthcare for 19 years with the dream of someday joining the Peace Corps or going on a medical mission to a third world country. I was in my early 30s and on the verge of going on a medical mission to Tanzania when I decided to use the money to go back to school. I received bachelor's degrees in chemistry and laboratory forensics. After graduation, I worked as an analytical chemist for five years where my primary job was analyzing raw materials and finished goods in the nutraceutical industry for trace elements; one of which was arsenic.

While I enjoyed my job, I decided to go back to school again and get my master's degree in environmental science. I wrote my master's thesis on arsenic speciation in sediment and Callinectes sapidus (blue crab) in an oilfield-contaminated freshwater marsh on the Louisiana Gulf Coast. By this time, I felt like I had extensive experience researching and analyzing arsenic. I recall during my literature review for my thesis coming across a statement from the World Health Organization (WHO) declaring that arsenic-contaminated drinking water in Bangladesh had caused the largest mass poisoning in history. The largest mass poisoning in history!

As an analytical chemist with membership in the ACS, I receive digital copies of the weekly Chemical & Engineering News (C&EN). I came across an article in the September 12, 2016 issue of C&EN profiling Chemists Without Borders. That spurred me to check out the website where I saw one of the major active projects was the Clean Water Initiative/Bangladesh Arsenic Project. I about fell out of my chair because I thought that was tailor-made for me–science, arsenic, and a humanitarian mission! I emailed a few people telling them of my background and I have been working with CWB as an expert advisor ever since.

I provide technical support regarding the sampling, handling, analysis, and results validation from the laboratories in Bangladesh that we have testing our water samples for arsenic. This is quite challenging from 8,500 miles away, but it is one of many hurdles we face as we try to mitigate this problem and provide arsenic-free drinking water to the people of Bangladesh. I have Skyped with our President, Ray Kronquist as well as with Shahena Begum, our Project Leader in Bangladesh. I also keep in touch and have had many introductions through e-mail and conference calls. I am involved with fundraising and giving local presentations to get the word out about Chemists Without Borders and our mission.

I currently work for the United States Department of Agriculture doing greenhouse gas research and have recently become interested in and a minor part of our Biochar Team working on Drought Relief and Climate Control/Reversal. This has ended up being supremely worthwhile and fulfilling. I can't wait to see what the future has in store for Chemists Without Borders, the Bangladesh Arsenic Project and the Drought Relief/Climate Control team!

AIDSfreeAFRICA and the Malaria Free Zone Program

BY DR. ROLANDE HODEL

If you live in a community with malaria and are interested in implementing our program in your community, feel free to contact us via our web site www.AIDSfreeAFRICA.org. We would like this program to be used all over the world.

Malaria, a devastating disease that runs rampant in sub-Saharan Africa, is passed on to mosquitoes by an infected human and spread to many more humans by that very same infected mosquito. Of the over 200 million cases of malaria worldwide, 90% of them happen in Africa. In countries like Cameroon, more than 70% of the population is in danger of falling victim to this disease; many of those include children under the age of 5. How do we

affect change on a grassroots level? The answer is on many levels.

AIDSfreeAFRICA has been educating Cameroonians on how the disease is spread. First the mosquito is born disease free. The mosquito then finds a person to bite, sucking up a sample of their blood, which has Plasmodium falciparum (which is the malaria parasite.) The mosquito is not affected by the parasite, but when this mosquito bites another person, thus begins the disease process of malaria. The parasites multiply in the blood, feeding on its host's red blood cells. This life cycle of the parasite in the host is particularly deadly in children, since children have less blood than adults.

Inspired by the recent ebola outbreak, which taught Africans to separate the healthy from the ill person, the initiative AIDSfreeAFRICA is implementing to prevent malaria is to cover windows and doors with mosquito nets, thus preventing mosquitoes from entering the house. This is a simple initiative requiring only a few supplies, such as a hammer, saw, nails, and a mosquito net. We instruct the villagers to measure the window and use these measurements to cut out a mosquito net to fit a little bigger than the window itself. They then place the net over the entire window and secure it in place by nailing thin strips of plywood over the frame. One might think this would be a simple endeavor; however, we have felt some resistance from the village community. Some community members would rather use their nets to protect their crops from bugs and parasites. This can often be a difficult argument to make since most villagers live off the crops they grow. We encourage them to keep their homes and family safe first, and then use any left over nets for the fields. Most recently, we have seen a steep uptake of the program. We are looking forward to the day when we will see a statistically significant drop in malaria cases.

Analytical Chemistry in the Developing World: Student Organized Symposium for the Spring 2018 ACS National Meeting

BY CATHARINE BRADY (FAIRFIELD UNIVERSITY '18)

Analytical chemistry is a powerful tool to identify, characterize, and solve interdisciplinary problems in global development. With researchers across academia and industry, among other sectors, working to combat the challenges faced in the developing world every day, collaboration and discussion is essential to find necessary solutions. A group of undergraduate students who all took part in the University of Notre Dame's Research Experience for Undergraduates (REU) program, Analytical Chemistry in the Developing World, is planning and hosting a symposium at the upcoming Spring 2018 American Chemical Society National Meeting in March. The students are from various backgrounds and universities across the United States (Fairfield University (CT), Stetson University (FL), University of Hawaii at Manoa (HI), Grinnell College (IA), University of Notre Dame (IN), University of North Carolina-Chapel Hill (NC) and Winthrop University (SC)), and are working towards the common goal to facilitate the exchange of ideas between innovative, scientific minds aiming to save and improve lives in developing countries by using analytical chemistry. Ansley Nemeth (Winthrop University '18) reiterates this idea by stating, "Being able to work with a group of people who are dedicated to the same area of work as me sheds light on how much we may be able to change through the sharing of knowledge."

The symposium, titled Analytical Chemistry in the Developing World, follows and continues the on-going theme of the students' summer research projects and will focus on the topics of food and nutrition, environment, medicine, and technology development to contribute to scientific discussion of challenges faced in the develop-

ing world. Over the course of four oral presentation sessions and one poster session, the symposium will feature research from over 20 prominent figures within the previously mentioned topics. Planning the event has been a challenging task to take on by undergraduate students, but presents them with many rewarding experiences and opportunities to learn. Maxwell Tetrick (Grinnell College '19) reflects on the experience so far saying, "With so many chemists working on developing world problems, it was challenging to narrow down who to invite to the symposium. But, I was amazed that we, as a group of undergraduate students, could successfully apply for and organize a symposium at the ACS National Meeting." Adam Cooper (Stetson University '18) adds, "Organizing this symposium has exposed me to the dedication of researchers to stop not at publication, but implementation." With months of dedication to preparation, the student planners are excited for a great symposium in March and hope that many will attend to join the discussion of Analytical Chemistry in the Developing World!

We would like to thank all members who participated in our most recent survey. Your feedback has been very encouraging and we are working on the suggestions received.

Moreover, we would like to encourage you to follow our Facebook page (https://www.facebook.com/Chemists-Without-Borders-289844437713596/) for updates and join our Facebook group (https://www.facebook.com/groups/ChemistsWithoutBorders/) to connect and discuss with fellow members!

Support Chemists Without Borders!

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