

## Biographical Sketch

James Bain

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### Professional Preparation

University of Pennsylvania, Dept. of Materials Sci. and Eng, Bachelor of Science in Engineering, 1988

Stanford University, Department of Materials Sci. and Eng., Master of Science 1991

Stanford University, Department of Materials Sci. and Eng., Doctor of Philosophy 1993

Carnegie Mellon University, Department of ECE., Postdoctoral Research Associate 1993-1995

### Appointments

2005 – Present: Carnegie Mellon University, Dept. of ECE (Electrical and Computer Engineering), Professor and Associate Director - DSSC

2002 – 2005: Carnegie Mellon University, Department of ECE, Professor

2001 - 2002: Carnegie Mellon University, Department of ECE, Associate Professor

2001 - 2002: Carnegie Mellon University, Department of ECE, Senior Research Scientist

1995 - 2001: Carnegie Mellon University, Department of ECE, Research Scientist

1993 - 1995: Carnegie Mellon University, Department of ECE, Postdoctoral Research Assoc.

### Products

1. Noman, Mohammad; Sharma, A.A; Lu, Y., Kamaladasa, R., Skowronski, M., Salvador, P.A., Bain, J.A., “Mechanism of localized electrical conduction at the onset of electroforming in TiO<sub>2</sub> based resistive switching devices,” *Appl. Phys. Lett.*, vol. 104, p. 113510 (2014).
2. Sharma, Abhishek A; Noman, Mohammad; Abdelmoula, Mohamed; Skowronski, Marek; Bain, James A; “Electronic Instabilities Leading to Electroformation of Binary Metal Oxide-based Resistive Switches,” *Adv. Func. Mat.*, vol. 24, p. 5522 (2014).
3. Kwon, Jonghan; Sharma, A.A., Bain, J.A., Picard, Y.N., Skowronski, M., “In Situ Biasing TEM Characterization of Resistive Switching Phenomena in TiO<sub>2</sub>-based RRAM,” *Microscopy and Microanalysis*, vol. 20, p. 1548 (2014).
4. Noman, Mohammad; Sharma, A.A; Lu, Y.; Skowronski, M., Salvador, P.A., Bain, J.A., “Transient characterization of the electroforming process in TiO<sub>2</sub> based resistive switching devices,” *Appl. Phys. Lett.*, vol. 102, p. 23507 (2013).
5. Hogg, Charles R; Picard, Y.N., Narasimhan, A; Bain, J.A; Majetich, S.A; “Pattern transfer with stabilized nanoparticle etch masks,” *Nanotechnology*, vol. 24, p.85303 (2013).

### Five Other Significant Products

1. Hu, W., Bain, J.A., Ricketts, D. “An AFM/STM multi-mode nanofabrication approach allowing in situ surface modification and characterization,” *Micro & Nano Lett*, vol. 8, p. 43 (2013).
2. Huang, J.C; Bain, J.A., Song, W.D., Li, M.H., Shi, L.P., Schlesinger, T.E., Chong, T.C., “Assessing diffusion barriers for phase change memory devices using the magnetization of Fe,” *Appl. Phys. Lett.*, vol. 102, p. 254102 (2013).
3. Kuriyama, Kazumi; Chabalko, M.J., Kong, Y, Luo, Y., Schlesinger, T.E., Bain, J.A., “Modeling of Polarization Effects in Au Nanodots Excited With InAs Quantum Dot Emitters for Use as a HAMR Heat Source,” *IEEE Trans. Mag.*, vol. 49, p. 3560 (2013).
4. Quirk, E.B., Gamble, A. Hussin, R., Slovin, G., Kong, Y., Schlesinger, T.E., Bain, J.A., Kuriyama, K., Luo, Y. “A Process for Transferring and Patterning InAs Quantum Dot Optical Gain Media for HAMR Near Field Optical Sources,” *IEEE Trans. Mag.*, vol.49, p. 3564 (2013).
5. Ho, Hoan; Sharma, A.A., Ong, W-L., Malen, J.A., Bain, J.A., Zhu, J-G, “Experimental estimates of in-plane thermal conductivity in FePt-C granular thin film heat assisted magnetic recording media using a model layered system,” *Appl. Phys. Lett.*, vol. 103, p. 131907 (2013).

## **Synergistic Activities**

- 1) Initiated a new seminar series within the CMU ECE Department on Device Science and Nanofab. This series makes nanotechnology and device fabrication more visible and more cross-pollinated at CMU.
- 2) Organized and hosted a roundtable discussion on heat assisted magnetic recording among recording industry leaders. Conclusions included a ranking of needed research.
- 3) Flipped the classroom on two ECE undergraduate courses: ECE 18-300 Fundamentals of Electromagnetics and ECE 18-402 Electrodynamics. All lectures are recorded and all contact time is problem workshop style. This work has received strong positive reviews from students.
- 4) Secured funding for and installed a new 11-target sputtering system for compositional studies of phase change materials.
- 5) Initiated a pilot project on a reconstituted wafer process to expand the access of university researchers to the ability to fabricate nanoscale devices on top of state of the art foundry CMOS in a cost-effective and fast manner.

## **Collaborators & Other Affiliations:** Total Number: 91

M. Abdelmoula, R. Berechman (CMU), V. Bhagavatula (CMU), E.J. Black (Boeing), R.D. Blanton (CMU), P. Borodulin (Northrop Grumman), D. Bromberg (CMU), Y. Cai (CMU) L. Cao (CMU), M.J. Chabalko (Disney), W. Chen, T.C. Chong (N. Univ. of Singapore), E.K. Chua, (DSI), M. De Graef (CMU), L. J. Draghi (Intel), A. El-Ghazaly (Stanford), N. El-Hinnawy (CMU), D. Evans (CMU), E. R. Evarts (NIST), G. K. Fedder (CMU), J. Fujimori (Pioneer), A. Gamble (CMU), Q. Guo (DSI), H. Ho (WD), C. R. Hogg (Google), R. S. Howell (Northrop Grumman), W. Hu (Lam Research), J.C. Huang (DSI), H.K. Hui (DSI), R. Hussin (CMU), T. Iida (Pioneer), A. Itagi, S. Jeon (CMU), W. Jiang (Soraa), E. B. Jones (Northrop Grumman), R. J. Kamaladasa (Intel), M. Katsumura (Pioneer), T. Kasuya (Pioneer), M. R. King (Northrup Grumman), Brian R. Knight, Yunchuan Kong, Mark H. Kryder (CMU), Kazumi Kuriyama (Pioneer), J. Kwon (CMU), Y.T. Lai (CMU), K.G. Lim (DSI), W.C. Lin (Pioneer), J. Liu, H. Lo, Y.M. Lu (WD), Y. Luo (Teratonix), K. Mai (CMU), S. A. Majetich (CMU), J. A. Malen (CMU), J. S. Mason (Northrup Grumman), W. C. Messner (Tufts), M. T. Moneck (CMU), S. Nabavi, A. Narasimhan (CMU), M. Noman (Intel), T. Okada (Pioneer), W.L. Ong (CMU), O. Ozcan, J. Paramesh (CMU), Y. N. Picard (CMU), L. T. Pileggi (CMU), S. P. Powell (Seagate), E. B. Quirk, D. S. Ricketts (CMU), N. D. Rizzo (Freescale), P. A. Salvador (CMU), T. E. Schlesinger (CMU), A. A. Sharma (CMU), L. Shi (DSI), M. Sitti (Max Plank Inst.), C. H. Sim (DSI), M. Skowronski (CMU), G. Slovin (CMU), V. Sokalski (CMU), W.D. Song (DSI), D. D. Stancil (NCS Univ.), H. Suzuki (Fujitsu), C.C. Tan (DSI), S. Tamaru (AIST, Japan), A. Vicari, B. P. Wagner (Seagate), Y. Wang (Seagate), C.Y. Wen, Y Tang (DSI) R. Zhao (DSI) Jian-Gang Zhu (CMU).

## **Graduate and Postdoctoral Advisors**

Bruce Clemens (Stanford), Mark Kryder (CMU)

## **Thesis Advisor and Postgraduate-Scholar Sponsor**

Total number of Ph.D. students (entire career): 30

Total Number of Post Docs (entire career): 7

Post Docs in the last 5 years: Joshua Smith (ARL).

Ph.D. Advisees in the last 5 years (12): D.E. Black (Boeing), M. Chabalko (Disney), E.K. Chua (DSI), L. Draghi (Intel), T. Cornell (N/A), J. Huang (DSI), B. Knight (Clear Edge Power), H.-Y. Lo (MIT), M. Noman (Intel), S. Powell (Seagate), C.C. Tan (DSI), L. Zhou (Seagate).

Current Ph.D. Advisees (6): C.M. Chow, N. El-Hinnawy, J. Liang, A. Sharma, G. Slovin, G. Tian, M. Xu.