

**George William Kajjumba**—Cover letter

*“The first step toward success is taken when you refuse to be a captive of the environment in which you first find yourself”*—Mark Caine. I am an alumna of the science, technology, engineering, and mathematics (STEM) cohort in Uganda. I am an environmental engineer with a passion for increasing water and food sustainability, making the world a better place through sustainable development and health. Post-college, while working for an oil and gas company, I observed many dry farm fields during a particularly long drought. Many subsistence farmers lacked water and systems for irrigation. Seeing these situations echoed my childhood experience—we had to rely on the rainy season to plant crops; any rain pattern changes meant sleeping on empty stomachs. Though water covers 70% of our planet, fresh water is scarce, only 3%. I joined the graduate school at UNLV to further my knowledge of water treatment, reuse, and nutrient recovery; these nutrients like phosphate can be recycled to foster food production while maintaining water quality.

My PhD dissertation research deals with lanthanide coagulants in water and wastewater treatment to improve wastewater reclamation while recovering plant nutrients to boost food production. This field is inherently interdisciplinary. My work is at the interface of chemistry, physics, and biology because it deals with the treatment of wastewater, reuse, and toxicity of emerging water coagulants. I have collaborated with University of Cambridge and community wastewater treatment plants to establish the mechanism through which lanthanides interact and remove contaminants from wastewater. Furthermore, I have worked with George Washington University to establish the toxicity limit of lanthanides in effluent water. This work lays a foundation of my future work of understanding the impact of reclaimed water and nutrients on food crops. Like Lonnie Johnson, I envision myself developing cheap and efficient bioassays that can determine the effluent water quality before it is recycled back into the community.

Attending the Black Trailblazers in Engineering (BTE) affords the opportunity to discuss ideas with researchers, whom I would otherwise not meet through typical conferences. BTE provides an excellent opportunity to connect and build a network that will help me land on my first dream job as an educator. BTE will help me develop my negotiation skills and improve my research proposal writing skills—the crucial skills as I enter the academic profession. I feel that this meeting provides a unique chance to expand my circle to include academicians and leaders from the private sector. I can already envision sharing my experience in BTE. Naturally, I would want to convey the inspiration and knowledge I gained with my fellow graduate students. Having already done something similar for my 70<sup>th</sup> Lindau Nobel Laureate Meeting, it would be a simple task to arrange. As an educator, I’m even more excited about visiting local high schools and middle schools to motivate future unprivileged researchers. Whomever I meet, I will have plenty of stories to stimulate the students’ interest and provide inspiring evidence that someone they know, who is attending a Minority Serving Institution (UNLV) and got an education in a country ranked near the bottom for graduation rates (Uganda), had the opportunity to converse with Black Trailblazers.

To me, the BTE conference is more than a resume builder. It’s the chance to gather new information and ways of thinking, develop future research partnerships, and motivate the next generation of researchers who can improve water and food security. I’m proud of my distinctive educational “soup,” and I would certainly look forward to spicing up my career of becoming around academicians with words of wisdom from the Black Trailblazers.

*'Oil Then,' 'Water Now': Another Reason for War in the 21<sup>st</sup> Century*—Strobe Driver. Though water covers 70% of our planet, freshwater needed for our survival is a minor fraction, only 3%. Five years from now, at least one in three persons will face water shortage<sup>1</sup>. Water shortage is making world food security worse—one in nine people sleep on an empty stomach every day. The higher frequency of droughts and erratic nature of rain, combined with underlying economic and social vulnerabilities, has meant that food and water scarcity (FWS) is here to stay. My research that was supervised by Dr. Erica J. Marti focuses on attenuating FWS through water reclamation and reuse.

My PhD research focuses on gaining control over the massive-scale implementation and analysis of lanthanides (Ln) in wastewater (WW) treatment. I collaborated with wastewater treatment plants (WWTPs) to study the applicability of lanthanide coagulants to treat and recover nutrients like phosphate from wastewater. We discovered that lanthanides are superior coagulants compared to traditional coagulants like ferric and alum. Using lanthanides to treat WW, low lanthanide dose was needed. From WWTP operation perspective, this translates into cost-savings because it reduces the size of the tank required to store the lanthanides and saves on the freight costs. We further discovered that the amount of waste (sludge) generated as of using lanthanides is small compared to famous ferric and alum coagulants. Thus, using lanthanides in WW treatment does not only save WWTP plants from huge sludge disposal costs, but it is also sustainable in terms of land requirement. We teamed up with the University of Cambridge to understand lanthanides' interaction with contaminants (especially phosphorus) at an atomic level. We found that lanthanides (cerium and lanthanum) form a direct bonding with phosphorus (P). The Ln-P bond is much favored compared to Ln-oxide/hydroxide bond that could escalate the dose requirement. We further discovered that the external oxygen in the Ln-P precipitates possesses a net negative charge that would act as a reactive site to further attenuate other contaminants like organic matter. Reducing organic matter plummets disinfection byproduct formation—another contiguous issue in water reclamation and reuse.

Introducing new wastewater treatment chemicals comes with a disadvantage when compared to traditional chemicals whose toxicity is already established. Though lanthanides out-perform other coagulants in WW treatment, WWTP cannot do full-scale implementation without knowing the dangers. The toxicity of lanthanide is not well established, also measuring/detecting them in effluent water is expensive. To fully understand the toxicity of lanthanides, we joined forces with George Washington University. We studied the interaction of lanthanides at a cellular level using *in vitro* approach. We found that lanthanides affect the cell function by attacking the mitochondria—the powerhouse of a cell. Through calcium channels, Ln penetrate the mitochondria membrane and alter the proton gradient and/or adsorb the phosphorus needed to produce ATP; this effect is observed when at least 2.0 mM as Ln<sup>3+</sup> is present in effluent water. We found that lanthanides are neither genotoxic nor chronic toxic at less than 2.0 mM. In addition, the presence of different lanthanides in water could attenuate their toxicity potency; therefore, we suggested to use lanthanides as a mixture in wastewater treatment. The result from this work helps us to understand the interaction of lanthanides with animal cells and bacteria. It also allows policymakers like EPA and WHO to establish effluent limits of lanthanides as we try to combat water scarcity.

**Education philosophy and plan:** All humans are innately equipped to be endlessly exploratory, to ask questions, and to be fascinated by the minds around them. My ultimate goal is to foster students' passion and curiosity. To make myself a better education, I have participated in [mentorship programs](#) at UNLV to improve my skills of delivering information to students. I have mentored two undergraduate students; Christian graduated in Spring 2020, and she is on track of joining the graduate school. Currently, I am [mentoring Savanna](#) a sophomore at UNLV. I have taken different classes from professional bodies like [ACS/ASMS](#) to improve my knowledge of modern machines that can assess emerging contaminants in water. Teaching through inquiry and active participation is a toll order. Students emerge from high school lulled by studying facts and quizzed through multiple-choice testing with an expectation of net career path—just to connect dots—graduate and start their career. But I will want my students to be independent thinkers and pioneers when they graduate. I hope to foster a thirst for knowledge that extends beyond the classroom.

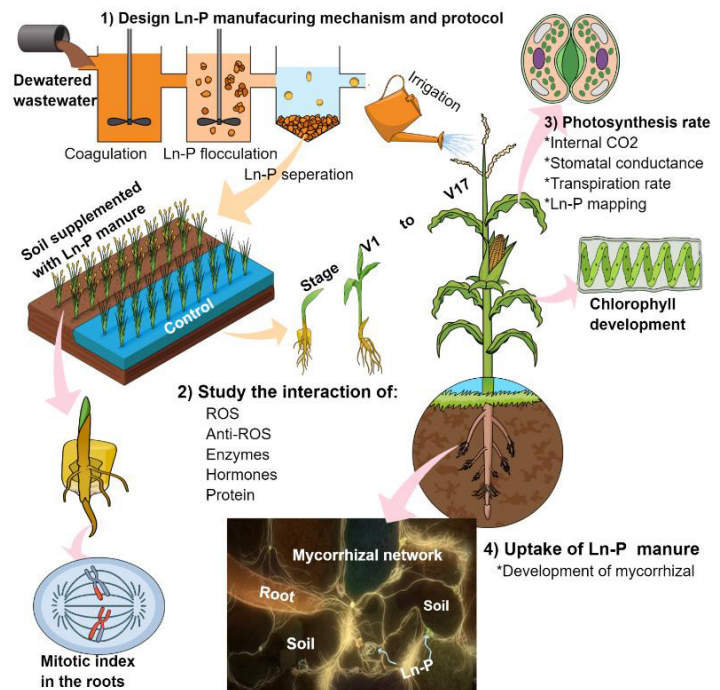
## Future research as a faculty trailblazer engineer

### 1. Lanthanide detection in water

My PhD research demonstrates that lanthanides offer a competitive alternative in terms of performance and cost compared to traditional coagulants like ferric and alum. As WWTPs are looking for an alternative to abatement contaminants in WW, especially nutrients, full-scale implementation of lanthanides is anticipated in a short future. However, detecting lanthanides in water is an expensive venture and can cost over \$50 to analyze a single sample on ICP-MS. Bioassays can offer an alternative; they are relatively cheap and easy to operate. Over the last decade, different assays have been developed to detect changes in different toxicity endpoints. For example, CellTiter Glo™ can detect changes in cytoplasmic ATP; mitochondrial membrane potential dye can track the changes in mitochondrial proton gradient<sup>2</sup>. In our recent studies, we demonstrated that lanthanides could cause a response in different toxicity endpoints. However, we don't know which endpoints are specifically related to lanthanides. **Research strategy:** During the first 1-2 years of operation, my lab will investigate the cell activities associated explicitly with lanthanides using combined expertise from UNLV and George Washington University. To examine our primary research's translational implications, we will use biochemical assays to explore the activation and functional state of cells/bacteria. Having identified the most sensitive endpoint/bioassay for lanthanides, we shall design a simple tool that can be used to detect and quantify lanthanides in water.

### 2. Application of lanthanide reclaimed water and biosolids food production

Humans need water, oxygen, and food to survive; the former and latter need constant input by humans themselves. At least 17 people die due to hunger every minute—killing more people than AIDS, tuberculosis, and malaria combined<sup>3</sup>. In developing economies, there is a direct link between water scarcity and hunger<sup>4,5</sup>. In our previous studies, we effectively treated wastewater and captured nutrients. However, expending reclaimed water and captured nutrients (Ln-P) directly into agriculture can significantly risk crops due to chemical (coagulant) toxicity that were used to treat wastewater. Being an emerging coagulant, little is known on how lanthanide coagulants can influence corn growth and productivity. Thus, we propose to study the effect of Ln-P manure on corn growth and its environment. The proposed interdisciplinary research's expected outcome that bridges wastewater treatment and food production is summarized in Figure below.



We shall advance the understanding of lanthanides effects on corn growth and yield when applied either as fertilizers or during irrigation. Different plant species may react to lanthanides differently. Lanthanides can promote or attenuate cell division, germination rate, photosynthetic rate, and hormone development. The project will establish the relationship between these variables to ensure proper recycling of Ln-P manure and lanthanide reclaimed water during irrigation. The uptake of Ln-P by corn is assisted by mycorrhizal and rhizobacteria. We shall study the development of mycorrhizal fungi and map their relationship with corn roots under Ln environment. My first future work as a faculty focuses on improving food and water security through nutrient recycling, irrigation and wastewater treatment.

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## References

1. Eliasson, J. The rising pressure of global water shortages. *Nature* vol. 517 6 (2015).
2. Sakamuru, S., Attene-Ramos, M. S. & Xia, M. Mitochondrial membrane potential assay. *Methods Mol. Biol.* **1473**, 17–22 (2016).
3. Food and Agriculture Organization. The State of Food Security and Nutrition in the World. *United Nations* (2020).
4. Endfield, G. H. & Tejedo, I. F. Decades of drought, years of hunger: Archival investigations of multiple year droughts in late colonial Chihuahua. *Clim. Change* **75**, 391–419 (2006).
5. Behera, B. K., Rout, P. K. & Behera, S. Water, Energy and Food Security: Pillars for Zero Hunger. in *Move Towards Zero Hunger* 37–60 (Springer Singapore, 2019). doi:10.1007/978-981-32-9800-2\_2.

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### EDUCATION

PhD, Civil and Environmental Engineering University of Nevada Las Vegas (UNLV), USA	Aug 2018–Present
MSc, Environmental Engineering Istanbul University, Turkey	Aug 2016–Jun 2018
MBA, Makerere University (MUK), Uganda	Aug 2013–Jun 2015
BSc, Engineering Makerere University, Uganda	Aug 2008–Jun 2012

### RELEVANT EXPERIENCE

**Program Reviewer: Umm Al Qura University** Feb 2019—Present

I have reviewed and helped faculty members meet the course and project objectives through critical and constructive feedback of student works. I have examined over 10 student projects and examined different programs.

- Provide written, unbiased, constructive feedback in a timely manner on the scholarly merits and the scientific value of the work, together with the documented basis for the reviewer's opinion
- Indicate whether the writing is clear, concise, and relevant by rating the work's composition, scientific accuracy, and originality
- Maintaining the confidentiality of the process: not sharing, discussing with third parties, or disclosing information from reviewed projects/programs

**Teaching assistant: University of Nevada, Las Vegas, USA** Aug 2018—Present

I have mentored, shared, and transferred knowledge with Vietnamese & S. Korean scholars to manage arsenic, chromium, & TCE contamination. ***Wrote and won grants/fellowships worth over \$120,000.***

- Supervised/mentored students through Louis Stokes Alliance for Minority Participation (LSAMP) and Research and Mentorship Program ([RAMP](#))
- Trained aspiring engineers the usage of modelling tools and research applicability in day-to-day operations and processes
- Developed efficient dye treatment mechanism through advanced oxidation process and adsorption
- Developed innovative recovery mechanism of nutrients from municipal sewage sludge to better reuse them in irrigation systems and for human consumption
- Investigated the cytotoxicity and genotoxicity of lanthanides, an emerging class of phosphorus coagulants in water treatment

**Co-Founder & CFO: UZURI Health & Beauty, Uganda** Feb 2015—Present

[UZURI Health](#) is a healthcare startup changing Ugandans' *sick-care mentality* by providing preventive and primary care at beauty centers which are trusted and popular community spaces.

- Provided technical, planning, development, and evaluation of financial policies and systems, including strategic financial plan and budget to ensure prudent management and control of financial resources
- Developed business plans that enabled UZURI to raise over \$50,000 in convertible debt seed capital
- Monitored the utilisation of capital, revenues, and expenditures against approved plans and ensured that any variances were justified following the approved plans
- Worked with Human Resource to create good employee relations to ensure productivity and organisational effectiveness

**Wastewater Research Assistant: Istanbul University, Turkey** Aug 2016–Jun 2018

I mentored and worked with undergraduate and graduate students. They were able to develop research ideas, present and write publications.

- Researched and collected water data through complex techniques and procedures, library research, structured interviews or other project specific methodology
- Planned and modified wastewater treatment techniques, procedures, and tests
- Wrote and edited water related publications and presentations

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### Operations Engineer: Delta Petroleum Ltd, Uganda

Sept 2012–Apr 2015

Responsible for retail operation with 100+ staff, 10 direct reports and accountable for the revenue of \$1.2m per month. I instituted changes that reduced operating costs while maximizing turnover.

- Ensured that all fuel stations conformed to Health and Environmental standards as set by the oil industry and government
- Ensured all oil spills were managed and restored before they contaminated soil and water
- Oversaw all operational activities at 12 petroleum stations for Eastern Region to ensure that margins & sales results met monthly targets and fostered high performance amongst team members
- Analysed data to find the most efficient sales methods & opportunities and marketing strategies through customer research
- Presented and promoted new products and services to present and prospective customers
- Monitored competition within assigned region, prepared and submitted reports to the Sales Director
- Advised dealers on station staff requirements and followed up on their welfare and training
- Tracked and monitored fuel trucks in transit to ensure smooth logistics of the goods

### FELLOWSHIPS, AWARDS, AND HONORS

- The [70<sup>th</sup> Lindau Nobel Laureate Meeting \(LNLM\)](#), 28<sup>th</sup> June -3<sup>rd</sup> July, 2020. The prestigious LNLM is an opportunity for excellent young scientists from around the world to meet Nobel Laureates and share ideas. Because of the interdisciplinary nature of my research, I was among the 650 participants selected worldwide to be a part of the 70<sup>th</sup> LNLM in Lindau, Germany.
- [Dr. Pankaj Parekh Memorial Scholarship](#): In 2020, I became the [first UNLV](#) from Civil & Environmental Engineering to be awarded this scholarship because of my contribution towards water quality—\$5,000
- [UNLV Foundation Board of Trustees Fellowship](#): The fellowship recognizes top graduate students whose research is helping to advance both the community and the academic world. In 2020, I became the [first student](#) from the College of Engineering to win this fellowship. The fellowship is valued at **\$60,000**.
- **2020 Gauteng Accelerator Program (GAP) Innovation Grant**: We won the 1<sup>st</sup> prize of 2020 medical category accelerator award that aims at improving the supply chain of malaria artemisinin-based drugs in developing economies. The award is valued at [S.A Rands 300,000](#) (≈\$20,000).
- In 2020, I was awarded Roy and Helen Kelsall scholarship fund, value \$1000
- [Nevada Water Resources Association](#) (NWRA): NWRA focuses at advancing the water solutions in Nevada. In 2020, I was among the recipients who received a **\$500** award because of my contribution towards advancing water treatment technology.
- [Nevada WaterReuse Association](#) (NWA) offers graduate scholarship (**\$1,000**) to a student in the water field. NWA recognized my contribution and commitment to water field and awarded me this scholarship both in 2019 and 2020.
- [American Chemical Society \(ACS\), Southern Nevada section](#) facilitates students from Southern Nevada to attend different conferences; in 2020, I was awarded with **\$ 300.00** to attend [ACS conference](#).
- The [Rebel Grad Slam](#) awards students at UNLV who can pitch their research—why you study it, what your research question is, how you're analyzing it, and —why it matters to folks outside your field using a 1-PowerPoint slide in less than 3 minutes! I have won this award (**\$250.00**) both in 2018 and 2019
- [Association of Energy Engineers](#) awards merit and career-focus based individuals that are pursuing a career in engineering and technical fields including environmental science, architecture; in 2019, I was awarded **\$1500**.
- Every year UNLV awards outstanding students who have elicited academic excellency; I have won this award in 2019 and 2020; award value **\$ 2,150**
- Turkey Government Scholarship, 2016-2018—MSc. Environmental Engineering at Istanbul University: ≈\$ 20,000
- Delta Petroleum (U) Limited sponsorship—MBA at Makerere University, 2013-2015: ≈\$ 4,000
- Uganda government Scholarship—BSc. Engineering at Makerere University, 2008-2012: ≈\$ 6,000

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### GRANTS AND PROPOSALS

- 1) **Title:** Alternative DOE tank waste processing: Phosphate encapsulation of radionuclides using a waste product from wastewater treatment. **PI:** Erica J. Marti, PhD, UNLV. **Funder:** Department of Energy, USA: \$ 272,780, pending. **Role:** Novel idea development, proposal writing, and methodology development
- 2) **Title:** Generating volatile fatty acids from secondary sludge and/or Waste juice for biological phosphorus removal. **PI:** Erica J. Marti, PhD, UNLV. **Funder:** City of Henderson Water Reclamation Facility, NV, US: \$59,863.49. Pending. **Role:** Novel idea development, proposal writing, and methodology development
- 3) **Title:** Cytotoxicity of lanthanide elements: an evaluation of in-vitro bioassays. **PI:** Erica J. Marti, PhD, UNLV. **Funder:** Graduate & Professional Student Association, UNLV: \$ 1,250.00. Awarded. **Role:** Novel idea development, proposal writing, and methodology development
- 4) **Designer/Researcher:** Upgrading and improving phosphorus recovery in return streams of a wastewater treatment plant. **PI:** Erica J. Marti, PhD, UNLV. **Funder:** Clark county wastewater reclamation district, NV US: \$ 49,988.00 Awarded. **Role:** Novel idea development, proposal writing, and methodology development
- 5) **Researcher:** Synthesis, characterisation, and optimisation of hydrophilic biochar produced from waste biomass, which would be used as a drinking water filter media for application in rural and disadvantaged communities whose groundwaters are suffering from contamination by perchlorate or a mixture of perchlorate and nitrate. **Funder:** U.S. Environmental Protection Agency: \$ 25,000.00. Not awarded.

### PUBLICATIONS

#### Published

- Abbas, T., Kajjumba, G.W., Ejjada, M., Masrura, S.U., Marti, E.J., Khan, E., Jones-lepp, T.L., 2020. Recent advancements in the removal of cyanotoxins from water using conventional and modified adsorbents—a contemporary review. *Water*. <https://doi.org/10.3390/w12102756>
- Kajjumba, G. W., Nagitta, O. P., Mkansi, M. & Osra, F. A. Offshoring-Outsourcing and Onshoring Tradeoffs: The Impact of Coronavirus on Global Supply Chain. in (Intechopen, 2020). <http://dx.doi.org/10.5772/intechopen.95281>
- Kajjumba G.W., Yildirim E., Aydın S., Emik S., Ağun T., Osra F., Wasswa J., 2019. A facile polymerisation of magnetic coal to enhanced phosphate removal from solution. *J. Environ. Manage.* 247, 356–362. <https://doi.org/10.1016/j.jenvman.2019.06.088>
- Kajjumba, G. W., Yildirim, E., Osra, F., Aydın, S., Ngan, T. T. K., & Emik, S. (2019). Insights into nonlinear adsorption kinetics and isotherms of vanadium using magnetised coal-polyaniline. *Desalination and Water Treatment*, 172, 158–166. <https://doi.org/10.5004/dwt.2019.24985>
- Osra, F.A., Kajjumba, G.W., 2019. Landfill site selection for Makkah using GIS and analytical hierarchy process. *Waste Manag. Res. Vol. 38(3)* 245–253. <https://doi.org/10.1177/0734242X19833153>
- Kajjumba, G.W., Emik, S., Öngen, A., Özcan, H.K., Aydın, S., 2018. Modelling of adsorption kinetic processes—Errors, theory and application. *Advanced Sorption Process Applications. IntechOpen*, 1–19. <https://doi.org/10.5772/intechopen.80495>
- Kajjumba, G.W., Aydın, S., Güneysu, S., 2018. Adsorption isotherms and kinetics of vanadium by shale and coal waste. *Adsorpt. Sci. Technol.* 36, 936–952. <https://doi.org/10.1177/0263617417733586>

#### Accepted

P.O. Nagitta, M. Mkansi, G.W. Kajjumba, “The relationship between market environment dimensions and availability of malarial pills in Uganda”, *Journal: Global Advances in Health and Medicine*

#### Under review

G.W. Kajjumba, M. Attene-Ramos, E.J. Marti, “A comprehensive toxicity assessment of rare earth elements (lanthanides) used in wastewater treatment” *Journal: Environmental Science & Technology*

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### In preparation

- G.W. Kajjumba**, M. Attene-Ramos, E.J. Marti, "Inhibition of mitochondria activity in a human carcinoma (HepG2) cell exposed to disinfection byproduct mixtures using mitochondria membrane potential indicator assay" Journal: Environmental Science & Technology
- G.W. Kajjumba**, M. Attene-Ramos, E.J. Marti, "Screening potential of six in vitro bioassays as toxicity indicators of disinfection byproducts (DBPs)" Journal: Environmental Science & Technology
- G.W. Kajjumba**, B. Peng, D. Koury E.J. Marti, "Phosphorus management in wastewater treatment plants using cerium, aluminium, and iron", Chemical Engineering Journal
- Kajjumba**, Vu, Ejjada, Obra, Marti, "*In situ* regeneration of granular activated carbon column through advanced oxidation process", Journal: Science of Total Environment
- P.O. Nagitta, M. Mkansi, **G.W. Kajjumba**, "A structural equation modelling of supply chain determinants for Artemisinin-based Combination Therapies in Uganda", Journal: Public health in Practice
- Kajjumba**, Meena, Ejjada, Krishnaswamy, Haider, Gajurel, Marti, "Exploring disinfection byproducts management at household level", Journal: Water research

### CONFERENCE PRESENTATIONS

- G.W. Kajjumba**, E.J. Marti "Making a case to switch coagulants: Lanthanum applicability in wastewater treatment", WEFTEC 2021- 94<sup>th</sup> Annual Technical Exhibition and Conference, 16-20 Oct 2021 Chicago, IL.
- G.W. Kajjumba**, S. Vacek, E.J. Marti "Application of lanthanum reclaimed wastewater to stimulate corn germination and biomass development" 3<sup>rd</sup> International Conference for Bioresource Technology for Bioenergy, Bioproducts & Environmental Sustainability, May16-19, 2021, Riva del Garda, Italy
- S. Vacek, **G.W. Kajjumba**, E.J. Marti "The Effect of Lanthanides on Corn Growth", 2021 NWRA Annual Conference, 19–21 Jan 2021
- G.W. Kajjumba**, M. Attene-Ramos, E.J. Marti "An alternative to analytical chemistry for assessing disinfection byproducts in potable water reuse", 259<sup>th</sup> American Chemical Society National meeting, Virtual Meeting & Expo, 17 – 20 Aug 2020
- G.W. Kajjumba**, M. Ejjada, T. Jones-Lepp, E.J. Marti, "Comparison of extracted and non-extracted calibration curves in the GCMS determination of method detection limits for haloacetonitriles", 68<sup>th</sup> Annual American Society for Mass Spectrometry, Houston, Texas, May 31 -Jun 4 2020
- E.J. Marti, **G.W. Kajjumba**, M. Attene-Ramos, "Toxicity Bioassays for Assessing Disinfection Byproducts in Potable Water Reuse". WateReuse Association Annual Conference, San Francisco, California, 15-17, March 2020
- G.W. Kajjumba**, M. Attene-Ramos, E.J. Marti "Mitochondrial membrane potential assay as a quick water quality assessment tool", Nevada Water Resources Association, Las Vegas, Nevada, 11<sup>th</sup> Feb 2020
- G.W. Kajjumba**, M. Attene-Ramos, E.J. Marti "Effect of lanthanide coagulants on mitochondrial membrane potential", 6<sup>th</sup> American Chemical Society—Southern Nevada Section Student Poster Competition Exposition, Las Vegas, Nevada, 23<sup>rd</sup> Nov 2019
- P.B. Masiko, P. O. Nagitta, M. K. Barifaijo, **G. W. Kajjumba**, "Linking the Technology and Human Resource Competences with Productivity of the Petroleum Industry in Uganda: The Situation in Buliisa District", Uganda Management Institute, 2<sup>nd</sup> International conference on governance and service delivery in developing economies, Kampala, Uganda, Oct 22<sup>nd</sup>-26<sup>th</sup> 2019
- C. Obra, V. X. Tran, **G.W. Kajjumba**, M. Ejjada, E. J. Marti, "Adsorption of methylene blue and in-situ reactivation of granular activated carbon (GAC) with ozone". OUR-UNLV 2019 Fall Undergraduate Research Symposium. UNLV: University of Nevada, Las Vegas, Oct 2019
- M. Ejjada, C. Obra, V. X. Vu, **G. W. Kajjumba**, E. J. Marti "Adsorption of methylene blue and in-situ reactivation of granular activated carbon with ozone" Water Quality Technology Conference, Dallas, Texas, 3<sup>rd</sup> Nov. 2019



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- G.W. Kajjumba**, E.J. Marti, "Toxicity of rare earth elements on mammalian cells" Rebel Grad Slam competition, Las Vegas, Nevada, 30<sup>th</sup> Oct 2019
- G.W. Kajjumba**, M. Attene-Ramos, E.J. Marti "Cytotoxicity and genotoxicity of lanthanides", 26<sup>th</sup> NSF EPSCoR National Conference, Columbia, SC, 29<sup>th</sup> Oct 2019
- E.J. Marti, **G.W. Kajjumba**, M. Attene-Ramos, "Joining Forces for Safe Water: Interdisciplinary Research on Toxicity of Disinfected Drinking Water", 26<sup>th</sup> NSF EPSCoR National Conference, Columbia, SC, 28<sup>th</sup> Oct. 2019
- Masrura, Ejjada, **Kajjumba**, et al. "Equalization basin design and biosolids conveying system upgrade for the city of North Las Vegas water reclamation facility", 92<sup>nd</sup> Water Environment Federation's Technical Exhibition and Conference, Chicago, Illinois, 22<sup>nd</sup> Sept 2019
- G.W. Kajjumba**, E.J. Marti, "Solving the catch-22 of phosphorus", [Rebel Grad Slam competition](#), presented, Oct 2018
- G.W. Kajjumba**, "Think of the next generation", 4<sup>th</sup> Contemporary Topics in Environmental Engineering, Istanbul, Turkey, 11<sup>th</sup> May 2018
- F. A. Osra, **G.W. Kajjumba**; H. K Ozcan, "Review of influencing solid waste landfill site selection parameters of Makkah city", EurAsia Waste Management Symposium, presented on 3<sup>rd</sup> May 2018
- N. Karabağ, **G. W. Kajjumba**, A. Öngen, "Application of computer-aided modeling in thermal processes", 3<sup>rd</sup> ICOCEE Conference, presented on 25<sup>th</sup> April 2018
- G. W. Kajjumba**, S. Aydin, and S. Guneyusu, "Assessing the potential of shale in the adsorption of vanadium ions from wastewater systems", 3<sup>rd</sup> Annual Istanbul University Nanotechnology research symposium, presented on 4<sup>th</sup> May 2017
- G. W. Kajjumba** and H. Selçuk, "Brackish water treatment using capacitive deionization technology-A review", Istanbul University Environmental Engineering Symposium, presented on 14<sup>th</sup> December 2016

### SKILLS AND INTERESTS

**Skills:** Environmental audit | Research | Structural Equation Modeling (SEM) | Water treatment | Water quality assessment | Waste management | Strategy & Project development | Finance & budgeting | Quantitative & qualitative analysis | Investment analysis | MS Office | LandGEM | Origin Pro | Solid Edge | SPPS | AMOS | GCMS | LCMS

**Languages:** English (Excellent), Ganda (Good), Turkish (Intermediate)

### INTERESTS AND COMMUNITY ENGAGEMENTS

#### LinoExpo

LinoExpo is a branch [Lindau Noble Laureates](#) that aim to increase the number of nobles from developing countries. Academic resources are unequally distributed worldwide; countries such as Switzerland, Austria or Denmark have more than 15 Laureates/10 million in their population, whereas countries such as Paraguay, South Sudan or the United Arab Emirates have no Laureates at all. As a result, students, and young scientists in developing economies are unable to be exposed or be part of the scientific and technological innovations that change the course of history. In [LinoExpo](#) we connect local minds with top global scientists.

#### Journal reviewer

I have per reviewed and edited different journal articles for Journal of Hazardous material, Journal of Radioanalytical and Nuclear Chemistry, Desalination and Water Treatment Journal, Toxins, and South African Journal of Chemical Engineering

#### Tree planting

I have participated in different tree planting projects with the aim of curbing global warming. Personally, I have planted over 20,000 trees. This year, 2020, I planted 1500 trees

## GEORGE WILLIAM KAJJUMBA

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### **Inclusion Council—College of Engineering**

This council facilitates an inclusive environment at UNLV for all groups through relevant education, training, and strategic action. We identify challenges of excluded groups and formulate solutions and implement them. We work with University Diversity, Equity and Cultural Intelligence Council to provide education and training. Besides, we act as a first responder or first level of resource for victims.

### **World water day, Girl Scout Brownies**

This community activity is aimed at teaching Brownies (grades 2-3) the value of water and how to conserve it; when they earn this award, they know the value of water. Trained the Brownies on the water cycle and ways of protecting water. The participants learned that runoff water is easily contaminated when people throw garbage on the ground, don't take care of leaking cars, or don't pick up after their pets.

### **Rebel STEM Academy and STEM Tank Judging**

The Rebel STEM Academy aims to expose groups of high school seniors from the Las Vegas Valley to a laboratory experience at UNLV. STEM careers are defining Nevada's future. I educated high school seniors about the vital careers and motivated them to study STEM. Demonstrated GC-MS operation, dye removal by ozone, adsorption, and filtration with different media. I have also participated in 2020 STEM Tank as a judge for younger scientists and community leaders

### **Science Olympiad**

Science Olympiad is a nationwide competition where students compete in more than 20 events that include earth science, biology, chemistry, physics, and engineering. Science Olympiad is designed to increase a student's interest in STEM fields and provide recognition for outstanding achievement in team events. Participated as a judge.

### **Springs/ well cleaning**

Every day, families are gathering dirty, diseased water. In Uganda's suburbs and villages, families depend on spring water; therefore, they must be maintained to the highest standards. Participated in cleaning and maintaining community wells.

### **Leadership**

Water Environmental Federation provides technical education and training for thousands of water quality professionals who clean water and return it safely to the environment. I co-founded WEF student chapter at UNLV and led the team in 2019 competition. As an undergraduate student, I was the chairperson of University Hall, MUK; presided over 5,000 students. Also invested in the local community by starting Uzuri health and beauty, an organisation that seeks to improve peoples' health using beauty as a conduit.

## **PROFESSIONAL MEMBERSHIPS**

### **American Chemical Society (ACS)**

Founded in 1876 and chartered by the U.S. Congress, ACS is the world's largest scientific society. It advances the broader chemistry enterprise and its practitioners for the benefit of Earth and its people. I joined ACS to improve people's lives through the transforming power of chemistry.

### **American Water Works Association (AWWA)**

Founded in 1881, AWWA is the largest water organisation that brings all water professionals together. Joined AWWA to provide water solutions while ensuring the effective management of water on a global scale.

### **American Society for Mass Spectrometry (ASMS)**

ASMS is a professional association that supports the scientific field of mass spectrometry. I joined ASMS to understand the analysis of emerging organic contaminants.

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### **Water Environment Federation (WEF)**

Since 1928, WEF has provided technical education and training for thousands of water quality professionals who clean water and return it safely to the environment. Joined WEF to protect public health and support clean water worldwide. In 2019, we formed the WEF student chapter at UNLV.

### **Engineers Without Borders (EWB)**

EWB builds a better world through engineering projects that empower communities to meet their basic human needs. Volunteered to collaborate with communities to find appropriate solutions for their infrastructure needs. Currently, the EWB UNLV chapter is engaged in a school construction project in rural Guatemala.

### **Association of Energy Engineers (AEE)**

With over 26,000 certified energy professionals in 100 countries, AEE is at the cornerstone of fostering sustainable energy developments. Joined AEE to provide and further education in energy and management.

### **WateReuse Association (WRA), Nevada Chapter**

WRA is solely dedicated to advancing laws, policy, funding, and public acceptance of recycled water. Joined WRA to be part of a coalition that recycle water, support the development of recycled water projects, and consumers of recycled water.

### **PROFESSIONAL LINKS**

Scholar profile: <https://scholar.google.com/citations?user=BWNGrncAAAAJ&hl=en>

ResearchGate profile: [https://www.researchgate.net/profile/George\\_William\\_Kajjumba](https://www.researchgate.net/profile/George_William_Kajjumba)

UNIVERSITY OF NEVADA, LAS VEGAS

December 30, 2020

Black Trailblazers in Engineering Selection Committee:

With my highest recommendation, I support George Williams Kajjumba's application for the Black Trailblazers in Engineering (BTE) program at Purdue Engineering. George is an extremely motivated PhD student who plans to complete his degree in summer 2021. George is an excellent match for the BTE program due to his research aptitude, academic accomplishments (4.00 GPA), character, and potential as a future faculty member. George is an author on seven peer-reviewed journal articles and was selected for the 70<sup>th</sup> Lindau Nobel Laureate Meeting, a prestigious meeting of international researchers and Nobel Prize Winners. He submitted four research proposals as a PhD student at UNLV, and he mentors undergraduate students doing research in my lab. In addition, he finds time to volunteer for activities that inspire younger students. George is a natural leader who elevates and motivates everyone around him. I can say with confidence that George would be a highly successful faculty member in the future.

I joined the University of Nevada, Las Vegas (UNLV) as a faculty member in August 2017 after a year of postdoctoral research with the Southern Nevada Water Authority, a municipal not-for-profit water agency. My research expertise is water and wastewater treatment with an emphasis on water reuse—extending current water supplies through the reuse of treated wastewater to meet growing needs while maintaining a safe water supply. Since joining as faculty, I have served as advisor to nine graduate students; two have graduated with Master degrees and seven are continuing their graduate education. George will be my first PhD student to graduate, and he is an exceptional student with multiple honors at local, national, and international levels.

I specifically recruited George to the PhD program at UNLV. It only took one Skype call to see that he is motivated to learn and conduct research. He is also passionate about preparing the next generation of students. In his time at UNLV, George has volunteered for demonstrations to excite middle and high school students, explained important concepts about water treatment and sanitation to elementary students, mentored undergraduate students doing research, and reviewed university student projects.

As mentioned already, George has seven publications and has written research proposals. He has one manuscript under review and several more in preparation. This is evidence that he values and knows the importance of communicating his research results through publications. George was my first choice for a summer-long, collaborative, interdisciplinary research project funded by the National Science Foundation. In summer 2019, he and I worked with a toxicologist at a renowned public health institution, George Washington University, to investigate bioassays as a tool for rapid and comprehensive measurement of disinfected water. He presented some of our results at national conferences this past year. Besides publications, George wrote and submitted two proposals to local wastewater agencies in order to get his dissertation research funded. One proposal was funded and the project recently completed. He was also a

main contributor to a U.S. Environmental Protection Agency proposal on biochar adsorption for groundwater pollution and to a Department of Energy proposal on using remediation of nuclear waste using discarded matter from wastewater treatment (proposal under review). Writing proposals speaks to George's motivation to conduct research and his potential to apply for grants once he becomes a faculty member.

Many of George's accomplishments set him apart from other PhD students. At UNLV, George was selected for the top fellowship—the two-year UNLV Foundation Board of Trustees Fellowship at \$30,000 per year—owing to his excellence in academics and research. He was awarded several local and national scholarships, including the Dr. Pankaj Parekh Memorial Scholarship (\$5,000) from the California-Nevada American Water Works Association. What stands out the most is that George was selected to attend the 70<sup>th</sup> Lindau Nobel Laureate Meeting in Lindau, Germany. This impressive opportunity was awarded to 650 graduate students around the world. Although the July 2020 meeting had to be postponed until the following summer, George worked virtually with an international team this past July to develop an idea, LinoExpo, that would connect young researchers in developing countries with leading scientists around the world. Already, George is thinking about how to equitably provide access to science and technology resources. In summer 2021, he will attend the Lindau Nobel Laureate Meeting and have the chance to exchange ideas with Nobel Prize winners in physics, medicine and chemistry, as well as meet peer researchers from countries all over the world. This is an extraordinary opportunity for a student like George, who conducts interdisciplinary research at the intersection of water, health, and food. With a comprehensive education in engineering, business, and science, he stands out as a future leader who can embrace the interconnectedness of water treatment, health, environment, and economics, as well as bridge an understanding for those with limited backgrounds. I fully expect him to be a strong leader and tackle interdisciplinary projects in his research trajectory.

Going beyond his research and academic history, George has a desire to improve the world around him. At UNLV, he is a member of the Engineers Without Borders (EWB) chapter. He also helped the undergraduate students apply for funding to attend a "Failure Forum" to share about problems they've experienced with their composting latrine project in Nicaragua, as well as learn from mistakes that other EWB chapters have made. In Uganda, George worked on several projects to provide clean drinking water to disadvantaged communities. These actions prove that George is not just interested in personal success but also societal progress; everyone has the right to clean water.

For all of the above reasons, I highly recommend that you consider George William Kajjumba for the Black Trailblazers in Engineering program. His experience and past success indicate great potential as a future engineering faculty member.

Sincerely,



Erica J. Marti, PhD, MEd  
Assistant Professor  
Department of Civil & Environmental Engineering and Construction  
University of Nevada, Las Vegas

30, December 2020

From: Rama Venkat

Dean, HRH College of Engineering



To: Black Trailblazers in Engineering (BTE) Selection Committee

Re: George William Kajjumba's recommendation

I wholeheartedly support George William Kajjumba (a.k.a. Kajjumba)'s nomination for BTE program as he fits as the necessary conditions and has exceeded expectations many aspects. Kajjumba is an excellent, careful and detailed oriented experimentalist. Kajjumba conducts interdisciplinary research at the intersection of water, health, and food. Kajjumba has seven published journal articles with five as the first author. He has two more articles under review related to toxicity and application of lanthanides in wastewater treatment. He has also developed and submitted research proposals, and a wastewater treatment plant funded one at approximately \$50,000. Such achievements show that the community appreciate and are interested in Kajjumba's research, which is amazing for a PhD student.

Kajjumba has received scholarships and recognition at the state, national, and international levels. Kajjumba was also selected to attend the 70<sup>th</sup> Lindau Nobel Laureate Meeting in Lindau, Germany, a rare opportunity afforded to only 650 select graduate students from around the world. With his getting selected in the first round of the World Bank Group Young Professionals Program, Kajjumba will have the opportunity to exchange ideas with the world as a Postdoc. Such a program will equip him with the necessary techniques to become a better faculty member.

Kajjumba a natural leader and participates in STEM activities, climate change prevention activities and preventive healthcare activity in sub-Saharan Africa. He has also focused on diversity and inclusion activities as evidenced by his active participation in the College's Inclusion Council activities to improve student retention and graduation rate at UNLV.

Kajjumba is a unique and a typical PhD student who excels in technical work, but at the same time has the ability and interest and passion for getting involved in challenges the world faces including climate change and lack of healthcare in certain parts of the world. I am confident that with his training, skills and passion, Kajjumba will go places and change the world for the better as a faculty. Attending the BTE program will improve and equip him with the tools necessary to navigate as he tries to find a faculty position. Thus, I support Kajjumba with much enthusiasm for the BTE program.