

APPLICANT BIOGRAPHICAL SKETCH

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NAME OF APPLICANT: Adam White

eRA COMMONS USER NAME (credential, e.g., agency login): ADAM.WHITE

POSITION TITLE: Postdoctoral Researcher

EDUCATION/TRAINING *(Most applicants will begin with baccalaureate or other initial professional education, such as nursing. Include postdoctoral training and residency training if applicable. High school students should list their current institution and associated information. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	START DATE MM/YYYY	END DATE <i>(or expected end date)</i> MM/YYYY	FIELD OF STUDY
University of British Columbia	B.Sc.	09/2001	05/2007	Physics (Honors)
University of British Columbia	M.A.Sc.	09/2007	08/2010	Biomedical Engineering
University of British Columbia	Ph.D.	09/2010	12/2015	Genome Science and Technology
Stanford University (postdoc)	n/a	1/2016	present	Genetics/Bioengineering

A. Personal Statement

I am broadly interested in trying to solve problems and answer scientific questions through the development of enabling technology. Through my education and work experience I have developed an interdisciplinary skill set well suited to working at the intersection of technology development and biomedical research. In my graduate studies in Dr. Carl Hansen's laboratory, I developed the first microfluidic device fully integrating all fluidic capabilities for single cell capture, lysis, reverse transcription of contained RNA, and quantitative measurements of cDNA by real-time polymerase chain reaction. From this work, I gained skills in microfabrication methods such as photolithography, as well as molecular biology techniques such as RNA purification, reverse transcription, PCR, and fluorescence microscopy. My computer skills include technical drawing in AutoCAD, and programming in LabVIEW and MATLAB. During my undergraduate studies in physics, I worked as a co-operative education student at the Terry Fox Laboratory, where I learned aseptic cell culture techniques and performed stem cell assays on patient blood and bone marrow samples. I also performed flow cytometry (FACS) analysis, and assisted in detection of chromosomal translocations by fluorescence in situ hybridization (FISH). As a member of UBC Snowstar, I competed in the X-Prize NASA Beam Power Challenge in New Mexico (October, 2006). My responsibilities included researching solar panels, and the design and soldering of electrical circuits such as a current sensor.

Through my career, I have collaborated with stem cell and cancer biologists, engineers, and industry partners. My ability to communicate research effectively is demonstrated in my poster presentation awards (see part B). I was also invited to give an oral presentation at the MicroTAS conference (Seattle, 2011), as well as at UBC's Biomedical Engineering Research Symposium, where I was presented the Paul Geyer Graduate Award in Biomedical Engineering for leadership and entrepreneurial spirit. In 2010, I taught at the Institute for Systems Biology (Seattle, WA) microfluidics course.

In 2016, I joined Polly Fordyce's and Stephen Quake's laboratories as a postdoctoral researcher, and I am currently developing microfluidic tools for highly multiplexed measurements of biological interactions. I am also the director of the Stanford Microfluidics Foundry, where I manage the cleanroom, train users, and am involved in a variety of microfabrication projects.

Special circumstances: In May 2004, I was diagnosed with Hodgkin's Lymphoma and left my co-op position to begin chemotherapy and radiation treatment in Toronto. Treatment ended December 2004. I resumed studies at UBC in January 2005, but with a reduced course load. In the summer of 2005, I celebrated being alive with a backpacking trip around Europe. In September 2005 I resumed full-time studies at UBC, and I remain healthy and cancer free

Select Publications

1. **White, A.K.**, Heyries, K.A., Doolin, C., Vaninsberghe, M., Hansen, C.L. "High-throughput microfluidic digital polymerase chain reaction", *Analytical Chemistry* 85(15): 7182-7190 (2013).
2. **White, A.K.**, VanInsberghe, M., Petriv, O.I., Hamidi, M., Sikorski, D., Marra, M.A., Piret, J.M., Aparicio, S., Hansen, C.L. "High-throughput microfluidic single-cell RT-qPCR" *PNAS* 108(34):13999-4004 (2011).
3. Lecault, V., Vaninsberghe, M., Sekulovic, S., Knapp, D.J., Wohrer, S., Bowden, W., Viel, F., McLaughlin, T., Jarandehi, A., Miller, M., Falconnet, D., **White, A.K.**, Kent, D.G., Copley, M.R., Taghipour, F., Eaves, C.J., Humphries, R.K., Piret, J.M., Hansen, C.L. "High-throughput analysis of single hematopoietic stem cell proliferation in microfluidic cell culture arrays" *Nature Methods* 8(7):581-6 (2011).
4. Petriv, O.I., Kuchenbauer, F., Delaney, A.D., Lecault, V., **White, A.**, Kent, D., Marmolejo, L., Heuser, M., Berg, T., Copley, M., Ruschmann, J., Sekulovic, S., Antignano, F., Kuroda, E., Ho, V., Benz, C., Halim, T., Giambra, V., Krystal, G., Takei, C.J.F., Weng, A.P., Eaves, C., Piret, J., Marra, M.A., Humphries, R.K., Hansen, C.L. "Comprehensive microRNA expression profiling of the hematopoietic hierarchy" *PNAS* 107(35):15443-8 (2010).

B. Positions and Honors

ACTIVITY/ OCCUPATION	START DATE MM/YYYY	END DATE MM/YYYY	FIELD	INSTITUTION/ COMPANY	SUPERVISOR/ EMPLOYER
Research Assistant	05/2002	08/2002	Family Medicine	Mount Sinai Hospital (Toronto, Canada)	Joanne Permaul
Co-op Student	01/2003	08/2003	Stem Cell Assay Lab	Terry Fox Laboratory, B.C. Cancer Agency	Karen Lambie
Co-op Student	05/2004	06/2004	Cell Biology and Antibody Generation	Abgenix Biopharma	Alison Fitch
Co-op Student	05/2006	06/2006	Microfluidic Technology Development	UBC Physics & Astronomy Department	Carl Hansen
Teaching Assistant	01/2008	04/2008	Cognitive Systems	University of British Columbia	Lawrence Ward
Teaching Assistant	01/2009	04/2009	Physics lab course	University of British Columbia	Carl Michal
Teaching Assistant	9/2012 9/2013	10/2012 10/2013	Genome Science and Technology lab course	University of British Columbia	Carl Hansen
Director, Microfluidics Foundry	10/2015	Present	Microfabrication	Stanford University	Stephen Quake
Postdoc	1/2016	Present	Bioengineering	Stanford University	Polly Fordyce, Stephen Quake

Other Experiences

2005-2007	UBC Snowstar team, competing in Spaceward and NASA 2006 X-Prize Beam Power Challenge
2014-2015	Let's Talk Science Creative Science Program Mentor to middle-school students
2015	Judge, Greater Vancouver Regional Science Fair
2016	Reviewer, The Royal Society of Chemistry (<i>Lab on a Chip</i> , <i>Journal of Materials Chemistry B</i>)

Awards and Scholarships

2001	UBC Undergraduate Scholar Program Scholarship
2006	Dean of Science Scholarship
2008	Michael Smith Foundation for Health Research Junior Research Trainee
2009	Paul Geyer Graduate Award in Biomedical Engineering
2010	UBC Four-Year Fellowship
2010	Genome BC 8 th Annual Genomics Forum Poster Award
2011	Canada Institutes for Health Research Poster Competition (CSHRF) Gold Award of Excellence
2011	Gene Screen BC Viewer's Choice award
2012	NSERC Alexander Graham Bell Canada Graduate Scholarship – Doctoral
2012	College for Interdisciplinary Studies Graduate Award
2013	Gordon Research Conference: Physics and Chemistry of Microfluidics Poster Award

C. Contributions to Science

1. *Integrated microfluidic technology for high-throughput single-cell gene expression analysis.*

Role: Graduate Student, lead author

In my graduate studies in Dr. Carl Hansen's laboratory, I developed the first microfluidic device fully integrating all fluidic capabilities for single cell capture, lysis, reverse transcription of contained RNA, and quantitative measurements of cDNA by real-time polymerase chain reaction. The precise fluid handling, automation, and economy of scale of this device enable high-throughput studies of gene expression with single cell resolution. My role in the project was the design and fabrication of microfluidic devices, and performing on-chip experiments. I also developed the protocols and software for running the device, and wrote the first draft of the manuscript. Through collaboration with Dr. Samuel Aparicio (BC Cancer Agency), we used this device to measure the frequency of single nucleotide mutations in a primary breast cancer sample. We also studied the co-expression of pluripotency markers during human embryonic stem cell differentiation, with cells provided by Dr. James Piret (UBC). This work is the beginning of collaboration with Dr. Marco Marra (Canada's Michael Smith Genome Sciences Centre) to apply microfluidic technology to single cell genome and transcriptome sequencing. We patented this technology and licensed it to Fluidigm for commercialization, contributing to the development of their C1 product. I worked with a postdoc, Kevin Heyries, to build upon this single-cell PCR device by integrating the single cell with a digital PCR (dPCR) measurement of cDNA. Digital PCR is performed by amortizing a sample across thousands of nano- or pico-liter reaction chambers such that each chamber has a high probability of containing a single DNA template molecule, or zero. This allows quantification of single molecules by counting the number of fluorescent reaction wells after PCR amplification. The direct quantification of single molecules by dPCR has advantages over RT-qPCR in the measurement of low abundance transcripts, as well as obviating the need for relative abundance measurements or calibration standards. In collaboration with Precision Nanosystems, I used this device to quantify the delivery of siRNA and mRNA to cells by lipid nanoparticle transfection, as well as the abundance of transcripts targeted for knockdown.

- White, A.K.**, Heyries, K.A., Doolin, C., Vaninsberghe, M., Hansen, C.L. "High-throughput microfluidic digital polymerase chain reaction", *Analytical Chemistry* 85(15): 7182-7190 (2013).
- U.S. Patent Application 14/122,653, PCT/CA2011/000612. "Microfluidic Cell Trap and Assay Apparatus for High-Throughput Analysis". C. Hansen, M. VanInsberghe, **A. White**, O. Petriv, T. Leaver, A. Singhal, W. Bowden, V. Lecault, D. Da Costa, L. Wu, G. Russell, D. Sikorski. (2011).
- White, A.K.**, VanInsberghe, M., Petriv, O.I., Hamidi, M., Sikorski, D., Marra, M.A., Piret, J.M., Aparicio, S., Hansen, C.L. "High-throughput microfluidic single-cell RT-qPCR" *PNAS* 108(34):13999-4004 (2011).
- White, A.K.**, Ansari, A., Zwaenepoel, D., Walsh, C., Ramsay, E., Taylor, R.J., Cullis, Hansen, C.L. "Single Cell Analysis of Lipid Nanoparticle RNA Delivery", in preparation.

2. *Microfluidic technology for mammalian cell culture experiments*

Role: Undergraduate Student (Honors Thesis)

For my thesis project, I designed, fabricated and characterized microfluidic devices for mammalian cell culture. This work was highly interdisciplinary as design considerations included heat and mass transport, fluid mechanics, microscopy, and biocompatibility. These preliminary results contributed to a publication by Lecault V, et al. (*Nature Methods*, 2011), and an invention disclosure. This work was part of a collaboration between Dr. Carl Hansen's microfluidics lab (UBC), and stem cell biologists Drs. Connie Eaves, and Keith Humphries (BC Cancer Agency).

- a. Lecault, V., Vaninsberghe, M., Sekulovic, S., Knapp, D.J., Wohrer, S., Bowden, W., Viel, F., McLaughlin, T., Jarandehi, A., Miller, M., Falconnet, D., **White, A.K.**, Kent, D.G., Copley, M.R., Taghipour, F., Eaves, C.J., Humphries, R.K., Piret, J.M., Hansen, C.L. "High-throughput analysis of single hematopoietic stem cell proliferation in microfluidic cell culture arrays" *Nature Methods* 8(7):581-6 (2011).
- b. Falconnet, D., Taylor, J., **White, A.K.**, and Hansen, C.L. Method for High-throughput tracking of non-adherent cells. Invention disclosure No. 10-003. University Industry Liaison Office. University of British Columbia. Submitted April 3, 2009.

Full list of publications: <https://scholar.google.com/citations?user=fgcB0hcAAAAJ&hl=en>

D. Scholastic Performance

YEAR	SCIENCE COURSE TITLE	GRADE	YEAR	OTHER COURSE TITLE	GRADE
	University of British Columbia			University of British Columbia	
2002	Scientific Reasoning	82 A-	2007	Lab in Animal Cell Molecular Biology	95 A+
2002	Principles of Computer Programming	99 A+	2007	Biophotonics	84 A-
2003	Electricity and Magnetism	74 B	2008	Biomedical Equipment and Physiological Principles	81 A-
2003	Electrical Lab	84 A-	2008	Microsystems Design	81 A-
2003	Elemental Differential Equations I	83 A-	2008	Micro and Nano Fabrication	87 A
2004	Thermal Physics I	72 B	2008	Clinical and Industrial Biomedical Eng	93 A+
2004	Mechanics	78 B+	2009	Genetics	93 A+
2004	Optics	73 B	2010	Biomedical Engineering MSc Thesis	93 A+
2005	Elementary Differential Equations II	73 B	2010	GSAT Intensive Laboratory Course	93 A+
2005	Probability with Physics Applications	74 B			
2005	Quantum Mechanics	87 A			
2005	Biophysics	74 B			
2005	Statistical Physics	72 B			
2005	Medical Physics	80 A-			
2005	Computational Physics	84 A-			
2006	Developmental Neurobiology	72 B			
2006	Designing Cognitive Systems	83 A-			
2006	Experimental Physics	87 A			
2007	Physics B.Sc. Honors Thesis	92 A+			
2007	Cosmology	80 A-			
2007	Seminar in Cognitive Systems	94 A+			