Dr. Victoria A. Stuart, Ph.D.
Cover Letter | C.V.

Vancouver, British Columbia, Canada
(604) 628-9609
mail@VictoriasJourney.com
Persagen.com

PERSONAL STATEMENT

Preeminent among my professional Aims and Vision is my passion regarding biomolecular knowledge, which has evolved from my basic research in biochemistry, microbial genetics and molecular genetics to a deeper appreciation of the information encoded within our genomes.

I seek innovative, impactful solutions to scientific and societal issues through the application of science and technology to the betterment of human health, via

(i) the advancement of knowledge in genetics and functional genomics (the phenotypic and functional expression of the information contained within genomes), and

(ii) knowledge discovery, through natural language processing and machine learning approaches applied to the biomedical domain.

These efforts build on my thorough grounding in biochemistry (B.Sc.), environmental health (M.Sc.), molecular genetics (Ph.D), and post-doctoral experience in bioinformatics.

I am especially motivated by information retrieval/extraction, the construction of knowledge stores and graphical models, and the application of that knowledge to real-world problems including molecular biology, cellular signalling, cancer genomics, and personalized medicine.

The union of my core domains (biochemistry; genetics; genomics; programming; natural language processing; machine learning; bioinformatics) enables a better understanding of implicit and explicit relationships and interactions, facilitating translational knowledge discovery.

CURRENT POSITION

Scientific Consultant | Owner: Persagen.com   Jun 2009 - Present

I have been self-employed since June 2009 as a Scientific Consultant, providing scientific expertise in molecular genetics, genomics, molecular biology, life sciences, bioinformatics and scientific review.

From 2009-2014 I was subcontracted to Battelle Memorial Institute (Chapel Hill, N.C.), providing scientific expertise for the U.S. Army Research Office (ARO; Durham, N.C.) and the U.S. Army Center for Environmental Health Research (USACEHR; Washington, D.C.). That work primarily involved evaluation of molecular genetics and other life sciences research proposals for the ARO, and analyses of genomic expression data (*Yersinia pestis*-infected primate cells) for the USACEHR. That work, with my previous postdoctoral studies, reinforced my desire to pursue a career in bioinformatics.

Fundamentally, I am interested in information and the relationships among data. The overarching model for my approach is interpreting how the information encoded in DNA manifests biologically – so-called "functional genomics." Addressing that task requires conceptualization of domains (e.g. metabolic networks and signal transduction, metabolic flux, druggable targets relevant to oncogenomics, in silico models, etc.) and acquisition and processing of supporting data (e.g. the biomedical literature and biological databases).

From 2015–present I have been immersed in a highly concentrated self-supported and -directed programme of study to acquire the tools in core domains (data management; programming languages; informatics; graphical models; data visualization; natural language processing; machine learning) needed to realize my Vision. Consequently, I possess a theoretical understanding and appreciation of the underlying principles (modeling; loss functions; gradient descent; back propagation; tensors; linear algebraic approaches such as eigenvalues and semirings applied to data matrices; etc.) associated with leading-edge machine learning and natural language processing models.

In my current work, although I have not yet deployed leading edge contextual language models and machine learning approaches (e.g. representation learning and link prediction; hyperbolic embeddings), I intend to investigate their use in the next stage of my research. While I use routinely use CSV for graph construction, I permanently store data in normalized Postgres databases and tables. I use Python as a general purpose scientific programming language. My work in graphs and graphical models extends my prior (published) work on genomic interaction data. Knowledge graphs, carefully constructed using ontologies and schemas, allow a deeper understanding of data structure and discovery of latent relationships.

I am presently concentrating on the use of established, yet high performing approaches to relation extraction (e.g. shortest paths dependency parsing) and graph construction (ontologies; semantic entity linking; RDF triples; ...), for characterizing subsets of the biomedical literature as well as a custom corpus of biomedical-related content spanning several hundred topic areas (some of this work is described in various posts on my my research blog research blog (https://persagen.com/posts.html). You may also review my contributions on StackOverflow (user:1904943 | ~2k reputation | top 7%, 2019) for contributions to issues encountered from ~2013–present.

| EDUCATION | **Ph.D., Biology** | Jun 2000 |

University of Victoria, Victoria, British Columbia, Canada
Specialization: Molecular Genetics: Mechanisms of Mutagenesis & Carcinogenesis
Dissertation: "Influences of Ageing and Diet on Mutational Frequency and Specificity
    in Big Blue® *lacI* Transgenic Rodents"

M.Sc., Occupational Hygiene   May 1995

Occupational Hygiene Programme
   [*now the School of Environmental Health*]
University of British Columbia, Vancouver, British Columbia, Canada
Specialization: Molecular Epidemiology
Thesis: "Genotoxicity of Captan Measured in the Comet Assay"

B.Sc. with Honours, Biochemistry   Oct 1983

Dalhousie University, Halifax, Nova Scotia, Canada
Minor: Chemistry
Honours Thesis: "Dimroth Rearrangement of the Oligodeoxyribonucleotide Synthesis
    Precursor N^6-Benzoyl-Deoxyadenosine"

RECENT AFFILIATIONS   **Research Scientist**   May 2001 - Nov 2008

Laboratory of Molecular Genetics
   [*now the Genome Integrity and Structural Biology Laboratory*]
National Institute of Environmental Health Sciences
Research Triangle Park, North Carolina 27709.
Specialization: mitochondrial molecular genetics; bioinformatics

Throughout this period support was provided by the **U.S. Army Research Office** (Research Triangle Park, Durham, North Carolina), through:

- **Research Associateship Award**   May 2005 - Nov 2008
  National Academy of Sciences, Washington, D.C.
- **Research Assistant**   May 2002 - Apr 2005
  Department of Molecular Genetics and Microbiology
  Duke University Medical Center, Durham, North Carolina
- **International Research Scholar**   May 2001 - Apr 2002
  Department of Microbiology
  North Carolina State University, Raleigh, North Carolina

EXPERIENCE & SKILLS

With formal training and comprehensive research experience in genomics and molecular genetics, I possess *supra* Ph.D.-level domain expertise in biology, biochemistry, bioinformatics, cancer biology and genomics, cellular signaling/metabolic pathways, DNA metabolism, etc.

Molecular Biology | Microbiology | Genetics / Genomics:
- formally trained in biochemistry: classroom, research
- bacterial, yeast genetics | cloning, strain constructions | DNA sequencing, analysis | ...
- bacterial mutational assays | transgenic rodent mutational models
- molecular genetics / genomics | mitochondrial genetics | oncogenomics
- biochemical, metabolic, cellular signaling pathways and networks

Supplementing this experience is my more recent (2014–present) training and expertise:

Informatics:
- information retrieval, extraction & processing: BASH | TF-IDF, RAKE, TextRank, ...
- knowledge stores: textual; relational (RDBMS; graphs)

Programmatic:
- command-line: BASH scripts, ...
- Python (virtual environments) | R
- LaTeX | Vim | Markdown
- GitHub: compiling (debugging) from source

Machine Learning:
- computer vision
- classification | clustering | summarization
- natural language processing (CoreNLP; spaCy; ...) | language models
- graphical models

Platforms:
- HTML: DOM / canvas / CSS / JavaScript
- PostgreSQL (all NCBI; entire human metabolome; ...) | PSQL
- GeneSpring | Cytoscape | Neo4j | NetworkX
- Machine learning: various (TensorFlow)

Operating Systems:
- Linux (super-user): compiling; debugging; ...

Community:
- StackOverflow: https://stackoverflow.com/users/1904943/victoria-stuart?tab=profile
- GitHub: https://github.com/victoriastuart

| **LEADERSHIP &** | Genetics and Environmental Mutagenesis Society, Durham N.C. | 2002 - 2007 |

LEADERSHIP & SCIENTIFIC SERVICE

Genetics and Environmental Mutagenesis Society, Durham N.C.　　2002 - 2007

- **President**　　　　　　　　　　　2006 - 2007
- **President-Elect**　　　　　　　　2005 - 2006
- **Councilor**　　　　　　　　　　　2002 - 2005

Peer Review, Academic Journals: Acta Biochimica et Biophysica Sinica; Archives of Biochemistry and Biophysics; Cancer Letters; Environmental and Molecular Mutagenesis; Eukaryotic Cell; Functional and Integrative Genomics; Genetics; Molecular and Cellular Biology; Mutagenesis; Mutation Research; NIEHS internal reviews; Proceedings of the National Academy of Sciences of the United States of America

Scientific Review: Expertise in peer review of scientific research proposals: hundreds (>230) of genetics, genomics and life sciences proposals reviewed, ranging from US$50K - US$16M.

Project Leader　　　　　　　　　　　　　　　　　　　　　　2000 – 2001

Supervision of graduate students in: Individual Susceptibility Group, Centre for Environmental Health, Department of Biology, University of Victoria

Leadership - Extracurricular:

- **President**　　　　　　　　　　　　　　　　　　　　　　1985 – 1986
  Phi Kappa Pi Fraternity, Dalhousie University, Halifax, Nova Scotia, Canada

- **Founder**　　　　　　　　　　　　　　　　　　　　　　April 2008
  Durham Gender Alliance. Durham, N.C. USA

- **Chair**　　　　　　　　　　　　　　　　　　　Feb 2009 - Jun 2009
  Trans Alliance Society, Vancouver, B.C.

TEACHING & MENTORSHIP

Teaching:

- Co-Lecturer　　　　　　　　　　　　　Spring 2001; Spring 2000
  Biology 437/550E, DNA Repair and Mutagenesis, University of Victoria
- Co-Lecturer & Course Coordinator /Administrator　　　　　Winter 2000
  Biology 439/550E, Molecular Epidemiology, University of Victoria
- Supervisor　　　　　　　　　　　　　　　　　　　1997 - 2001
  Supervision & training of undergraduate summer students & technicians
  Department of Biology, University of Victoria
- Laboratory Instructor　　　　　　　　　　　　　　　　　1983
  Biochemistry Laboratory, Dalhousie University

Supervision: undergraduate students and technical staff (various)

Mentor, University of British Columbia "Women in Science":　　　2014 - 2015

Mentor, "Women in Science and Engineering"　　　　　　2012 - 2013
University of British Columbia: Annual WiSE event

HONORS & AWARDS

National Research Council Research Associateship Award　　2005 - 2008
National Academies, Washington D.C.

National Cancer Institute of Canada (NCIC) Student Travel Award　　1999

Environmental Mutagen Society Student Travel Award	1997

Foundation for the Promotion of Cancer Research   1996
    Fellowship for Research in Japan
National Cancer Center Research Institute, Tokyo, Japan

Graduate Student Stipend   1995 - 1999
Cancer Research Society Inc., Montreal, Canada

Undergraduate Summer Research Fellowship   1981; 1982
Natural Sciences and Engineering Research Council, Ottawa, Canada

INVITED TALKS, LECTURES

Natural Language Laboratory   Apr 09, 2014
Simon Fraser University, Burnaby, B.C.
"Biomedical Text Mining/Artificial Intelligence Applied to Clinical Reporting"

University of Victoria Sustainability Project   Mar 29, 2000
University of Victoria, Victoria, B.C.
"Genetic Studies of Dietary and Environmental Mutagens and Carcinogens
    Using *lacI* Transgenic Rodents"

Occupational Hygiene Programme   Feb 05, 1999
University of British Columbia, Vancouver, B.C.
"Genetic Studies of Dietary and Environmental Mutagens and Carcinogens
    Using *lacI* Transgenic Rodents"

Carcinogenesis Division, NCCRI   Jan 18, 1996
National Cancer Center Research Institute, Tokyo, Japan
"A study of *Tris*(2,3-dibromopropyl)-phosphate in Big Blue$^{®}$ transgenic
    mice, and aflatoxin B_1 in Big Blue$^{®}$ mice and rats"

PEER-REVIEWED PUBLICATIONS

Citations – (Google Scholar): http://scholar.google.com/citations?user=VictoriaStuart

Published Papers

Stuart, G.R., Copeland, W.C. and Strand, M.K. (2009) Construction and Application of a Protein and Genetic Interaction Network (Yeast Interactome) Nucleic Acids Research 37, e54.

Stuart, G.R., Humble, M.M., Strand, M.K. and Copeland, W.C. (2009) Transcriptional Response to Mitochondrial NADH Kinase Deficiency in *Saccharomyces cerevisiae*. Mitochondrion 9, 211-221.

Stuart, G.R., Santos, J.H., Strand, M.K., Van Houten, B. and Copeland, W.C. (2006) Mitochondrial and nuclear DNA defects in *Saccharomyces cerevisiae* with mutations in DNA polymerase γ associated with progressive external ophthalmoplegia. Human Molecular Genetics 15, 363-374.

Thornton, A.S., Oda, Y., **Stuart, G.R.**, Holcroft, J. and de Boer, J.G. (2004) The dioxin TCDD protects against aflatoxin-induced mutation in female rats, but not in male rats. Mutation Research 561, 147-152.

Strand, M.K., **Stuart, G.R.**, Longley, M.J., Graziewicz, M.A., Dominick, O.C. and Copeland, W.C. (2003) *POS5* Gene of *Saccharomyces cerevisiae* encodes a mitochondrial NADH kinase

required for stability of mitochondrial DNA. Eukaryotic Cell 2, 809-820.

Yang, H., **Stuart, G.R.**, Glickman, B.W. and de Boer, J.G. (2001) Modulation of 2-amino-1-methyl-6-phenylimidazo[4,5-*b*]pyridine-induced mutation in the cecum and colon of Big Blue® rats by conjugated linoleic acid and 1,2-dithiole-3-thione. Nutrition and Cancer 39, 259-266.

Stuart, G.R., de Boer, J.G., Haesevoets, R., Holcroft, J., Kangas, J., Sojonky, K., Thorleifson, E., Thornton, A., Walsh, D.F., Yang, H. and Glickman, B.W. (2001) Mutations induced by 2-amino-1-methyl-6-phenylimidazo [4,5-*b*]pyridine (PhIP) in cecum and proximal and distal colon of *lacI* transgenic rats. Mutagenesis 16, 431-437.

Thornton, A.S., Oda, Y., **Stuart, G.R.**, Glickman, B.W. and de Boer, J.G. (2001) Mutagenicity of TCDD in Big Blue® transgenic rats. Mutation Research 478, 45-50.

Stuart, G.R., Holcroft, J., de Boer, J.G. and Glickman, B.W. (2000) Prostate mutations in rats induced by the suspected human carcinogen 2-amino-1-methyl-6-phenyl-imidazo[4,5-*b*]pyridine. Cancer Research 60, 266-268.

Stuart, G.R., Oda, Y., de Boer, J.G. and Glickman, B.W. (2000) Mutation frequency and specificity with age in liver, bladder and brain of *lacI* transgenic mice. Genetics 154, 1291-1300.

Stuart, G.R., Oda, Y., de Boer, J.G. and Glickman, B.W. (2000) No change in spontaneous mutation frequency or specificity in dietary restricted mice. Carcinogenesis 21, 317-319.

Stuart, G.R. and Glickman, B.W. (2000) Through a glass, darkly: Reflections of mutation from *lacI* transgenic mice. Genetics 155, 1359-1367.

Stuart, G.R., Thorleifson, E., Okochi, E., de Boer, J.G., Ushijima, T., Nagao, M. and Glickman, B.W. (2000) Interpretation of mutational spectra from different genes: Analyses of PhIP-induced mutational specificity in the *lacI* and *cII* transgenes from colon of Big Blue® rats. Mutation Research 452, 101-121.

Stuart, G.R., Influences of Ageing and Diet on Mutational Frequency and Specificity in Big Blue® *lacI* Transgenic Rodents. Ph.D. Dissertation, University of Victoria, 1999.

Okonogi, H., **Stuart, G.R.**, Okochi, E., Ushijima, T., Sugimura, T., Glickman, B.W. and Nagao, M. (1997) Effects of gender and species on spectra of mutation induced by 2-amino-1-methyl-6-phenylimidazo[4,5-*b*]pyridine in the *lacI* transgene. Mutation Research 395, 93-99.

Dycaico, M.J., **Stuart, G.R.**, Tobal, G.M., de Boer, J.G., Glickman, B.W. and Provost, G.S. (1996) Species-specific differences in hepatic mutant frequency and mutational spectrum among lambda/*lacI* transgenic rats and mice following exposure to aflatoxin B_1. Carcinogenesis 17, 2347-2356.

Stuart, G.R., Gorelick, N.J., Andrews, J.L., de Boer, J.G. and Glickman, B.W. (1996) The genetic analysis of *lacI* mutations in sectored plaques from Big Blue® transgenic mice. Environmental and Molecular Mutagenesis 28, 385-392.

Mazur-Melnyk, M., **Stuart, G.R.** and Glickman, B.W. (1996) Benzo[*a*]pyrene diol-epoxide induces loss of heterozygosity in a Chinese hamster ovary *aprt* heterozygote. Mutation Research 358, 89-96.

Stuart, G.R., Application of the single-cell gel electrophoresis ('Comet') assay to lymphocytes exposed in vitro to captan, a fungicide. M.Sc. Thesis, University of British Columbia, 1995.

Pohajdak, B., Dixon, B. and **Stuart, G.R.**, Immune System, In: Biochemistry and Molecular Biology of Fishes, Volume 2, Chapter 8. Hochachka, P.W., and Mommsen, T.P. (Eds), Elsevier Science Publishers B.V., Amsterdam, 1993. pp. 191-205.

Stuart, G.R., Dixon, B. and Pohajdak, B. (1992) Isolation of a putative retrovirus pol gene fragment from trout. Comparative Biochemistry and Physiology. B Comparative Biochemistry 102, 137-142.

Stuart, G.R. and Chambers, R.W. (1987) Synthesis and properties of oligodeoxynucleotides with an AP site at a preselected position. Nucleic Acids Research 15, 7451-7462.

REFERENCES   As mentioned, I have been self-employed since 2009. While they are not familiar with my most recent work, my most recent references – Drs. Copeland, Strand and Longley – are nonetheless intimately familiar with my most recent public / collaborative research.

Dr. Micheline K. Strand, Ph.D.
Division Chief, Molecular Genetics and Genomics, Life Sciences
U.S. Army Research Office
P.O. Box 12211
4300 S. Miami Blvd.
Research Triangle Park, NC 27709-2211 U.S.A.
Tel. (919) 549-4343
Fax: (919) 549-4310
E-mail: micheline.k.strand.civ@mail.mil

Dr. William C. Copeland, Ph.D.
Principle Investigator and Chief, Genome Integrity and Structural Biology Laboratory
Head, Mitochondrial DNA Replication Group
National Institute of Environmental Health Sciences
111 T.W. Alexander Drive
Building 101, Mail Drop E3-01
P.O. Box 12233
Research Triangle Park, NC 27709 U.S.A.
Tel: (984) 287-4269
E-mail: copelan1@niehs.nih.gov

Dr. Matthew J. Longley, Ph.D.
Associate Scientist
Genome Integrity and Structural Biology Laboratory
National Institute of Environmental Health Sciences
111 T.W. Alexander Drive
Building 101, Mail Drop E3-01
P.O. Box 12233
Research Triangle Park, NC 27709 U.S.A.
Tel. (984) 287-4268
E-mail: longley@niehs.nih.gov