

## Biographical Sketch

**Provide the following information for each individual included in the Research & Related Senior/Key Person Profile (Expanded) Form.**

NAME BLACK, ROBERT D.		POSITION TITLE VP, SCION NEUROSTIM	
EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE (IF APPLICABLE)	YEAR(S)	FIELD OF STUDY
Miami University	BA	1979	English
Miami University	BS	1979	Physics
Miami University	BS	1979	Mathematics
University of Illinois, Urbana	MS	1980	Physics
University of Illinois, Urbana	Ph.D.	1984	Elec Engineering

RESEARCH AND PROFESSIONAL EXPERIENCE:

### Positions and Honors

- 2010 Vice President, Scion NeuroStim, Raleigh, NC
- 2008-2011 Adjunct Professor, Joint Dept. of Biomedical Engineering, The University of North Carolina at Chapel Hill & North Carolina State University at Raleigh
- 2006-2010 President & Director, Civatech Oncology, RTP, NC
- 1999-2005 CEO, CTO, and Director, Sichel Technologies, Inc., Morrisville, NC
- 1995-1998 President & Director, Magnetic Imaging Technologies, Inc., Durham, NC
- 1993-1995 Assistant Professor, Duke University, Dept. of Radiology, Durham, NC
- 1984-1993 Staff Scientist at General Electric R&D Center, Schenectady, NY
  
- 2006, FELLOW, AMERICAN INSTITUTE FOR MEDICAL AND BIOLOGICAL ENGINEERING

### Overview of Key Publications

- Co-developer of a seminal theory of the cause of 1/f noise in solids (R.D. Black, P.J. Restle, and M.B. Weissman, "Nearly Traceless 1/f Noise in Bismuth," *Phys. Rev. Lett.* **51**, 1476 (1983))
- Inventor of first superconducting MRI microscope (R.D. Black, T.A. Early, P.B. Roemer, O.M. Mueller, A. Mogro-Campero, L.G. Turner, and G.A. Johnson, "A High-Temperature Superconducting Receiver for Nuclear Magnetic Resonance Microscopy," *Science* **259**, 793 (1993));
- Co-inventor of first inert gas MRI system for human use (J.R. MacFall, H.C. Charles, R.D. Black, et al., "Human Lung Air Spaces: Potential for MR Imaging with Hyperpolarized He-3," *Radiology* **200**, 553 (1996));
- Co-inventor of first implantable radiation dosimeter for clinical oncology (RD Black, CW Scarantino, GG Mann, MS Anscher, RD Ornitz, BE Nelms "An analysis of an implantable dosimeter for external beam therapy," *Int. J. of Radiat. Oncol., Biol., Phys.* **63**, 290 (2005)
- Editor, Special Issue on In Vivo Sensors for Medicine, *IEEE Sensors Journal* **8** (2008).

RESEARCH AND PROFESSIONAL EXPERIENCE (CONTINUED). PAGE LIMITATIONS APPLY. DO NOT EXCEED 4 PAGES FOR THE ENTIRE BIOGRAPHICAL SKETCH PER INDIVIDUAL.

***Nuclear Magnetism:***

G.M. Julian, R.D. Black, et al., "Hyperfine Magnetic Field at Cd Site in C1<sub>b</sub> Heusler Alloys PtMnSb and NiMnSb by TDPAC Technique," *J. Appl. Phys.* **50**, 7510 (1979).

S. Jha, R.D. Black, et al., "Hyperfine Magnetic Field at Cd Impurity Site in L2 Heusler Alloys Rh<sub>2</sub>MnGe and Rh<sub>2</sub>Mn Pb by TDPAC Technique," *J. Appl. Phys.* **50**, 7507 (1979).

***Noise***

R.D. Black, M.B. Weissman, and F.M. Fliegel, "1/f Noise in Metal Films Lacks Spatial Correlations," *Phys. Rev. B* **24**, 7454 (1981).

R.D. Black, W.M. Snow, and M.B. Weissman, "Nonscalar 1/f Conductivity Fluctuations in Carbon and Gold Films," *Phys. Rev. B* **25**, 2955 (1981).

M.B. Weissman, R.D. Black, and W.M. Snow, "Calculations of Experimental Implications of Tensor Properties of Resistance Fluctuations," *J. Appl. Phys.* **53**, 6276 (1982).

R.D. Black, M.B. Weissman, and P.J. Restle, "1/f Noise in Silicon Wafers," *J. Appl. Phys.* **53**, 6280 (1982).

M.B. Weissman, R.D. Black, P.J. Restle, and T. Ray, "Thermally Activated Features in 1/f Noise in Silicon-on-Sapphire," *Phys. Rev. B* **27**, 1428 (1983).

R.D. Black, P.J. Restle, and M.B. Weissman, "Hall Effect, Anisotropy, and Temperature Dependence of Measurements of 1/f Noise in Silicon-on-Sapphire," *Phys. Rev. B* **28**, 2333 (1983).

P.J. Restle, M.B. Weissman, and R.D. Black, "Tests of Gaussian Statistical Properties of 1/f Noise," *J. Appl. Phys.* **54**, 5844 (1983).

R.D. Black, P.J. Restle, and M.B. Weissman, "Nearly Traceless 1/f Noise in Bismuth," *Phys. Rev. Lett.* **51**, 1476 (1983).

R.D. Black, "1/f Noise in Semiconductors and Metals," thesis (U. of Illinois, Urbana, 1984).

H. Rommelmann, A.J. Epstein, J.S. Miller, P.J. Restle and R.D. Black, "Noise Power in the Nearly Commensurate Quasi One-Dimensional Conductor (NMP)<sub>x</sub>(PHEN)<sub>1-x</sub>TCNQ," *Phys. Rev. B* **32**, 1257 (1985).

R.D. Black, "Comments on 'A Theory of the Hooge Parameters of Solid-State Devices'," *Trans. on Elect. Dev.* **ED-33**, 532 (1986).

R.D. Black, L.G. Turner, A. Mogro-Campero, T.C. McGee and A.L. Robinson, "Thermal Fluctuation and 1/f Noise in Oriented and Unoriented YBCO Films," *Appl. Phys. Lett.* **55**, 2233 (1989).

R.D. Black, "Noise in High Temperature Superconductors," *Materials Sci.Forum*, vol. 130-132, 1993, p. 287

***Semiconductor/Superconductor Devices:***

H.-R. Chang, R.D. Black, V.A.K. Temple, W. Tantraporn, and B.J. Baliga, "Self-Alligned UMOSFET's with a Specific On-Resistance of 1 mW-cm<sup>2</sup>," *Trans. Elec. Dev* **ED-34**, 2329 (1987).

R.D. Black, S.D. Arthur, R.S. Gilmore, N. Lewis, E.L. Hall, and R.D. Lillquist, "Silicon and Silicon Dioxide Bonding for SOI Applications," *J. Appl. Phys.* **63**, 2773 (1988).

R.D. Black, "Capacitance and Conductance Properties of SIPOS Films," *J. Appl. Phys.* **63**, 2458 (1988).

### ***NMR Microscopy and Inert Gas MRI***

R.D. Black, T.A. Early, P.B. Roemer, O.M. Mueller, A. Mogro-Campero, L.G. Turner, and G.A. Johnson, "A High-Temperature Superconducting Receiver for Nuclear Magnetic Resonance Microscopy," *Science* **259**, 793 (1993).

R.D. Black, P.B. Roemer, O.M. Mueller, "Electronics for a High Temperature Superconducting Receiver System for use in Magnetic Resonance Imaging (MRI)," *IEEE Trans. on Biomed. Eng.* **41**, 195 (1994).

R.D. Black, P.B. Roemer, A. Mogro-Campero, L.G. Turner, and K.W. Rohling, "High Temperature Superconducting Resonator for use in Nuclear Magnetic Resonance Microscopy," *Appl. Phys. Lett.* **62**, 771 (1993).

M.B. Banson, G.P. Cofer, R.D. Black, G.A. Johnson, "A Probe for Specimen Magnetic Resonance Microscopy," *Invest. Radiol.* **27**, 157 (1992).

G.A. Johnson, H. Benveniste, R.D. Black, G.P. Cofer, S.L. Gewalt, L.W. Hedlund, R.R. Maronpot, and S.A. Suddarth, "MR Microscopy of Disease Models," in *Magnetic Resonance Microscopy: Methods and Application in Materials Science, Agriculture, and Biomedicine*, pg. 501, eds. Blumich and Kuhn, VCH, Weinheim (Germany), 1992.

G.A. Johnson, H. Benveniste, R.D. Black, L.W. Hedlund, R.R. Maronpot, and B.R. Smith, "Histology by Magnetic Resonance Microscopy," *Mag. Res. Quarterly* **9**, 1 (1993).

R.D. Black, T.A. Early, and G.A. Johnson, "Performance of a High Temperature Superconducting Resonator for High-Field Imaging," *J. Mag. Reson.* **A113**, 74 (1995).

H. Middleton, R.D. Black, et al. "MR Imaging with Hyperpolarized  $^3\text{He}$  Gas," *Mag. Res. Med.* **33**, 271 (1995).

L.L. Arnder, M.D. Shattuck, R.D. Black, "SNR Comparison Between Surface Coils and Implanted Coils," *Mag. Res. Med.* **35**, 727 (1996).

R.D. Black, H. Middleton, G.D. Cates, G.P. Cofer, B. Driehuys, W. Happer, L.W. Hedlund, G.A. Johnson, M.D. Shattuck, and J. Swartz, "In Vivo  $^3\text{He}$  Magnetic Resonance Images of Guinea Pig Lungs," *Radiology* **199**, 867 (1996).

J.R. MacFall, H.C. Charles, R.D. Black, et al., "Human Lung Air Spaces: Potential for MR Imaging with Hyperpolarized He-3," *Radiology* **200**, 553 (1996).

### ***Implantable Biomedical Sensors:***

CW Scarantino, BR Prestidge, MS Anscher, CR Ferree, WT Kearns, RD Black, NG Bolick, GP Beyer, "The observed variance between predicted and measured radiation dose in breast and prostate patients utilizing an in vivo dosimeter," *Int. J. Rad Onc Biol* **72**, 597 (2008).

RD Black, NG Bolick, RA Richardson, MW Dewhirst, "In vivo monitoring of a fluorescently labeled antibody in mice with breast cancer xenografts, *IEEE Sensors Journal* **8**, 81 (2008).

RD Black, editor, Special Issue on In Vivo Sensors for Medicine, *IEEE Sensors Journal* **8** (2008).

GP Beyer, CW Scarantino, BR Prestidge, AG Sadeghi, MS Anscher, M Miften, TB Carrea, M Sims, RD Black, "Technical evaluation of radiation dose delivered in prostate patients as measured by an implantable MOSFET dosimeter," *Int. J. Rad Onc Biol* **69**, 925 (2007)

CW Scarantino, CJ Rini, M Aquino, TB Carrea, RD Ornitz, M Anscher, RD Black, "Initial clinical results of an *in vivo* dosimeter during external beam radiation therapy," *Int. J. of Radiat. Oncol., Biol., Phys.* **62**, 606 (2005).

RD Black, CW Scarantino, GG Mann, MS Anscher, RD Ornitz, BE Nelms "An analysis of an implantable dosimeter for external beam therapy," *Int. J. of Radiat. Oncol., Biol., Phys.* **63**, 290 (2005).

CW Scarantino, DM Russlander, CJ Rini, GG Mann, HT Nagle, RD Back, "An Implantable Dosimeter for use in External Beam Radiation Therapy," *Med. Phys.* **31**, 2658 (2004).

***Issued Patents:***

4,796,070: Lateral charge control semiconductor device and method of fabrication

4,939,101: Method of making direct bonded wafers with a void free interface

5,258,710: Cryogenic probe for NMR microscopy

5,508,613: Apparatus for cooling NMR coils

6,717,154: Evaluation of irradiated foods and other items with telemetric dosimeters and associated methods

7,011,814: Systems, methods and devices for *in vivo* monitoring of localized response via radiolabeled analyte in a subject

7,479,108: Methods for using an implantable sensor unit

7,510,699: *In vivo* fluorescence sensors, systems, and related methods operating in conjunction with fluorescent analytes

7,557,353: Single-use external dosimeters for use in radiation therapies

7,686,756: Brachytherapy devices and related methods and computer program products

7,778,695: *In vivo* fluorescence sensors, systems, and related methods operating in conjunction with fluorescent analytes

7,923,694: Single-use external dosimeters for use in radiation therapies