

# Andrew Hubble

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info@ahubble.com

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## Education

<b>Cornell University</b> , Ithaca, NY	May 2022
Ph.D.: Biological and Environmental Engineering, Bioenergy and Integrated Energy Systems Thesis: Redesigning the Biorefinery: Thermochemical Catalytic Upgrading of Biofuel Pyrolysis	
<b>Tufts University</b> , Medford / Somerville, MA	May 2015
Master of Science: Mechanical Engineering Thesis: Two-Dimensional Compressible Vortex Analysis (Computational Fluid Dynamics)	
<b>Rose-Hulman Institute of Technology</b> , Terre-Haute, IN	May 2011
Bachelor of Science: Mechanical Engineering Concentration: Energy Production, Utilization, and Forecasting	

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## Experience

**Advanced Lead Engineer (Combustion Aerodynamics)**, GE Aerospace, *West Chester, OH* Mar. 2023 - Present

- Supported conceptual and theoretical activities aimed at optimizing combustion and emission performance.
- Developed in-depth knowledge of multiple technical disciplines, utilizing prior experience, and acquired technical experience to execute policy/strategy.
- Executed the design, analysis, and evaluation of various thermodynamic and combustion projects utilizing sound engineering principles and adhering to business standards, practices, procedures, and program requirements.
- Provided technical leadership to other personnel supporting projects with various engineering and scientific backgrounds.
- Lead planning, execution, review and report-out of component and engine test campaigns.

**Postdoctoral Research Associate**, Cornell University, *Ithaca, NY* Aug. 2022 – Mar. 2023

- Assisted in design, development, and deployment of demo-scale thermochemical equipment for high-temperature conversion of biomass to solid, liquid, and gas products including fuels, chemical precursors, and soil amendments (including partial and complete combustion).
- Conducted thermal management review of all components.
- Completed CFD model of demonstration and bench-scale thermal units to ensure proper pre-heating of input purge gases and porogen gases. Additionally modeled lightweight hydrocarbon removal, handling, and storage.
- Modeled (CAD) and prototyped phosphorus and nitrogen scrubbing and recovery system from liquid biomass feedstocks by physisorption and chemisorption onto carbon radicals.
- Successfully retooled heat exchanger to improve recovery and distribution to apply process heat to incoming material for improved moisture removal.
- Conducted performance and life-cycle tests on prototypes to determine feasibility of wide-spread implementation of system.
- Key role in grant-writing to secure more funding to continue projects and explore new avenues.

**Ph.D. Candidate**, Cornell University, *Ithaca, NY* Aug 2018 – May 2022

- Designed, prototyped, and built high-temperature thermochemical conversion equipment for bench-top scale laboratory use including heating elements, active cooling elements, data acquisition, while designing for cost and safety.
- Conducted primary research on high-temperature thermochemical conversion technologies to generate high-quality chemical precursors for sustainable aviation fuels (SAFs), and developed/implemented low-cost catalyst use strategies to improve high-temperature selection and formation of desired compounds.
- Developed predictive catalyst behavior model (MatLab)
- Performed feasibility studies on commercial scaling with operational analysis for implementation on New York State farms.
- Selected, setup, ran, maintained a suite of high-temperature and high-pressure scientific equipment including GC-MS, TGA, ICPMS, HPLC, and Surface Area Adsorption.
- Mentored early-career graduate students and undergraduates. Provided direction for research topics, planning, and execution; assisted with experimental setup, data analysis, and modeling.
- Authored peer-reviewed scientific papers, presented live, virtual, and pre-recorded at conferences across the country to share and distribute scientific findings.

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## Experience Continued

**Project Engineer**, Energy and Resource Solutions, *North Andover, MA* Aug. 2017 – June 2018

- Performed analysis and assessment of the feasibility of energy efficiency measures in commercial, industrial, and residential facilities including district heat, high-temperature manufacturing, and electrical usage.
- Conducted building site surveys and performed energy project measure analyses, including data acquisition of electricity, natural gas, and propane use.
- Evaluated energy efficiency end-use equipment and technology, such as lighting design, combined heat and power installation, and district heating/cooling systems.
- Worked directly with clients and program users to identify problem areas in energy usage and develop mitigation strategies.
- Identified novel and emerging technologies to reduce dependence on grid power and fossil fuels.

**Process Engineer**, PivotWorks, *Kigali Rwanda* June 2015 – June 2017

- Lead role in design (CAD) and prototyping of equipment for enhancing water evaporation and material movement for sludge drying beds.
- Lead role in design and procurement of greenhouse structures, thermal drying equipment, and material movement and storage for full scale waste to energy treatment plant capable of servicing all of Kigali's septic sewage and a growing portion of pit latrine waste.
- Completed construction, commissioning, process planning, and optimization of rotary thermal oven dryer and solar greenhouse drying areas, and planned designs for full commercial scale with operational analysis, distribution and sourcing plans, equipment, and manufacturing needs.
- Designed and installed majority of electrical systems including cable layout utilizing wiring diagrams, troubleshot control panel and cable connections via diagnostics and equipment disassembly for dryer, greenhouses, offices, and laboratory.
- Designed, prototyped, and fabricated quality control measures for fuel size and form factor.
- Developed material movement equipment and procedures through greenhouses and thermal dryer processes.
- Trained, managed, and directed team of four equipment operators from early construction through commissioning and production phases.
- Developed operating procedures and maintenance schedules for thermal dryer and greenhouse equipment.

**Resource Specialist Volunteer**, Peace Corps, *Kuruman, South Africa* July 2011 – July 2013

- Provided classroom instruction in Mathematics, Natural Science, and English to grades six through nine. Developed classroom management systems, created and maintained a portfolio of lesson plans for future use, and submission of classroom progress reports.
- Worked with partner organization (Roundabout Water Solutions) to rehabilitate defunct borehole. Removing broken pump and flushed system. Tested water samples for coliforms, E. coli, turbidity, various minerals, nitrates, sulfates, and phosphates. Replaced pump with merry-go-round pump structure, added water tower and filtration system.
- Taught after school courses in woodworking to community youth by obtaining grant money to purchase tools and lumber. All woodworking projects benefited local center for orphans and vulnerable children by providing furniture for the center including tables, chairs, desks, shelving, cabinets, countertops and sinks (with gray-water drainage).

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## Research

**Redesigning the Integrated Biorefinery** Aug. 2018 – May 2022

Utilizing *in situ* upgrading of biofuels undergoing thermochemical conversion on both constituent biomass building blocks and agricultural waste to improve both bio-oil and pyrolysis gas quality. Catalytic processes included co-blending and wet impregnation of clay minerals and transition metal catalysts.

**Microgrid Optimization and Forecasting** Kigali Rwanda, *Independent Research* Oct. 2015 – Sept. 2017

Performing independent research microgrid optimization in rural communities – specifically sub-Saharan Africa. Work includes analysis on electricity consumption, distributed generation, breakeven distances to national grid, and economic impact factors to electrical usability.

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## Research Continued

### Compressible Vortex Flows Medford MA, *Master's Thesis*

Nov. 2011 – May 2015

Utilizing FEA and CFD models, adapted of Brenner's Bivelocity theory to Maxwellian, compressible, two-dimensional vortex flows. Utilized the Bivelocity term to determine significance to previous analytic attempts at describing this vortex flow, and compared back to experimental results. Preliminary results suggest the Bivelocity term is significant, but further transient modeling is required.

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## Skills and Accreditations

- Fundamentals of Engineering (Engineering in Training Accreditation) – April 2011.
- Modeling: MatLab, Mathematica, Maple, COMSOL, AutoCAD, Solid Edge, SolidWorks.
- Laboratory: GCMS, TGA, ICPMS, Surface Area Analysis (physisorption), SEM, XRD, XPS.
- Programming: C++, VBA, Arduino, and R.
- Machine shop: mill, lathe, band saw, drill press.

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## Publications

### Published (\* Equal Contribution)

- 1) A.H. Hubble, B.A. Childs, M. Pecchi, H. Sudibyo, J.W. Tester, and J.L. Goldfarb, "Role of in situ (in contact with biomass) and ex situ (in contact with pyrolysis vapors) transition metal catalysts on pyrolysis of cherry pits", *Fuel*, vol 352, Nov. 2023.
- 2) Hubble, A.H. and J.L. Goldfarb. "Bio-based Solid Fuels", Chapter 10 in *Renewable Fuels: Sources, Conversion and Utilization*. Edited by J. O'Connor, B. Noble, T. Lieuwen. Cambridge University Press. December 2022.
- 3) M. Karod\*, A.H. Hubble\*, A. Maag, Z. Pollard, J.L. Goldfarb, "Clay-catalyzed in situ pyrolysis of cherry pits for upgraded biofuels and heterogeneous adsorbents as recoverable byproducts", *Biomass Conv. and Biorefinery*, June 2022.
- 4) J.L. Goldfarb, A.H. Hubble, Q. Ma, M. Volpe, G. Severini, G. Andreottola, L. Fiori. "Valorization of cow manure via hydrothermal carbonization for phosphorus recovery and adsorbents for water treatment", *Journal of Environmental Management*, vol 308, April 2022.
- 5) Andrew H. Hubble, Emily M. Ryan, and Jillian L. Goldfarb, "Enhancing pyrolysis gas and bio-oil formation through transition metals as *in situ* catalysts", *Fuel*, vol 308, Jan. 2022.
- 6) Andrew H. Hubble and Jillian L. Goldfarb, "Synergistic effects of biomass building blocks on pyrolysis gas and bio-oil formation", *Journal of Analytical and Applied Pyrolysis*, vol. 156, June 2021.
- 7) A.H. Hubble and T.S. Ustun, "Composition, Placement, and Economics of Rural Microgrids for Ensuring Sustainable Development", *Sustainable Energy, Grids and Networks*, vol. 13, pp. 1-18, Mar. 2018.
- 8) A.H. Hubble and T.S. Ustun. Feasibility of Microgrid Optimization and Grid Extension for Rural Electrification. In *IEEE Region 10 Conference (TENCON)*, 22-25 Nov. 2016.
- 9) A.H. Hubble and T.S. Ustun. Scaling Renewable Energy Based Microgrids in Underserved Communities: Latin America, South Asia, and Sub-Saharan Africa. In *IEEE PES Power Africa Conference*, pages 134–138, 28 Jun. - 3 Jul. 2016.