

Curriculum vitae

John Frederick Currie

ACADEMIC BACKGROUND					
Degree	Name of Discipline	Institution		Country	Year
Bachelor's	Physics and Mathematics	University of Toronto		Canada	1973
Master's	Physics	University of Toronto		Canada	1974
Doctorate	Physics	Cornell University		U.S.A.	1977
Other: P.Eng.	Engineering Physics/ Electrical Engineering	Québec Professional Eng.		Canada	1980
ACADEMIC, RESEARCH AND INDUSTRIAL EXPERIENCE					
Position Held (begin with most recent)		Institution	Department	Period	
Full Professor		Georgetown University	Dep't. of Physics & Dep't. of Pharmacology	97-date	
Director GAEL: Georgetown Advanced Electronics Laboratory - Health Microsystems		Georgetown University		97-date	
Visiting Scientist		Walter Reed Army Institute of Research – Silver Spring MD	Resuscitative Medicine & Biomedical Engineering	2003-5	
Member, CITR (Canadian Institute for Telecommunications Research) Centres of Excellence		McGill University	Electrical Eng	96-98	
Adjunct Professor		McGill University	Electrical Eng.	96-98	
Member POLNOR, TENOR projects		Noranda/École Polytechnique	Adv.Mat.Div.	94-97	
Member GRESIP		École Polytechnique	Paper Sci.&Eng.	94-97	
PAPRICAN Faculty Associate		Can.Pulp & Paper Inst.	P&P Qual.Proc.	93-97	
Director, LISA		École Polytechnique	Eng. Physics	92-97	
Associate Director, GCM		École Polytechnique/U de M	Thin Film Group	90-95	
Director, MODFAB		École Polytechnique/U de M	Device Fabr.Lab	90-96	
Full Professor		École Polytechnique	Eng. Physics	89-97	
Director, ÉMMÉE		École Polytechnique/Concordia	Device Team	86-97	
Head, Solid State Physics		École Polytechnique	Eng. Physics	86-97	
NSERC Senior Industrial Fellow		BNR and Northern Telecom	Adv.Techn.Lab.	83-84	
Associate Professor		École Polytechnique	Eng. Physics	82-89	
Assistant Professor		École Polytechnique	Eng. Physics	78-82	
NSERC Postdoctoral Fellow		Massachusetts Inst.Technology	Phys. Chem. & Materials Sci.	77-78	
TRAINING OF RESEARCH PERSONNEL					
Total number of graduate students and postgraduate fellows supervised or co-supervised					
32 master's students		9 doctoral students		23 postdoctoral fellows	
Total number of other students, technical staff research associates or engineers trained					
31 undergraduate research projects / trainees		12 technicians		14 research associates /	

July 2004

Summary of Most Significant Recent Research Contributions

a) GAEL, standing for the Georgetown Advanced Electronics Laboratory, was founded at GU by Prof. Currie in 1997 and is a unique laboratory to make and to pattern thin solid films of metals, insulators and semiconductors on the scale of nanometers and to assemble these films into fully operating micro-devices. It is a 2000 square foot facility including 1200 square feet of clean-room space (classes 100 through 1000) in which design, lithographic, fabrication, packaging, characterization and test equipment is located.

b) Health Micro-systems: Prof. Currie's research group called the GAEL - Health Microsystems Group (GHMG) has as its mission is to improve health care and quality of life through the design, fabrication and testing of integrated micro-monitoring systems and drug delivery micro-systems, using state-of-the-art Physical Science, Pharmacology, and Bio-Engineering Technologies. These technologies include solid state physics, physical chemistry, materials science, advanced electronics, microelectronics, micro-fluidics, and bio-technical engineering. GHMG produces new drugs by developing of novel devices to administer existing drugs, and researches novel methods to ensure compliance, to monitor health, and to administer drugs at optimal times when the need arises. GHMG develops novel sensors and actuators using a variety of state-of-the-art solid state physics and micro-electronics technologies, micro-machining and advanced thin film materials such as super ionic conductors, superconductors, spin-on-glasses, III-V compound semiconductors, and metal multi-layers. GHMG has an extensive experience in thin-film deposition and characterization techniques, surface analysis, solid state physics, silicon micro-machining and MEMS (Micro Electro-Mechanical Systems). GHMG is currently concentrating of the design and production of novel gas sensors, thermometers, heaters, pressure sensors, micro-fluidic systems, bio-medical medicine delivery devices, and shape-memory alloy devices. A major research theme is the design and fabrication of non-invasive and chemically highly selective patient monitoring systems.

c) Bio MEMS: With DARPA support, we have fabricated a prototype micro-fluidic platform system, called BFIT (Bio-Fluidic Integrated Transdermal Microsystem), for the non-intrusive, sequential, real-time transdermal sampling & analysis of molecules that ordinarily do not diffuse across the skin, such as polar molecules. The BFIT provides an individual, personal baseline while being both disposable and sterile. Our approach employs the non-invasive sampling of living tissue, in a unique and minimally disruptive fashion, retrieving an insignificant volume of interstitial fluid ($\ll 10$ ng). The monitoring is time controlled and can cover short- or long-term time periods (days-months). It is an absolute measurement with no need for an external or on-board glucose reference. Finally, it is being generalized to monitoring almost any moderately hydrophilic/soluble bio-molecule of molecular weight less than 60k Daltons, as are commonly found in measurable concentrations in the interstitial fluid just under the skin's stratum corneum. Biologically, we sample, analyze and record the concentration of glucose and of lactate in the interstitial fluid as a stress and shock/trauma physiological indicator. We have proven both optical and electrical implementations of the transduction technology. Finally, we have adapted wireless control circuitry (RRAPDS), currently used in the field to monitor Army missiles and munitions, to the control and remote reporting of the BFIT's glucose and lactate assays

d) Semiconductor Device Design, Fabrication and Test. Prof. Currie has worked on both the basic physics and engineering of semiconductor devices for microelectronics and photonics, covering the complete span from design and fabrication technology, through to characterisation and assembly into systems, and eventually to commercialisation. His research covers all 3 of the main semiconductor families; Silicon MOS, polycrystalline & amorphous; III V In Ga As P, and calcogenides: Se. A major impact is the discovery of a novel interface engineering technique for InP based Metal Insulator Semiconductor (MIS) structures, fundamental work addressing surface physics, passivation, and the formation of interface control layers, and finally and means to use this to fabricate the first high speed InP/InGaAs Heterojunction Insulated Gate (HIG)FET devices. Circuits using these devices operate at frequencies as high as 6GHz.

e) Multilayer thin film Physics and Technology: This very productive area covers both the electrical, mechanical, and structural physics of multilayer thin films as well as the high vacuum physics and technology required to produce them. Two of the highest impact applications are those of i) diffusion barrier metalisation to silicon which have specific optical, electrical properties to assure high integrated circuit reliability, and ii) solid state superionic conducting films for alkaline micro ionic devices.

f) Sensor and Actuators: Micro devices and SYSTEMS: Using the fundamental science and engineering results Prof. Currie has focused on three specific areas: opto-electronics, micro electromechanics(MEMS), and electrochemical to produce systems which address specific practical needs, are commercially strategic, and are easily mass manufactured. These projects are mostly undertaken with Industrial Partners. Systems developed were i) fast analogue sampling circuits, ii) charge coupled devices, iii) magnetic sensors, iv) nonlinear optical detectors, v) bio compatible drug delivery systems, vi) environmental monitoring and control sensors and actuators.

g) Physics and Chemistry of Surfaces and Interfaces: Prof. Currie was one of the first in the world to use the highly original nuclear scattering technique of Elastic Recoil Detection for the study of thin films, interfaces and surfaces, mostly for electronic and physico chemical applications. These ERD which are highly sensitive to composition measurements are coupled with other surface techniques such as XPS, AES, SIMS, STM, AFM, XRD as well as with electron microscopy (SEM, TEM) to elucidate specific chemical bonding and structural phenomena.

h) Science and Technology Transfer, Prototyping, Pre commercialisation: For years national granting agencies have encouraged their researchers to make an effort to translate their research results into partnerships which have high socio economic benefit. Prof. Currie has worked to protect strategic research results, and to establish working, mutually beneficial collaborations and partnerships with companies. Where the required expertise exceeds the applicant's current abilities, strategic alliances have been formed with world leading laboratories.

OTHER EVIDENCE OF IMPACT AND CONTRIBUTIONS

Noranda Professor for Advanced Materials (NORMA) 1996;

with a 1-year R&D mandate to add value to precious metals and semi-metals which are produced by NORANDA & its Division NORAM by developing novel manufactureable solid state processing technologies, devices, components and systems, opening new markets and create new products and business opportunities.

Membership on Grant Selection Committees:

- A) Quebec Ministry of Higher Education and Science(MESSQ), FCAR Research Centre 90-93.
- B) Quebec Ministry of Higher Education and Science(MESSQ), FCAR College Researchers 91-5;
- C) NSERC Strategic Grants : Information Technology and Manufacturing Systems 92-95.
- Chairman 1995

Membership on advisory boards:

- 88-93 National Code Committee:Standards Council of Canada & International Electrotechnical Commission: Photovoltaics.
- 87-91 Federal Ministry of EMR Member of Photovoltaic Energy Technical Advisor.
- 92-93 President, U. of Montreal's Evaluation Committee: Department of Chemistry.

Membership in Professional Societies:

- Quebec Order of Engineers, active in the Junior Engineer Apprenticeship Program: (9 apprentices)
- American Physical Society (Condensed Matter/ Solid State section).
- IEEE elected Senior Member (Electron Devices, LEOS,Microwave,Circuits, Management Sections).
- Research Fellowships 83-4: NSERC Senior Industrial Fellowship & Northern Telecom Fellowship.
- Referee/ Reviewer for J.Appl.Phys., Phys. Rev., and Can.J. Phys., as well as for NSERC, FCAR, NSF.

Awards of Excellence:

- École Polytechnique Director's Excellence award: 1984, 1994; University/Industry Collaboration Excellence award: 1984, 1994.
- Quebec Order of Engineers & Quebec Ministry of Industry, Quebec Inventors Grand Prize 1996: First Place, Salaried Employees Category for Implantable Micro Drug Dispensing System.
- École Polytechnique's 1996 nominee for the Bell-Forum-Xerox Award for Excellence in University-Industry

Membership in National Centers of Excellence:

- Responsible for the Photonic technology program in the Institute of Telecommunication Research Center of Excellence (1995-date)

REFEREED JOURNAL PUBLICATIONS

Articles accepted for publication after examination by a journal editor and at least two experts:

2004

214. J. Currie, M. Bodo, and F. Pearce., Novel Non-Intrusive Trans-dermal Remote Wireless Micro-fluidic Monitoring System Casualty Care and Combat Readiness Assessment , 2004 NATO- Research and Technology Agency, Human Factors and Medicine SYMPOSIUM on Combat Casualty Care. NATO-HFM-109/RSY
213. A. Gadre, A. Nijdam, J. Garra, A. Monica, M. Cheng, C. Luo, Y. Srivastava, T. Schneider, T. Long, R. White, M. Paranjape, J. Currie, "Fabrication of a Fluid Encapsulated Dermal Patch Using Multi-layered SU-8", *Sensors and Actuators A-114*, pp. 478-485, 2004.
- 212 C. Luo, A. Govindaraju, J. Garra, T. Schneider, R. White, J. Currie, M. Paranjape, "Releasing SU-8 Structures Using Polystyrene as a Sacrificial Material", *Sensors and Actuators A-114*, pp. 123-128, 2004.
211. A. Leeds, E. Van Keuren, M. Durst, T. Schneider, J. Currie, M. Paranjape, "Integration of Micro-Fluidic and Micro-Optical Elements Using a Single-Mask Photolithographic Step", *Sensors and Actuators A-115*, pp. 571-580, 2004.
210. Y. Srivastava, A. Gadre, T. Hylton, A. Monica, T. Schneider, R. White, M. Paranjape, J. Currie, "Polymethylmethacrylate Membrane for Fluid Encapsulation and Release in Microfluidic Systems", *J. Vac. Sci. Tech. A22(3)*, pp. 1067-1072, 2004.
209. M. Cheng, J. Garra, A. Gadre, A. Nijdam, C. Luo, T. Schneider, R. White, J. Currie, M. Paranjape, "Dry Release of Polymer Structures with Anti-Sticking Layer", *J. Vac. Sci. Tech. A22(3)*, pp. 837-841, 2004.
208. E. Van Keuren, O. Albertini, M. Cheng, J. Currie, C. Luo, M. Paranjape, "Fluorescent Micro-Thermal Imaging of MEMS Heaters", *Sensors and Materials*, pending, 2004

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201. M. Paranjape, J. Garra, S. Brida, T. Schneider, R. White, J. Currie, "A PDMS Dermal Patch for Non-Intrusive Transdermal Glucose Sensing", *Sensors and Actuators – A104*, pp. 195-204, 2003.

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187. E. Van Keuren, J. Currie, M. Nelson, M. Paranjape, T. Schneider, R. Smith, P. Treado, J. Ward, R. White, (2002), "Three Dimensional Thermal Effects in MEMS Devices", *Proceedings of the Materials Research Society Symposium687*, pp. B.1.3.1-6.
- 186, Ressejac IC, Landsberger LM, Currie JF,, (2002) Micromachining and operation of a bistable electrothermal actuator , *Canadian Journal Of Electrical And Computer Engineering* 27 (1): 41-45 (4pages)
185. J. Garra, T. Long, J. Currie, T. Schneider, R. White, M. Paranjape, "Dry Etching of Polydimethylsiloxane for Microfluidic Systems", *Journal of Vacuum Science and Technology*, A20, pp. 975-982, 2002
184. C. Luo, J. Garra, T. Schneider, R. White, J. Currie, and M. Paranjape, "Determining Local Residual Strains of Polydimethylsiloxane Using Ink Dots, and Stiffening Polydimethylsiloxane Using SU-8 Particles", *Journal of Micromechanics and Microengineering*, 12, pp. 677-681, 2002.
183. C. Luo, T. Schneider, R. White, M. Paranjape, and J. Currie, "A FEA Deflection-Testing Method to Determine Poisson's Ratio for MEMS Applications", *Journal of Micromechanics and Microengineering*, 13, pp. 129-133, 2002.
182. T. Schneider, R.C. White, M. Cheng, J. Garra, M. Paranjape, J. Currie, "MEMS Bubble Actuated Valve for Interstitial Glucose Sensing", *Proceedings of the Electrochemical Society – Symposium on Microfabricated Systems and MEMS IV*, pp. 153-160, 2002.

2001

171. Ressejac IC, Landsberger LM, Currie JF (2001) Bistable microelectrothermal actuator in a standard complementary metal-oxide-semiconductor process *Journal Of Vacuum Science & Technology* A18:
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746-749 (4pages)

170. J.F. Currie, S.M. Richie, and S.D. Serre, (2001) Surface Acoustic Wave Mercury Vapor Sensor, IEEE-ASME Reports. CRTD-01-26. (12 pages).
169. Tashtoush A, Landsberger LM, Essalik A, Kahrizi M, Paranjape M, Currie JF, (2001) Pandy A, Experimental characterization of the Si/Al/tetramethylammonium hydroxide system ; Journal Of The Electrochemical Society 148 (7): C456-C460 (5pages)

1999

157. V. Fortin, S. C. Gujrathi^a, G. Gagnon^b, R. Gauvin and J. F. Currie, (1999), The effect of in-situ plasma oxidation of TiN diffusion barrier for AlSiCu/TiN/Ti metallization structure of integrated circuits, J. Vac. Sci. Tech. B 17 (2), pp-423-431 (9pages)
156. V. Fortin, R. Gauvin, G. Gagnon, M. Caron, S.C. Gujrathi, J.F. Currie, (1999) Field emission scanning electron microscopy to study thin film multilayers of integrated circuits. J. Vac. Sci. Tech. (6pages)
155. J. F. Currie, A. Essalik, and J-C. Marusic, (1999) Micromachined Thin Film Solid State Electrochemical CO₂, NO₂ and SO₂ Gas Sensors, Sensors and Actuators –**Chemical 59(2-3): p235-241 (7pages)**.
154. Renault O, Briand D, Delabouglise G, Labeau, M., Currie, J.F., (1999), Integration of a sensitive material to a silicon-based device for CO detection Sensors And Actuators A-Physical 74 (1-3): 225-228 APR 20 1999 (4pages)

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152. V. Fortin, G. Gagnon, M. Caron, S.C. Gujrathi, J.F. Currie, L. Ouellet, Y. Tremblay and M. Biberger, The determination of phases formed in AlSiCu/TiN/Ti contact metallization structure of integrated circuits by X-ray diffraction, J. Appl. Phys., 83 (1), 132-138 (1998).
151. S.C. Gujrathi, G. Gagnon, V. Fortin, M. Caron, J.F. Currie, L. Ouellet and Y. Tremblay, (1998). Elastic recoil detection using time-of-flight for analysis of TiN/AlSiCu/TiN/Ti contact metallization structure, Nuclear Instruments and Methods in Physics Research B137, 661-668, (8p).
150. B. Nikpour, S. Naseh, L. Landsberger, M. Kahrizi, M. Paranjape, R. Antaki, and Currie, J.F., (1998) Release Control Structures for Cantilever Based Sensors, Sensors and Materials, Vol. 10, No. 5, pp. 287-297, (11p)
149. Briand, D., Labeau, M., Currie, J.F., and Delabouglise, G., (1998), Pd-doped SnO₂ thin films deposited by assisted ultrasonic spraying CVD for gas sensing: selectivity and effect of annealing., Sensors and Actuators B48, pp395-402 (8p).
1148. Essalik A., Marusic J-C. & Currie, J.F., (1998), Study of a New Solid Electrolyte Thin Film Based Micropotentiometric Carbon Dioxide Gas Sensor. J. New. Mat. Electrochem. Syst., 1, pp67-70 (4p).
147. Yip, R.Y.-F., Ait-Ouali, Bensaada, A., Desjardins, P., Beaudoin, M., Isnard, L., Brebner, J.L., Currie, J.F., and Masut, R.A., (1998), Strain and Relaxation Effects in InAsP/InP Multiple Quantum Well Optical Modulator Devices grown by Metalorganic Vapour Phase Epitaxy, J. Applied Physics. 83, pp1758-69 (12p)
146. Yip RYF, Desjardins P, Isnard L, Ait-Ouali, Bensaada, A., Beaudoin, M., Brebner, J.L., Currie, J.F., and Masut, R.A., Band alignment and barrier height considerations for the quantum-confined Stark effect Journal Of Vacuum Science & Technology A-Vacuum Surfaces And FILMS 16 (2): 801-804 MAR-APR 1998 (4pages)
145. Leclerc S, Lecours A, Caron M, and J.F. Currie (1998) Electron cyclotron resonance plasma chemical vapor deposited silicon nitride for micromechanical applications, Journal Of Vacuum Science & Technology A-Vacuum Surfaces And Films 16 (2): 881-884 MAR-APR 1998 (4p).
144. Leclerc S, Antaki R, Currie JF, Novel simple and complementary metal-oxide-semiconductor-compatible membrane release design and process for thermal sensors, Journal Of Vacuum Science & Technology A-Vacuum Surfaces And Films 16 (2): 876-880 MAR-APR 1998

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142. Yip RYF, Ait-Ouali A, Bensaada A, Desjardins, P., Beaudoin, M., Isnard, L., Brebner, J.L., Currie, J.F., and Masut, R.A., Strain and relaxation effects in InAsP/InP multiple quantum well optical modulator devices grown by metal-organic vapor phase epitaxy (vol 81, pg 1905, 1997) Journal Of Applied
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141. Yip RYF, AitOuali A, Bensaada A, Desjardins, P., Beaudoin, M., Isnard, L., Brebner, J.L., Currie, J.F., and Masut, R.A., Strain and relaxation effects in InAsP/InP multiple quantum well optical modulator devices grown by metal-organic vapor phase epitaxy, JOURNAL OF APPLIED PHYSICS 81 (4): 1905-1915 FEB 15 1997

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140. Cuireanu, P., Rudkowski, P., Rudkowska, G., Ménard, D., Britel, M., Currie, J.F., Ström-Olsen J.O., and Yelon, A., (1996) Giant, Magnetoimpedance Effect in Soft and Ultrasoft Magnetic Fibres, J. Appl. Phys. 79, pp5136-8 (3p)
139. Cuireanu P, Rudkowski P, Rudkowska G, , Ménard, D., Britel, M., Currie, J.F., Ström-Olsen J.O., and Yelon, A., (1996) The magnetoimpedance effect in rapidly solidified soft magnetic fibers, Journal Of Magnetism And Magnetic Materials 158: 432-433 MAY (2p.)
138. Shah, S.A., Zeng, A., Wong, W.S., Jackson, M.K., Pouliot, L., Lecours, A., Currie, J.F., (1996) Separating temporally-overlapped waveforms with electrooptic sampling; OPTICAL AND QUANTUM ELECTRONICS 28 (7): 953-960 JUL 1996 (8p).
137. Shah, S.A., Zeng, W.S., Jackson, M.K., Pouliot, L., Lecours, A., Currie, J.F., (1996) Guided Substrate Waves in Photoconductive Excitation. IEEE Guided Wave Letters., 6, (3p) pp309-311, (3p)
136. Gagnon, G., Gujrathi, S.C., Caron, M., Currie, J.F., Tremblay, Y., Ouellet, L., Biberger, M., Reynolds, R., (1996) The influence of the oxidation of TiN on the stability of the Al/TiN interface. J. Appl. Phys. 80, pp.188-95 (8p).
135. Shah, S.A., Zeng, A., Wong, W.S., Jackson, M.K., Pouliot, L., Lecours, A., Currie, J.F., (1996) Millimeter-Wave Time-Resolved Measurement Near a Discontinuity: Separating Temporally Overlapped Incident and Reflected Signals. IEEE Microwave Microwave & Guided Wave Letters, 6, pp79-81, 3p.
134. Caron, M., Gagnon, G., Fortin, V., Currie, J.F., Ouellet, Tremblay, Y.L., Biberger, M., Reynolds, R., (1996) Calculation of Al-Ti-O-N Quaternary Isotherm Diagram for the Prediction of Stable Phases in TiN/Al Alloy Contact Metallization., J. Appl. Phys. 79, pp4468-70 (5p).
133. Gagnon, G. Currie, J.F., Brebner, J.L., Darwall, T., (1996) Efficiency of TiN Diffusion Barrier between Al and Si Prepared by Reactive Evaporation and Rapid Thermal Annealing. J. Appl. Phys. 79, 7612-20 (199p).
132. Lecours, A., Currie, J.F., Caron, M., Turcotte, Cuireanu, P., Ivanov, D., (1996) Laser Patterning of Thin Film Electrochemical Gas Sensors. Applied Surface Science, C70, pp441-6 (6p).
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130. Ouellet, L. Tremblay, Y., Gagnon G., Caron, M., Currie, J.F., Gujrathi, S.C., Biberger, M., Reynolds, R., (1996) The effect of oxygen plasma exposure on the reliability of a Ti/TiN contact metallization. J. Appl. Phys. 79, pp4438-43 (6p).
129. Ouellet, L. Tremblay, Biberger, M., Y., Gagnon G., Caron, M., Currie, J.F., Gujrathi, (1996) The effect of the Ti glue layer in an integrated Ti/TiN/Ti/AlSiCu/TiN contact metallization process. J.Vac.Sci.Tech.B14, pp.2627-2635 (19p).
128. Ouellet L, Tremblay Y, Gagnon G, Caron, M., Currie, J.F., Gujrathi, S.C., Biberger, M., Reynolds, R., (1996) Effect of the Ti/TiN bilayer barrier and its surface treatment on the reliability of a Ti/TiN/AlSiCu/TiN contact metallization, JOURNAL OF VACUUM SCIENCE & TECHNOLOGY B 14 (6): 3502-3508 NOV-DEC 1996; (7p).
127. Izquierdo, R., Hanus, F., Lang, T., Ivanov, D., Meunier, M., Laude, L., Currie, J.F., Yelon, A. (1996) Pulsed Laser Deposition of Nasicon Thin Films, Appl. Surf. Sci. 96-8, pp855-8 (4p).
126. Meunier, M., Izquierdo, R., Shen, B., Lecours, A., Allard, M., Bergeron, A., Hanus, F., Boughaba, S., Ivanov, D., Currie, J.F., Laude, L., Yelon, A., (1996) Applications of Laser Processing for Sensors and Actuators., Proc. MRS-397, pp305-316 (12p).
125. Lang, T., Caron, M., Izquierdo, R., Lecours, A., Pouliot, L., Ivanov, D., Currie, J.F., and Yelon, A., (1996) Characterisation of sodium-ion conductive thin-film ceramics for smart CO₂ sensors. Sensors & Actuators: B Chemical 31, pp 9-12 (6p).
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113. Shi, M.K., Legros, A., Mouton, A., Selmani, A., & Currie, J.F., Crystallisation of vacuum evaporated Se studied by near infrared microscopy, (1995) J. Mater. Sci. Lett. 14, pp 1278-80 (3p).
112. Diawara, Y., Currie, J.F., Yelon, A., Petrova-Koch and Nikolov, A. (1995) Temperature Dependence of Stresses and H-Desorption in Porous Silicon, Mat. Res. Soc. Proc. 358, pp 555-560 (6p).
111. Ivanov, D., Caron, M., Ouellet, L., Hendricks, N., Currie, J., (1995) Dielectric Properties of Barium Strontium Titanate Thin Films, J. Appl. Phys. 77, pp 2666-2671 (6p).
110. Sundararaman, C.S. & Currie, J.F., (1995) Characteristics of SiN/InP/In_{0.53}Ga_{0.47}As/InP Hetero-structure Insulated Gate (HIG) FETs with an In₂S₃ Interface Control Layer. IEEE Trans. Electron Devices 42, pp 1197-1199 (3p).
109. Sundararaman, C.S., Mihelich, P., Masut, R., and Currie, J.F., (1994) Conductance Study of InP/Si₃N₄ MIS Capacitors with an In₂S₃ Interface Control Layer; Applied Physics. Lett. 64, 2279-2281 (3p).

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102. Cova, P., Masut, R.A., Lacoursière R., Tran, Ch. Anh, Bensaada, A., and Currie, J.F., (1994) Combustion of Effluent Gases from a Metal-Organic Vapor Phase Epitaxy System; Combustion Science & Technology, 97, pp 1-11, (12p).

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96. Béique, G., Caron, M., Currie, J.F., & Meunier, M., Caractérisation structurale de couches minces de silicium polycristallin fabriquées par LPCVD du SiH₄ dopées en phosphore in-situ (1995) (Can. J. Phys.) 73, 526-529 (4p).
95. Diawara, Y., Lafontaine, H., Chaker, M., Pépin, H., Cochrane, R.W., Currie, J.F., Kieffer, J.C., Haghiri-Gosnet, A.M., Ravet, M.F., and Rousseaux F., (1993) Rapid thermal annealing for low stress W X-Ray mask absorber J. Vac. Sci. Tech. B11, pp 296-300 (5p).
94. Sundararaman, C.S. & Currie, J.F., (1993) Self-aligned passivated MISFETs on InP, Can. J. Phys., 70, pp 1035-9 (4p).
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33. d) Landau Theory pp. 2491-2493 (3 pages).

Technical Reports

A total of 18 over the last six years for groups including: DARPA, ARMY/ARO/ National Research Council, Federal Ministry of Energy Mines and Resources, Alcan Research, IBM, OMVPE Technologies, and Ecole Polytechnique. In all, over 2000 pages.

Books

41. Bertrand, L., Bures, J., Currie, J.F., Faucher, G., Martin, F., Saint-Dizier J.P., (1988) Physique I: Apprentissage Individualisé. ISBN 2-553-00120-7 (Editions Ecole Polytechnique).
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TRAINING OF RESEARCH PERSONNEL

(code: L.N; L=level: M=M.Sc.A., D=Ph.D. & P=Postdoc Fellow; R=Research Staff Engineer/Associate, T=Technical staff; N=# in chronological order)

Employment History of Graduate Students:

- D.07 Yip, R.(97) Tencor Ltd. CA
D.05 Sundararaman, Chetlur (93) Manager ULSI Test, AT&T Microelectronics
M.24 Hao, X.-B., 95; Opto-Electronics Component Engineer, Sensitron Semiconductor Inc., NY
M.28 Mashayeki, Massoud Ph.D. Student in Integrated Optics.
M.25 Chtchvyrkov, D., 95; Engineer, CAE, Montreal.
D.06 Gagnon, G., 94; Bombardier Ltd. Mirabel PQ
M.23 Yip, R., 94; Ph.D. Student, École Polytechnique, InP-based long wavelength laser diode.
M.22 Tazlauanu, M., 94; Ph.D. (96) Analytical Engineer, Semiconductor Insights, Kanata Ontario..
M.21 Létourneau, S., 94; Microelectronics Engineer, Northern Telecom, Ottawa.
M.20 Michelich, P., 94; Microelectronics MITEL SCC, Bromont Québec..
D.05 Chetlur, S., 93; Researcher, École Polytechnique; High Speed InP CCD project (&P.05).
M.19 Bouchard, H., 93; Systems Engineer, MicroCell Inc. (Montreal).
T.07 Gravel, Normand (96) High Speed Electrical Testing, GOAL ASIC Ltd.
P.07 Beaudoin, Mario (96) PDF in Physics at UBC
P.08 Lang, Thomas(95) Materilas Science Engineer, Tübingen Germany
P.09 Shi, M.K. (96) PDF in Surface Science, École Polytechnique
R.11 Rescousier, Alban(1996); Hautes Études Commerciales (France)
R.12 Hüller, Christoph(1996), Microelectronics, SGS Thomson
R.13 Mario Caron (1997) Research Scientist, Noranda Advanced Materials.
R.14 Lecours, Andre (1997) Director Engineering, Novimage/WideCOM Inc.
T.08 Turcotte, Gino (1997) Test & Packaging, GOAL ASIC Ltd.
R.15 Ivanov, Dentcho (1996) AT&T, Micro-Systems Manager
M.01 Fourcade, B. (1984) Assistant Professor, Physics, Simon Fraser University
M.02 Araj, N., (1984) Semiconductor Imaging Device Group Leader, Noranda Research Centre
M.03 Marcoux, J. (1984) Mitel Semiconductor Inc.; CMOS Group Leader Intel Inc. (Livermore,CA); Group Leader, Philips Electronics (Eindhoven, Holland)
R.01 Ranchoux, B. (1984) Manager Ion-implantation and patterning, Thomson CSF, Grenoble France
R.02 Aktik, Metin. (1984)Scientist, Mitel; Quality Assurance Manager, Space Electronics, SPAR.
R.03 Aktik, Cetin. (1985)Scientist OMVPE Tech. Ltd.; Professor, EE, U. Sherbrooke.
M.04 Mandeville, Pierre. (1986) Scientist, BNR (Ottawa); BNR & NSERC Ph.D Fellow, EE Dep't. Cornell U.
P.01 Barla, Kathie.,(1986) Research Scientist, CMOS R&D Group, C.N.E.T., Meylun, France
M.05 Répéta, Morris, (1986) Research Scientist, Advanced Device Group, Director BiCMOS Reliability Section, NORTEL
M.06 Harling. Gordon. (1987) Director Research, Mitel Semiconductor Inc., Bromont Québec, President GOAL ASIC Ltd.
M.07 Savard, Francois (1987) Engineer, Canadian Aviation Electronics Ltd., Ville St.Laurent Québec.
M.08 Lagarde, Christophe., (1987)Research Scientist, Advanced Device Group, NORTEL
P.02 Kamali, Walid., (1987) Microwave Circuit Design Engineer, Bel-Tronics Inc. , Mississauga, Ont.
T.01 Gaboriault, Alain(1987) Graduate, Electrical Engineering, Sherbrooke University
M.09 Tremblay, Mario. (1988) Consulting Engineer, Dolbeau Québec
M.10 Cova, Pedro., (1988) Professor, Physics, Universidad de Oriente, Venezuela
M.11 Dionne, Jean-Pierre. (1988) Research Scientist, LaPocatière Industrial Research Centre, LaPocatière
M.12 Lussier, Pierre., (1988) Thin Film Deposition Engineer, SPAR, Microwave Electronics, Ste-Anne
T.02 Morin, C. (1988) Technician, Hydro-Quebec Research Institute, Varennes, Québec
D.02 Ait-el-Habti, Driss (1990) Professor, Physics, King Hassan University, Morocco.
T.03 Rheault, Martin, (1990) Graduate, Industrial Engineering, University of Québec
-

Supervised Theses: [M=M.Sc.A; D=Ph.D; P=Postdoc]

- M.01 Fourcade, B. (1984) Application de méthodes de calcul dans l'espace direct au modèle de Hubbard généralisé. [Direct space renormalisation group treatment of a generalised Hubbard model.] {with G. Spronken}.
- M.02 Araj, N., (1984) Couches minces transparentes conductrices d'oxide d'indium et application. [Transparent indium-oxide thin films prepared by reactive evaporation.]
- M.03 Marcoux, J. (1984) Characterisation of a buried-load CMOS Compatible J-FET. [Caractérisation d'un transistor à effet de champ à jonction verticale et à charge résistive enfouillie].
- M.04 Mandeville, P. (1986) Croissance et caractérisation des couches de GaAs déposées sur Si (100) par jet moléculaire. [Growth and characterisation of heteroepitaxial MBE-grown GaAs on (100) Si]
- P.01 Barla, K., (1986) Deposition, characterisation, and patterning of reactively evaporated TiN.
- M.05 Répéta, M., (1986), Définition et caractérisation d'une technologie MESFET sur GaAs. [Definition and Characterisation of a GaAs MESFET Technology].
- M.06 Harling, G. (1987) Fabrication and Characterisation of the Amorphous Silicon Static Induction Transistor. [Fabrication et Caractérisation d'un transistor à effet de champ à jonction verticale en couche mince de silicium amorphe hydrogéné.] {with M.Meunier}
- M.07 Savard, F. (1987) Réalisation de dispositifs submicroniques à l'aide d'électro-lithographie. [Direct writing of submicron structures with focused electron beams.]
- M.08 Lagarde, C., (1987), Etude des contacts Ohmiques et Schottky sur le GaAs. [Improvement of Schottky and ohmic contacts on GaAs.]
- P.02 Kamali, W., (1987) Design of 2GHz high voltage amplifier on GaAs for optoelectronics driver applications.
- M.09 Tremblay, M., (1988) Caractérisation d'échantillons de silicium amorphe hydrogéné par mesures Seebeck. [Thermopower measurements of doped a-Si:H for trap spectroscopy].
- M.10 Cova, P., (1988) Conception et réalisation de réacteur MOCVD pour le InP. Construction and characterisation of a low-pressure MOCVD epitaxial crystal growth reactor].
- M.11 Dionne, J.-P. (1988), Conception et réalisation de circuits rapides sur GaAs. [Design and characterisation of BFL and DCFL GaAsFET circuit components operating above 2GHz.] {with Y. Savaria}
- M.12 Lussier, P., (1988), Gravure réactive en milieu plasma de GaAs. [Reactive Sputter etching of GaAs using plasmas of oxygen, CF₄, argon and nitrogen.] {with M.Meunier}
- D.01 Diawara, Y. (1990) Fabrication et caractérisation de dispositifs photovoltaïques en couche mince de silicium amorphe hydrogéné. [Fabrication and characterisation of thin film photovoltaic devices suitable for use in optoelectronic integrated circuits.]
- D.02 Ait-el-Habti (1990) Etude du transport électrique et thermique dans les superréseaux. [Theoretical study of electrical and thermo-electrical transport in GaAs-AlGaAs superlattices.] {with P. Vasilopoulos}.
- M.13 Lafontaine (1990) Fabrication et caractérisation de couches minces de tungstène pour les applications de photomasques ULSI à rayons-X. [Structural control of sputtered tungsten thin films through growth dynamics and anneals; applied to absorbant layers for ULSI X-ray masks.]
- M.14 Mouton, A. (1990) Fabrication et caractérisation d'un MESFET sur InP. [Development and characterisation of InP-MESFET technology for high speed analogue and digital circuit components]
- D.07 Tazlauanu, Mihai, (96) Hybrid InP MISFET-based sample & hold integrated circuit.
- M.26 Antaki, Robert (96) CMOS-compatible Micro-machined Silicon Actuators.
- M.28 Mashayeki, Massoud Crystalline Silicon Photodiodes (95). {with L. Landsberger}.
- M.24 Hao, Xiao-Bin (95) Selective heteroepitaxy of MOCVD InP. {with R.Masut}.
- M.25 Chitchev, Dmitri (95) High Speed CMOS Latch & Clock Circuit Design. {with Y.Savaria}.
- M.23 Yip, Raymond (94) InP-based long wavelength laser diode. {with R.Masut}.
- D.06 Gagnon, Gilles (97) Study of interfaces at sputtered and reactively evaporated TiN-semiconductor interfaces. {w/ J.Brebner}.
- M.22 Tazlauanu, Mihai, (97) Hybrid InP MISFET-based sample & hold integrated circuit.
- M.21 Létourneau, Sylvie (94), Multiphoton processes in III-V Nonlinear Anti-Resonant Reflecting Optical Waveguides (NAROWs). {with R. Normandin}.
- M.20 Michelich, Pierre, (94) InGaAs/InP Hetero-junction IV&CV Characterisation {with R.Masut}.
- D.05 Sundararaman, Chetlur (93) Development of high-mobility MIS and Heterojunction Insulated Gate FET on InP.
- M.19 Bouchard, Hugues, (93) Microstructural and mechanical Characterisation of Boro-phosphosilicate
- M.32 Marusic, Jean-Christophe (97) Thick and Thin-Film Electrochemical Micro-Gas Sensor Devices
-

D.08 Yip, Raymond (97) InP-based long wavelength laser diode. {with R.Masut}.
 M.30 Lessnick, Patrick (97) Polymer ionophore ISFET sensor.
 M.29 Briand, Danick (97) Thin Film Oxygen Sensor. glass films in 1.2mm CMOS Technology. {with M.Meunier}.

Theses in preparation:

M.31 Ressayac, Isabelle, (98) Fabrication and Control Circuitry for a MEMS micro-relay chip
 M.27 Leclerc, Stéphane (98) Micro-machined implantable medication dispensing device.

Exchange Students & Undergraduate Summer Students Supervised (93-96 only) :

E.1 Alban Rescoussier (95); E.2 Christoph Hüller(95); E.3 Bernd Hartmann (96); E.4 Christian Nolte (96); E.5 Denis Hafon (96); E.6 Gilles Robert (95); E.7 Emmanuel Marchais(95); E.8 Suresh Pajaniradja (95); E.9 Alexandre Cazes,(96), E.10 Guillaume Frèrejean (96), E.11 Stéphane Roumegou (96), E.12 Nathalie Zaghlani (96). Also an average of 5 undergraduate summer trainees each summer.

Postdoctoral fellows supervised:

- P.08 Gagnon, Gilles (94-5) Sputtered TiN for Integrated Circuit Metalisation
- P.10 Richard, Edwis. (97) Micromachining and Hybrid Packaging of GaAs/Si MQW-QCSE Opto-electronics chips.
- P.11 Essalik, Abdelatif. (97) Electrochemical Gas Sensors and Interface Physics.

OTHER EVIDENCE OF IMPACT AND CONTRIBUTIONS

Noranda Professor for Advanced Materials (NORMA) 1996; with a 1-year R&D mandate to add value to precious metals and semi-metals which are produced by NORANDA & its Division NORAM by developing novel manufactureable solid state processing technologies, devices, components and systems, opening new markets and create new products and business opportunities.

- Membership on Grant Selection Committees:Quebec Ministry of Higher Education and Science(MESSQ), FCAR Research Centre 90-93. College Researchers 91-5; NSERC Strategic Grants : Information Technology and Manufacturing Systems 92-95.

Membership on advisory boards:

- 88-93 National Code Committee:Standards Council of Canada & International Electrotechnical Commission: Photovoltaics.
- 87-91 Federal Ministry of EMR Member of Photovoltaic Energy Technical Advisor.
- 92-93 President, U. of Montreal's Evaluation Committee: Department of Chemistry.

Membership in Professional Societies:

- Quebec Order of Engineers, active in the Junior Engineer Apprenticeship Program: Lecours, Bouchard, Pouliot, and Mihelich.
- American Physical Society (Condensed Matter/ Solid State section).
- IEEE Senior Member (Electron Devices, LEOS, Microwave, Circuits, Management Sections).
- Research Fellowships 83-4: NSERC Senior Industrial Fellowship & Northern Telecom Fellowship.
- Referee/ Reviewer for J.Appl.Phys., Phys. Rev., and Can.J. Phys., as well as for NSERC, FCAR, NSF.

Prizes:

- École Polytechnique Director's Excellence award: 1984, 1994; University/Industry Collaboration Excellence award: 1984, 1994.
 - Quebec Order of Engineers & Quebec Ministry of Industry, Quebec Inventors Grand Prize 1996: First Place, Salaried Employees Category for Implantable Micro Drug Dispensing System.
 - École Polytechnique's 1996 nominee for the Bell-Forum-Xerox Award for Excellence in University-Industry
-

C. Research Support.**Ongoing Research Support**

00-41402-00 Currie (PI) 6/01/00-11/30/04

DARPA / Army Research Office-Biological Command

Bio-Fluidic Chip Integrable Transdermal Sampling Micro System.

To develop a Bio-Fluidic Chip Integrable Transdermal Sampling Micro System, that provides for transdermal sampling of molecules that ordinarily do not diffuse across the skin, such as polar molecules or proteins, using chip scale integrable technologies. In particular the goal is to sample glucose as a stress indicator. The safety and efficacy of the device is demonstrated in-vitro on graft-skin. The B-FIT sampling micro system is a micro fluidic capillary sampling system coupled to a thermal ablation micro system that enables sampling at the Stratum Corneum (SC)/viable epidermis (VE) interface, without invasive extraction of interstitial fluid.

Role: PI

Currie (PI) 01/01/04-12/31/04

American Registry of Physiology – Noninvasive Monitoring for Hemorrhagic Shock and Resuscitation

01-41402-01 Currie & Van Keuren (Co-PIs) 6/01/01-5/31/03

DARPA / Army Research Office-Biological Command with matching funds from Georgetown University

Three dimensional thermal imaging

This is a novel method for measuring three-dimensional temperature profiles in skin to depths of 1 cm. The method is based on normal fluorescence confocal imaging of dyes with strong temperature dependent properties. Thermo-chromism, a temperature dependence of the absorption and emission properties of molecules, is common among many groups of dyes. Skin graft tissues are doped with suitable non-toxic dyes that display strong thermo-chromic effects. The fluorescence emission is observed at 10-micron-thick sections through the graft-skin tissue to deduce the local temperatures, with a resolution of 0.01 centigrade-degree, on a scale comparable to that of the constituent cells. Early observations point to measurable differences between normal and cancerous cell within the tissue.

Role: Co-PI

02-41402-02 Currie (PI) 12/01/01-10/31/03

DARPA / Army Research Office-Biological Command, and Walter Reed Army Hospital /WRAIR .

Demonstration of a Physiological Health Monitoring proof-of-concept System employing the BFIT technology

The goal is to build a prototype system comprising the sampling technology of #1 above that can be applied to porcine models that

- i) provides sensing capability for physiological indicators of vital importance in shock monitoring,
- ii) comprises novel control electronics for an integrated device for demonstration
- iii) demonstrates human safeness and usefulness as both a health monitor and wound trauma critical care monitor, and
- iv) begins technology transfer to a manufacturer that would in turn produce the devices for war-fighters.

Role: PI

Currie (PI) 05/01/97-06/30/07

Georgetown University

Solid State Physics and Technology for Biomedical and Drug Delivery Device Research

Novel devices and technologies are researched for direct application to individual patient health monitoring.

Role: PI

NIH R-21 Thakor (PI -JHU)

Carbon Electrode Arrays for sensing Neuronal Messengers

Co-investigator

Completed Research Support

Currie(PI)

05/01/97 – 11/30/01

Gael Laboratory: Building a class 100 clean-room facility for solid state technology research

Georgetown University.

The applicant designed and supervised construction of a state of the art facility in which to conduct research on nano-technologies and micro-system research.

Role:PI

Currie(PI)

05/01/97 – 11/30/99

Design of novel monitoring micro devices

Miranda donation

This grant donation was to provide seed resources for health monitoring.

Role: PI

Currie(PI)

05/01/95 – 11/30/00

Physical Electronics of microelectronics devices

NSER Canada

This grant is the last one still active of those held while a Professor in Montreal Canada (McGill & Ecole Polytechnique) and provides support for the last three of my doctoral students there (one Ph.D. and two M.Sc.).

Role: PI

Currie(PI)

05/01/98 – 11/30/01

Gas component micro-sensors

SCACD Inc.

This contract is for the development of electrochemical gas sensors for environmental monitoring.

Role:PI
