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Educational History

2009 – to date Post-doctoral Fellow, **Harvard University**, Cambridge, USA

- *Charge transport across self-assembled monolayers*: Demonstration that the 'odd-even effect' is due to interfacial sterics, and not electronic, properties of the molecules. Designed a study demonstrating that rectification observed in SAM-based junctions was due to the molecule and not the junction architecture.
- *Paper-based devices*: Developed hydrophobic paper devices by chemisorption for microfluidic devices. Microfluidic devices by embossing and stacking paper. Supported the development of 1D and 3D MEMS sensors and studies on paper-based 3D cell cultures.
- *CO₂*: Free electron solution-based one-electron coupling of CO₂ to oxalate.

2004 – 2008 PhD, **University of Iowa**. Iowa City, IA USA

- *Cascade reactions*: Developed "pot-in-pot" reactions based on selective flux across polymeric membranes to isolate incompatible solvents and reagents.
- *Site-Isolation of catalysts and reagents*: Occluded catalysts in polymeric membranes for use with incompatible solvents or reagents.
- *Ultra-large Polymers*: Synthesized maleimide derived ultra-large comb-block polymers (> 1 million g/mole). These polymers self assemble into nanometer size rigid rods

2002 – 2004 MS, **Simon Fraser University**. Burnaby, BC Canada (Transferred to University of Iowa)

- *Chloro-amide rearrangements*: Investigated the conversion of α -chloroamides to ketones in bicyclo[2.2.1]heptanes systems. First closely correlated confirmation of Huckel's assumption on the absolute stereo-chemical configuration of (+)-norcamphor using anomalous dispersion of x-rays by Cl.
- *Thiirane dispalure analog*: Developed a 16-step total synthesis of the thiirane dispalure analog.

1996 – 2002 MS, **Kenyatta University**. Nairobi, Kenya

- *Tsetse Fly allomones*: Developed stereo-selective routes to chiral δ -octalactones and investigated their effects on the host-seeking behavior of *G. morsitans morsitans*
B.Ed(sc)(hons), Kenyatta University, Nairobi, Kenya
- *Honors thesis*: Fraction of three medicinal plants for anti-malarial compounds. Employed a bioassay guided approach that led to isolation of one active compound.

Professional Appointments

- Fall, 2008 Visiting Research Scholar, University of Iowa, Iowa City, IA
Advisor: Prof. Leonard R. McGillivray
- 2002 Research Associate, International Centre of Insect Physiology & Ecology (ICIPE),
Nairobi, Kenya.

Awards/Honors

- 2012 *Young Researcher on Advanced Materials*: Invited speaker and Session Chair, Internal
Unions of Materials Society, International Conference of Young Researchers on
Advanced Materials (ICYRAM). Singapore, 2012
- 2010 – 2011 *Nanoscale Science and Engineering Centre (NSEC) Postdoctoral Fellowship*, Harvard
University, Cambridge, MA
- 2009 – 2010 *Mary - Fieser Post-doctoral Fellowship*, Harvard University, Cambridge, MA
- 2008 Duke Conversations (Students invitee), Duke University, Durham, NC
- 2008 *Lynn-Anderson Inaugural award (Best graduate research student in Chemistry)*,
University of Iowa, Iowa City, IA
- 2008 *Best mentor*, Department of Chemistry, University of Iowa, Iowa City, IA
- 2008 *Most motivated* graduate student (graduate students vote), Department of Chemistry,
University of Iowa, Iowa City, IA
- 2008 *Research Fellow*, Graduate College, University of Iowa, Iowa City, IA
- 2000 – 2002 *African Regional Postgraduate Programs in Insect Science – Dissertation and Research
Internship Program (ARPPIS-DRIP) scholar*, International Centre of Insect Physiology
and Ecology (ICIPE), Nairobi, Kenya
- 2003 – 2006 *Travel Awards*
University Hospital of Northern Norway/Tromsø University, Norway, (2006),
University of Iowa, Chemistry Department (2005 - 2008, 6 awards from Chemistry
Department, Graduate student council, Dean - Graduate School),
University of Iowa, Dean of graduate studies, (2008)
Simon Fraser University, BC, Ca. (2003)

Teaching and Mentoring Experience

- 2009 – to date Post-doctoral fellow, Harvard University, Cambridge, MA
Mentored undergraduate interns and one visiting graduate student
Mentored African faculty and students in grant writing, conducting research, publishing
and in building networks across the world.
Outreach to under-represented minorities – appointed mentor by the Harvard black
science and engineering students
- 2004 – 2008 Teaching Assistant, University of Iowa, Iowa City, IA
Led discussion classes and graded exams, mentored undergraduate research students.
- 2002 – 2004 Teaching Assistant, Simon Fraser University, Burnaby, BC Canada
Led discussion classes and graded exams and mentored 3 undergraduate students.

Publications: Peer-Reviewed

1. Plettner, E.; Mohle, A.; Mwangi, M. T.; Griscti, J.; Patrick, B. O.; Nair, R.; Batchelor, R. J.; Einstein, F., 2-Chlorobicyclo[2.2.1]hept-5-ene-2-carboxamide and 2-chlorobicyclo[2.2.1]heptane-2-carboxamide as precursors of bicyclo[2.2.1]hept-5-en-2-one and bicyclo[2.2.1]heptan-2-one: resolution, absolute configuration and hydrogen-bonding properties. *Tet. Asym.* **2005**, *16* (16), 2754-2763 (IF 2.65)
2. Mwangi, M. T.; Runge, M. B.; Bowden, N. B., Occlusion of Grubbs' Catalysts in Active Membranes of Polydimethylsiloxane: Catalysis in Water and New Functional Group Selectivities. *J. Amer. Chem. Soc.* **2006**, *128* (45), 14434-14435 (IF 9.91)
3. Runge, M. B.; Mwangi, M. T.; Bowden, N. B., New selectivities from old catalysts. Occlusion of Grubbs' catalysts in PDMS to change their reactions. *J. Organomet. Chem.* **2006**, *691* (24-25), 5278-5288 (IF 2.38)
4. Runge, M. B.; Mwangi, M. T.; Miller, A. L., II; Perring, M.; Bowden, N. B., Cascade reactions using LiAlH_4 and Grignard reagents in the presence of water. *Angew. Chem., Int. Ed.* **2008**, *47* (5), 935-939 (IF 13.46)
5. Mwangi, M. T.; Runge, M. B.; Hoak, K. M.; Schulz, M. D.; Bowden, N. B., A materials approach to site-isolation of Grubbs catalysts from incompatible solvents and m-chloroperoxybenzoic acid. *Chem.—Eur. J.* **2008**, *14* (22), 6780-6788 (IF 5.93)
6. Mwangi, M. T.; Gikonyo, N. K.; Ndiege, I. O., Repellent properties of δ -octalactone against the tsetse fly, *Glossina morsitans morsitans*. *J. Insect Sci.* **2008**, *8*, 43 (IF 1.01)
7. Mwangi, M. T.; Schulz, M. D.; Bowden, N. B., Sequential Reactions with Grubb's Catalyst and AD-mix- α/β Using PDMS Thimbles. *Org. Letts.* **2009**, *11* (1), 33-36 (IF 5.86)
8. Runge, M. B.; Mwangi, M. T.; Miller, A. L., II; Perring, M.; Hoak, K. M.; Schulz, M. D.; Bowden, N. B., PDMS Thimbles for the development of cascade reactions: A materials approach to organic chemistry. *PMSE Preprints* **2009**, *100*, 690-691
9. Atkinson, M. B. J.; Sokolov, A. N.; Bucar, D.-K.; Mariappan, S. V. S.; Mwangi, M. T.; Tiedman, M. C.; MacGillivray, L. R., Applications of hydrogen-bond-acceptor templates to direct in-phase' reactivity of a diene diacid in the solid state. *Photochem. Photobiol. Sci.* **2011**, *10* (9), 1384-1386 (IF 2.41)
10. Thuo, M. M.; Reus, W. F.; Nijhuis, C. A.; Barber, J. R.; Kim, C.; Schulz, M. D.; Whitesides, G. M., Odd-Even Effects in Charge Transport across Self-Assembled Monolayers. *J. Amer. Chem. Soc.* **2011**, *133* (9), 2962-2975 (IF 9.91)
11. Liu, X.-Y.; Mwangi, M.; Li, X.-J.; O'Brien, M.; Whitesides, G. M., Paper-based piezoresistive MEMS sensors. *Lab on a Chip* **2011**, *11* (13), 2189-2196. (IF 6.26)
12. Derda, R.; Tang, S. K. Y.; Laromaine, A.; Mosadegh, B.; Hong, E.; Mwangi, M.; Mammoto, A.; Ingber, D. E.; Whitesides, G. M., Multizone paper platform for 3D cell cultures. *PLoS One* **2011**, *6* (5), e18940 (IF 4.09)
13. Liu, X.-Y.; O'Brien, M.; Mwangi, M.; Xiujun Li, Whitesides, George M. (2011) "Paper-based piezoresistive MEMS force sensors" MEMS 2011 Conference proceedings
14. Cademartiri, L.; Thuo, M. M.; Nijhuis, C. A.; Reus, W. F.; Tricard, S.; Barber, J. R.; Sodhi, R. N. S.; Brodersen, P.; Kim, C.; Chiechi, R. C.; Whitesides, G. M., Electrical Resistance of $\text{Ag}^{\text{TS}}\text{-S}(\text{CH}_2)_n\text{-CH}_3/\text{Ga}_2\text{O}_3/\text{EGaIn}$ Tunneling Junctions. *J. Phys. Chem. C* **2012**, *116* (20), 10848-10860 (IF 4.81)

15. Reus, W. F.; Nijhuis, C. A.; Barber, J. R.; Thuo, M. M.; Tricard, S.; Whitesides, G. M., Statistical Tools for Analyzing Measurements of Charge Transport. *J. Phys. Chem. C* **2012**, *116* (11), 6714-6733 (IF 4.81)
16. Reus, W. F.;[#] Thuo, M. M.;[#] Shapiro, N. D.; Nijhuis, C. A.; Whitesides, G. M., The SAM, Not the Electrodes, Dominates Charge Transport in Metal-Monolayer//Ga₂O₃/Gallium-Indium Eutectic Junctions. *ACS Nano* **2012**, *6* (6), 4806-4822 ([#] co-first author) (IF 11.42)
17. Yoon, H. J.; Shapiro, N. D.; Park, K. M.; Thuo, M. M.; Soh, S.; Whitesides, G. M., The Rate of Charge Tunneling through Self-Assembled Monolayers Is Insensitive to Many Functional Group Substitutions. *Angew. Chem., Int. Ed.* **2012**, *51* (19), 4658-4661 (IF 13.46)
18. Thuo, M. M.; Reus, W. F.; Simeone, F. C.; Kim, C.; Schulz, M. D.; Yoon, H. J.; Whitesides, G. M., Replacing -CH₂CH₂- with -CONH- Does Not Significantly Change Rates of Charge Transport through Ag^{TS}-SAM//Ga₂O₃/EGaIn Junctions. *J. Am. Chem. Soc.* **2012**, *134* (26), 10876-10884 (IF 9.91)

Publications: in Preparation (manuscripts available)

1. Martin M. Thuo, Ramses Martinez, Xinyu Liu, Jean-Francis Bloch, George M. Whitesides "Low-Cost microfluidic devices derived from embossed hydrophobic paper"
2. Martin M. Thuo,[#] Alex Nemiroski,[#] David K. Bwambok, and George M. Whitesides "Info-chemistry: Decoding Information Encrypted into Material Density Using Magnetic Levitation"
3. Martin M. Thuo, Jinlong Gong, Elizabeth J. Maxwell, George M. Whitesides. "Non-electrochemical one-electron reductive coupling of CO₂ to oxalate using solvated electrons."
4. David K. Bwambok, Martin M. Thuo, Nathan Shapiro Manza B.J. Atkinson, Katherine A. Mirica, George M. Whitesides "Paramagnetic ionic liquids for density-based measurements using magnetic Levitation"
5. Felice C. Simeone, Martin M. Thuo, Hyo-Jae Yoon, Jabulani R. Barber, George M. Whitesides "Defining injection conductance for charge transport by tunneling across SAMs"
6. Wenjie Lan, Martin M. Thuo, Jabulani Barber, George M. Whitesides "Paper-based gas permeable 3D microfluidic devices for environmental monitoring and infochemistry"
7. Manza B.J. Atkinson, David K. Bwambok, Martin M. Thuo, Jie Chen, Prashant Chopade, Charles R. Mace, Katherine A. Mirica, Steve Morin, Nathan D. Shapiro, Allan Myerson*, George M. Whitesides*. "Separation and Isolation of Polymorphs, Enantiomorphs, and Racemate Crystal Forms by Density Using Magnetic Levitation"
8. Martin M. Thuo, Felice C. Simeone, Jabulani Barber, Mike Miller, Mohammad Al-Sayah, Tricia B. Carmichael,* George M. Whitesides * Changing the Substrate from Ag to Au in Tunneling Junctions with the Structure Metal-S(CH₂)_nCH₃\Oxide\\EGaIn Reverses the Odd-Even Effect

Patents

1. Martin M. Thuo, Xinyu Liu, Jean-Francis Bloch, Ana Glavan, Ramses Martines, Wenjie Lan, George M. Whitesides "Microfluidic devices based on hydrophobic paper" *U.S. Patent Pending*
2. Xinyu Liu, Martin M. Thuo, XiuJun Li, Michael O'Brien, Yu Sun, and George M. Whitesides "MEMS force sensors fabricated using paper substrates" *U.S. Patent Application No.13/557,861*
3. David K. Bwambok, Martin M. Thuo, Katherine Mirica, Nathan Shapiro, Manza Atkinson, and George M. Whitesides "Density based methods for separation of materials, monitoring of solid supported reactions and measuring densities of small liquid volumes and solids using ionic liquids" *US Patent Application No. 61/659,715*

4. Martin M. Thuo, Alex Nemiroski, David K. Bwambok, and George M. Whitesides "Infochemist: Decoding Information Encrypted into Material Density Using Magnetic Levitation" *U.S. provisional Patent*

Sample Conference Presentations:

- 1 Thuo, M. M.; Reus, W. F.; Simeone, F. C.; Whitesides, G. M., Physical-organic studies on the rate of charge transport across EGaIn-based junctions. *International Conference of Young Researchers on Advanced Materials, Singapore, July 1-6, 2012*
- 2 Thuo, M. M.; Reus, W. F.; Simeone, F. C.; Whitesides, G. M., Physical-organic studies of charge transport across EGaIn-based junctions I: Substituting CH₂CH₂ with CONH. *244th ACS National Meeting, Philadelphia, PA, United States, August 19-23, 2012*
3. Mwangi, M. T.; Reus, W.; Nijhuis, C.; Kim, C.; Barber, J.; Schulz, M. D.; Whitesides, G. M., Odd-even effects on charge transport across n-alkanethiolate SAMs on metal/SAM/oxide/EGaIn junction. *Abstracts of Papers, 240th ACS National Meeting, Boston, MA, United States, August 22-26, 2010*
4. Mwangi, M. T.; Reus, W.; Kim, C.; Schulz, M. D.; Whitesides, G. M., Improving the yield of working tunnel junctions (AgTS/SAM//oxide/EGaIn) through near-surface effects on the SAM. *240th ACS National Meeting, Boston, MA, United States, August 22-26, 2010*
5. Mwangi, M. T.; Reus, W.; Nijhuis, C.; Kim, C.; Barber, J.; Whitesides, G. M., Odd-even effects in tunneling across n-alkanethiols self-assembled monolayers. *Gordon Conference, New Port, RI, United States, August 8-12, 2010.*
6. Mwangi, M. T.; Runge, M. B.; Hoak, K. M., Schulz, M. D., Elsey, R. J., Beaubrun, A. C., Bowden, N. B., "Pot-in-pot" reactions: A new paradigm in "Ad infinitum" cascade reactions. *13th ACS green Chemistry Conference, Washington, D.C., United States, June 23-25, 2009*
7. Mwangi, M. T.; Runge, M. B.; Bowden, N. B., "Pot-in-pot" reactions: Site-isolation of organometallic catalysts from each other for versatile cascade reactions and catalyst recycling *235th ACS National Meeting, New Orleans, LA, United States, April 6-10, 2008*
8. Mwangi, M. T.; Runge, M. B.; Bowden, N. B., "Pot-in-pot" reactions: Polymers macro-fabrication for site-isolation of catalysts and reagents. *AIChE Spring National Meeting, New Orleans, LA, United States, April 6-10, 2008*
9. Mwangi, M. T.; Runge, M. B.; Bowden, N. B., Occlusion of Grubbs' metathesis catalysts in PDMS: Serendipitous discovery of new reactivities in aqueous solvents. *233rd ACS National Meeting, Chicago, IL, United States, March 25-29, 2007*
10. Mwangi, M. T.; Runge, M. B.; Bowden, N. B., "Pot-in-Pot" Reactions: Site-Isolation of Organometallic Catalysts and Reagents for Otherwise Impossible Cascade Reactions. *42nd Midwest Regional Meeting of the American Chemical Society, Kansas City, MO, United States, November 7-10 2007*
11. Mwangi, M. T.; Runge, M. B.; Hoak, K. M., Bowden, N. B., A new approach to cascade reactions using site-isolated catalyst and/or reagents. *8th International Symposium on Carbanion Chemistry, Madison, WI, United States, June 6-10 2007*

Funded Grants:

1. Oct. 2012 – April 2014: "Development of low-cost diagnostic devices from biodegrade materials and can also be incinerated" Grand-Challenges Canada Grant No. 0153-01. (US\$ 113,000). **Role:** co-PI
2. Feb. 2012 – Aug. 2013: "A low-cost, paper-based electrochemical diagnostic device for point-of-care immunoassays" Grand-Challenges Canada Grant No. 0046-01-04-01-01. (US\$ 113,000). **Role:** co-PI