

# DR J M BROMLEY<sup>1</sup>

## Curriculum vitae

June 2016

### 1 HIGHER EDUCATION

#### 1.1 Degrees

1983-87 PhD in Biophysics <sup>[25]</sup>, Physics Department, Imperial College

1980-83 BSc (Hons) III in Physics, Imperial College

#### 1.2 Modules and MOOCs studied

2014 Introduction to Dynamical Systems and Chaos<sup>2</sup>, Santa Fe Institute

2013 Introduction to Complexity<sup>3</sup>, Santa Fe Institute

2012 Learn to Program: The Fundamentals, Coursera

2009 Design and the web (T183, 10 credits), The Open University

2008 The story of maths (TM190, 10 credits), The Open University

2006 Robotics & the meaning of life: a practical guide to things that think (T184, 10 credits), The Open University

#### 1.3 Awards

2002 Bell Laboratories President's Gold Award 2002

1985 W.D. Wright Award from The Colour Group of Great Britain for talk [15]

### 2 APPOINTMENTS AND EXPERIENCE

2016 - Research Fellow on Police Consortium project - Systems thinking and complexity science for policing (AC3, 0.9 contract)

2015 Research Fellow on Evaluation of Online Research Portals and Repositories for Department for International Development (DfID) with Prof Helen Sharp (AC3, 0.7 contract)

2012-14 Research Fellow, agINFRA FP7 project, The Open University (AC3, 0.7 contract)  
Research on bioinformatics; meeting deliverables; project reporting to EC; financial and time reporting.

2009-12 Research Associate, ASSYST FP7 project, The Open University (AC2, 0.5)  
Lead partner responsible for all co-ordination of all deliverables, financial and research reporting.

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<sup>1</sup> See also <http://www9.open.ac.uk/mct/people/j.m.bromley>

<sup>2</sup> <http://www.complexityexplorer.org/online-courses/4>

<sup>3</sup> <http://www.complexityexplorer.org/online-courses/3>

- 2005-09 Visiting Research Fellow in Robotics Outreach, The Open University  
Developed teaching material and activities for teachers and school pupils.
- 2004-09 Classroom Assistant at three primary schools in Milton Keynes
- 1999-03 Project Manager, Bell Laboratories / Lucent Technologies  
Large hardware and software development projects (Base Station for Cell Phone network, Bandwidth Management System for communications networks)
- 1994-98 Member of Technical Staff, Bell Laboratories, Lucent Technologies.  
Turning Machine Learning projects into products
- 1990-93 Post-doctoral Researcher, Adaptive Systems Research Department, Bell Laboratories, AT&T  
Part of the team that made the first machines capable of reading the handwriting on cheques and written forms using deep-learning.
- 1986-89 Post-doctoral Researcher, Imperial College / The Royal London Hospital  
Studying abnormal vision in order to aid treatment and to understand the normal visual system

### **3 CONTRIBUTIONS TO OPEN UNIVERSITY TEACHING AND STUDENT SUPPORT**

#### **(b) Contributions to teaching materials and methods**

- 2016 Shadowing presentation chair/Staff Tutor  
Critical reading on T192, *Engineering: origins, methods, context*, T194, *Engineering: techniques, maths, applications*  
AL on T192 (appointable)
- 2015 T212 *Electronics: Sensing, Logic & Actuation* Production Team member - consultant author and software designer
- 2014 PhD Exam Panel Chair; E&A Boards for T218 *Design for engineers*, TM190 *The Story of maths*
- 2005 *Developing Geometric Thinking* ME627 (30 credits). Critical Reader
- 2007-08 T160 *Return to SET* (10 credits) Maintenance and improvement of database of former students; evaluation of student success after the course.

#### **(c) Contributions to staff and student support and associated activities**

- 2015-16 TXR120/T176 *Engineering: An Active Introduction* – residential school tutor for robotics activity
- 2009 Mentored OU research associate and a work experience student.

#### **(d) Contributions to teaching outside the Open University**

- 2014 Co-authored learning material on the Etoile project for use by the Complex Systems Digital Campus with Prof Jeff Johnson
- 2013 Taught SPARQL and application of linked data at a hackathon, Athens as part of agINFRA outreach work.
- 2013 Ran activities using the Sense board at Techmix Digital Summer Camp, Hackney

- 2009-10 BrightGreenYouth Outreach – ran a 2 day workshop for 60+ students to find creative solutions to sustainability problems, and organised team trip to the youth camp in Denmark
- 2008-10 Key Stage 2 Computing and Control, devised and presented series of six lessons on robotics to fit in with the creative curriculum at Loughton School.
- 2006-10 Member of the OU RoboFesta team - outreach activities to inspire children to learn STEM subjects; judged at robotics competitions, ran robotics clubs, coached the winners of the UK primary champions for robot dance and took them to compete in the finals in Suzhou, China 2008.
- 2006-07 English editor for *Roberta – Girls discover Robots* teaching material produced under Roberta-EU FP6 project<sup>4</sup> with Fraunhofer Institute for Intelligent Analysis and Information Systems.
- 2006-date School Governor with responsibility for curriculum and target tracking, familiarity with governance and performance management.
- 1984-89 Teaching Assistant for class and lab work; supervision of undergraduate physics projects, Imperial College.

#### **4 CONTRIBUTIONS TO ADMINISTRATION AND MANAGEMENT**

##### **Open University**

- 2014-16 Athena Swan, member of Computing Department’s Self Assessment team for Bronze Award.
- 2013-15 MCT Staff Forum, researcher member
- 2013-15 Member of organising committee for International Conference on Technology Policy and Innovation (ICTPI) to be held at the Open University June 2015
- 2009- Co-ordinate the Design Group monthly progress meetings and weekly check ins.

#### **5 RESEARCH AND SCHOLARSHIP**

##### **Research interests**

I initially studied the human visual system, in particular higher level neuronal processing, using psychophysical techniques [10], [12], [13], [14]. I then moved to artificial neural networks as a way to model the visual system and developed machines to carry out real world perceptual tasks. I was part of the team that made the first commercial deployment of a neural network in the early 90s [5], [6], [7], [8], [9], [11] using what is now termed “*Deep learning*”.

I now look more broadly at the extraction of knowledge from data in general: my work on the agINFRA project centred on extraction of agriculturally relevant information from pre-digital texts [16], [18], and *linked data* as the method to share data. This was followed by the DfID funded project Evaluation of Online Research Portals and Repositories again around how information can be shared particularly with the Global South (developing countries). Currently I work on a project funded from the OU Police Consortium extracting information from police data and modelling with complexity science tools such as hypernetworks.

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<sup>4</sup> [http://www.iais.fraunhofer.de/uploads/media/RobertaEU-Final\\_Report\\_01.pdf](http://www.iais.fraunhofer.de/uploads/media/RobertaEU-Final_Report_01.pdf)

## Research funding

The Royal Society "Parliamentary Grant-In-Aid" to fund three month visit to AT&T Bell Laboratories, November 1989.

Contributed to the following funded bids via the OU: ASSYST, TOPDRIM, NESS, Etoile, GSDP. And to many non-funded bids: SIMBIOnt, LinkD, Heridigit, Data Science SRA, Alan Turing Institute, BIGDATA, DOCS, FuturICT, Polifolio, hIghCitiles.

## 6 POSTGRADUATE STUDENT SUPERVISION

- 2016- Co-supervise Philip Davies for part-time PhD, thesis title *Systems thinking and complexity science for policing*
- 2015- Co-supervise Richard Charlesworth for part-time PhD, thesis title *Automating change through Graft-oriented Design*
- 2013 Edited the English version of PhD thesis *Reading the News Through its Structure: New Hybrid Connectivity Based Approaches* David Manuel de Sousa Rodrigues, Instituto Universitário de Lisboa
- 2012- Co-supervise Cristian Jimenez-Romero, a full-time postgraduate student due to submit this summer, thesis title *Intelligent and socially intelligent assessment systems for massive open online education*

## 7 EXTERNAL ACADEMIC ACTIVITIES

### Membership or offices held in learned societies and professional bodies

- 2014 Elected to Complex Systems Digital Campus Educational and Socio-environmental Committees
- 2012- Member of Flossie, a network of women interested in using free and open source software, the Women's Engineering Society and Women in Science and Engineering.
- 2008- Member of the Complex Systems Society. Elected council member since 2012.
- 1983- Member of the Institute of Physics

### Invited Talks

Signature verification using a "Siamese" time delay neural network at London Finance Meeting in 1995

## 8 PUBLICATIONS<sup>5</sup>

### Chapters in Books

- [1] Guyon, I.; Bromley, J. M.; Matić, N.; Schenkel, M. and Weissman, H. (1996). Penacée: a neural net system for recognizing on-line handwriting. In: Domany, E.; Van Hemmen, J. L. and Schulten, K. eds. *Models of Neural Networks III: Association, Generalization and Representation. Physics of Neural Networks*, 3. New York: Springer, pp. 255–279.
- [2] Jackel, L. D.; Battista, M. Y.; Ben, J.; Bromley, J.; Burges, C. J. C.; Baird, H. S.; Cosatto, E.; Denker, J. S.; Graf, H. P.; Katseff, H. P.; Le Cun, Y.; Nohl, C. R.; Sackinger, E.; Shamilian, J. H.; Shoemaker, T.; Stenard, C. E.; Strom, B. I.; Ting, R.; Wood, T. and Zuraw, C. R. (1994). Neural network applications in character recognition and document analysis. In: Yuhas, Ben and Ansari, Nirwan eds. *Neural Networks in Telecommunications*. Boston: Kluwer Academic Publishers, pp. 271–285.
- [3] Alkhateeb, W.; Bromley, J. M.; Ibbotsen, V.; Javadnia, A.; Ruddock, K. H. and Terry, A. (1989). Parallel and sequential processing in visual discrimination of simple geometrical patterns. In: Kulikowski, J. J.; Dickinson, C. M. and Murray, I. J. eds. *Seeing Contour and Colour: Proceedings of the Third Symposium of the Northern Eye Institute*, Manchester, UK, 9-13 August 1987. *Vision and Visual Health Care* (3). Oxford: Pergamon Press, p. 419.

### Journal Articles

- [4] Johnson, J.; Buckingham Shum, S.; Willis, A.; Bishop, S.; Zamenopoulos, T.; Swithenby, S.; MacKay, R.; Merali, Y.; Lorincz, A.; Costea, C.; Bourguine, P.; Louçã, J.; Kapenieks, A.; Kelly, P.; Caird, S.; Bromley, J.; Deakin Crick, R.; Goldspink, C.; Collet, P.; Carbone, A. and Helbing, D. (2012). The FuturICT education accelerator. *European Physical Journal - Special Topics*, 214 pp. 215–243.
- [5] Bromley, Jane ; Bentz, James W.; Bottou, Léon; Guyon, Isabelle; LeCun, Yann; Moore, Cliff; Säckinger, Eduard and Shah, Roopak (1993). Signature verification using a "Siamese" time delay neural network. *International Journal of Pattern Recognition and Artificial Intelligence*, 7(4) pp. 669–688.
- [6] Bromley, Jane and Denker, John S. (1993). Improving rejection performance on handwritten digits by training with "rubbish". *Neural Computation*, 5(3) pp. 367–370.
- [7] Säckinger, Eduard; Boser, Bernhard E.; Bromley, Jane M.; LeCun, Yann and Jackel, Larry D. (1992). Application of the ANNA neural network chip to high-speed character recognition. *IEEE Transactions on Neural Networks*, 3(3) pp. 498–505.
- [8] Boser, Bernhard E.; Sackinger, Eduard; Bromley, Jane ; leCun, Yann and Jackel, Lawrence D. (1992). Hardware requirements for neural network pattern classifiers: a case study and implementation. *Micro, IEEE*, 12(1) pp. 32–40.
- [9] Matan, Ofer; Baird, Henry S.; Bromley, Jane M.; Burges, Christopher J. C.; Denker, John S.; Jackel, Lawrence D.; Le Cun, Yann ; Pednault, Edwin P. D.; Satterfield,

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<sup>5</sup> Most papers are available here <http://oro.open.ac.uk/view/person/jmb995.type.html>

- William D.; Stenard, Charles E. and Thompson, Timothy J. (1992). Reading handwritten digits: a ZIP code recognition system. *Computer*, 25(7) pp. 59–63.
- [10] Alkhateeb, W.; Bromley, J. M.; Humphreys, G. W.; Javadnia, A.; Riddoch, M. J. and Ruddock, K. H. (1992). Abnormal responses to multielement spatial stimuli in a subject with visual form agnosia. *Clinical Vision Sciences*, 7(3) pp. 163–173.
- [11] Boser, Bernhard E.; Säckinger, Eduard; Bromley, Jane M.; Le Cun, Yann and Jackel, Lawrence D. (1991). An analog neural network processor with programmable topology. *IEEE Journal of Solid-State Circuits*, 26(12) pp. 2017–2025.
- [12] Bromley, J. M.; Javadnia, A. and Ruddock, K. H. (1987). Visual spatial filtering and pattern discrimination are abnormal in strabismic amblyopia. *Clinical Vision Sciences*, 1(3) pp. 209–218.
- [13] Blythe, Isobel M. ; Bromley, Jane M.; Kennard, C. and Ruddock, K. H. (1986). Visual discrimination of target displacement remains after damage to the striate cortex in humans. *Nature*, 320 pp. 619–621.
- [14] Blythe, I. M.; Bromley, J. M.; Ruddock, K. H.; Kennard, C. and Traub, M. (1986). A study of systematic visual perseveration involving central mechanisms. *Brain*, 109(4) pp. 661–675.
- [15] Blythe, Isobel M.; Bromley, Jane M.; Holliday, I. E. and Ruddock, K. H. (1986). The contribution of blue-sensitive cones to spatial responses of post-receptoral visual channels in man. *Spatial Vision*, 1(4) pp. 277–289.

### Refereed Conference Items

- [16] Bromley, Jane; King, David, Morse, David (2014). Finding agriculture among biodiversity: metadata in practice. To be published in *Proceedings of 8th Metadata and Semantics Research Conference*. 26<sup>th</sup>-28<sup>th</sup> November 2014, Karlsruhe, Germany, Springer International Publishing.
- [17] Johnson, Jeff; Jimenez-Romero, Cristian; Rodrigues, David; Bromley, Jane; Willis, Alistair (2014). Hypernetwork-based Peer Marking for Scalable Certificated Mass Education. In: *European Conference on Complex Systems (ECCS' 14)*, 22-26 September 2014, Lucca, Italy.
- [18] Morse, David; Bromley, Jane and King, David (2013). agINFRA - where agriculture, biodiversity and information technology meet. In: *TDWG 2013*, 27 October - 1 November 2013, Florence, Italy.
- [19] Bromley, Jane M.; Guyon, Isabelle; LeCun, Yann; Sackinger, Eduard and Shah, Roopak (1994). Signature verification using a Siamese time delay neural network. In: *7th Annual Neural Information Processing Systems Conference*, 29 November - 02 December 1993, Denver, Morgan Kaufmann Publishers, pp. 737–744.
- [20] Boser, Bernhard E.; Säckinger, Eduard; Bromley, Jane ; LeCun, Yann; Howard, Richard E. and Jackel, Lawrence D. (1991). An analog neural network processor and its application to high-speed character recognition. In: *IJCNN-91- International Joint Conference on Neural Networks*, 8-14 July 1991, Seattle, WA, USA, pp. 415–420.
- [21] Jackel, L. D.; Stenard, C. E.; Baird, H. S.; Boser, B.; Bromley, J.; Burges, C. J. C.; Denker, J. S.; Graf, H. P.; Henderson, D.; Howard, R. E.; Hubbard, W.; LeCun, Y.;

Matan, O.; Pednault, E., E.; Satterfield, W.; Sackinger, E. and Thomson, T. (1991). A neural network approach to handprint character recognition. In: *Compcon Spring'91. Digest of Papers*, 25 February - 1 March 1991, San Francisco, CA, USA, pp. 472–475.

- [22] Alkhateeb, Wafa; Bromley, Jane; Javadia, Atafeh and Ruddock, K. H. (1987). Functional mapping of stimulus colour in human subjects suffering a central visual defect. In: *Physiological Society Meeting*, Imperial College London, 13-14 February 1987, Imperial College London, p. 44.
- [23] Bromley, J. M.; Humphreys, G. W.; Javadnia, A.; Riddoch, M. J. and Ruddock, K. H. (1986). Pattern discrimination in a human subject suffering visual agnosia. In: *Physiological Society, University College London/Middlesex Meeting*, 25-26 March 1986, London/Middlesex, UK, 67P.
- [24] Blythe, I. M.; Bromley, J. M.; Kennard, C. and Ruddock, K. H. (1985). Abnormal prolongation of visual sensations in a human subject. In: *Physiological Society, St. Andrews Meeting*, 14-15 June 1985, St. Andrews, Scotland, UK, p. 20.

#### **Other Publications**

- [25] Bromley, Jane. (1987). *Visual Thresholds and Discriminations Measured for Spatial Patterns*. PhD Thesis, Imperial College