

# Josiah Johnston

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## Research Interests:

Product design for sustainable community development.

Publication of practical guides and background information related to renewable energy and related services.

Reducing greenhouse gas emissions by planning renewable energy build-outs.

## EXPERIENCE

August 2007 - present: **Graduate Student.** *Energy and Resources Group (ERG)*, University of California, Berkeley.  
My current research projects are a) designing an ambient light to replace candles for under \$15, using LEDs, solar panels, and an ergonomic generator; and b) expanding the geographic coverage of SWITCH, a cost-minimization model for planning renewable generator construction and dispatch, and evaluating policy impacts.

Nov 2002 - June 2007: **Computer Scientist.** *Image Informatics and Computation Biology Unit (IICBU)*, Laboratory of Genetics, National Institute on Aging.

I held a research position at IICBU which entailed developing image analysis tools for biological research and integrating those tools into the *Open Microscopy Environment (OME)* to increase their usability. OME is an Open Source application suite for storing, transferring, and analyzing image datasets and associated metadata.

Jan 2004 - June 2007: **Technology Officer**, Board of Directors, *Greenmount West Community Development Corporation*  
GWDC is a non-profit corporation that seeks to improve the social and economic conditions of residents of Greenmount West, an impoverished, predominately African-American community in inner-city Baltimore.

June 1995 - Oct 2002: **Subcontractor**, self-employed, seasonal

My father owns and operates a small construction company. From a very young age, he gave me on-the-job training. At the age of 15, I began working for him as an independent sub-contractor. As I grew older, I hired workers and negotiated my own contracts.

## SKILLS

- **Energy Systems Analysis:** Calculating Levelized Costs, Greenhouse Gas emissions, and other environmental impacts of generation or conservation projects, applying Economic Input-Output Lifecycle Analysis.
- **Community organizing:** Conducting needs assessments, project planning and implementation. Building trust and dialogue with community members.
- **Product design:** Interviewing users to understand needs, uses, budget, and priorities. Identifying and adapting existing products. Designing new custom products that can be built from local materials.
- **Technical writing:** Scientific writing, Documentation, User Guides, Construction Manuals
- **Scientific research:** Experiment Design, Analytical and Mathematical Modeling, Computational Pattern Recognition, Conducting Independent Research Projects, Cross-discipline collaboration
- **Project implementation:** Planning Execution of complex projects. Coordinating Activity and Resources in complex projects. Training and Managing workers, interns, and volunteers. Managing a small business.
- **Software development:** Systems Architecture, Open Source Development, Computer clusters, Database design, Image Analysis, Web Development of Database Applications
- **Computer languages:** Perl, C, C++, Matlab, Stata, Javascript, HTML, CSS, SVG, XML, XML-Schema, CVS, SQL, Unix, Apache
- **Digital Video Production and Online Publication**

## RESEARCH PROJECTS

- **Designing low cost off-grid lighting.** I am working with blueEnergy, an NGO, to develop lighting services for rural communities on the eastern coast of Nicaragua. I conducted field work there in the summer of 2008 and developed low-cost lights for households and health clinics that could be built from locally-available parts. I worked with community members to evaluate a variety of light designs, and taught construction workshops. I am expanding this

work to a) improve training materials, b) incorporate a small solar panel, rechargeable batteries, and a small ergonomic manual generator into the design, and c) develop a computational model of system performance and cost in order to compare a large system built incrementally to one purchased all at once.

- **Planning reductions in Greenhouse Gas emissions.** The initial goals of this project were to characterize the cost and total GHG reduction potential of a variety of pathways such as renewable energy generation, household efficiency programs, reforestation, etc. [10] Subsequently, this project has focused more narrowly on power generation, evaluating the potential of building more renewable energy generators. I am working with a team of students to expand the Switch model from California to the entire US. The Switch model plans generator construction and dispatch, minimizing cost while meeting projected loads, combining historic data of renewable resources and load profiles, with projections of load growth, fuel costs, and generator costs. This model allows us to project policy impacts, evaluate the benefits of storage, and evaluate the costs of carbon reductions.
- **Age-related structural changes in muscle tissues of the worm *C. elegans*.** The goals of this project were to a) establish rate of structural aging in a non-regenerative muscle model, and b) construct morphological assays to estimate age and predict sustained muscle ability for use in genomic screens. My contributions to this project were data collection, assisting in experimental design, developing image analysis tools, performing analysis, and writing portions of publications. [4,8]
- **Determination of image similarity using supervised learning.** As part of my muscle aging research, I developed novel methods of determining image similarity, validated those methods against ground truth, and wrote software to generate interactive visualizations of the results. [2,9,12]
- **General-purpose image classifier that has comparable accuracy to other application-specific classifiers.** Briefly, the image classifier works by extracting 1026 features from each image, identifying which features are relevant to the problem at hand, and building a classifier using those features. My contributions were improving the classification algorithm, building benchmark and report generations tools, and integrating these tools into OME. [5,6]
- **Dynamic expansion of the OME working ontology.** Given XML-defined data structures, OME extends its database and generates new class definitions and user interfaces on-the-fly. I wrote the XML data specification and much of the code that implements the described functionality. A significant portion of the interface generation code was performed by an high school intern whom I mentored. [3,13]
- **OME pluggable analysis architecture that executes a workflow over a computer cluster and stores results in the OME database.** Legacy analysis algorithms can be integrated by writing a simple XML descriptor of their interface. I wrote much of interface to legacy algorithms, and portions of the cluster computing. [7,11]

## COMMUNITY PROJECTS

- **Computer Recycling Program.** I directed a computer recycling program that provides rebuilt computers to area residents and schools. I founded the program, have performed all aspects of operational activities, trained volunteers, and transitioned management to a different umbrella non-profit so the program would be sustainable after I left Baltimore.
- **Developing a Community Center.** I chaired a committee responsible for planning and constructing a community center that will obtain income by leasing space to organizations that offer community benefits. My duties included writing development proposals, planning space usage, estimating financial expenses and income streams, identifying discrete tasks and delegating responsibilities, facilitating meetings, and coordinating activity.
- **Recruiting businesses that offer community benefits.** Part of the GWCDC's mission was to engage the private sector to provide affordable housing, employment, and other social benefits. Towards this mission, I initiated contact with a Greater Baltimore AHC, a non-profit housing developer, who has since invested ten million dollars into low-income housing in our community and is partnering with us in the development of our community center. I have also arranged meetings for the development of a vacant factory in our community.

## EDUCATION

- Graduate student. Energy and Resources Group. University of California at Berkeley. 2007-Present.
- Computer Science BS. Math minor. University of Arkansas, Fayetteville. 1998-2002.

## AWARDS

- Graduate Opportunity Fellowship: 2007-2008
- Tenured employment status at National Institute on Aging (NIA), 2006

- Employee recognition award, NIA: 2003, 2004, 2005, 2006, 2007
- Mentor recognition award, NIA: 2005, 2006
- Employee-of-the-month award, NIA: June 2006
- Honorable mention in world finals of ACM's Intercollegiate Programming Competition: 2001
- Scholarships (1998-2002): Governor's Distinguished Scholarship, Chancellor's Scholarship, Arkansas Academic Challenge Scholarship
- Graduated in the top tier of my class at the Arkansas School for Mathematics and Sciences, a competitive state-wide boarding school for 11th and 12th grade students

## PUBLICATIONS

(copies of papers available at <http://josiah.berkeley.edu/Papers/>)

1. Johnston, J.L., Iser, W.B., Chow, D.K., Goldberg, I.G., Wolkow, C.A. (2008) Quantitative Image Analysis Reveals Distinct Structural Transitions During Aging in *Caenorhabditis elegans* Tissues. PLOS One. 3:7.
2. Tadeu, A.M.B., Ribeiro, S., Johnston, J., Goldberg, I., Gerloff, D., Earnshaw, W.C. (2008). CENP-V is required for centromere organization, chromosome alignment and cytokinesis. EMBO J. 27, 2510-2522.
3. N. Orlov, L. Shamir, T. Macura, J. Johnston, D. M. Eckley, and I. G. Goldberg, (2008) WND-CHARM: Multi-purpose image classification using compound image transforms, Pattern Recognition Letters. 29:11-1684.
4. Shamir, L., Orlov, N., Eckley, D. M., Macura, T., Johnston, J., Goldberg, I., (2008) Wndchrm - An Open Source Utility for Biological Image Analysis. BMC - Source Code for Biology and Medicine. 3:13.
5. Chow, D.K., Glenn, C.F., Johnston, J.L., Goldberg, I.G., and Wolkow, C.A. (2006) Sarcopenia in the *Caenorhabditis elegans* pharynx correlates with muscle contraction rate over lifespan. Exp. Gerontol. 41:252-60.
6. Johnston, J., Nagaraja, A., Hochheiser, H., and Goldberg G. (2006). A Flexible Framework for Web Interfaces to Image Databases: Supporting User-Defined Ontologies and Links to External Databases. 2006 IEEE International Symposium on Biomedical Imaging.
7. Orlov, N., Johnston, J., Macura, T., Wolkow, C., Goldberg, I. (2006) Pattern Recognition Approaches to Compute Image Similarities: Application to Age Related Morphological Change. 3rd IEEE International Symposium on Biomedical Imaging: Macro to Nano. p1152 - 1155.
8. Goldberg, I., C. Allan, J.-M. Burel, D. Creager, A. Falconi, H. Hochheiser, J. Johnston, J. Mellen, P.K. Sorger, and J.R. Swedlow. (2005). The Open Microscopy Environment (OME) Data Model and XML File: Open Tools for Informatics and Quantitative Analysis in Biological Imaging. Genome Biol. 6:R47.

## BOOK CHAPTERS

9. Orlov, N., Johnston, J., Macura, T., Shamir, L., Goldberg, I.; Computer Vision for Microscopy Applications, In Vision Systems - Segmentation and Pattern Recognition. pp. 221-242. Obinata, G., and Dutta, A. (Eds.). Vienna, Austria: ARS Pub., 2007. ISBN: 978-3-902613-05-9. [Available online.](#)

## CONFERENCES

10. Kantner, J.W., Hoffman, I.M., Johnston, J.L., Levin, J.E., Komiyama, R., Motschenbacher, A., Fripp, M., Gimón, E., Kammen, D.M.; The Cost of Conserved Carbon (C<sup>3</sup>): A Modeling System for Evaluating the Monetary, Social, and Carbon Implications of Regional-, National-, and Global-Scale Energy Choices. American Geophysical Union 2008 Joint Assembly. Fort Lauderdale, FL. 2008.
11. Macura, T., Johnston, J., Cordero, J., Orlov, N., Shamir, L., Goldberg, I. G.; Quantitative pattern analysis of a large tissue collection across multiple experimental variables. 3rd Workshop on Bio-Image Informatics: Biological Imaging, Computer Vision and Data Mining, #1241. Santa Barbara, CA. 2008.
12. Cordero, J., Macura, T., Johnston, J., Goldberg, I. G., Quantitative Morphometry of Mouse Tissue during Aging, Presented at the 2007 Annual Biomedical Research Conference for Minority Students.
13. Goldberg, I., David, L., Hochheiser, H., Johnston, J., Orlov, N., Creager, D., Hughes, B., Mellen, J., Burel, J-M., Allan, C., Falconi, A., Brauner, E., Sorger, P., and Swedlow, J. OME: Image Informatics in a Post-Genomic World. American Society for Cell Biology, 2003 Annual Meeting, December 2003.