

## Dr. Chris Daft

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## SUMMARY

- Award winning, Oxford Educated scientist whose areas of expertise include imaging, electronics, semiconductors, MEMS, medical engineering, sensors, signal processing and image processing.
- Experience in industries/applications including medical devices, imaging, consumer electronics, biometric security, and electrical power delivery.
- Extensive Intellectual Property experience including patent development, analysis, licensing, and strategy. Serial inventor holding 26 U.S. Patents.
- Diverse technical consulting experience includes multinationals such as GE, Medtronic, Fujifilm, Samsung, Siemens, and many start-ups.
- Well-published in peer-reviewed scientific journals.
- Winner of grants from National Institute of Health (NIH) and DARPA. Extensive international consulting experience.
- Three years at University of Illinois teaching electrical and computer engineering.
- IEEE Senior Member since 2004.

## EDUCATION

- D. Phil. (equal to Ph.D.) in Materials Science, Oxford University, UK, 1987. Thesis title: *Acoustic microscopy of biological tissue*.
- M.A. in Physics, Oxford University, UK, 1985.
- B.A. in Physics with 1<sup>st</sup> class honors, Oxford University, UK, 1984.

## HIGHLIGHTS OF RECENT WORK

- Deposition and trial testimony experience, mostly in patent litigation (PTAB and ITC) and trade secret matters.
- Deposition and trial testimony experience in the Superior Court of California, and US District Courts.
- Chief Technology Officer of a neurotech startup.
- System design for a wearable cancer monitoring device.

- Portable point-of-care imaging (research supported by a grant to River Sonic Solutions from the National Institutes of Health).
- Design of beam formation and image reconstruction techniques for transcranial imaging and treatment (with the University of Arizona).
- Acoustics and transducer design for medical and industrial applications.
- Design of MEMS (micro-electro-mechanical systems) transducers, signal processing and front-end electronics for pediatric otitis diagnosis.

## HONORS AND AWARDS

- *Senior Key Expert*, Siemens AG, February 2009: Siemens defines the Key Expert position as “a career path for key technology experts analogous to that for our top managerial talents.”
- *Willis R. Whitney Technical Achievement Award*, GE Global Research, August 2000: For participating in the development of a Six-Sigma software toolkit, which was widely deployed within GE.
- *Six-Sigma Certified Green Belt*, GE Global Research, April 1998: A certified Green Belt at GE has taken classes and completed several projects resulting in cost savings for the company. In my case these involved Design for Six-Sigma (DFSS).
- *Dushman Award*, GE Global Research, June 1994: Highest-ranking team award for contributions to the introduction of GE’s first premium ultrasound product, the LOGIQ 700.

## VOLUNTEER WORK

- *Member of the Board of Directors*, IEEE-CNSV (Consultants' Network of Silicon Valley), 2017-2019. IEEE-CNSV is the Silicon Valley chapter of the IEEE-USA Consultants' Network. It brings together consultants, clients, and other interested parties to exchange ideas about electrical, electronic and software engineering. I served as the Secretary of this organization for two years.
- *Project Manager*, Keizai Silicon Valley, 2013-2021. KSV is a non-profit business and professional networking organization. It provides a venue for showcasing specialists with expertise on issues critical to the success of entrepreneurs and companies doing business with Japan and the U.S.
- *Member of Technical Program Committee*, IEEE International Ultrasonics Symposium. This committee is responsible for the technical content of the IEEE International Ultrasonics Symposium.

## ISSUED PATENTS

1. Receive-side beam forming for an ultrasonic image sensor: European Patent EP3353708B1

2. Methods, devices and systems for inducing collagen regeneration: United States Patent 11,172,978
3. Receive-side beam forming for an ultrasonic image sensor: United States Patent 10,067,229
4. Ultrasonic device and operation method therefor: European Patent EP3311752B1
5. Piezoelectric transducer device for configuring a sequence of operational modes: United States Patent 10,022,751
6. Redistribution layer in an ultrasound diagnostic imaging transducer: United States Patent 9,274,088
7. Switch for aperture control in medical diagnostic ultrasound imaging: United States Patent 8,795,182
8. Volume mechanical transducer for medical diagnostic ultrasound: United States Patent 8,647,279
9. Aperture synthesis using cMUTs: United States Patent 8,641,628
10. Multi-dimensional CMUT array with integrated beam formation: United States Patent 8,465,431
11. Piezoelectric and CMUT layered ultrasound transducer array: United States Patent 8,277,380
12. Ultrasound imaging transducer array for synthetic aperture: United States Patent 7,963,919
13. Apparatus for two-dimensional transducers used in three-dimensional ultrasonic imaging: United States Patent 7,824,338
14. Method and apparatus for improving the performance of capacitive acoustic transducers using bias polarity control and multiple firings: United States Patent 7,780,597
15. Apparatus for two-dimensional transducer used in three-dimensional ultrasonic imaging: United States Patents 7,719,166 & 7,679,263
16. Electric circuit for tuning a capacitive electrostatic transducer: United States Patent 7,670,290
17. Microfabricated ultrasonic transducer array for 3-D imaging and method of operating the same: United States Patent 7,618,373
18. Apparatus for two-dimensional transducers used in three-dimensional ultrasonic imaging: United States Patent 7,508,113
19. Microfabricated ultrasonic transducers with bias polarity beam profile control and method of operating the same: United States Patent 7,087,023
20. System and method for statistical design of ultrasound probe and imaging system: United States Patent 7,006,955
21. Method and system for conducting medical imaging transactions: United States Patent 6,931,270
22. Ultrasound imaging system having post-beamformer signal processing using deconvolution algorithm: United States Patent 6,245,016
23. Ultrasound imaging system with dynamic window function generator: United States Patent 5,817,023

24. Focused ultrasound surgery system guided by ultrasound imaging: United States Patent 5,769,790
25. Method for adaptively filtering doppler signals using a complex time domain filter: United States Patent 5,445,156
26. Color flow imaging system utilizing a time domain adaptive wall filter: United States Patent 5,349,524
27. Ultrasound imaging system with dynamic window function: United States Patent 5,345,939

## PENDING PATENT APPLICATIONS

1. US 63/435,158 – Image guided therapeutic
2. US 63/516,463 – Physiological measurement
3. US 63/516,465 – EEG shielding
4. US 63/516,469 – EEG design
5. US 63/580,071 – Ultrasound aberration correction
6. US 63/589,928 – Treatment system
7. US 63/590,716 – Ultrasonic device
8. US 63/601,577 – Wearable device
9. US 63/607,032 – Acoustic coupling device
10. US 63/617,605 – Treatment safety method
11. US 63/554,004 – AI guided therapeutic
12. US 63/599,816 – Blockchain protected therapeutic
13. US 63/567,382 – AI centric treatment
14. US 63/582,162 – Closed loop treatment
15. US 63/586,735 – Stroke treatment
16. US 63/572,577 – Transcranial parameters

## ACADEMIC PUBLICATIONS

### *Invited Papers*

1. Daft, C.M.W., "Conformable transducers for large-volume, operator-independent imaging," Ultrasonics Symposium, 2010 IEEE, pp.798-808, 11-14 Oct. 2010
2. Daft, C.; Wagner, P.; Bymaster, B.; Panda, S.; Patel, K.; Ladabaum, I., "cMUTs and electronics for 2D and 3D imaging: monolithic integration, in-handle chip sets and system implications," Ultrasonics Symposium, 2005 IEEE, vol.1, pp.463-474, 18-21 Sept. 2005
3. Daft, C.M.W., "Neural networks for image analysis," Ultrasonics Symposium, 1990. Proceedings., IEEE 1990, pp.1425-1433 vol.3, 4-7 Dec 1990

## *Other Papers*

4. Reznik, S.; Sanguinetti, J.; Tyler, W.; Daft, C.; Allen, J., "A Double-Blind Pilot Study of Transcranial Ultrasound (TUS) as a Five-Day Intervention: TUS Mitigates Worry among Depressed Participants," *Neurology, Psychiatry and Brain Research* 37C, 60-66 (2020)
5. Sanguinetti, J.; Hameroff, S.; Smith, E.; Sato, T.; Daft, C.; Tyler, W.; Allen, J., "Transcranial Focused Ultrasound to the Right Prefrontal Cortex Improves Mood and Alters Functional Connectivity in Humans," *Frontiers in Human Neuroscience*, vol. 14, 52 (2020)
6. Nistorica, C.; Latev, D.; Gardner, D.; Imai, D. and Daft, C., "Characterization of a 3D-MEMS piezoelectric transducer for portable imaging systems," 2015 IEEE International Ultrasonics Symposium (IUS), Taipei, 2015, pp. 1-4
7. Daft, C.; Brueske, D.; Wagner, P.; Liu, D., "A Matrix Transducer Design with Improved Image Quality and Acquisition Rate," *Ultrasonics Symposium*, 2007 IEEE, pp.411-415, 28-31 Oct. 2007
8. Daft, C.; Panda, S.; Wagner, P.; Ladabaum, I., "Two Approaches to Electronically Scanned 3D Imaging Using cMUTs," *Ultrasonics Symposium*, 2006. IEEE, pp.685-688, 2-6 Oct. 2006
9. Liu, D.; Brueske, D.; Willsie, T.; Daft, C., "Sigma-delta dynamic receive beamforming," *Ultrasonics Symposium*, 2008. IUS 2008. IEEE, pp.1270-1273, 2-5 Nov. 2008
10. Daft, C.; Wagner, P.; Bymaster, B.; Panda, S.; Patel, K.; Ladabaum, I., "cMUTs and electronics for 2D and 3D imaging: monolithic integration, in-handle chip sets and system implications," *Ultrasonics Symposium*, 2005 IEEE, vol.1, no., pp.463-474, 18-21 Sept. 2005
11. Daft, C.; Calmes, S.; da Graca, D.; Patel, K.; Wagner, P.; Ladabaum, I., "Microfabricated ultrasonic transducers monolithically integrated with high voltage electronics," *Ultrasonics Symposium*, 2004 IEEE, vol.1, no., pp.493-496 Vol.1, 23-27 Aug. 2004
12. Daft, C.; Wagner, P.; Panda, S.; Ladabaum, I., "Elevation beam profile control with bias polarity patterns applied to microfabricated ultrasound transducers," *Ultrasonics*, 2003 IEEE Symposium on, vol.2, no., pp.1578-1581 Vol.2, 5-8 Oct. 2003
13. Daft, C.M.W.; Leue, W.M.; Thomenius, K.E.; Macdonald, M.C.; Odegaard, L.A., "Comprehensive imager simulation for improved acoustic power control," *Ultrasonics Symposium*, 1999. Proceedings. 1999 IEEE, vol.2, no., pp.1571-1575 vol.2, 1999
14. Wildes, D.G.; Chiao, R.Y.; Daft, C.M.W.; Rigby, K.W.; Smith, L.S.; Thomenius, K.E., "Elevation performance of 1.25D and 1.5D transducer arrays," *Ultrasonics, Ferroelectrics, and Frequency Control*, IEEE Transactions on, vol.44, no.5, pp.1027-1037, Sept. 1997

15. Daft, C.M.W.; Engeler, W.E., "Windowing of wide-band ultrasound transducers," Ultrasonics Symposium, 1996. Proceedings., 1996 IEEE, vol.2, no., pp.1541-1544 vol.2, 3-6 Nov 1996
16. Daft, C.M.W.; Wildes, D.G.; Thomas, L.J.; Smith, L.S.; Lewandowski, R.S.; Leue, W.M.; Rigby, K.W.; Chalek, C.L.; Hatfield, W.T., "A 1.5D transducer for medical ultrasound," Ultrasonics Symposium, 1994. Proceedings., 1994 IEEE, vol.3, no., pp.1491-1495 vol.3, Oct. 31 1994-Nov. 3 1994
17. Daft, C.M.W.; Siddiqi, T.A.; Fitting, D.W.; Meyer, R.A.; O'Brien, W.D., Jr., "In-vivo fetal ultrasound exposimetry," Ultrasonics, Ferroelectrics, and Frequency Control, IEEE Transactions on, vol.37, no.6, pp.501-505, Nov. 1990
18. Daft, C.M.W.; Smith, L.S.; O'Donnell, M., "Beam profiles and images from two-dimensional arrays," Ultrasonics Symposium, 1990. Proceedings., IEEE 1990, pp.775-779 vol.2, 4-7 Dec 1990
19. Conrath, B.C.; Daft, C.M.W.; O'Brien, W.D., Jr., "Applications of neural networks to ultrasound tomography," Ultrasonics Symposium, 1989. Proceedings., IEEE 1989, pp.1007-1010 vol.2, 3-6 Oct 1989
20. Daft, C.M.W.; Siddiqi, T.A.; Fitting, D.W.; Meyer, R.A.; O'Brien, W.D., Jr., "In-vivo fetal ultrasound exposimetry," Ultrasonics Symposium, 1989. Proceedings., IEEE 1989, pp.1053-1056 vol.2, 3-6 Oct 1989
21. Weaver, J.M.R.; Daft, C.M.W.; Briggs, G.A.D., "A quantitative acoustic microscope with multiple detection modes," Ultrasonics, Ferroelectrics, and Frequency Control, IEEE Transactions on, vol.36, no.5, pp.554-560, Sept. 1989
22. Daft, C.M.W.; Briggs, G.A.D., "Wideband acoustic microscopy of tissue," Ultrasonics, Ferroelectrics, and Frequency Control, IEEE Transactions on, vol.36, no.2, pp.258-263, March 1989
23. Daft, C. M. W.; Briggs, G. A. D., "The elastic microstructure of various tissues," The Journal of the Acoustical Society of America, 85, 416-422 (1989)
24. Daft, C. M. W.; Briggs, G. A. D.; O'Brien, W. D., Jr. "Frequency dependence of tissue attenuation measured by acoustic microscopy" The Journal of the Acoustical Society of America, 85, 2194-2201 (1989)
25. Daft, C.M.W.; Briggs, G.A.D.; O'Brien, W.D., Jr., "Frequency dependence of tissue attenuation measured by acoustic microscopy," Ultrasonics Symposium, 1988 Proceedings., IEEE 1988, pp.971-974 vol.2, 2-5 Oct 1988
26. Daft, Christopher M. W.; Briggs, G. A. D., "Wideband acoustic microscopy of tissue," The Journal of the Acoustical Society of America, 83, S110-S110 (1988)
27. Bamber, J.C.; Daft, C., "Adaptive filtering for reduction of speckle in ultrasonic pulse-echo images," Ultrasonics 24(1), 41-44 (1986)

## PROFESSIONAL MEMBERSHIPS

- *IEEE Consultants Network of Silicon Valley*: member from 2012 to Present.
- *IEEE Senior Member*: September 1987 to Present. The Institute of Electrical and Electronic Engineers is the world's largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity.

## EMPLOYMENT EXPERIENCE

### **SANMAI TECHNOLOGIES, PBC (2020 – present)**

*Chief Technology Officer*

Responsible for technology at Public Benefit Corporation aimed at non-pharmaceutical treatment of mental illness.

### **RIVER SONIC SOLUTIONS, LLC (2012 – present)**

*Principal*

Technical Consulting and Expert witness practice in: Imaging, especially Medical Imaging; Patents; Ultrasound; Electronics; Transducers; Application Specific Integrated Circuits (ASIC); Micro-electro-mechanical systems (MEMS); FDA approval of medical devices; Signal Processing; Design for Six-Sigma (DFSS); Semiconductors/ICs; Biometric security; Surgical Tissue Ablation; Tomography; Parallel Computing; Minimally Invasive Surgical Guidance; Wearables and Hearables.

### **CEPHASONICS, INC. (previously Samplify)**

*Chief Scientist, Santa Clara, CA: 2011-2013*

- Responsible for technical direction of a start-up seeking to commoditize front-end and beam formation electronics.
- Advised CEO on all technical matters; also deeply involved in angel and VC fundraising.
- Extensive customer interaction: marketed products to imaging and non-traditional customers.

### **SIEMENS HEALTHCARE, ULTRASOUND DIVISION**

*Senior Manager, Engineering, Mountain View, CA: 2005-2011*

- Delivered 3 ASICs on tight schedule to support new Silicon Ultrasound product line.
- Managed team of eight engineers to design, test and manufacture all electronics needed for introduction of Silicon Ultrasound transducers.
- Technology evangelist presenting weekly to customers at Siemens' Innovation Center.

### **SENSANT CORPORATION**

*Manager, Research and Development, San Leandro, CA: 2003-2005*

- Managed group which created electronics for first 2D and 3D images using silicon ultrasound transducer.
- Co-authored successful grant proposal to DARPA on battlefield ultrasound imaging and surgery. \$7.5 M was awarded to Sensant and its collaborator.

*Senior Staff Engineer, San Leandro, CA: 2000-2003*

- Design of new types of imaging systems using capacitive micro-fabricated ultrasound transducers (cMUTs, also known as Silicon Ultrasound.)
- Co-authored several successful SBIR grant proposals.

## **GENERAL ELECTRIC COMPANY**

*Physicist, Corporate R&D, Niskayuna, NY: 1990-2000*

- Designed algorithms for IC implementation; resulting beamforming IC was the heart of GE's successful entry into the premium ultrasound market.
- Developed statistical methods (now patented) for robust simultaneous design of transducer and imaging system to six-sigma quality standards.
- Much transducer design, acoustic field simulation and measurement.
- Research in signal processing for improved image quality and blood flow estimation. Several of these signal processing innovations are used in current GE products.

## **UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN**

*Assistant Professor of Electrical and Computer Engineering, Urbana, IL: 1987-1990*

- Research in scanning laser acoustic microscopy to characterize tissue, and applications of neural networks to ultrasonic imaging.
- Taught undergraduate courses in circuit theory, medical imaging, and acoustics.
- Thesis Advisor for Masters' students and undergraduate senior projects.

## **TESTIMONY EXPERIENCE**

1. Hologic v. Fujifilm, *Certain X-ray Breast Imaging Devices and Components Thereof*, ITC Investigation No. 337-TA-1063. **Deposition:** Feb. 8, 2018; **Trial testimony:** Apr. 11, 2018.
2. Fujifilm v. Hologic, Patent Trial and Appeal Board, Case IPR2018-00595, patent number 7,688,940. **Deposition:** Nov. 27, 2018.



3. Superior Court of California, County of Santa Clara, Case 17CV311668, Lobo v. Intel Mobile. **Deposition:** Sep. 19, 2019; **Trial testimony** Feb. 26-27, 2020.
4. Philips North America v. Garmin International, Fitbit and others, *Certain Wearable Monitoring Devices, Systems and Components Thereof*, ITC Investigation No. 337-TA-1190. **Deposition:** Aug. 14, 2020; **Trial testimony:** Oct. 23, 2020.
5. BTL Industries v. Allergan USA, Zeltiq Aesthetics and others, *Certain Non-Invasive Aesthetic Body Contouring Devices, Components Thereof, and Methods of Using the Same*, ITC Investigation No. 337-TA-1219. **Deposition:** March 24, 2021; **Trial testimony:** June 18, 2021.
6. US District Court, Central District of California, Southern Division, Case 8:18-cv-2001, Masimo and Cercacor v. True Wearables and Lamego. **Deposition:** August 4, 2021; **Trial testimony:** March 18-22, 2022.
7. US District Court, Northern District of Illinois, Eastern Division, Case 1:19-cv-01374, Howe v. Speedway. **Deposition:** Sept. 24, 2021.
8. ReCor Medical and Otsuka Medical Devices v. Medtronic Ireland Manufacturing, Case IPR2022-00431, patent number 8,845,629. **Initial deposition:** Sept. 30, 2022; **Rebuttal deposition:** Mar. 2, 2023.
9. US District Court, Western District of Texas, Waco Division, Case 6:21-cv-00166-ADA, CPC Patent Technologies v. HMD Global Oy, **Invalidity deposition:** Jan. 9, 2023; **Noninfringement deposition:** Feb. 9, 2023.
10. US District Court, Northern District of California, Oakland Division, Case 4:19-cv-04162-YGR, Carl Zeiss Meditec v. Topcon Medical Systems et al., **Deposition:** May 4, 2023.
11. Butterfly Network v. FUJIFILM Sonosite, Patent Trial and Appeal Board, Case IPR2022-01575, patent number 7,867,168. **Deposition:** Aug. 2, 2023.
12. US District Court, District of Maine, Case 1:23-cv-00032, BTL Industries v. Rejuva Fresh and Jacobs. **Claim Construction Deposition:** Mar. 26, 2024.