



CURRICULUM VITAE

Name: **Professor Julian William Gardner FEng**
BSc (*Birmingham*), PhD (*Cambridge*), DSc (*Warwick*), CEng, FIEE, SMIEEE

H-index 43; 503 publications

Current Employment/Job Titles:

- Professor of Electronic Engineering, University of Warwick
- Head of Electrical & Electronic Engineering, University of Warwick
- Head of Microsensors & Bioelectronics Laboratory, Warwick University
- Co-director of Centre for Cognitive and Neural Systems, Warwick University
- Director and Treasurer of International Society for Olfaction and Chemical Sensors
- Chief Scientist and Founder Director of Cambridge CMOS Sensors Ltd
- Senior Research Fellow, University of Cambridge

Work Address:

School of Engineering
Warwick University
Coventry CV4 7AL, UK

Tel: +44 (0) 2476 523695

Fax: +44 (0) 2476 418922

E-mail: j.w.gardner@warwick.ac.uk

WWW: <http://www.warwick.ac.uk/go/MBL>

Home Address:

The Terrets, Mill Lane
Kineton
Warwick CV35 0LA, UK.

Tel: +44 (0) 1926 640902

Date of Birth: 5th August 1958, Oxford

Academic Qualifications:

D.Sc. Electronic Engineering, University of Warwick (1997).

Ph.D. Physical Electronics, University of Cambridge (1982).

B.Sc. First Class Honours in Physics, University of Birmingham (1979).

Past Employment/Job Titles:

2013- Chief Scientist of Cambridge CMOS Sensors Ltd
2011- Head of Electrical & Electronic Engineering Discipline, Warwick University
2011- Head of Microsensors and Bioelectronics Laboratory, Warwick University
2012- Treasurer & director of International Society for Olfaction and Chemical Sensing
2010-2 President of International Society for Olfaction and Chemical Sensing
2008-2010 Vice President of International Society for Olfaction and Chemical Sensing

2008-2012	CTO and Founding director of Cambridge CMOS Sensors Ltd
2006-	Director of Centre for Cognitive & Neural Systems
2003-7	Dean, School of Engineering, Warwick University.
1998-2003	Head of Electrical & Electronic Engineering Division, Warwick University
1994-8	Reader, School of Engineering, University of Warwick.
1991-4	Senior Lecturer, Department of Engineering, Warwick University.
1987-91	Lecturer, Department of Engineering, Warwick University.
1986-7	Research Engineer, Advanced Technology Centre, Molins Plc, Coventry.
1983-6	Principal & Technical Officer, Safety & Reliability Directorate, AEA Technology.

Research areas:

- Chemical Sensing and Artificial Olfaction
- CMOS Microsensors/Microsystems
- Biomimetic devices (electronic noses and tongues)
- Biomedical engineering
- Intelligent signal processing and pattern analysis

Education:

1997	DSc, University of Warwick, Coventry, UK.
1979-83	PhD, Queens' College, University of Cambridge, Cambridge, UK.
1976-9	BSc at University of Birmingham, Birmingham, UK.
1969-76	Full Scholarship to Abingdon School, Abingdon, Oxon.
1976	3 'A' Levels; Chemistry (A), Physics (B), Mathematics (B).
1974	10 GCSE 'O' Levels; 1 GCSE 'AO' Level.

Awards:

2013	Received CleanTech Company of the Year Award (Business Weekly) from Lord Sainsbury, Cambridge
2011	Highly Recommended Start-up Company of the Year, British Engineering in Excellence Awards, London
2007	Awarded JJ Thomson Medal for Achievement in Electronics by Institution of Engineering and Technology, UK.
2004	Wolfson Refurbishment Award funded by Royal Academy of Engineering and Royal Society to create Nanostructures Laboratory
2003	Global Research Award from the Royal Academy of Engineering, UK
2002	Best paper in session at IEEE Sensors 2002 conference, Florida, USA
1995	A paper received both a <u>Diploma</u> for the best section paper at the 17th Edition of Annual Semiconductor Conference, Sinaia, Romania, 11-16 October 1994 and, judged by 9 international referees, the <u>Best Paper Award</u> on behalf of the Microelectronics Journal
1995	A journal article was reported in Spotlights 95 (Elsevier) to be the most cited paper in the journal Sensors and Actuators B in 1992
1992	Awarded Diploma in Science pour L'Art competition funded by Moët-Hennessy Louis Vuitton, France.

1988 Esso Centenary Award from Royal Society and Fellowship of Engineering.

Learned Society Membership:

Fellow of the Royal Academy of Engineering, UK (2006)

Fellow of the Institution of Engineering and Technology, UK (since 1996)

Fellow of Institute of Physics, UK (2004-8)

Senior Member of Institute of Electrical & Electronic Engineers, USA (since 2002)

Fellow of Alexander van Humboldt Society, Germany (since 1994)

Current Research Staff and Postgraduate Students:

- 3 Postdoctoral research assistants
- 4 PhD students (23 successfully graduated)
- 1 MSc/MPhil student (18 successfully graduated)

Recent Grants and Contracts – Total Value of ca. £5 million

2013-16 FP7 EU ICT Collaborative project called “Multi-Sensor Platform for Smart Building Management” with Samsung and Siemens. PI for Warwick: €400k.

2011-15 Work package leader on FP7 EU Large scale integrating project called “Grafol” with Philips and Thales. Spin-out €250k.

2011-4 Work package leader on FP7 EU STREP called “SOIHITS” with Zarlink and Honeywell to start late 2011 for 3 years. PI for Warwick: €500k.

2011-12 Work package leader on EEDS project called “SOI IR sources” May 2011 to 2012. Spin-out £180k.

2009-12 EU FP7 funded Large Scale Integrating project called “Technotubes” with Philips and Thales. €360k for spin-out company

2009-13 EU COST project called “nanoTP”. Work package 2 leader on devices.

2007-11 EU funded FET project on “Intelligent Chemical Communication”. €2M

2007-10 EPSRC responsive mode grant on “Nanostructures”. £300k

2007-10 TSB funded technology project on “Ultra-low power gas sensors” £150k

2004-7 Denso plc. Industrial contract “Design of smart sensors”. £248k.

2003-5 Sony (Germany). Research contract on “Ratiometric gas sensors”. £65k.

2004-5 Royal Society. Wolfson Laboratory Scheme. “Wolfson Nanostructures Laboratory”. £200,000.

2004 HEFCE. SRIF2 programme. “Microsculpting Laboratory”. £230,000.

2004 NATO Advanced Workshop on “Electronic Noses and Sensors for the Detection of Explosives”. £27,600.

2001-4 EPSRC. Responsive mode grant. “Adaptive neuromorphic analogue VLSI chip for odour sensing”. £142,114. Total value of project with Edinburgh and Leicester is £400,000.

2001-4 EU. Second network on artificial olfactory sensing. Warwick value is £11,200.

2003 Royal Academy of Engineering. Global research award. “Smart electronic tongue and nose-on-a-chip”. £19,350.

2001-3 Wellcome Trust. “Novel Biosensor”. £284k.

2002-3 Honeywell plc (USA). “Smart SOI gas sensors for future use in wireless applications”. £25,600.

2001-3 Welch-Allyn. “Rapid screening of ENT infections using an electronic nose”. £78,279.

2001-3 Wellcome Trust. “Development of novel bioprobe”. £284,017.

Manuscripts reviewed for:

- Bioelectronics and Biosensors
- IEE Journals (various)
- IEEE Journals (various)
- Institute of Physics Journals (Various)
- Nature
- Royal Society
- Royal Society of Chemistry
- Sensors and Actuators

Grant proposals reviewed for:

- EU and ERC
- Royal Academy of Engineering
- Biological & Biochemistry Research Council (UK)
- Department of Trade and Industry (UK)
- Engineering & Physical Research Council (UK)
- National Science Foundation (USA)
- Government bodies in Australia, Denmark, India, Israel, Italy, Spain, Sweden, New Zealand, UK, USA.

Services to Profession:

External National Committees and Editorships:

- Academic mentor for Royal Academy of Engineering
- President of International Society for Olfaction and Chemical Sensors (2009-11)
- Vice-President of International Society for Olfaction and Chemical Sensors (2008-9)
- Chair of Scientific Council, EU Network of Excellent on Machine Olfaction (2003- 8)
- Expert for NATO Science programme (2006-10)
- Member of ESPRC College (2002-)
- Series Editor of Wiley-VCH on “Sensor Applications” – 4 volumes published (1999-)
- Member of EPSRC Advisory panel on Basic Technologies Materials (2006)
- Editorial board member of IOP Smart Materials and Systems journal (2001-)
- Governor of Silsoe Research Institute, BBSRC (2001-5)
- Advisor to Wellcome Trust (2004) and EU Science programme (2002-5)
- Member of DTI Advisory Panel for LINK programme on Basic Technologies (2002-4)
- Associate Editor of the IEEE Sensors Journal (2000-5)
- Executive Member of IEE Professional Network on Microsystems Technology and Nanotechnology (2001-3)
- Member of DTI/EPSC Advisory panel for LINK programme Sensors and Sensor Systems (1997-2002)

Recent activities associated with International Conferences:

- Appointed member of technical committee of CENICS conference (Spain)
- Chair of the Steering Committee of The International Symposium on Olfaction & Electronic Noses (ISOEN 2011)
- Member of Executive Committee and Scientific Committee Eurosensors conference series
- Member of International Steering Committee of International Meeting of Chemical Sensors 2000-2012
- Member of Technical Advisory Board of IASTED Biomedical Engineering Conference 2008-12
- Executive member of Eurosensors Steering Committee (2000-2011)
- Co-director of ISOCS Winter Schools in 2009 and 2011

Other Professional Activities

- Appointed Visiting Professor in the Faculty of Electrical Engineering at Universiti Teknologi Malaysia (UTM) 2013
- External examiner for two departments at Faculty of Electrical Engineering at Universiti Teknologi Malaysia (UTM) 2013
- External examiner for new MSc programme in Industrial Electronics for Southampton University 2013
- External examiner on undergraduate programme for Cambridge University (2011-13)
- External examiner on undergraduate programme for Durham University (2010-12)
- Senior Research Fellow at Cambridge University, UK (2007-10)
- External examiner on masters degree at Nanyang Technological University, Singapore (2005-9)
- Visiting Professor at Center for the Engineering of Electronic and Acoustic Materials, Penn State University, USA (1998-2005)
- Member of Advisory Board of Cyrano Science, USA (1998-2005)
- Appointed to Editorial Board of Sensors Update, Wiley-VCH Publishers (1998-)
- Alexander von Humboldt Research Fellow, Germany (1994-)
- Consultant to Hewlett-Packard, USA (1997-2001)
- Visiting Professorship at Seoul National University, Korea (1997)
- Visiting Professor at Gintic Institute of Manufacturing Technology, Nanyang Technological University, Singapore (1996-7)
- Consultant to Alpha MOS, France (1994-6)
- Visiting Professor (Japan Society for Promotion of Science) at Department of Electrical and Electronic Engineering, Tokyo Institute of Technology, Tokyo, Japan.

External PhD Examiner for:

- Nanyang Technical University, Singapore; University of Barcelona, Spain, India, Sweden
- University of: Birmingham, Brunel, Cambridge, Durham, Edinburgh, Heriot-Watt, Imperial College London, Leeds, Leicester, Manchester, Nottingham, Sheffield, Southampton, UCL

Recent Services to the University:

2010-2009-	Co-ordinating New York University Abu Dhabi partnership with Engineering
2006-8	Co-ordinating partnership with IBEC in Barcelona.
2005-7	University Senate
2005-7	University Research Committee
2005-7	University International Committee
2004-7	Faculty of Science Advisory Borad
2003-7	University International Strategy Committee
2003-7	University Finance Committee
2003-7	University Academic Committee

Services to the School:

2011-2006-	Head of Electrical & Electronic Engineering Discipline
2003-7	Founding Director, Centre for Cognitive & Neural Systems
1999-2003	First Dean of School of Engineering
1996-9	Head of Electrical & Electronic Engineering Division
1993-6	Director, Centre of Microengineering and Nanotechnology
	Director of Postgraduate Studies

Media Work:

Local Radio Interviews: Mercia Sound, The Bear, Fox FM, Radio Galaxy, Heart FM.
National Radio Interviews: Science Now, BBC Radio 4, BBC World Service, Radio 5 Live.
TV programmes: BBC1 Tomorrow's World, BBC2 QED, BBC1 Midland Today

Teaching Experience:

MSc Microsensors and Microsystems Technology, Industrial Measurement Systems (Brunel University); Data Processing (Cranfield University); Microsensors (NTU, Singapore), Microsensors and Electronic Noses (Taiwan).

4th Year: ASICs, MEMS and Smart Devices, Analogue VLSI design

3rd Year: Fundamentals of Modern VLSI Design, Quality Techniques & Reliability Engineering, Automatic & Robotics

2nd Year: Instrumentation & Reliability, Information Engineering, Electronic Systems

1st Year: Digital Electronics, Engineering Systems Analysis, PCB CAD, Industrial Systems, Industrial Seminars, Professional Studies, Mobile Robots.

Publications:

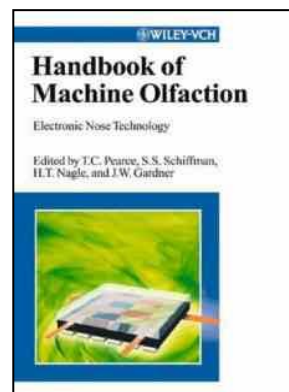
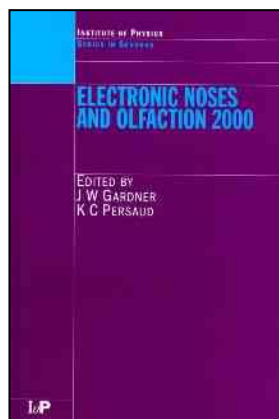
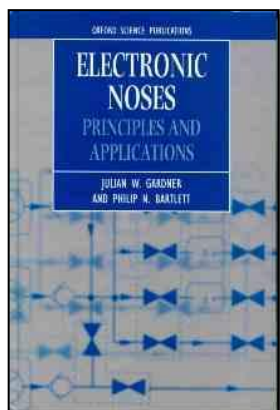
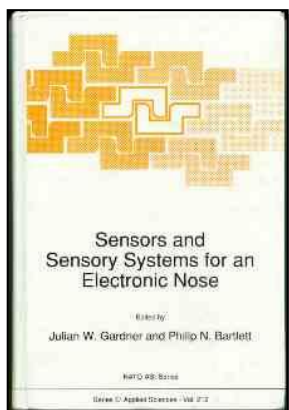
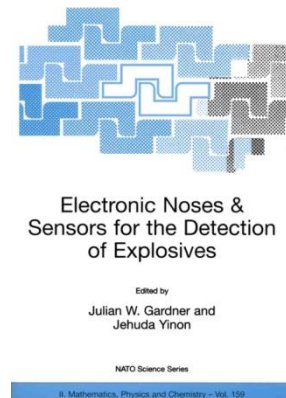
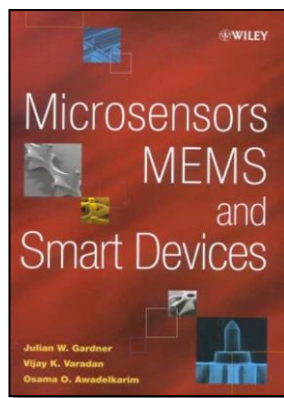
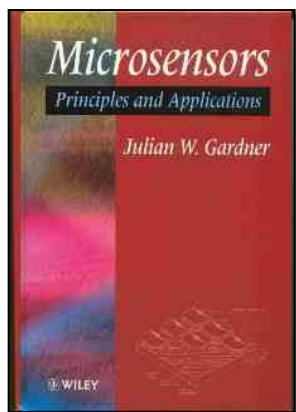
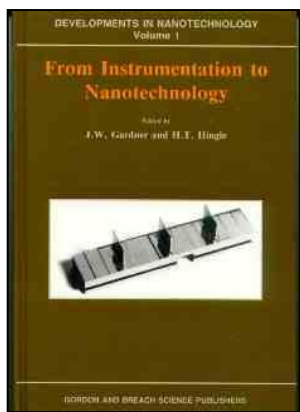
I am an author on over 500 technical articles (> 150 refereed) with H-index of 43; recent ones are listed below. (A full list of publications can be provided on request.)

Books

1. Edited book: **Gardner JW**, Perasud K and Gutierrez, R (2012) Special Issue of IEEE Sensors Journal covering ISOEN 2011, New York.
2. Edited book: **Gardner JW** (2007) *Proc. of the 25th IASTED International Multi-conference Biomedical Engineering*, 13-15 Feb. 2007, IASTED, Canada, pp468. ISBN 978-0-88986-648-5.
3. Authored Book (Chinese edition of): **Gardner JW**, Varadan VJ and Awadelkarim O (2006) *Microsensors, MEMS and Smart Devices*, Tsinghua University Press, Beijing, ISBN 7-302-08122-0.
4. Edited book (Chinese translation of): Hesse J, **Gardner JW** and Göpel W (2006) *Sensors in Household Appliances*, Sensors Applications, Volume 5, Wiley-VCH, Weinheim, pp244. ISBN 7-5025-5446-7
5. Edited book: **Gardner JW** and Yinon J (2004) *Electronic Noses and Sensors for the Detection of Explosives*, Kluwer, Dordrecht, pp324. ISBN 1-4020-2317-0 (hardbound) and 1-4020-2318-9 (paperback).
6. Edited book: Hesse J, **Gardner JW** and Göpel W (2004) *Sensors in Medicine and Health Care*, Sensors Applications, Volume 3, Wiley-VCH, Dordrecht, ISBN 3-527-29556-9.
7. Edited book: Hesse J, **Gardner JW** and Göpel W (2003) *Sensors for Automotive Technology*, Sensors Applications, Volume 4, Wiley-VCH, Dordrecht, pp560. ISBN 3-527-29553-4.
8. Edited book: Hesse J, **Gardner JW** and Göpel W (2003) *Sensors in Household Appliances*, Sensors Applications, Volume 5, Wiley-VCH, Dordrecht, pp287. ISBN 3-527-30362-6.
9. Edited book: Pearce TC, Schiffman SS, Nagle HT, **Gardner JW** (2003) *Handbook of Machine Olfaction*, Wiley-VCH, Dordrecht, pp592. ISBN 3-527-30358-8.

10. Edited Issue: Nagle T, Gardner JW and Persaud KC (2002) *Special Issue on Artificial Olfaction*, IEEE Sensors Journal, Volume 2, 131-271. ISSN 1530-437X.
11. Authored Book: **Gardner JW**, Varadan VJ and Awadelkarim O (2001) *Microsensors, MEMS and Smart Devices*, John Wiley & Sons Ltd, Chichester, pp552. ISBN 0-471-86109-X.
12. Edited book: Hesse J, **Gardner JW** and Göpel W (2001) *Sensors in Manufacturing*, Sensors Applications, Vol. 1, Wiley-VCH, Dordrecht, pp395. ISBN 3-527-29558-5.
13. Edited book: Hesse J, **Gardner JW** and Göpel W (2001) *Sensors in Intelligent Buildings*, Sensors Applications, Volume 2, Wiley-VCH, Dordrecht, pp586. ISBN 3-527-29557-7.
14. Edited book: **Gardner JW** and Persaud KC (2000) *Electronic Noses and Olfaction*, IOP Publishing Ltd, Bristol, pp310. ISBN 0-7503-0764-1.
15. Edited Book: Middlehoek S and **Gardner JW** (1999) *Proceedings of Eurosensors XII, Part III, Sensors and Actuators B*, Vol. 58, pp283-558.
16. Authored Book: **Gardner JW** and Bartlett PN (1999) *Electronic noses: principles and application*, Oxford University Press, Oxford, pp245. ISBN 0-19-855955-0.
17. Authored Book: **Gardner JW** (1994) *Microsensors: Principles and Applications*, J. Wiley & Sons Ltd, Chichester, pp 320. ISBN 0-471-94135-2.
18. Edited book: **Gardner JW** and Bartlett PN (1992) *Sensors & Sensory Systems for an Electronic Nose*, Kluwer Academic Publishers, Dordrecht, NATO ASI Series: Applied Science Vol. 212, pp327. ISBN 0-7923-1693-2.
19. Edited book: **Gardner JW** and Hingle HT (1991) *From Instrumentation to Nanotechnology*, Gordon and Breach Science Publishers, Philadelphia, pp336. ISBN 2-88124-794-6.

Some Books Published:





Recent Book Chapters

1. Book chapter: Pearce TC, Karout S, Capurro A, Racz Z, Cole M, **Gardner JW** (2013) in *Biomimetic and Biohybrid Systems*, Lepora NF et al (eds), Vol. 8064, pp 204-215, Springer, Berlin “Robust ratiometric infochemical communication in a neuromorphic synthetic moth”
2. Book chapter: Guha P, Santra S and **Gardner JW** (2013) in *Measurement, Instrumentation and Sensors Handbook*, Taylor and Francis, Ch 9 “CMOS integrated gas sensors”
3. Book chapter: Guha P, Santra S and **Gardner JW** (2013) in *Semiconductor Gas Sensors* (Eds. R. Jaaniso, Z. Weiguang and T. Kiang), Ch 15 “Integrated Semiconductor Sensors for Gas and Odour Detection”
4. Book chapter: **Gardner JW**, Covington JA and Che Harun F (2012) in *Human Olfactory Displays and Interfaces: Odor Sensing and Presentation*, T. Nakamoto (Ed.), IGI Global, USA, Ch 12, pp257-274 “Electronic mucosa: a natural successor to the electronic nose system?”
5. Book chapter: Pearce TC, Sanchez-Montanes MA and **Gardner JW** 2009, Chapter in book, *Srpinger series, Ch5, pp75-92*, “Improved odour detection through imposed biomimetic temporal dynamics”
6. Book chapter: Brezmes J, Llobet E, Al-Khalifa S, Maldonado S and **Gardner JW**, in *Support Vector Machines: Theory and Applications*, Lipo W (Ed) "Support Vector Machine: Theory and Applications Chapter: Gas Sensing Using Support Vector Machines", Studies in Fuzziness and soft computing, Springer-Verlag, Berlin, ISBN 3-540-24388-7, June, 2005.
7. Book chapter: **Gardner JW** in *Electronic Noses & Sensors for the detection of explosives* (Eds JW Gardner and J Yinon), Kluwer, Dordrecht, 2004. “Review of conventional electronic noses and their possible application to the detection of explosives”
8. Book chapter: **Gardner JW** and Cole MV in *Handbook of Machine Olfaction* (Eds. TC Pearce, S Schiffman, T Nagle T, JW Gardner), Wiley-VCH, January 2003. “Integrated e-nose and Microsystems for chemical analysis”

9. Book chapter: Hines EL, Boilot P, **Gardner JW**, Gongora MA, Llobet E in *Handbook of Machine Olfaction* (Eds. TC Pearce, S Schiffman, T Nagle T, JW Gardner), Wiley-VCH, January 2003. "Pattern analysis for electronic noses"

Recent Refereed Journal Articles and Patents

1. Pearce TC, Karout S, Racz Z, Capurro A, **Gardner JW** and Cole M 2013 *Frontiers in Neuroscience* **7** 119 1-17 "Rapid processing of chemosensor transients in a neuromorphic implementation of the insect macroglomerular complex"
2. Guha PK, Santra S, Covington J, Udrea F, **Gardner JW** *Sensors and Actuators B* "ZnO nanowires based sensors grown on fully processed SOI CMOS substrate" at press
3. Racz Z, Cole M, **Gardner JW**, Chowdhury MF, Bula WP, Gardeniers J, Karout S, Capurro A, Pearce TC 2012 *Int. J. Circ. Theor. Appl. Wiley*, DOI: 10.1002/cta.1829 "Design and implementation of a modular biomimetic infochemical communication system"
4. Falconi C, di Natale C, Martinelli E, d'Amico A, Zampetti E, **Gardner JW**, van Vliet C 2012 *Sensors and Actuators B* **174** 577-585 "1/f noise and its unusual high-frequency deactivation at high biasing currents in carbon black polymers with residual 1/f^ν noise and a preliminary estimation of the average trap energy"
5. Che Harun FK, Covington JA and **Gardner JW** 2012 *IET Nanobiotechnology* **6** 45-51 "Mimicking the biological olfactory system: a portable electronic mucosa"
6. Yang J, Racz Z, **Gardner JW**, Cole M, Chen H 2012 *Sensors and Actuators B* **173** 547-554 "Ratiometric info-chemical communication system based on polymer-coated surface acoustic wave microsensors"
7. Vivancos J, Rác Z, Cole M, **Gardner JW** 2012 *Sensors and Actuators B* **171-172** 469-477 "Surface acoustic wave based analytical system for the detection of liquid detergents"
8. Ali S, Ho W, Chowdhury M, Covington J, Moseley P, Saffell J, **Gardner JW** and Udrea F 2011 *AIP Conf. Proc.* 1362 53-54 "A high temperature SOI CMOS NO₂ sensor"
9. Aziz M, CheHarun F, Covington J, and Gardner JW 2011 *AIP Conf. Proc.* **1362** 223-224 "Towards an analogue neuromorphic VLSI instrument for the sensing of complex odours"
10. Karout S, Racz Z, Capurro A, Cole M, **Gardner JW**, Pearce TC 2011 *AIP Conf. Proc* **1362** 77-78 "Ratiometric chemical blend processing with a neuromorphic model of an insect macroglomerular complex"
11. Racz Z, Olsson S, **Gardner JW**, Pearce TC, Hannson, Cole M 2011 *Procedia Computer Science* **7** 106-109 "Challenges of biomimetic infochemical communication"
12. Cole M, Covington JA, and **Gardner JW** 2011 *Sensors and Actuators B* **156** 832-839 "Combined electronic nose and tongue for a flavour sensing system"
13. Santra S, Ali SZ, Guha P, Zhong G, Robertson J, Covington JA, Milne WI, **Gardner JW** and Udrea F 2010 *Nanotechnology* **21** 1-7 "Post-CMOS wafer level growth of carbon nanotubes for low cost microsensors – a proof of concept"
14. **Gardner JW**, Guha PK, Udrea F and Covington JA 2010 *IEEE Sensors* **10** 1833-1848 "CMOS interfacing for integrated gas sensors: a review"
15. Santra S, Guha PK, Ali SZ, Hiralal P, Unalan HE, Covington JA, Amaratunga GAJ, Milne WI, **Gardner JW** and Udrea F 2010 *Sensors and Actuators B* **146** 559-565 "ZnO nanowires grown on SOI CMOS substrates for ethanol sensing"
16. Garcia-Guzman J, **Gardner JW** and Cole M 2010 *Procedia Engineering* **5** 176-179 "A duo-type smart gas sensor ASIC chip for use with resistive nanomaterials"
17. Udrea F and **Gardner JW** 2010 **United States Patent Application 12/691104** "Electromigration reduction", 21 January 2010.
18. Iwaki T, Covington JA, and **Gardner JW** 2009 *IEEE Sensors Journal* **9** 314-318 "Identification of different vapors using a single temperature modulated polymer sensor with a novel signal processing technique"
19. **Gardner JW** and Taylor JE 2009 *IEEE Sensors Journal* **9** 929-935 "Novel convolution-based signal processing techniques for an artificial olfactory mucosa"

20. Iwaki T, Covington JA, Udrea F, **Gardner JW** 2009 *Sensors and Actuators B* **141** 370–380 “Identification and quantification of different vapours using a single polymer chemoresistor and the novel dual transient temperature modulation technique”
21. Che Harun FK, Taylor JE, Covington JA, and **Gardner JW** 2009 *Sensors and Actuators B* **141** 134-140 “An electronic nose employing dual-channel odour separation columns with large chemosensor arrays for advanced odour discrimination”
22. Ali SZ, Udrea F, Milne WI, and Gardner JW 2008 *J. Microelectromechanical Systems*, **17**, 1408-1417 “Tungsten-based SOI microhotplates for smart gas sensors”
23. Sanchez-Montanes MA, **Gardner JW** and Pearce TC 2008 *Proc. Roy. Soc. A*, **464**, 1057-1077 “Spatiotemporal information in an artificial olfactory mucosa”
24. Maeng S, Guha P, Udrea F, Ali SZ, **Gardner JW** et al., 2008 *ETRI Journal*, **30**, 516-525 “SOI CMOS-based smart gas sensor system for ubiquitous sensor networks”
25. Koickal T, Hamilton A, Tan SL, Covington JA, **Gardner JW** and Pearce TC 2007 *IEEE Transactions on Circuits and Systems I*, **54**, 60-73 “Analog VLSI circuit implementation of an adaptive neuromorphic olfaction chip”
26. Yates J, Chappell M, and **Gardner JW** 2007 *Proc. Roy. Soc. A*, **463**, 551-568 “Novel phenomena based dynamic model of carbon-black/composite vapour sensors”.
27. Covington JA, **Gardner JW**, Hamilton A, Pearce TC and Tan SL 2007 *IET Proc. Nanobiotechnology*, **1**, 15-21 “Towards a truly biomimetic olfactory microsystem: an artificial olfactory mucosa”
28. **Gardner JW**, Covington JA, Tan S-L and Pearce TC 2007 *Proc. Roy. Soc. A*, **463**, 1713-1728 “Towards an artificial olfactory mucosa for improved odour classification”
29. Guha PK, Ali SZ, Lee CC, Udrea F, Milne WI, Iwaki T, Covington JA and **Gardner JW** 2007 *Sensors and Actuators B*, **127**, 260-266 “Novel design and characterisation of SOI CMOS microhotplates for high temperature gas sensors”
30. Tan SL, Covington JA, and **Gardner JW** 2006 *IEE Proc.-Sci. Meas. Technol.*, **153**, 94-100 “Velocity-optimised diffusion for ultra-fast polymer-based resistive gas sensors”
31. Leonte II, Sehra G, Cole M, Hesketh P, and **Gardner JW** 2006 *Sens. Actuators B*, **118**, 349-355 “Taste sensors utilizing high-frequency SH-SAW devices”
32. Patent: **Gardner JW**, Udrea F, Covington JA, "CMOS compatible tungsten micro heaters", GB Patent Application 0505192.5, (Mar 2006).
33. Dutta R, **Gardner JW** and Hines EL 2005 *Encyclopaedia of Sensors* (<http://www.aspbs.com/eos>), American Scientific Publishers, May 2005 “Object-orientated expert electronic nose system”
34. Jacesko S, Abraham JK, Taeksoo J, Varadan VK, Cole M and **Gardner JW** 2005 *Smart Mater. Struct.*, **14**, 1010-1016 “Investigations on an electronic tongue with polymer microfluidic cell for liquid sensing and identification”
35. Patent: **Gardner J**, Udrea F and Covington J 2005 **GB Patent Application 0505192.5**, 18 March 2005, “CMOS compatible tungsten micro heaters”
36. Yates JWT, **Gardner JW**, Chappell MJ, and Dow CS 2005 *IEE Proc.-Sci. Meas. Technol.*, **152**, 97-102 “Identification of bacterial pathogens using quadrupole mass spectrometer data and radial basis function neural networks”
37. Yates JW, Chappell MJ, **Gardner JW**, Dow CS, Dowson C, Hamood A, Bolt F and Beeby L 2005 *Computer Methods and Programs in Biomedicine*, **79**, 259-271 “Data reduction in headspace analysis of blood and urine samples for robust bacterial identification”
38. **Gardner JW**, Hines EL and Dowson C 2005 *Ingenia*, **18738**, 38-39 “Smelling illness”
39. Dutta R, Morgan D, Baker N, **Gardner JW** and Hines EL 2005 *Sensors and Actuators B*, **109**, 355-362 “Identification of Staphylococcus aureus infections in hospital environment: electronic nose based approach”

40. **Gardner JW**, Boilot P and Hines EL 2005 *Sensors and Actuators B*, **106**, 114-121 “Enhanced electronic nose performance by sensor selection using a new integer based genetic algorithm approach”

Recent Keynote, Invited and Conference Papers (2006-13)

1. Thomas S, Cole M and **Gardner JW** 2013 *Proc. New Sensing Technologies for Air Pollution Control and Environmental Sustainability, 18-20 December, Cambridge* “Particulate matter detection based on acoustic resonators for air quality monitoring”
2. De Luca A, Racz Z, Cole MT, Ali SZ, Udrea F, **Gardner JW** and Milne WI 2013 *Proc. IEEE Sensors Conference*, 3-6 November, Baltimore, USA “In situ grown carbon nanotubes for enhanced CO₂ detection in non-dispersive infra-red system”
3. Thomas S, Racz Z, Cole M, and **Gardner JW** 2013 *Proc. IEEE Sensors Conference*, 3-6 November, Baltimore, USA “Dual high-frequency surface acoustic wave resonator for ultrafine particle sensing”
4. Ghadar A, **Gardner JW** and Dowson C 2013 *Proc. IEEE Sensors Conference*, 3-6 November, Baltimore, USA “Precision transducer for fluorescence-based immunoassays”
5. Invited paper: **Gardner JW** 2013 *Proc. ESSDERC, Bucharest, Romania, 16-20 September 2013*, “MEMS and Sensors – emerging technologies and applications”
6. Avramescu V, de Luca A, Brezeanu M., Ali SZ, Udrea F, Buiu O, Cobianu C, Serban B, **Gardner JW** et al 2013 *Proc. ESSDERC, Bucharest, Romania, 16-20 September 2013*, “Resistive oxygen sensor based on CMOS-compatible SOI micro-hotplate”
7. Thomas S, Racz Z, Cole M, **Gardner JW** 2013 *Proc. IEEE CENICS, Barcelona, Spain, 25-28 August 2013* “High-frequency One-port Colpitts SAW Oscillator for Chemical Sensing”
8. Plenary paper: **Gardner JW** *Proc. ISOEN 2-5 July 2013, Korea* “A biomimetic olfactory system: insect-based info-chemical communication”
9. Milne WI, Cole MT, DeLuca A, Ali SZ, **Gardner JW**, Udrea F, Stokes R 2013, *Proc. 7th International Conference on Materials for Advanced Technologies (ICMAT 2013) 30 June to 5 July* “SOI platform for smart microsensors”
10. **Gardner JW** et al. 2013 *Proc. Transducers, Barcelona, Spain, 16-20 June 2013* “Graphene SOI CMOS sensors for detection of ppb levels of NO₂ in air”
11. Invited paper: **Gardner JW** 2013 *Public lecture at UTM, Malaysia, 28th March 2013* “Bioelectronic microsystems in CMOS”
12. Santra S, Guh PK, Ray SK, Udrea F and **Gardner JW** *5th International Nanoelectronics Conference, Singapore, 2-4 January 2013* “SOI CMOS integrated zinc oxide nanowire for toluene detection”
13. Cole M, Racz Z, **Gardner JW** and Pearce TC 2012 *Proc. IEEE Sensors conference, 28-31 October 2012, Taiwan, pp2219-2222* “A novel biomimetic infochemical communication technology: from insects to robots”
14. Invited paper: Udrea F, Ali SZ, Brezeanu M, Dumitru V, Buiu O, Poenaru I, Chowdhury MF, Luca A, **Gardner JW** 2012 *IEEE International semiconductor conference (CAS) 2012, Sinaia, Romania, 15-17 October 2012* “SOI sensing technologies for harsh environment”
15. Garcia-Guzman J, Cole M, **Gardner JW**, Mendoza-Gutierrez 2012 *Proc. Eurosensors conference, Poland, 9-12 September 2012* “Multiphysics modelling of a resistive polymeric sensor for VOC”
16. Santra S, Guha PK, Ray SK, Ali SZ, Udrea F, **Gardner JW** 2012 *IEEE Nano 2012 conference, UK, 20-23 August 2012* “Carbon nanotube integration on a fully processed CMOS MEMS wafers and their NO₂ response”
17. Invited paper: **Gardner JW** 2012 Special session for EU EUNetAir at *IMCS 2012, Nuremberg, German, May 20-23* “New Approaches to Chemical Sensing for Application in Environmental Monitoring”
18. Thomas S, Li Tai Leong S, Rácz Z, Cole M and **Gardner JW** 2012 *IMCS 2012, Nuremberg, German, May 20-23* “Design and Implementation of a High-Frequency Surface Acoustic Wave

- Sensor Array for Pheromone Detection in an Insect-inspired Infochemical Communication System”
19. Cole M, Thomas S, Racz Z, **Gardner JW**, Jordan M, and Challis J 2012 *Biosensors 2012, Cancun, Mexico, May 15-18* “Cell-based surface acoustic wave sensor with transfected olfactory receptors OR67d and OR22a for a highly specific chemo-receiver”
 20. Invited paper: **Gardner JW** 2012 *Irish Forum on Future of Integrated Sensors, SRC, Dublin, Ireland, March 22-24*, “Microsensors for electronic nose and tongue”
 21. **Gardner JW** et al. 2012 *Proc. Biomedical Engineering 2012, Innsbruck, Austria, Feb 15-17*, “Classification of field asymmetric ion mobility spectrometry data for detection of bowel bacteria”
 22. **Gardner JW**, Ahmed T, Moseley P, Ali SZ, Chowdhury M and Udrea F 2011 *Proc. Eurosensors XXV, Athens, Greece, September 4-7* “High temperature robust SOI ethanol sensor”
 23. Vivanos JL, Racz Z, Cole M, Soto J and **Gardner JW** 2011 *Proc. Eurosensors XXV, Athens, Greece, September 4-7* “Detergents sensing system based on SH-SAW devices”
 24. Guha P, Santra S, Covington J, Udrea F and **Gardner JW** 2011 *Proc. Eurosensors XXV, Athens, Greece, September 4-7* “Zinc oxide nanowire based hydrogen sensor”
 25. Racz Z, Cole M, **Gardner JW**, Pathak S, Jordan M, and Challiss RA 2011 *Proc. Transducers 11, Beijing, China June 5-9* “Cell-based surface acoustic wave resonant microsensor for biomedical agent detection”
 26. responses using surface acoustic wave biosensors”
 27. Karout S, Racz Z, Capurro A, Cole M, **Gardner JW** and Pearce TC 2011 *Proc. 14th Int Symp on Olfaction and Electronic Nose, New York, May 3-5 AIP Conf. Proc. 1362 77-78* “Ratiometric chemical blend processing with a neuromorphic model of the insect macroglomerular complex”
 28. Aziz M, Che Harun F, Covington J and **Gardner JW** 2011 *Proc. 14th Int Symp on Olfaction and Electronic Nose, New York, May 3-5 AIP Conf. Proc. 1362 223-224* “Towards an analogue neuromorphic VLSI instrument for the sensing of complex odours”
 29. Covington J, Ouaret N, **Gardner JW**, et al. 2011 *Proc. 14th Int Symp on Olfaction and Electronic Nose, New York, May 3-5 AIP Conf.* “Detection and identification of inflammatory bowel disease by electronic nose”
 30. Ali SZ, Ho W, Chowdhury F, Covington J, Moseley P, Saffell J, **Gardner JW** and Udrea F 2011 *Proc. 14th Int Symp on Olfaction and Electronic Nose, New York, May 3-5 AIP Conf. Proc. 1362 53-54* “A high temperature SOI CMOS NO₂ sensor”
 31. **Gardner JW** and Taylor JE 2011 *Proc. Biomedical Engineering, February 16-18, Innsbruck, Austria* “Novel convolution based signal processing technique for an artificial olfactory mucosa”
 32. Invited paper: Pathak S, Jordan M, Racz Z, Challiss RA, **Gardner JW** and Cole M 2011 *Proceedings of EU FET Conference, May 4-6, Budapest, Hungary* “Detection of ligand-elicited secondary cellular responses using surface acoustic wave biosensors”
 33. Garcia-Guzman, **Gardner JW** and Cole M 2010 *Proc. Eurosensors XXIV, September 5-8 2010, Linz, Austria* “A duo-type smart gas sensor ASIC chip for use with resistive materials”
 34. Invited paper: **Gardner JW** 2010 *3rd IBEC Symposium on Bioengineering and Biomedicine, Barcelona, Spain, 9-10 April 2010* “Artificial olfaction: a Warwick perspective”
 35. Invited paper: **Gardner JW** 2010 *EC FP7 COST nanoTP Workshop, Berlin, Germany, 18-19 March 2010* “CMOS based gas sensors: progress and problems”
 36. Invited paper: **Gardner JW** *Proceedings of EC Advanced Workshop on Infochemical Communication, Granada, Spain, 10-11 March 2010* “Smart piezoelectric chemoreceiver”
 37. Cole M, **Gardner JW**, Pathak S, Racz Z, Challiss R and Markovic D 2010 *Proceedings of 7th IASTED International Conference on Biomedical Engineering, Innsbruck, Austria, 17-19 Feb, 2010, pp.195-201 ISBN: 978-0-88986-826-7* “Cell-based acoustic sensors for biomedical applications”
 38. Invited paper: **Gardner JW** *Proceedings of EC Advanced Workshop on Infochemical Communication, Granada, Spain, 10-11 March 2010* “Smart piezoelectric chemoreceiver”
 39. Invited paper: **Gardner JW** 2010 *EC FP7 COST nanoTP Workshop, Berlin, Germany, 18-19 March 2010* “CMOS based gas sensors: progress and problems”

40. Cole M, **Gardner JW**, Pathak S, Racz Z, Challiss R and Markovic D 2010 *Proceedings of 7th IASTED International Conference on Biomedical Engineering, Innsbruck, Austria, 17-19 Feb, 2010, pp.195-201* ISBN: 978-0-88986-826-7 "Cell-based acoustic sensors for biomedical applications"
41. Covington JA and **Gardner JW** 2009 *Olfaction and Electronic Nose: Proceedings of the 13th International Symposium*, edited by M. Pardo and G. Sberveglieri, American Institute of Physics 978-0-7354-0674-2/09 "Carbon nanomaterial polymer composite ChemFET and chemoresistors for vapour sensing"
42. Taylor JE, Che Harun FK, Covington JA, and **Gardner JW** 2009 *Olfaction and Electronic Nose: Proceedings of the 13th International Symposium*, edited by M. Pardo and G. Sberveglieri, American Institute of Physics 978-0-7354-0674-2/09 "Applying convolution-based processing methods to a dual-channel, large array artificial olfactory mucosa"
43. Udrea F, Santra S, Guha PK, Ali SZ, Covington JA, Milne WI, **Gardner JW**, Maeng S 2009 *Olfaction and Electronic Nose: Proceedings of the 13th International Symposium*, edited by M. Pardo and G. Sberveglieri, American Institute of Physics 978-0-7354-0674-2/09 "Nanotubes and nanorods on CMOS substrates for gas sensing"
44. Santra S, Ali SZ, Guha PK, Hiralal P, Unalan HE, Dala SH, Covington JA, Milne WI, **Gardner JW**, Udrea F 2009 *Olfaction and Electronic Nose: Proceedings of the 13th International Symposium*, edited by M. Pardo and G. Sberveglieri, American Institute of Physics 978-0-7354-0674-2/09 "CMOS alcohol sensor employing ZnO nanowire sensing films"
45. Cole M, **Gardner JW**, Racz Z, Pathak Guerrero SA, Muñoz L, Carot G, Pearce TC, Challiss J, Markovic D, Hansson BS, Olsson S, Kübler L 2009 *Proceedings of IEEE Sensors Conference*, 978-1-4244-5335-1/09 "Biomimetic insect infochemical communication system"
46. Ali SZ, Santra S, Haneef I, Schwandt C, Kumar RV, Milne WI, Udrea F, Guha PK, Covington JA, **Gardner JW** 2009 *Proceedings of IEEE Sensors Conference*, 978-1-4244-5335-1/09 "Nanowire hydrogen gas sensor employing CMOS micro-hotplate"
47. Iwaki T, Covington JA, **Gardner JW**, Udrea F 2009 *Proceedings of Transducers, Denver, CO, USA, June 21-25, 2009, pp592-592* "Novel dual transient temperature modulation technique for multi-vapour detection"
48. Cole M, **Gardner JW**, Pathak S, Pearce TC, Racz Z 2009 *Procedia Chemistry* **1** 305-308, Proceedings of the Eurosensors XXIII conference, Lausanne "Towards a biosynthetic infochemical communication system"
49. Che Harun FK, Covington JA, **Gardner JW** 2009 *Procedia Chemistry* **1** 911-915, Proceedings of the Eurosensors XXIII conference, Lausanne "Portable e-Mucosa System: Mimicking the biological olfactory"
50. Best Poster Award: Santra S, Ali SZ, Guha PK, Udrea JW, Gardner JW and Milne WI "Carbon nanotube gas sensor integrated on CMOS substrate" *Cambridge CNT Symposium*, 11 December, Cambridge, 2008.
51. Invited Paper: Udrea F, Santra S and **Gardner JW**, "CMOS temperature sensors – concepts, state-of-the-art and prospects" *Proceedings of IEEE Conference CAS*, 13-18 October, Romania, 2008, pp31-40.
52. Udrea F, Ali SZ and **Gardner JW**, "CMOS micro-hotplate array design for nanomaterial-based gas sensors" *Proceedings of IEEE Conference CAS*, 13-18 October, Romania, 2008, pp143-146.
53. Santra S, Guha PK, Ali SZ, Haneef I, Udrea F, and **Gardner JW**, "SOI Diode Temperature Sensor Operated at Ultra High Temperatures – A Critical Analysis," *Proceedings of the 7th IEEE Conference on Sensors*, 26-29 October, Lecce, 2008, pp. 78-81.
54. Cole M, Leonte II, **Gardner JW**, and Hesketh P, "Identification of taste solutions and their binary mixtures using SH-SAW resonator-based taste sensor," *Proceedings of the 7th IEEE Conference on Sensors*, 26-29 October, Lecce, 2008, pp. 1556-1559.

55. Leonte I, Cole M and **Gardner JW** *Proceedings Eurosensors XXII*, 7-10 September 2008, Germany, pp558-561 “Multivariate analysis of SH-SAW based e-tongue sensors”
56. Che Harun FK, Taylor JE, Covington JA and **Gardner JW** *Proceedings 12th International Meeting on Chemical Sensors*, 13-16 July 2008, Ohio, 296-297 “Dual channel odour separation columns with large chemosensor arrays for advanced odour discrimination”
57. Invited Paper: **Gardner JW**, Southampton Electrochemistry Society, 7-8 April 2008 “The electronic nose; the early days”
58. **Gardner JW**, Nadarajan S and Kimber P, *Proceedings 6th IASTED International Conf Biomedical Engineering*, 13-15 February 2008, Austria, pp145-150, ISBN:978-0-88986-721-5 “Modelling and measurement of odour transportation within the human nasal cavity”
59. Invited Paper: **Gardner JW**, Covington JA, Tan SL and Pearce TC *GOSPEL Workshop on Bio-inspired Signal Processing, Barcelona, Spain, 24-26 January 2007*, “A biologically-inspired artificial olfactory mucosa”
60. **Gardner JW**, Apostolidou A, Cole M, Dowson C, Edmunds S, and Sehra G, *Proc. Biomedical Engineering 2007*, Austria, Feb 2007. “Towards a low-cost optical biosensor system for biomedical immunoassay applications”
61. **Gardner JW**, Tan SL, Covington JA and Pearce TC, *Technical Digest of Transducers and Eurosensors 2007*, pp 2465-2467, Lyon, France, June 10-14, 2007 “Enhanced discrimination of complex odours based upon spatio-temporal signals from a micro-mucosa”
62. **Gardner JW** and Taylor JE, *Technical Digest of Transducers and Eurosensors 2007*, pp 2473-2476, Lyon, France, June 10-14, 2007 “Novel convolution based signal processing techniques for a simplified artificial olfactory mucosa”
63. Tan SL, Covington JA, **Gardner JW** and Pearce TC, *AsiaSim 2007, Seoul, Korea, October 10-12, 2007* “Finite element simulation of biomimetic olfactory microsystem for spatio-temporal signal generation”
64. Iwaki T, Covington JA and **Gardner JW**, *Proc. of IEEE Sensors 2007 conference*, pp 1229-1232, Atlanta, USA, October 28-21, 2007 “Identification of vapours using a single carbon black/polymer composite sensor and a novel temperature modulation technique”
65. Che Harun FK, King PH, Covington JA and **Gardner JW**, *Proc. of IEEE Sensors 2007 conference*, pp 1361-1363, Atlanta, USA, October 28-21, 2007 “Novel gas chromatographic microsystem with very large sensor arrays for advanced odour discrimination”
66. Udrea F, Maeng S, **Gardner JW** et al., *Proc. of IEEE Electron Devices Meeting*, pp 831-834, Washington DC, USA, December 9-12, 2007 “Three technologies for a smart miniaturized gas sensor: SOI CMOS, micromachining and CNTs – challenges and performance”
67. Cole M, Mutukwa SS, Briand D, de Rooij NF and **Gardner JW** *Proceedings of ISOEN, St. Petersburg, Russia, 3-5 May 2007* “SH-SAW dual delay line based e-tongue system with improved discrimination capabilities”
68. Keynote paper: **Gardner JW**, *Eurosensors XX, Gothenberg, Sweden, Sept. 2006*. “Technologies for chemical sensors and microsystems”
69. Iwaki T, Covington JA, **Gardner JW**, Udrea F, Blackman CS and Parkin IP, *Proc. IEEE Sensors Conference, Korea, Oct. 2006*. “SOI-CMOS based single crystal silicon micro-heaters for gas sensors”.
70. Ali SZ, Guha PK, Lee CC, Udrea F, Milne WI, Iwaki T, Covington JA and **Gardner JW**, *Proc. IEEE Sensors Conference, Korea, Oct. 2006*. “High temperature SOI CMOS tungsten micro-heaters”.
71. Khawaja J, Cole M, **Gardner JW**, *Eurosensors XX, Gothenberg, Sweden, Sept. 2006*. “Gold nanoparticle CMOS sensor for VOC detection”
72. **Gardner JW**, Covington JA, Tan SL, and Pearce TC, *Eurosensors XX, Gothenberg, Sweden, Sept. 2006*. “A biologically inspired artificial olfactory mucosa”

73. Guha PK, Ali SZ, Udrea F, Milne WI, Iwaki T, Covington JA and **Gardner JW**, *Euroensors XX, Gothenberg, Sweden, Sept. 2006*. "Novel design and characterisation of SOI CMOS micro-hotplates for gas sensors"
74. Covington JA, Tan SL, Pearce TC, Hamilton A and **Gardner JW**, "Towards a truly biomimetic olfactory microsystem: an artificial olfactory mucosa", *IET Seminar on MEMS Sensors & Actuators*, London, pp.107-112, ISBN 0 86341 627 6, (Apr 2006)
75. Covington JA, Tan SL, Pearce TC, Hamilton A and **Gardner JW**, *Proc. of IET Seminar on MEMS Sensors & Actuators*, 27-28 April 2006, London, UK, "Towards a truly biomimetic olfactory microsystem: an artificial olfactory mucosa"
76. Koickal TJ, Hamilton A, Pearce TC, Tan SL, Covington JA, and **Gardner JW**, *Proc. IEEE Circuits & Systems Symposium (ISCAS)* May 2006, "Analog VLSI design of an adaptive neuromorphic chip for olfactory systems"
77. **Gardner JW**, Beeby L, Chappell M, Udrea F, Yates J and Dowson CG, *Proc. of the 24th IASTED International Multi-conference Biomedical Engineering*, 15-17 Feb. 2006, "Identification of staphylococcus aureus infections by volatile chemical headspace analysis"