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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
Doctor of Philosophy in the Field of Biofuels and Renewable Energy June 2017
Master of Science in Biological Engineering February 2013

University of Cambridge, Cambridge, United Kingdom
Master of Philosophy in Physics December 2009

Princeton University, Princeton, NJ
Bachelor of Arts in Physics, *summa cum laude* June 2008

RESEARCH

Lawrence Berkeley National Laboratory, Berkeley, CA
Entrepreneurial Fellow 2018-2021
- Participated in the Cyclotron Road entrepreneurial fellowship program, for my start-up Takachar under a joint Cooperative Research and Development Agreement with the lab.
- Raised and managed $1,400,000 in research funding on behalf of my company.
- Collaborated with UC Berkeley to further the technical goals of my technology.

MIT Reacting Gas Dynamics Laboratory, Cambridge, MA
Research Assistant 2013-2019
- Managed a six-year, $700,000 research project sponsored by the Tata Trusts and the Abdul Latif Jameel business, including setting up a new biomass characterization laboratory.
- Conceived, designed, implemented, and operated a lab-scale reactor for low-cost, decentralized densification (torrefaction) of crop and forest residues in rural communities.
- Carried out multi-scale modeling of the reactor, accounting for chemical kinetics, thermochemistry, individual component performance, and overall process simulation.
- Spent about 4-6 weeks every year in emerging markets (India, Kenya, Nepal, etc.) interacting with relevant project stakeholders, end users, and collaborators.
- Supervised 2 B.Sc. theses, one M.Sc. thesis, and 15 undergraduate research students.
- Filed one patent; patent being licensed exclusively by my company Takachar as a spinout.

MIT Senseable City Lab, Cambridge, MA
Research Fellow 2012-2013
- Studied the mobility behaviors using mobile phone data in Portugal and Ivory Coast.
- Designed and implemented a mobile phone toolset for more efficient waste management.
- Prototyped low-cost charcoal production kiln reactor for pilot in Kenya

MIT QuantLab, Cambridge, MA
Research Assistant 2009-2013
- Spatially visualized messenger RNAs to study of the early development of colon cancer.

ENTREPRENEURSHIP

Takachar Ltd.

Chief Technology Officer 2018-present

- Exclusively license biomass technology from my MIT PhD work for commercialization.
- Set up four decentralized technology prototypes in California, Massachusetts, and India.
- Responsible for raising and managing more than $1 million in follow-on grant-based R&D funding from the Schmidt Family Foundation, National Science Foundation, Department of Energy, Department of Forestry, State of California, and Massachusetts Clean Energy Center.
- Serve as the Principal Investigator (PI) on R&D collaborations with MIT, Georgia Institute of Technology, Colorado State University, and University of California Berkeley.
- Company received accolades such as the Forbes 30 Under 30 Energy shortlist, interview by Stephen Colbert, and recognition by former U.S. President Clinton.

Safi Organics Private Limited

Co-Founder and Chief Technology Officer 2013-2017

- Co-founded a carbon-negative organic fertilizer company that improves smallholder farmers' yields by up to 30% and net income by up to 50%.
- Built a team of 15 full-time employees and more than 3,500 paying customers.
- Led the company to financial profitability, after raising $200,000 in non-dilutive grants.
- Developed a series of proprietary recipes to complete the nutrient requirements for different soil conditions.

GreenChar Solutions Private Limited

Industry Advisor 2014-2016

- Advised on the operations and machinery in setting up a waste-to-energy business.
- Implemented quality control measures for GreenChar's fuel production plant in Awendo.

SafiCoils

Co-Founder and Chief Technology Officer 2011-2013

- Sold more than one million low-toxin mosquito coils to a large distributor.

PUBLICATIONS

Peer-Reviewed Articles

- **Kung, K.S.**, *et al.* (2021) Bulk permeability characteristics in a biomass moving bed and their effects on reactor design and scaling. *Chemical Engineering Journal* 420: 129979.
- Thengane, S., **Kung, K.S.**, *et al.* (2021) Market prospects for biochar production and application in California. *Biofuels, Bioproducts and Biorefining* doi:10.1002/bbb.2280.
- **Kung, K.S.**, *et al.* (2020) Thermal loss analysis and improvements for biomass reactors. *Energy Conversion and Management* 218: 112924.
- **Kung, K.S.**, Thengane, S., and Ghoniem, A.F. (2020) Functional mapping of torrefied product characteristics with index of torrefaction. *Fuel Processing Tech* 202: 106362.
- Thengane, S., Burek, J., **Kung, K.S.**, *et al*. (2020) Life cycle assessment of rice husk torrefaction and prospects for decentralized facilities at rice mills. *Journal of Cleaner Production*: 123177.

Publications – Peer-Reviewed Articles Continued

- Thengane, S., **Kung, K.S.**, *et al*. (2020) Technoeconomic and emissions evaluation of mobile in-woods biochar production. *Energy Conversion and Management* 223: 113305.
- Thengane, S., **Kung, K.S.**, and Ghoniem, A.F. (2020) State-of-the-art review on advances in biomass torrefaction, under review (*Progress in Energy and Combustion Science*).
- Barr, M., **Kung, K.S.**, Thengane, S., Mohan, V., Sweeney, D., and Ghoniem, A.F. (2020) Characterization of aggregate behaviors of torrefied biomass as a function of reaction severity. *Fuel* 266: 117152.
- **Kung, K.S.**, Thengane, S., Shanbhogue, S., and Ghoniem, A.F. (2019) Parametric analysis of torrefaction reactor operating under oxygen-lean conditions. *Energy* 181: 603-614.
- **Kung, K.S.**, and Ghoniem, A.F. (2019) A decentralized biomass torrefaction reactor concept. Part II: Mathematical model and scaling law. *Biomass Bioenergy* 125: 204-211.
- **Kung, K.S.**, Shanbhogue, S., Slocum, A.H., and Ghoniem, A.F. (2019) A decentralized biomass torrefaction reactor concept. Part I: Multi-scale analysis and initial experimental validation. *Biomass Bioenergy* 125: 196-203.
- **Kung, K.S.**, and Ghoniem, A.F. (2019) Multi-scale analysis of drying thermally thick biomass: from single particles to reactors. *Energy* 187, 115989.
- **Kung, K.S.**, *et al*. (2015) Techno-economic feasibility of green charcoal production in Kenya. In *Sustainability Access to Energy in the Global South*. Springer: 87-100.
- **Kung, K.S.**, Greco, K., Sobolevsky, S., and Ratti, C. (2014) Exploring universal patterns in human home-work commuting from mobile phone data. PLoS One. 9(6): e96180.
- Amini, A., Kung, **K.S., Kung**, C., Sobolevsky, S., and Ratti, C. (2014) The impact of social segregation on human mobility in developing and industrialized regions. *The European Physical Journal Data* Science 3(1): 6.
- TPSOC Network. (2013) A physical sciences network characterization of non-tumorigenic and metastatic cells. *Scientific Reports*. 3: 1449.
- Munoz, J., Stange, D.E., Schepers, A.G., van de Wetering, M., Koo, B.K., Itzkovitz, S., Volckmann, R., **Kung, K.S.**, *et al*. (2012) The Lgr5 intestinal stem cell signature: robust expression of proposed quiescent '+4' cell markers. *EMBO Journal*. 31(14): 3079-3091.
- **Kung, K.S.**, *et al*. (2011) The development of anisotropic behaviours of 3T3 fibroblasts on microgrooved patterns. *The European Physical Journal E: Physics* 34(3): 1-9.

Popular Literature

- **Kung, K.S.** (2018) *How to Drink from a Fire Hose: What MIT Taught Me about Innovation, Leadership, and the Pursuit of Life*. YLib Publishing Co., Taipei, Taiwan. Simplified Mandarin Chinese version published by Beijing Times Chinese Press (2020).

Patent Applications

- **Kung, K.S.** (2020) A method to improve the energy efficiency of the production of carbon-based products. US63/076571.
- **Kung, K.S.** (2020) Improvements in biomass reactors. US63/630861.
- **Kung, K.S.**, and Mohan, V. (2019) System and method for the control of biomass conversion systems. US62/933684.
- **Kung, K.S.**, Shanbhogue, S.J., Slocum, A.H., Stoner, R.J., and Ghoniem, A.F. (2017) Biomass conversion reactors and associated systems and methods. WO2018/213474.

CONFERENCE PROCEEDINGS

- Thengane, S.K., Burek, J., **Kung, K.S.**, *et al.* (2020) A life cycle assessment of biomass torrefaction in inert and partially oxidative conditions. Applied Energy A+B Symposium, Cambridge, MA.
- **Kung, K.S.**, *et al*. (2019) Design and validation of a decentralized biomass thermochemical reactor. Biochar and Bioenergy, Fort Collins, CO.
- **Kung, K.S.**, Thengane, S., and Ghoniem, A.F. (2019) Characterizing transient timescales in a biomass reactor. Applied Energy A+B Symposium, Cambridge, MA.
- **Kung, K.S.**, Kaplan, H.J., Kotowick, K.J., and Montgomery, C.S. (2018) A low-cost ambulance idle reduction system. The Journal of Collegiate Emergency Medical Services, Philadelphia, PA.
- Barr, M., **Kung, K.S.**, Sweeney, D., and Ghoniem, A.F. (2018) Torrefaction severity influences combustion and emission characteristics of agricultural waste briquettes as cookstove fuel. Abstracts of Papers of the American Chemical Society 256.
- Lee, D., **Kung, K.S.**, and Ratti, C. (2015) Mapping the waste handling dynamics in Mombasa using mobile phone GPS. Proceedings of the 14th International Conference on Computers in Urban Planning and Urban Management.
- **Kung, K.S.**, Kamil, A., Ratti, C., and McDonald, L. (2013) Low-cost production of charcoal briquettes from organic waste. International Solid Waste Association Congress.
- Amini, A., **Kung, K.S.**, *et al*. (2013) The differing tribal and infrastructural influences on mobility in developing and industrialized regions. Orange D4D Challenge.

AWARDS

Biossance Impact Award	2020
Echoing Green Fellowship	2019-2021
Cyclotron Road Entrepreneurial Fellowship	2018-2020
Keeling Curve Prize	2018
Licensing Executives Society Foundation Global Prize	2017
MIT Water Innovation Prize	2017
University of California – Berkeley BigIdeas Scale-Up Award	2017
MIT Food and Agribusiness Prize (second place)	2016
Factor(E) Energy for Development Prize	2015
National Solid Waste Design Competition	2015
Two-time winner, MIT IDEAS/Global Challenge Competition	2012/2014
Dolores Zohrab Liebmann Fellowship	2013-2016
MIT-Tata Center for Technology and Design Fellowship	2013-2016
Legatum Fellowship (for entrepreneurship in developing countries)	2013-2015
Robert and Patrician Switzer Foundation Fellowship	2013-2014
General Electric/Alva Emerging Fellowship	2013-2014
James Dyson Invention Award (shortlist)	2013
Carroll Wilson Award	2013
Orange Africa Venture Prize (second place)	2012
International Telecommunication Union Young Innovator	2012
Avery Ashdown Leadership Award	2010

INVITED TALKS

- Design and validation of a decentralized biomass thermochemical reactor for biochar production. Keynote at the Australia and New Zealand Biochar Conference. July 23, 2020. Cairns, Australia.
- How to hack the university R&D system for fun and profit. Keynote at the Taipei International Startup Week. November 12, 2019. Taipei, Taiwan.
- Harvesting value from agricultural waste. MIT Energy Initiative. October 26, 2018. Cambridge, MA.
- Decentralized biomass torrefaction and fuel design. Advancing Sustainable Charcoal Enterprises at Scale Conference. October 2, 2018. Naivasha, Kenya.
- Design and validation of a decentralized biomass torrefaction system. Colorado State University. September 19, 2018. Fort Collins, CO.
- Radio interview. IC Broadcasting Co. Ltd. August 9, 2018. Taipei, Taiwan.
- How to drink from a firehose. National Taiwan University. July 14, 2018. Taipei, Taiwan.
- How to drink from a firehose. MIT Club of Taiwan. July 13, 2018. Taipei, Taiwan.
- Panelist on the "Entrepreneurship in Science and Engineering" panel. Boston Postdoc Association Annual Conference. June 9, 2018. Cambridge, MA.
- Panelist on the "Innovators to Watch in Environmental Protection" panel. The Collaborative Conference. June 13, 2017. Boston, MA.
- Opening speaker at the plenary session. MIT Solve Conference. May 9, 2017. Cambridge, MA.
- Dead ends and U-turns: all the mistakes we've made with utilizing biomass waste as energy in MIT Energy for Development seminar series. March 15, 2016. Cambridge, MA.
- Panelist on the "From the Fire: Energy Production in Asia" panel. Legatum Conference. May 10, 2014. Cambridge, MA.
- Using mobile phones to map the waste handling dynamics in Mombasa, Kenya. Oral presentation at the II Africa Sustainable Waste Management Conference. April 23, 2014. Luanda, Angola.
- Panelist on the Social Entrepreneurship Panel. 20th Harvard International Development Conference. April 12, 2014. Cambridge, MA.
- Transforming waste: from vision to reality. Invited speaker at the Global Sustainability Working Group. March 18, 2014. Cambridge, MA.
- Speaker and poster presenter, "Young Innovators Pitch" session, 2013 ITU Telecom World. November 20, 2013. Bangkok, Thailand.
- A micro-enterprise commercialization model in "Strategic Planning for a Sustainable Green Charcoal Enterprise" workshop. July 16, 2013. Nairobi, Kenya.
- Interviewee, *The Colbert Report*. April 6, 2013. St. Louis, MO.
- Turning urban waste into energy. Oral presentation at the 2012 MIT Presidential Inaugural Symposium. Cambridge, MA.
- Speaker and poster presenter, "Young Innovators Pitch" session, 2012 ITU Telecom World. October 11, 2012. Dubai, United Arab Emirates.
- Turning waste into energy. Oral presentation and poster session at the 2012 Poverty Action Conference, Fredericksburg, VA.
- Speaker, "A Globally Engaged MIT" session, Presidential Inaugural Symposium. September 20, 2012. Cambridge, MA.

OTHER ACTIVITIES

American Institute of Chemical Engineers (AIChE)

Member 2020-present

- Participated in short courses.

Fuel

Peer Reviewer 2019-present

- Provided scientific review for articles in the biomass field for the academic journal.

MIT Waste Alliance

Founding Member and President 2014-2020

- Built a community of 700 students, entrepreneurs, and policymakers around waste-sector innovations.
- Hosted various external guests for lecture series, field trips, and organized the inaugural Waste Research and Innovation Poster Night, attracting 20 exhibitors from research to local start-ups.
- Led the MIT team to win first prize in the first National Solid Waste Design Competition.

MIT Emergency Medical Service

Emergency Medical Technician (Massachusetts Certified EMT-B) 2014-2020

- Staffed the ambulance and responded to emergency medical/trauma calls within the MIT community as well as in the greater Boston area through mutual aid dispatches by other ambulance agencies.
- Achieved the rank of provisional crew chief, responsible for overall scene management and for the entire ambulance crew operation in emergency responses.
- Developed a novel low-cost ambulance engine idle reduction system (provisional patent filed in 2017).

MIT Global Startup Workshop

Selection Committee, Business Plan Competition 2014-2015

- Read and selected finalists from 150 applications from startups around the world.

Panel Organizer 2012-2014

- Organized the "Taking Startup Global" panel in Tallinn, Estonia (2013) and the "Social Entrepreneurship: Doing Well by Doing Good" panel in Marrakech, Morocco (2014).

Engineers Without Borders

Volunteer 2005-2013

- *Kenya*: Contributed to the prototyping of a low-cost shower unit for use in urban slums in Kenya.
- *Uganda*: Held participatory co-design workshops in Ddegeya, Uganda on water purification technologies.
- *Ghana*: Investigated the potential of interlocking stabilized soil blocks for application in rural Ghana.
- *Peru*: Designed and built solar cooker prototypes; contributed to the technical design of a solar power and rechargeable lantern system for implementation in Huamanzaña, Peru.