

# Valentine Asongu Nzengung, PhD

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PROFESSOR, ENVIRONMENTAL GEOCHEMISTRY  
NATIONAL ACADEMY OF INVESTORS FELLOW  
FOUNDER ■ CEO ■ CTO, MUNIREM ENVIRONMENTAL

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## EXECUTIVE SUMMARY

**Over 25 years' experience developing, implementing, and managing innovative green remediation technologies.** Currently holding multiple patents for proprietary green and sustainable remediation technologies for explosives, perchlorate, nitrocellulose propellants, and chemical warfare agents. Developed and taught undergraduate and graduate level courses, including Environmental Geosciences (Undergraduate), Aqueous Environmental Geochemistry (Undergraduate and Graduate levels), Organic Contaminant Hydrogeology (Graduate), and Hazardous Waste Sites Remediation (Graduate). Research has focused on phytoremediation, bioremediation, chemical neutralization of conventional and homemade explosives, development of specialty biochars for nutrient removal from wastewaters and remediation of metals. Have authored and co-authored over 150 publications, including peer reviewed professional journal papers, book chapters, conference proceedings and monographs.

**Subject matter expert on Chemical Security Assessment, Training and Hazardous Chemical Neutralization.** Working with governments and non-profit organizations to assess the security of dual use and precursor chemicals worldwide, then use the data collected to develop chemical safety, security, and innovative neutralization and destruction solutions. I support the United States Department of State global Chemical Security Program (CSP) in developing and providing customized non-proliferation solutions through in-country trainings to academic and chemical industry personnel. The goal is to safeguard against the proliferation of weapons of mass destruction.

**Pioneered the development of MuniRem<sup>®</sup>,** an innovative remedial technology developed and patented by the University of Georgia for near instant neutralization of bulk explosives, bomb fillers and chemical warfare materiel (CWM) at ambient temperature as well as their conversion to non-hazardous end-products. The application of MuniRem<sup>®</sup> provides a remedial solution for a broad range of explosives and munitions constituents. MuniRem products are applied in the United States and internationally for the demilitarization of conventional munitions, the routine decontamination of operational munitions manufacturing facilities as well as in remediation projects for sites that are being repurposed. In addition to the suite of MuniRem products applied worldwide, has developed a product for the neutralization and destruction of bulk ammonium nitrate and removal of nutrients from different types of wastewater, including industrial and agricultural wastewater.

**Founded MuniRem Environmental, LLC. to focus on the growth, research, development, and application of MuniRem<sup>®</sup> and its other green remediation products and technologies.** Responsible for business growth strategy, program management and program execution. As the Chief Technology Officer, evaluate client's specific requirements, goals, and objectives and designs MuniRem's remediation solutions accordingly. Have served as Program Manager and Chief Technology Officer on several government and private industry contracts. Experienced communicating with all levels of stakeholders involved in environmental remediation. Developed Standard Operating Procedures for the application of MuniRem<sup>®</sup> to address the safe recovery and neutralization of over 10,000 pounds of explosives and on-site demilitarization of recovered underwater munitions. Trained and certified over 100 remediation professionals on the safe handling and efficient application of MuniRem<sup>®</sup> products for explosives remediation and decontamination in various media.

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## EDUCATION

<b>GEORGIA INSTITUTE OF TECHNOLOGY</b> - Atlanta, GA <b>Ph.D. – Environmental Geochemistry &amp; Master of Science – Environmental Engineering</b>	Graduate 1993
<b>GEORGIA STATE UNIVERSITY</b> – Atlanta, GA <b>Bachelor of Science - Geology</b>	Graduate 1988 <b>Cum Laude</b>

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## PROFESSIONAL EXPERIENCE

<b>Professor</b> – DEPARTMENT OF GEOLOGY, UNIVERSITY OF GEORGIA	2006 – Present
<b>Associate Professor</b> – DEPARTMENT OF GEOLOGY, UNIVERSITY OF GEORGIA	2000 – 2005
<b>Assistant Professor</b> – DEPARTMENT OF GEOLOGY, UNIVERSITY OF GEORGIA	1995 – 1999
<b>Member</b> - HARVARD BUSINESS REVIEW ADVISORY COUNCIL	2019 – Present
<b>Founder   CEO   CTO</b> – MUNIREM ENVIRONMENTAL, LLC	2013 – Present
<b>Founder   CEO   CTO</b> – PANTECO ENVIRONMENTAL CONSULTANTS, LLC.	2001 – 2013
<b>National Research Council Post-Doctoral Research Associate</b> – US ENVIRONMENTAL PROTECTION AGENCY/NATIONAL EXPOSURE RESEARCH LABORATORY, ATHENS, GEORGIA	1993 – 1995

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## PATENTS

- Zero-Valent Metal and Black Carbon Framework and Method of Using Same (Patent Pending)
  - Munitions and Ordnance Remediation Blanket (MORB) and Methods of Using Same (Patent Pending) Publication No. **US-2018-0112963-A1**
  - **US 8,865,961-B2**: Methods for Dissolution and Instant Neutralization of Solid Nitrocellulose Propellants and Plasticized Military Munitions (Awarded 2014)
  - **US 8,722,957-B2**: Sulfur-Based Bulk Reductants and Methods of Using Same (Awarded 2014)
  - Sulfur-Based Bulk Reductants and Methods of Using Same (2015) International
  - **US 2008/0116131 A1**: Surfactant-modified earth materials for the treatment of perchlorate and other emerging contaminants in water and brines (2008)
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## NOTEWORTHY RECOGNITIONS & MENTIONS

- Named Georgia groundbreaker for inventions that neutralize explosives and protect humans and the environment. September 2020.
- Subject matter expert on international nonproliferation of weapons of mass destruction.
- Elected Fellow of the National Academy of Inventors (FNAI) December 2019
- Recognized by Minority Business Development Administration (MBDA) as a community leader and environmentalist committed to improving lives worldwide. Atlanta, Georgia 2019
- Featured in Georgia Trend Magazine (<https://www.georgiasbdc.org/?s=Nzengung>) 2019
- Featured by the Small Business Development Center (SBDC) “[UGA PROFESSOR TEAMS UP WITH SBDC TO HELP CLEAN UP EXPLOSIVES](https://www.georgiasbdc.org/?s=Nzengung)” (<https://www.georgiasbdc.org/?s=Nzengung>)
- Governor Deal of Georgia recognizes MuniRem Environmental, LLC as a 2017 Globe Award winner. This state-led awards program recognizes companies that entered into a new international market in the previous year.
- Featured in University of Georgia Research Magazine for successful application of research to solve challenges of neutralizing explosives recovered during expansion of the Savannah River Harbor. Spring 2016
- Recognition by US Navy and Donjon Marine for exceptional performance of underwater munitions demilitarization during salvaging of Confederate States Ship (CSS) Georgia. May 2016
- April 2016 University of Georgia Academic Entrepreneur
- February 2015 Recognized as a UGA Innovator
- June 2015 Patented technology developed and commercialized as MuniRem selected by the Georgia Research Alliance as a Breakthrough Technology

- 2011 Nominated for John L. Byrd, Jr. Memorial Award for Excellence in Munitions Demilitarization
- 2010 Better World Technology (2010 Better World Report <http://www.betterworldproject.net> pg 72)

## **HIGHLIGHTED ENTREPRENEURIAL ACHIEVEMENTS**

- Georgia Trend Magazine picks MuniRem Environmental as Trendsetter and Planet Protector (October 2019)
- MuniRem identified by the United States Environmental Protection Agency (USEPA) as an Alternative Treatment Technologies to Opening Burning and Open Detonation of Energetic Hazardous Wastes (2019 Final Report)
- MuniRem designated by the National Academies of Sciences, Engineering and Medicine (NASEM) as a mature alternative for demilitarization of conventional munitions in its 2018 report.
- Professor Nzengung received the University of Georgia 2016 Academic Entrepreneur and 2015 University Innovator awards.
- MuniRem solution offers a safe solution and is applied to recover and neutralize dynamite and other explosives abandoned at former mine sites.
- MuniRem solution applied at Lake City Army Ammunition Plant to render safe the scene of a fatal explosive accident, enabling investigators to safely access the accident scene. Iowa Army Ammunition Plant selected MuniRem as the safe solution to decontaminate a 2018 explosive accident site.
- MuniRem solution applied at Camp Minden to render safe access for UXO Technicians to conduct a controlled burn of magazines with unstable propellants.
- On-site Demilitarization of recovered underwater munitions (DMMs) from the CSS Georgia in support of the Savannah Harbor Expansion Project. MuniRem Environmental received an award.
- MuniRem is adopted as the solution for safe decontamination of multiple explosives contaminated United States Department of Defense (DoD) installations to enable for safe deconstruction, demolition and renovation.
- MuniRem was voted among the 2010 Better World Technologies by the Association of University Technology Managers.
- MuniRem designated by the Georgia Research Alliance as a State of Georgia Breakthrough Technology in 2015.
- MuniRem has an international footprint in Australia, Canada, Israel, South Africa and Taiwan.

## **PROFESSIONAL AFFILIATIONS**

2004 to Present	International Biochar Initiative (IBI)
2012 to 2014	Interstate Technology Regulatory Council (ITRC)
2014 to Present	International Society of Explosives Engineers (ISEE)
2014 to Present	International Association of Bomb Technicians and Investigators (IABTI)
2002 to present	American Society of Civil Engineers (ASCE)
2001 to present	National Ground Water Association (NGWA)
1995 to present	Sigma Xi
1994 to present	American Chemical Society (ACS)

## **PUBLISHED WORK – BOOK CHAPTERS**

- **Nzengung, V. A.**, Stephanie Gugolz. 2021. Biochar Based Constructed Wetlands for Contaminants Removal in Sustainable Biochar for Water and Wastewater Treatment. Dinesh Mohan, Todd Eric Mlsna and Charles U. Pittman Jr. Elsevier (Eds) (In Preparation)
- **Nzengung, V. A.**, Hans F. Stroo, Tony M. Lieberman. 2008. Emerging Technologies for Perchlorate Bioremediation. In Situ Bioremediation of Perchlorate in Groundwater. H.F. Stroo and C.H. Ward (Eds). Springer Science. P. 217 – 241.
- **Nzengung, V. A.** 2006. “Chapter 18: Using Hydroponic Bioreactors to Assess Phytoremediation Potential of Perchlorate,” Phytoremediation: Methods and Reviews, Neil Willey Eds. Humana Press, Totowa, NJ. P. 221-232.
- **Nzengung, V. A.**, O’Niell, W., McCutcheon, S.C., and Wolfe, N.L. 2003. “Chapter 16: Sequestration and Transformation of Water Soluble Halogenated Organic Compounds Using Aquatic Plants, Algae, and Microbial Mats” Phytoremediation: Transformation and Control of Contaminants, Steven C. McCutcheon and Jerald L. Schnoor Eds. John Wiley & Sons, Hoboken, NJ. p.499-528.

- **Nzengung, V. A.**, and McCutcheon, S.C. 2003. "Chapter 29: Phytoremediation of Perchlorate," *Phytoremediation: Transformation and Control of Contaminants*, Steven C. McCutcheon and Jerald L. Schnoor Eds. John Wiley & Sons, Hoboken, NJ. p.863-885.
- **Nzengung, V. A.**, Wang C. 2000. "Chapter 21: Influences on Phytoremediation of Perchlorate Contaminated Water," *American Chemical Society (ACS) Special Symposium Series: Perchlorate in the Environment*, Editor: Urbansky. Kluwer Academic/Plenum Publishers, New York. p.219 - 229.

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## **PUBLISHED WORK – JOURNAL PUBLICATIONS**

- **Valentine A. Nzengung** and Ben Redmond. 2016. On-site Neutralization of Civil War Munitions Recovered from an Underwater Environment. *Marine Technology Society Journal* 50 (6), 2016.
- Diego Barcellos, Lawrence A. Morris, **Valentine Nzengung**, Tiago Moura, Nehru Mantripragada & Aaron Thompson (2016): Eucalyptus urograndis and Pinus taeda Enhance Removal of Chlorobenzene and Benzene in Sand Culture: A Greenhouse Study, *International Journal of Phytoremediation*. url: <http://dx.doi.org/10.1080/15226514.2016.1183565>.
- **Valentine A. Nzengung**, Anthony J. Bednar, Stephen L. Pilcher, A. L. Russell, Charolett Hayes & Jared Smith. 2016. Rapid Chemical Destruction of Bulk and Residual Explosives in Various Materials. *Journal of Explosives Engineering* 2016.
- Dawit D. Yifru and **Valentine A. Nzengung**. 2012 "Use of Dissolved Organic Carbon to Biostimulate Rapid Rhizodegradation of Perchlorate in Soil" *J Bioremed Biodeg* S7:003. doi: 10.4172/2155-6199.S7-003.
- Dawit D. Yifru and **Valentine A. Nzengung**. 2008 "Organic carbon biostimulates rapid rhizodegradation of perchlorate" *Environmental Toxicology and Chemistry*, Vol. 27, No. 12, p. 56-63).
- Dawit D. Yifru and **Valentine A. Nzengung**. 2007 "Uptake of Perchlorate by Vegetation Growing at Field Sites in Arid and Subhumid Climates." *Remediation* Autumn 2007. p. 53 -68.
- Dawit D. Yifru and **Valentine A. Nzengung**. 2006. "Uptake of N-Nitrosodimethylamine (NDMA) from Water by Phreatophytes in the Absence and Presence of Perchlorate as a Co-contaminant." *Environmental Science & Technology*, Vol. 40, p.7374-7380.
- **Nzengung, V.A.**, Penning, H., and O’Niell, W. "Mechanistic Changes During Phytoremediation of Perchlorate Under Different Root Zone Conditions," *International Journal of Phytoremediation*: Vol. 6, No. 1, pp. 63-83. 2004.
- **Nzengung, V. A.** and Jeffers, P.M. 'Sequestration, Phytoreduction, and Phytooxidation of Halogenated Organic Chemicals by Aquatic and Terrestrial Plants," *International Journal of Phytoremediation*: Vol. 3, No. 1, pp. 13-40. 2001.
- **Nzengung, V. A.**, Castillo, R.M., Gates, W.P., Mills, G.L. "Abiotic Transformation of Perchloroethylene in Homogeneous Dithionite Solution and in Suspensions of Dithionite-Treated Clay Minerals," *Environmental Science & Technology*, Vol. 35, No. 11, p.2244-2251. 2001.
- Garrison, A. W., **Nzengung, V. A.**, Avants, J. K., Ellington, J. J., Wolfe, N. Lee. "Phytodegradation of p,p'-DDT and Enantiomers of o,p'-DDT," *Environmental Science & Technology*, Vol. 34, p.1663–1670. 2000.
- O’Niell, W., **Nzengung, V. A.**, Noakes, J., Bender, J., Phillips, P. "Biosorption and Biodegradation of Tetrachloroethylene and Trichloroethylene Using Mixed-Species Microbial Mats," *Journal of Hazardous Substance Research*. Vol. 2. 2000. p. 2-1 to 2-16. <http://www.engg.ksu.edu/HSRC/JHSR/vol2no2.pdf>
- **Nzengung, V. A.**, Wang, C., Harvey, G. "Plant-Mediated Transformation of Perchlorate into Chloride," *Environmental Science & Technology*, Vol. 33, p.1470-1478. 1999.
- **Nzengung, V. A.**, Wolfe, L.N., Rennels, D., McCutcheon, S.C. "Use of Aquatic Plants and Algae for Decontamination of Waters Polluted with Chlorinated Alkanes," *International Journal of Phytoremediation*, Vol. 1, No. 3, p.203-226. 1999.
- Jeffers, P.M., Wolfe, N.L., **Nzengung, V. A.** "Green Plants: A Terrestrial Sink for Atmospheric CH<sub>3</sub>Br," *Geophysical Research Letters*, Vol. 25, No. 1, p.43-46. 1998.
- **Nzengung, V. A.**, Nkedi-Kizza, P., Voudrias, E. A. "Organic Cosolvent Effects on Sorption Kinetics of Hydrophobic Organic Chemicals by Organoclays," *Environmental Science & Technology*, Vol. 31, No. 5, p.1470-1475. 1997.
- **Nzengung, V. A.**, Voudrias, E.A., Nkedi-Kizza, P., Wampler, J.M., Weaver, C.E. "Organic Cosolvent Effects on Sorption Equilibrium of Hydrophobic Organic Chemicals by Organoclays," *Environmental Science & Technology*, Vol. 30, No. 1, p.89-96. 1996.

- Voudrias, E.A, **Nzengung, V. A.**, and Li, C. "Removal of Light Nonaqueous Phase Liquids (LNAPLs) by Flushing," *Journal of Waste Management*, Vol. 14, No.2, p.115-126. 1994.

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## **PUBLISHED WORK – OTHER PUBLICATONS** \*Student Authors

- **Nzengung V. A** and Diana Bretner "Case Studies of In-Situ and On-Site Chemical (Abiotic) Remediation of Explosives Contaminated Soils" SAFEX 2019 (Accepted)
- **Nzengung V. A.**, "MuniRem® Handlers Application and Safety Training Manual" for explosives neutralization.
- **Nzengung V. A.**, "Neutralization of explosives by a chemical reduction product", SAFEX Newsletter No.59 December 2016.
- Interstate Technology Regulatory Council: Web-based Technical and Regulatory Guidance Document, "Mining Waste Treatment Technology Selection" 2010 **Nzengung** – one of multiple co-authors.  
<http://www.itrcweb.org/miningwaste-guidance/>
- Interstate Technology Regulatory Council: Web-based Technical and Regulatory Guidance Document, "Remediation Technologies for Perchlorate Contamination in Water and Soil" March 2008.  
<http://www.itrcweb.org/Documents/PERC-2.pdf> **Nzengung** – one of multiple co-authors.
- Schroer, K.L., D.M. Endale, C.L. Tebes-Stevens, J.W. Washington, **V. Nzengung** (2007) Concentrations and estimated loads of Nitrogen contributed by two adjacent wetland streams with different flow-source terms in Watkinsville, GA. Proceedings of the 2007 Georgia Water Resources Conference, held March 27–29, 2007, at the University of Georgia, 4 p.
- EPA 542-R-05-001. January 2005. [www.rtdf.org](http://www.rtdf.org): "Evaluation of Phytoremediation for Management of Chlorinated Solvents in Soil and Groundwater" prepared by the USEPA's Remediation Technologies Development Forum: Phytoremediation of Organics Action Team, Chlorinated Solvents Workgroup. Authored by Remediation Technologies Development Forum (RTDF): Phytoremediation of Chlorinated Solvents Subgroup Members.
- Ostroumov, S. A., D. Yifru, **V. Nzengung**, S. McCutcheon. 2006. Phytoremediation of perchlorate using aquatic plant *Myriophyllum aquaticum*. *Ecological Studies, Hazards, Solutions* 11(25-27).
- O'Niell, W. and **Nzengung, V.A.** "In-Situ Bioremediation of Explosives and Perchlorate in Vadose Zone Source Areas," 2005 National Groundwater Conference on MTBE and Perchlorate. Assessment, Remediation, and Public Policy. San Francisco, CA. May 26–27, 2005.
- Dawit D. Yifru\* and **Valentine A. Nzengung**. "Enhancement of Microbial Degradation of Perchlorate ( $\text{ClO}_4^-$ ) in the Rhizosphere," In-Situ and On-Site International Bioremediation. The Eighth International Symposium. Baltimore, MD. June 6 – 9, 2005.
- Dawit D. Yifru\* and **Valentine A. Nzengung**. "Biostimulation and Enhancement of Rhizodegradation of Perchlorate during Phytoremediation," 2005 NGWA Conference on MTBE and Perchlorate: Assessment, Remediation, and Public Policy. May 26 – 27, 2005.
- Lina Wayo\* and **Valentine A. Nzengung**. "Biodegradation of Polycyclic Aromatic Hydrocarbons in Compost Extract Treated Soils," In-Situ and On-Site International Bioremediation. The Eighth International Symposium. Baltimore, MD. June 6 – 9, 2005.
- **Valentine A. Nzengung**. "Case Studies of Phytoremediation of Petrochemicals and Chlorinated Solvents in Soil and Groundwater," Georgia Water Resource Conference (in press, 2005)
- O'Niell, W.L. and **Nzengung, V.A.** "In-Situ Bioremediation and Phytoremediation of Contaminated Soils and Water: Three Case Studies," US Baltic International Symposium - Advances in Marine Environmental Research, Monitoring and Technologies, June 15-17, 2004, Klaipeda, Lithuania. 6p.
- Sparling, D.W., Harvey, G., and **Nzengung, V.** "Interaction Between Perchlorate and Iodine in the Metamorphosis of *Hyla versicolor*" Multiple Stressor Effects in Relation to Declining Amphibian Populations. ASTM STP 1443, G. Linder, S. Krest, E. Little, and D.W. Sparling, Eds. American Society for Testing and materials, West Conshohocken, PA, 2002.
- O'Niell, W. and **V.A. Nzengung**. "Feasibility of In-Situ Bioremediation of Perchlorate Contaminated Soils," Paper in Magar VS, Kelley ME, eds. In-Situ and On-site Bioremediation, 2003: Proceedings of the Seventh International In-Situ and On-site Bioremediation Symposium. CD-ROM. Columbus (OH): Battelle Press.
- Spriggs T, Tsangaris S, **Nzengung VA**, Nwokike B. 2004. Phytoremediation of a chlorinated solvent plume in Orlando, Florida. Paper F-13 in Magar VS, Kelley ME, eds. In Situ and On-site Bioremediation, 2003: Proceedings

of the Seventh International In-Situ and On-site Bioremediation Symposium. CD-ROM. Columbus (OH): Battelle Press.

- O’Niell, W. and **V.A. Nzungung** “Field Demonstration of In-situ Bioremediation of Perchlorate-Contaminated Soils and Groundwater,” A&WMA 96th Annual Conference & Exhibition Proceedings. San Diego, CA. June 22 - 26, 2003.
- Kastner, J.R., Das, K.C., **Nzungung, V.A.**, Dowd, J., Fields, J. “In-situ Bioremediation of Perchlorate-Contaminated Soils,” Editor: Leeson et al. 6<sup>th</sup> International. In Situ and On-Site Bioremediation Symposium, San Diego, CA. p.289-295. 2001.
- **Nzungung, V. A.**, Wang C. and Stacey B. “Phytotransformation Pathways and Mass Balances for Chlorinated Alkanes and Alkenes,” EPA’s Phytoremediation State of the Science Conference. Boston, MA. May 1-2, 2000. EPA/625/R-01/011a November 2001.
- **Nzungung, V. A.**, O’Niell, W., Adesida A. “Treatment of Perchlorate Contaminated Water in Microbial Mat, Algae, and Ebb-and-Flow Hydroponic Bioreactors,” Symposium Series: Case Studies in the Remediation of Chlorinated and Recalcitrant Compounds. Editors: Godage B. Wickramanayake, Arun R. Gavaskar, James T. Gibbs, and Jeffrey L. Means. Battelle Press, Columbus, OH. 2(7), p.101-106. 2000.
- O’Niell, W. and **Nzungung, V. A.** “Treatment of Organic Contaminated water in Microbial Mat Bioreactors,” Symposium Series: Bioremediation and Phytoremediation of Chlorinated and Recalcitrant Organics. Editors: Godage B. Wickramanayake, Arun R. Gavaskar, Bruce C. Alleman, and Victor S. Magar. Battelle Press, Columbus, OH. 2(4), p.347-252. 2000.
- **Nzungung, V. A.**, Wang, C., Harvey, G., McCutcheon, S.C., and Wolfe, N.L. “Phytoremediation of Perchlorate Contaminated Water: Laboratory Studies,” Symposium Series: Fifth International Symposium on *In-Situ* and *On-Site* Bioremediation: Phytoremediation. Editors; Leeson Andrea and B. C. Alleman. Battelle Press, p.239-244. 1999.
- Dhankher, O. P., Tucker, J., **Nzungung, V. A.**, Wolfe, N.L. “Isolation, Purification and Partial Characterization of Plant Dehalogenase-Like Activity from Waterweed (*Elodea Canadensis*),” Symposium Series: Fifth International Symposium on *In-Situ* and *On-Site* Bioremediation: Phytoremediation. Editors; Leeson Andrea and B. C. Alleman, Battelle Press, p.145-150. 1999.
- O’Niell, W.\* , **Nzungung, V. A.**, Noakes, J., Bender, J. and Phillips, P. “Biodegradation of PCE and TCE Using Mixed-Species Microbial Mats” *Bioremediation and Phytoremediation*. Editors: G.B. Wickramanayake and Hinchee. Battelle Press, p.233 - 237. 1998.
- Arthur W. Garrison, **Nzungung, V. A.**, Avants, J.K., Ellington, J., and Wolfe, N.L. “Determining the Environmental Enantioselectivity of o,p’-DDT and o,p’-DDD,” Proceedings of the 17th International Symposium on Chlorinated Dioxins and Related Compounds (Edited by Ronal Hites). Vol. 31, p.256 - 261. 1997.
- **Nzungung, V. A.**, Voudrias, E.A., Wampler, J.M. “A Modified Clay as Adsorbent of an Organic Contaminant in Aqueous and Mixed-Solvent Systems” *Proceedings of the 48th Industrial Waste Conference, Purdue University, West Lafayette, Indiana*, Ed. Ronald F. Wukasch, Lewis Publishers, Chelsea, Michigan, p.387 - 391. 1993.
- Nkedi-Kizza, P. and Nzungung, V. A. “Use of the Cosolvency Model to Predict Sorption Kinetics and Equilibria of Diuron and Naphthalene on Organoclays,” *Kearney Foundation of Soil Science International Conference Proceedings, Vadose Zone Hydrology: Cutting Across Disciplines*. p.107 - 108. 1995.

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## **PUBLISHED WORK – REPORTS**

- **Nzungung, V.A.** and Katherine Schroer. November 2012. Bench-Scale Treatability Study on In-Situ Oxidation of Cyanide in Vadose Zone Soil and Groundwater at Continental Motors Company Plant, Mobile, AL.
- **Nzungung, V.A.** and Katherine Schroer. August 2012. Tower Chemical Company Site Remedial Design Clermont, Florida Bench-Scale Treatability Studies to Mitigate Pesticides in Groundwater.
- Kevin M. Morrissey, **Nzungung, V.A.**, Lucille P. Forrest, James L. Horton. 2010. Micro-Scale Evaluation of MuniRem<sup>®</sup> Reagent for the Demilitarization of Sulfur Mustard: Application to EDS Operations. Chemical Warfare Materiel (CWM) Non-Stockpile Division, Edgewood, Maryland, USA. (Unclassified)
- **Nzungung, V.A.** and O’Niell, W 2009 (March 12<sup>th</sup>, 2009) Georgia Research Alliance VentureLab Phase I – MuniRem<sup>™</sup> Evaluation and Confirmation of Degradation Products.
- **Nzungung, V.A.** 2002. “Phytoremediation of Perchlorate and Trichloroethylene Contaminated Water.” Grant/Contract # F6615-00-C-6060-2/10-21-RR176-261.

- **Nzengung, V.A.**, Das, K.C. and Kastner, J.R. 2001. "Pilot-Scale In-Situ Bioremediation of Perchlorate-Contaminated Soils at the Longhorn Army Ammunition Plant in Karnack, Texas." Contract # DAAA09-00-C-0060.
- **Nzengung, V.A.** 2001. "Phytoremediation of Perchlorate-Contaminated Soils and Water." Agreement #: F33615-00-2-6001.
- **Nzengung, V.A.** 1999. "Data on Phytotransformation Process for the Degradation of Perchloroethene (PCE). Data Specific for the Orlando Naval Training Center (NTC), Orlando, Florida." USEPA/NERL, Athens-GA and US Navy, Southern Division, Charleston-SC.
- **Nzengung, V.A.** 1999. "Phytodegradation Kinetics and Pathways of Perchlorate." Presented to USEPA-NERL, Athens, GA.
- **Nzengung, V.A.** 1998. "Laboratory Characterization of Phytotransformation Products of PCE, TCE and Perchlorate." For US Airforce, Wright Patterson AFB, Dayton, OH and USEPA-NERL, Athens, GA.
- **Nzengung, V.A.**, Voudrias, E.A., Nkedi-Kizza, P., Wampler, J.M., Weaver, C.E. 1995. "Modified Clays as Sorbents for Aromatic Hydrocarbons in Aqueous and Mixed-Solvent Systems." ERC 06-95, Georgia Water Resources Research Institute Program, Georgia Institute of Technology, Atlanta, Georgia, 52 p. (Technical Completion Report for USDI/Geological Survey Project 14-08-0001-G2013 (07)).
- **Nzengung, V.A.**, Voudrias, E.A., Nkedi-Kizza, P., Wampler, J.M., Weaver, C.E. 1993. "Modified Clays as Sorbents for Aromatic Hydrocarbons in Aqueous and Mixed-Solvent Systems." ERC 06-93, Georgia Water Resources Research Institute Program, Georgia Institute of Technology, Atlanta, Georgia, 56 p. (Technical Completion Report for USDI/Geological Survey Project 14-08-0001-G2013 (07)).

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## **STUDENTS' ABSTRACTS & PRESENTATIONS**

- William Crumpacker and **V.A. Nzengung**. Abiotic Removal of Bromide from Flue Gas Discharge Wastewater. 2021 Georgia Water Resource Conference.
- Jared Conner and **Valentine Nzengung**. Removal of Nutrients from Agricultural Wastewater by Modified Biochar. 2018 Oconee River Symposium, UGA.
- Jared Conner and **Valentine Nzengung**. Application of Modified Biochar for Removal of Nitrogen and Phosphorus from Agricultural Wastewater. 2018 UGA Center for Undergraduate Research Opportunities Poster.
- Gulgoz, Stefanie and **Nzengung, Valentine**, 2016, Evaluation of a Biochar Enhanced Constructed Treatment Wetland for the Removal of Contaminants from Agricultural Wastewater. BIOCHAR 2016 Symposium: The Synergy of Science and Industry. August 22-25, Corvallis OR.
- Cary, M. Elizabeth and **V. A. Nzengung**. Treatment of Perchlorate-Contaminated Water Using Surfactant-Modified Clay. The 45th Annual Meeting of the Clay Minerals Society. New Orleans, LA April 10, 2008.
- Purvis, Elizabeth and **V. A. Nzengung**. Sorption of Perchlorate from Water Using Surfactant-Modified Clay and Zeolite. The Second Annual University of Georgia Engineering Conference. Athens, GA. October 24, 2005.
- Schroer, K.L., R.C. Thomas, J.W. Washington, D.M. Endale, and **V. Nzengung** (2006) Use of tracer injection experiments to quantify nitrate loss in two adjacent wetland streams draining an agricultural field in the Georgia Piedmont. Poster and abstract at USDA/CSREES National Water Conference in San Antonio, TX, 5-9 Feb 2006. <http://www.extension.iastate.edu/WaterConf2006/ShowAbstract.aspx?TypeID=2&PresID=214>.
- Yifru, Dawit D., **Nzengung, Valentine**, 2005. Use of dissolved organic carbon to reduce plant perchlorate uptake during phytoremediation. Submitted to the 23<sup>rd</sup> American Chemical Society meeting (Geochemistry division), Washington DC. August - September, 2005.
- Yifru, Dawit D., **Nzengung, Valentine**, 2005. Removal of N-Nitrosodimethylamine from waters using sorption and phytoremediation approaches. Submitted to the Strategic Environmental Research and Development Program (SERDP) conference, Washington DC. November - December, 2005.
- Yifru, Dawit D., **Nzengung, Valentine**, 2005. Biostimulation and enhancement of rapid rhizodegradation of perchlorate. Submitted to the Strategic Environmental Research and Development Program (SERDP) conference, Washington DC. November - December, 2005.
- Schroer, Katherine and **Valentine A. Nzengung**. 2005. Distribution of N and other redox-sensitive species in two adjacent wetland streams draining an agricultural field in the Georgia Piedmont. 2005 Geological Society of America Annual Conference. Salt Lake City, Utah.

- Lina Wayo and **Valentine A. Nzungung**. 2005. Bioremediation of heavy end petrochemicals with compost amendments. International Conference on Energy, Environment and Disasters (INCEED 2005). Bridging the Gaps for Global Sustainable Development (UNESCO – ISEG – GADR). Charlotte, NC, USA. July 24 - 30, 2005.
- Dawit D. Yifru and **Valentine A. Nzungung**. 2005. Use of dissolved organic carbon to minimize plant uptake of perchlorate. 230th ACS National Meeting in Washington, DC, Aug 28-Sept 1, 2005.
- Dawit D. Yifru and **Valentine A. Nzungung**. 2005. "Enhancement of Microbial Degradation of Perchlorate ( $\text{ClO}_4^-$ ) in the Rhizosphere." In-Situ and On-Site International Bioremediation. The Eighth International Symposium. Baltimore, Maryland. June 6 – 9, 2005.
- Dawit D. Yifru and **Valentine A. Nzungung**. 2005. "Biostimulation and Enhancement of Rhizodegradation of Perchlorate During Phytoremediation." 2005 NGWA Conference on MTBE and Perchlorate: Assessment, Remediation, and Public Policy. May 26 – 27, 2005.
- Lina Wayo and **Valentine A. Nzungung**. 2005. "Biodegradation of Polycyclic Aromatic Hydrocarbons in Compost Extract Treated Soils." In-Situ and On-Site International Bioremediation. The Eighth International Symposium. Baltimore, Maryland. June 6 – 9, 2005.
- Dawit D. Yifru and **Valentine A. Nzungung**. 2005. "Biostimulation and Enhancement of Rhizodegradation During Phytoremediation of Perchlorate." Third International Phytoremediation Conference. Atlanta, Georgia. April 20 – 23, 2005.
- Dawit D. Yifru and **Valentine A. Nzungung**. 2004. "Biostimulation of Rhizodegradation of Perchlorate ( $\text{ClO}_4^-$ )." Geological Society of America. Denver, Colorado. November 2004.
- Uddin, M.M.K., G.L. Mills, J.C. Seaman, **V.A. Nzungung**. 2001. "Laboratory Studies of In-situ Redox Manipulation for Remediation of PCE, TCE and Cr (VI) Contaminated Groundwater in Atlantic Coastal Plain Sediments." *In*: M.L. Trehy (Ed.), Preprints of paper presented at the 221<sup>st</sup> ACS National Meeting, April 1-5, 2001, San Diego, CA: American Chemical Society: Washington, DC, 2001; vol. 41(1), p.301-306.
- O’Niell, W. and **Nzungung, V. A.** "Treatment of Organic Contaminated Water in Microbial Mat Bioreactors." Symposium Series. 2<sup>nd</sup> International Conference on Remediation of Chlorinated and Recalcitrant Compounds. Monterey, California. May 22-25, 2000.
- Payne, D. and **Nzungung, V.A.** 1999. "Chemically Induced Remediation of Sediments Contaminated with Chlorinated Aliphatics." 217<sup>th</sup> American Chemical Society National Meeting, Anaheim, California. March 21 - 25, 1999.
- O’Niell, W., **Nzungung, V.A.**, Noakes, J., Bender, J., Phillips, P. 1999. "Sorption and Transformation of Tetrachloroethylene and Trichloroethylene Using Mixed Species Microbial Mats." Southeastern Geological Society of America Annual Meeting. Athens, Georgia. March 25 - 27, 1999.
- Heath, B., **Nzungung, V.A.**, Mills, G. 1998. "Transformation of Perchloroethylene at the Surface of Dithionite-Reduced Clay Minerals and Iron Oxides." 35<sup>th</sup> Annual Meeting of the Clay Minerals Society. Cleveland, Ohio. June 6 - 10, 1998.
- O’Niell, W., **Nzungung, V.A.**, Noakes, J., Bender, J., Phillips, P. 1998. "Biodegradation of PCE and TCE Using Mixed-Species Microbial Mats." First International Conference on Remediation of Chlorinated and Recalcitrant Compounds. Monterey, California. May 18 - 21, 1998.
- O’Niell, W., **Nzungung, V.A.**, Noakes, J., Bender, J., Phillips, P. 1997. "Bioremediation of PCE and TCE Using Mixed-Species Microbial Mats." In Emerging Technologies in Hazardous Waste Management VIII Special Symposium, Pittsburgh, PA, American Chemical Society (D.W. Tedder, Editor).
- Castillo, R., **Nzungung, V.A.**, Gates, W., Mills, G. 1997. "Enhanced Degradation of Tetrachloroethylene by Redox-Manipulated Iron-Bearing Clays and Aquifer Material." 213th American Chemical Society National Meeting. San Francisco, California. April 13-17, 1997. Vol. 37, No. 1, p.180.

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## **STUDENTS AND THESIS ADVISEMENT**

### **Graduate students advised and theses titles**

1. William Crumpacker. Removal of Bromide from Coal Combustion Residuals and Flue Gas Desulfurization (FGD) Wastewater. Spring 2021.
2. Mujtaba Al-Hamami. Biochar Enhanced Phytoremediation of High Concentrations of Petrochemicals in Soil. University of Bagdad, Iraq. Fall 2021.



3. Lucas Novello Favero. Development and Evaluation of Methods for the Immobilization of Metals and Non-Metals in Coal Combustion Residuals. Spring 2019.
4. Stefanie Gulgoz. Evaluation of a Biochar Enhanced Constructed Treatment Wetland for the removal of Contaminants from Agricultural Wastewater. Spring 2017.
5. Cary, M. Elizabeth. Filtration of Perchlorate from Water using Hexadecyltrimethylammonium (HDTMA)-Modified Montmorillonite. Ph.D. Fall 2012.
6. Katherine Schroer. Geochemical Influences on Biodegradation of Nitrate in a Shallow Stream/Riparian Wetland at USDA Test Farm in Watkinsville, GA. Ph.D. Spring 2011.
7. Jason D. Nail. Dithionite mediated Degradation of 2,4,6-Trinitrotoluene in Soils from a Former Department of Defense Ammunition Plant. MS. Spring 2007.
8. Lina Wayo: Biodegradation and Phytoremediation of Polycyclic Aromatic Hydrocarbons using Mushroom Compost. Ph.D. Spring 2006.
9. Dawit Yifru. Phytoremediation and Enhanced Natural Attenuation of the Emergent Contaminants Perchlorate and N-nitrosodimethylamine as single and co-contaminants. Ph.D. Spring 2006.
10. Uddin Momin: Laboratory Studies on In-Situ Redox Manipulation for Remediation of PCE, TCE and Cr(VI) Contaminated Groundwater in Atlantic Coastal Plain Sediments. Ph.D. Fall 2002.
11. Penning, Holger: Phytoremediation of Perchlorate and Trichloroethylene Contaminated Water Using Willow Trees. MS, Fall 2002 (Germany).
12. Box, Stacey: Feasibility studies on phytoremediation of a shallow groundwater plume contaminated with perchloroethylene and trichloroethylene. MS, Summer 2002.
13. Dondero, Anna: Phytoremediation of Perchlorate under Greenhouse and Natural Conditions. MS, Spring 2001.
14. Ramaley, Seth: Treatability Investigation for Natural Attenuation of a Shallow Chlorinated Solvent Plume at the Former Naval Training College, Orlando, Florida. MS, Spring 2001.
15. Payne, David: Chemically Induced Remediation of Sediments Contaminated with Chlorinated Aliphatics. MS, Spring 2001.
16. Heath, Bryan: Dehalogenation of PCE by Dithionite Reduced Clays and Aquifer Materials. MS, Spring 2000.
17. O'Niell L. W.: Biosorption and Transformation of Tetrachloroethylene and Trichloroethylene Using Mixed-Species Microbial Mats. Ph.D., Fall 1999.
18. Rennels, Darrell: Aquatic Plant Mediated Transformation of Halogenated Aliphatic Compounds. MS, Fall 1997.
19. Oates, Tara: Sorption of Halogenated Aromatic Organic Contaminants with Single- and Dual-Cation Organo-Modified Montmorillonites. MS, Fall 1997.
20. Castillo, Reyna: Enhanced Anaerobic Degradation of PCE by Redox-Manipulated Iron-Bearing Clays. MS, Summer 1997.

## **GRANTS, AWARDS and ROYALTIES**

**Date: 2019:** Amount: \$21,000.00

Royalties from UGRAARF IP #1320 (US 8,722,957-B2): Sulfur-Based Bulk Reductants and Methods of Using Same (Awarded 2014)

**Date: 2018 – 2020:** Amount: \$200,000.00

Principal Investigator: Valentine A. Nzengung

Project Title: Development and Evaluation of Methods for the Immobilization of Metals and Non-Metals in Coal Combustion Residuals.

**Date: 2017 – 2022:** Amount: \$500,000.00

Co-Investigator: Valentine A. Nzengung

Project Title: UGA-I Corps

Funding Agency: National Science Foundation (NSF)

**Date: 2003 – 2005:** Amount: \$153,081.00 (Total Grant: \$400,000.00)

Investigator: Valentine A. Nzengung

Co-Investigators: Odemari S. Mbuya, Ngozi H. Ugochukwu (Florida A&M University)

Funding Agency: United State Environmental Protection Agency (STAR), Washington, DC.

Project Title: Phytoremediation of perchlorate and N-nitrosodimethylamine as single and co-contaminant

**Date: 2000 – 2002:** Amount: \$234,000  
Principal Investigator: Valentine A. Nzungung  
Co-Investigators: K.C. Das and James R. Kastner (Biological & Agricultural Engineering)  
Funding Agency: Department of Defense – US Army Operations Support Command  
Project Title: Pilot scale in-situ bioremediation of perchlorate-contaminated soils at the Longhorn Army Ammunition Plant in Karnack, Texas.

**Date: 2000 – 2002:** Amount: \$204,000  
Principal Investigator: Valentine A. Nzungung  
Co-investigator: William Kisaalita (Biological & Agricultural Engineering)  
Funding Agency: Department of Defense - Wright Patterson Airforce Base, Dayton, Ohio  
Project Title: Phytoremediation of perchlorate contaminated soil and water.

**Date: 2000 – 2001:** Amount: \$9,000  
Principal Investigator: Valentine A. Nzungung  
Funding Agency: USEPA-NERL, Athens, GA  
Project Title: Determination of nitroreductase activity in Elodea and nitroreductase isolation and purification.

**Date: June 1999 – July 2000:** Amount: \$90,000  
Principal Investigator: Valentine A. Nzungung  
Funding Agency: US Navy Facilities Southern Engineering Command Division, Charleston, SC.  
Project Title: Natural attenuation and phyto-based treatability studies for shallow groundwater plumes contaminated with chlorinated ethenes at the Naval Training Center, Orlando.

**Date: 09/1998 – 12/1998:** Amount: \$20,000  
Principal Investigator: Valentine A. Nzungung  
Funding Agency: USEPA-NERL, Athens, GA  
Project Title: Phytodegradation kinetics and pathways of perchlorate.

**Date: 1997 – 2000:** Amount: \$481,000  
Principal Investigators: Valentine A. Nzungung and Mills, G. (SREL)  
Funding Agency: DOE-SRS Water Remediation Research Center Program.  
Project Title: Enhanced degradation of tetrachloroethylene (PCE) by dithionite-reduced clays and aquifer materials.

**Date: 1997 – 2000:** Amount: \$183,000  
Principal Investigator: Valentine A. Nzungung  
Funding Agency: US-DOE, subcontract with Florida A & M University.  
Project Title: Phytoremediation: Marine algae and plant mediated transformation of organic pollutants.

**Date: 1997 – 1998:** Amount: \$24,915  
Principal Investigator: Valentine A. Nzungung  
Funding Agency: USEPA/NERL in Athens, GA  
Project Title: Phytoremediation at Carswell AFB, TX: Laboratory characterization of phyto-transformation products of tetrachloroethylene (PCE), trichloroethylene (TCE) and perchlorate.

**Date: 1997:** Amount: \$20,000  
Principal Investigator: Valentine A. Nzungung  
Funding Agency: USEPA/NERL in Athens, GA  
Project Title: Plant extract mediated transformation of chlorinated organic compounds

**Date: 1996:** Amount: \$23,000  
Principal Investigator: Valentine A. Nzungung  
Funding Agency: DOE-SREL (Dr. Mills, G.)  
Project Title: Degradation of tetrachloroethylene (PCE) by dithionite-reduced ferruginous smectites.

**Date: 1996:** Amount: \$9,752  
Principal Investigator: Valentine A. Nzungung  
Funding Agency: UGARF Equipment Grant  
Project Title: Request for partial funding for components of a high-pressure liquid chromatograph (HPLC)

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## **TEACHING AND DEVELOPED COURSES**

- Remediation of Hazardous Waste Sites (Developed Graduate Course)
  - Aqueous Environmental Geochemistry (Developed Undergraduate/Graduate Course)
  - Agrogeology (New Course 2019)
  - Organic Contaminant Hydrogeology (Developed Graduate Course)
  - Earth Processes and Environments
  - Environmental Geosciences (Developed Undergraduate Course)
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## **OTHER PROFESSIONAL ACTIVITIES**

- Performed panel reviews for:
  - Department of Defense Strategic Environmental Research and Development Program (SERDP)
  - National Science Foundation (NSF)
  - National Academies of Science, Engineering and Medicine
  - Environmental Protection Agency's National Hazardous Substance Research Centers
  - Environmental Protection Agency's Small Business Innovative Research Program
  - Davidson Scholars Program
  - US State Department Civilian Research Program
  - Full Professor Promotion (External) Review
- Member of International Scientific and Technology Advisory Board (ISTAB) on Underwater Munitions (UWM's), The Hague, The Netherlands. (2020 – Present)
- Editorial Board Member, Journal of Environmental Sustainability and Climate Change 2019 - Present
- Editorial Board Member, Journal of Experts Opinion on Environmental Biology 2012 to Present
- Editorial Board, Journal of Waste Conversion, Bioproducts and Biotechnology – ISSN 2155-1804 2011 to Present
- Invited participant in the National Science Foundation (NSF) workshop on Food-Energy-Water Systems Challenging Chemists in the 21<sup>st</sup> Century. October 13 – 15, 2015, Arlington, Virginia. The workshop developed a road-map and a prospectus/report; interdisciplinary working groups crafted sections of the report based on fundamental questions/challenges of science and engineering as generated in the working groups.
- Co-Organizer of workshop on “Degradation of Organic Contaminants at Clay Mineral Surface,” 38<sup>th</sup> Annual Meeting of the Clay Minerals Society, Madison, Wisconsin. June 16-20, 2001.
- Chair 37<sup>th</sup> Annual Meeting of The Clay Minerals Society, Loyola University, Chicago, IL. June 24-29, 2000.
- Have mentored high school and undergraduate students under the Summer Minority Research Apprenticeship Program
- Have reviewed of manuscripts multiple technical journals:
  - Water Research
  - Environmental Science and Technology
  - Journal of Soil Biology and Chemistry
  - University of Wisconsin - Madison, Water Resources Center
  - Clays and Clay Minerals
  - Chemosphere
  - International Journal of Phytoremediation
  - Journal of Water, Air and Soil Pollution
  - Journal of Food Chemistry
  - Georgia Annual Groundwater Conferences
  - Industrial & Engineering Chemistry Research