The Chain Reaction

Humanitarian Solutions Worldwide

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CHEMISTS WITHOUT BORDERS

Assuring Water Quality

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Do you know how clean your drinking water is? If not, contact your water supplier to determine the purity of your water. Furthermore, bottled water does not guarantee the safety of the water. Its quality must be supported by suitable testing.

Do you know that only 0.06% of fresh water is readily accessible for human use? Though water is a valuable commodity, we often fail to prevent its contamination (S. Ahuja, Chemistry and Water: The Science Behind Sustaining the World's Most Crucial Resource, Elsevier, 2017). Interestingly, the American Chemical Society chose Chemistry and Water as the theme of their August 2019 meeting. A large number of contaminants from A to Z can enter our water supply and adversely affect human health. Based on personal experience and efforts to help remediate these situations, three disasters that span almost four decades are mentioned below (see more details in Evaluating Water Quality to Prevent Future Disasters, Elsevier, 2019):

1. Arsenic contamination of groundwater in Bangladesh
2. Lead contamination of surface water in Flint, Michigan
3. GenX contamination of drinking water in Wilmington, North Carolina

Described below are situations that lead to water contamination:

- Poor consideration of groundwater quality in Bangladesh
- Inability to recognize the impact on water quality from an alternate source in Flint, Michigan
- Failure of Chemours to assure the safety of people in three counties in North Carolina when it put GenX from its wastewater stream into the Cape Fear River.

A number of lessons can be learned from these water disasters. Most importantly, the disasters could have been entirely avoided if steps had been taken to assure optimal water quality.

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

Chemists Without Borders is a registered 501(c)(3) with the Internal Revenue Service. EIN: 14-1984379

Goals of the Chemists Without Borders Project

The goal of the Water Quality Project is to involve young volunteers in water quality issues. The volunteers asked to contact their municipality and request a water quality report. This report is reviewed by me; and the volunteer informs the municipality of any elements of concern that are not being addressed. Moreover, the municipalities are guided to look into the source of water supply and the infrastructure to determine problems such as corrosion of lead pipes.

What has been done so far?

A number of volunteers, including Amanda Huie, Seanna Johnson, Joyce Zhou, David Miyamoto, Symiah Barnett, Maria Castillo Venegas, and Jade Pratt are already working on this project. Sut Ahuja organized and chaired a symposium on Monitoring Water Quality and Infrastructure to Prevent Future Flints on August 22, 2017 at the American Chemical Society meeting in Washington DC. He spoke on Lessons Learned from Horror Stories of Water Contamination. In addition, Chemists Without Borders' co-founder Steve Chambreau hosted a lunch for the speakers. Recently, Sut Ahuja published the second edition of his Handbook on Water Purity and Quality, Elsevier, 2021.

Future Plans
The project is seeking more volunteers who are eager to help investigate potential water quality problems.

The Launch of the Healthy Soil Alliance project in Northern California

BY SERGEY LITVINENKO
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The mission of the Healthy Soils Alliance (HSA) is to carry out scientific research in community settings and communicate the findings for global impact. HSA research will focus on food security and resilience, urban farming and sustainable agriculture. We will conduct collaborative research by bringing together expertise from universities and non-profit groups, and offer learning opportunities for youth through participation in STEM programs. By communicating the results of scientific research, HSA will empower the community to bring about change and achieve healthier soils through water retention, pollution remediation and carbon sequestration.

The Anioch site

The Vision of the Healthy Soils Alliance (HSA) is to change the way the world grows food by measuring and demonstrating the benefits of sustainable agriculture. We aim to:

- Develop scientific knowledge about the effective use of biochar and other sustainable agriculture practices
- Provide opportunities for local communities to participate in, and learn from, science-driven investigations
- Communicate research findings through a variety of channels to reach people of all levels of scientific knowledge in all parts of the community

- Expand the project from two initial demonstration sites to include sites across the globe, and incorporate results from different environmental conditions
- Generate actionable data and make this available to policy and decision makers and the wider community

There are currently three sites being developed in the Northern California area:

The Antioch site is a small scale project located on a private property at the former food production facility. Pestec, a family owned environmental services company granted us access to this site and is working with us on developing of the educational site for local students. Project covers small scale sustainable agriculture in the urban setting.

The Fremont site

The Fremont site involves an undeveloped 1.5 acre lot belonging to the Alameda County Water District. This land was leased to Local Ecology and Agriculture Fremont, a local nonprofit focusing on small scale urban framing and educational opportunities for local community. LEAF currently operates two urban farms in the area. Developing the new parcel will involve a significant soil improvement efforts.

The Fort Jones site is located in the beautiful Siskiyou County on the Oregon/California border. We are currently discussing project details as the possibilities are truly endless. Treeland Trails, Inc., the owner of this 5500 acre property are looking to expand their regenerative and conservation efforts along with native habitat restoration projects.

Please keep in touch by following the project at https://www.civichub.us/hsa where we will be posting monthly updates.

Sierra Leone Chemistry Education Project

BY DR. A BAKARR KANU
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Dr. Kanu at WSSU has been working with a team of students (from WSSU) and scientists (from Chemists Without Borders and Sierra Leone) to develop STEM-related inexpensive microchemistry kits for science education in developing nations, currently very limited. The ultimate aim is to provide resources that people can then apply to their daily lives to teach others, make improvements in their own country, and contribute to nation-building and national security to foster their journey towards self-reliance. Sierra Leone remains the focus of our efforts at present; like many developing nations, Sierra Leone was subject to a civil war that caused significant disruption to its educational infrastructure. Although most students in the region retain a solid theoretical background in chemistry, they still lack a laboratory framework in which they can develop the associated practical skills. We are currently developing several ready-for-use laboratory activity kits in Sierra Leone - all of which are inexpensive, produced by green approaches, and tied to laboratory activities associated with the West African

Diavian Bellamy (Sophomore, Winston-Salem State University) analyzing fractionated plant extracts on capillary electrophoresis instrumentation.

Mieka Cobbs (Junior, Winston-Salem State University) obtaining a fractionated extract from plants using liquid-liquid extraction.

Examination Council (WEAC) curriculum.

The project activities came to a halt due to the outbreak of COVID-19. However, we continue to offer the study abroad course developed at WSSU. Following our last update, our team is glad to report on the following project progress.

1. We offered the study sbroad class in an online format for spring 2021. Three students enrolled in the class were required to write papers on topics related to the intelligence community as their final project. The students gave two presentations on their final project - one at WSSU and the second at the University of North Carolina Charlotte colloquia.
2. Two additional students in Dr. Kanu's research lab have been conducting research on method development for opioids detection.
3. Students working in Dr. Kanu's research lab won two presentation awards. The first award was at the 2020 Annual Biomedical Research Conference for Minority Students (ABRCMS): The Virtual Experience on November 9-13, 2020 (https://www.abrcms.org/index.php/program/past-and-future-conferences). The second award was at the 2021 National Organization for the Professional Development of Black Chemists and Chemical Engineer (NOBCChE) Collaborative meeting on May 27, 2021 (https://www.nobcche2020.com/).
4. A new member, Teneisha Fergurson (Junior, College of Saint Benedict & Saint John's University), has joined our team. We want to welcome Teniesha to the team. Please read more about her below.
5. The team has set up a GoFundMe page at https://www.gofundme.com/sierra-leone-chemistry-project. Please donate to the project by following this link.

For more information, please contact Dr. A. Bakarr Kanu at bakarrkanu@chemistswithoutborders.org.

Volunteer Spotlight

My name is Teniesha Ferguson, and The Bahamas is my home. I am currently a junior majoring in Biochemistry at the College of Saint Benedict & Saint John's University in Minnesota. I am participating in a full-time summer internship at the Minnesota Medical Association as a part of their health equity and advocacy team for the summer.

I found Chemist Without Borders through another student at my school and was particularly intrigued with their mission. I am mainly passionate about science education and saw that the Sierra Leone Chemistry Education Project is developing chemistry kits for high school students. That made me interested in being a volunteer.

Remote education on HIV/AIDS and malaria: Using technology to improve health literacy

BY KATELYN STEBBINS
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In the midst of the telehealth/tele-education boom, AIDSfreeAFRICA has announced the release of the Dr Rolande app to help improve health literacy around the world. The Dr Rolande app was specially designed to spread awareness about malaria and HIV prevention in countries like Cameroon, where these diseases are endemic. The app's goal is to empower people around the world to protect themselves and their loved ones, while saving individuals time and money by avoiding trips to the doctor's office for preventable illnesses. The app was created with input from physicians, chemists, biologists, and more. It features a simple tutorial to provide individuals with the skills to install recycled netting in their homes to create more barriers for mosquitoes, includes expert advice regarding the transmission and prevention of HIV/AIDS, and answers the important questions asked by users around the world.

Bridging the Gap

Though seemingly unrelated, malaria and HIV can exacerbate the effects of one another when occurring as a coinfection (https://pubmed.ncbi.nlm.nih.gov/23327493/). HIV immune suppression raises the risk of clinical malaria and malaria infection may lead to decreased efficacy of antiretroviral therapeutics. In order to correctly understand and control both infections and their particular interactions, better communication and inclusion of concerned citizens and activists is necessary and encouraged as much as possible. In this way, Cameroonians and other Africans can be empowered to improve health at the individual and community level and help move closer to an Africa free of these devastating diseases.

Harnessing tele-education to improve health literacy

Community health education projects have long been used to address the knowledge gaps associated with rural health care and health literacy. Recent studies have demonstrated the numerous benefits of creative methods of health education delivery, as it allows for effective human-to-technology and human-to-human communication in novel ways (https://dl.acm.org/doi/abs/10.1145/3001913.3001922). In particular, mobile apps permit workers and community members to report health challenges and knowledge gaps to the app creators, who can then create new content that addresses these gaps for more cost-effective, efficient delivery of health education. Through development of the Dr Rolande app, AIDSfreeAFRICA is taking a step forward in identifying and addressing underlying barriers to healthcare in order to incite the greatest change.

The Dr Rolande app was created to empower people around the world to stay safe from HIV and malaria infections. Our team is active to answer your questions with expert advice and all answers will be posted within 24 hours. The app includes a simple, effective video tutorial on installation of a mosquito net in windows and doorways to protect homes from mosquitos and the infections they carry. Download the Dr Rolande app on Google-Play today (Android only)

https://play.google.com/store/apps/details?id=org.aidsfreeafrica.health

Disclaimer: The information provided on this app is not intended to replace professional medical advice and management. Please seek the services of a qualified healthcare provider regarding Malaria and or HIV/AIDS.

Waste Streams, Thermolysis & Climate Change Emissions

BY KEVIN HULL
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"... if we're going to make progress with sustainability, we'll have to accept the fact that many people are like Faust — they will sell their souls (or at least their planet) to the devil in order to maintain their current standard of living. Until we give them a better choice, and prove that sustainability doesn't require sacrifice, we'll be fighting an uphill battle..." Sustainability's Faustian Dilemma April 5, 2011 - Ron Ashkenas.

This quote from Mr. Ashkenas beautifully describes the motivation behind Emergent Waste Solutions' founding, and the reason we acquired the rights to one of the world's leading thermolysis technologies.

Thermolysis is the most effective means we have today to eliminate waste streams while providing alternative electricity production and at the same time mitigating climate change emissions. Thermolysis takes place when a carbon-based substance is subjected to a very high temperature in the absence of oxygen. Without the oxygen combustion cannot take place and instead the substance is broken down into its constituent elements: gas, oil, and carbon.

The gas and oil produced can be used to generate electricity while the carbon can be used in a wide variety of applications (53 actually), from soil amendment, to livestock health, to filtration, and to high-tech applications. This conversion of carbon-based waste into biochar keeps approximately 30% of the greenhouse gasses in the original waste from being released into the atmosphere through decomposition. The gasses are instead sequestered in the biochar, for as much as thousands of years.

As an example of how biochar can indirectly reduce greenhouse gas emissions, we can look at its impact on the use of fertilizers. Most fertilizers, including manure, release nitrous oxide (better known as ("laughing gas"), a greenhouse gas that can stay in the atmosphere for more than 100 years and is up to 300 times more damaging than carbon dioxide. It accounts for around 6% of our total greenhouse gas emissions. The use of biochar as a soil amendment can reduce the amount of fertilizer required by adsorbing it before it washes down past the root systems of the plants. Making the fertilizer more available to crops saves money, reduces water requirements, and reduces the creation of nitrous oxide.

A biochar experiment

The value derived from the waste, in the form of electricity, and especially in the carbon produced, allows us to demonstrate that "sustainability doesn't require sacrifice". Showing that responsible waste management does not have to be a burden on taxpayers, especially amongst the developing nations, is key to getting widespread adoption of our thermolysis solution. It enables us to turn a capitalist into an environmentalist and it allows us to get buy-in from cash-strapped communities facing serious health challenges from their waste streams.

It is imperative that we undergo a major paradigm shift in our attitudes toward waste, we must learn to view it as a resource and not simply as a "problem to be gotten rid of."

If you would like to be on the cutting edge of innovations to combat climate change and benefit the environment, you might be interested in a position as a volunteer with one of our marketing or development teams. They are solving chemical engineering and marketing problems and acquiring useful skills.

Please contact me for more information at (604) 282-7329

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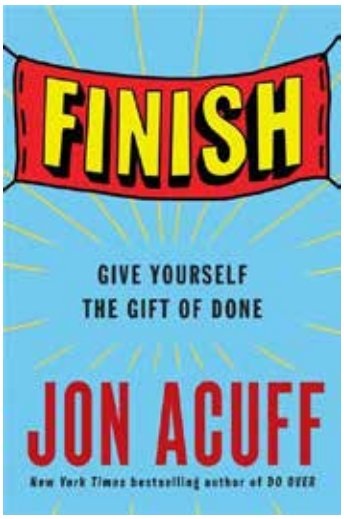

I bet some of you are a bit like me: even when you get over the gigantic invisible hurdle of starting something, you have an even harder time finishing it.

Ever since the inception of Chemists Without Borders, I've been meaning to contribute a book-of-the-month recommendation to post online and in our newsletter. I've known exactly which book I wanted to start with, and I have a long list for subsequent months. After all this time, however, I'm finally doing it because of another book I'm reading now, so you'll have to wait for the original recommendation.

According to Jon Acuff, the author of "Finish", the data indicate that the fundamental problem is perfectionism, which is often ingrained in us from an early age. It is insidious, devious, malicious and unrelenting - good to the last drop. Once you read "Finish" - and it's an easy, entertaining read - you will understand how perfectionism works and strategies for countering it. I was halfway through the book, et voilà, you are now reading the result: not a perfect piece of writing, but at least it's done! You can probably read it online from your local library and there are plenty of summaries online, too.

One last thing: "But I don't have the time," you may say. Again, that's perfectionism rearing its ugly head. My mentors teach that the trick to reading a book every month is simply to read ten pages a day. We can choose to get up just 10 minutes earlier in the morning and use those 10 minutes to read ten pages from a book that will improve us. As a result, you will read on average one book a month; that's twlve books a year and sixty books in five years. You're on your way to becoming an expert!

Let me know what you think, and what books, if any, would you recommend for self-improvement?

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