

S SYSTEMS, Inc.

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RESUME

John M. Strawn, Ph.D.

Goal: Continue full-time consulting in my own corporation, writing software and testifying as an expert witness.

Expert Witness and Litigation Support Experience

- Date: 2009 **Weil Gotschal, Redwood Shores, CA**
Case: In the Matter of Certain Digital Cameras, ITC 337-TA-671
Project: Analyze cell phone source code relating to digital cameras. This involved baseband chips from Qualcomm, Philips, Agere, Texas Instruments; register-level code for camera image sensors from Samsung, Sony, Micron, Omnivision; Windows Mobile 5 and 6 digital camera device drivers; Qualcomm BREW 2 and BREW 3 cell phone operating systems; patents involving digital cameras, Bayer subsampling, and pixel interpolation; and standard digital optical concepts such as RGB, YUV, YCbCr, EXIF, and JPEG.
Status: My work completed, July 2009.
- Date: 2008-2009 **Sidley Austin, Chicago**
Case: Undisclosed
Project: Analyze C/C++ source code for defendant in patent action involving Internet-based multimedia file downloading system running in Windows. Worked with multiple versions of client and server code contained in more than 60,000 files occupying more than 3 GByte disk space.
Status: Plaintiff dismissed, 2009.

Date: 2005-2007 **Fish and Richardson, San Diego, CA**
Case: Lucent Technologies Inc. v. Gateway, Inc., et al., defendants, and Microsoft Corporation, Intervener. Case No. 02-CV-2060 B (CAB) consolidated with 03-CV-0699 B (CAB) and 03-CV-1108 B (CAB).
Project: Expert for defense (Microsoft) involving audio compression and MP3. Two days testimony at three-week jury trial, February 7-8, 2007, cross-examined by Kirkland and Ellis. Prepared 8 expert reports (total 331 pages) on non-infringement and invalidity including 20 claim charts and 15 other substantive attachments. Analyzed over 4000 pages of C/C++ source code; analysis of assembly and machine code. Worked directly with German documents. Deposed, November 3, 2006.
Status: Judge Brewster overturned jury decision and ruled in favor of defense. Judge Brewster's decision upheld on appeal, September 2008, <http://www.cafc.uscourts.gov/opinions/07-1546.pdf>

Date: 2007 - 2008 **Fish and Richardson, Atlanta**
Case: Nice Systems Inc. and Nice Systems Ltd. v. Witness Systems Inc. Civil Action No. 06-311-JJF, Delaware District.
Project: Testifying expert for the defense involving telephone call centers (telephony, software, hardware architecture, digital recording.) Prepare claim charts, expert reports. Deposed January 2008. Testified at one-week trial, Wilmington, DE, January 2008.
Status: Hung jury. Settled at terms favorable to my client, August 2008.

Date: 2007 **Law firm: Morrison and Foerster, Los Angeles**
Case: 3:06-cv-7736 CA Northern District, Seer Systems v. Yamaha
Project: Prior art research; documents from my own files; commentary on prior art found by me and by attorneys; meetings with attorneys and their client in Los Angeles.
Status: Settled before trial at terms favorable to my client.

Date: 2006-2007 **Law firm: Mayer Brown Rowe & Maw, Houston, TX**
Case: 2:06-cv-156, Digital Technology Licensing (DTL) v. Cingular Wireless
Project: Prepare claim charts, technology background. Two-day meeting with attorney in Palo Alto.
Status: Case settled on terms favorable to client.

Date: 2007 **Law firm: Meyer & Associates Co. LPA, Columbus, Ohio**
Case: Health Science Products LLC and Kairos & Associates, In., v. Sage Software SB, Inc.
Project: For class action litigation, analyze functionality of database software before and after release of ACT 2005 (Version 7.0). Analyze software failure using databases provided by plaintiffs.
Status: Settled, payments to affected parties in progress 2008.

Date: 2005-2006 **Law firm: Black Lowe & Graham, Seattle**
Case: Digeo, Inc. v. Audible, Inc., Case No. C05-00464-JLR, Seattle
Project: Testifying expert for plaintiff in case involving Internet file downloading. Prepare expert reports on validity and infringement. Analysis of C/C++ code. Deposed for Markman hearing, February 2006.
Status: Settled, plaintiff lost standing, 2006.

Date: 2006 **Law firm: Ropes and Gray, Palo Alto**
Case: MediaTek, ASUSTek & ASUS v. Sanyo
Project: Prepare claim charts on 24-hour notice. Assist in preparation of tutorial.
Status: Settled, terms unknown. My involvement was limited due to schedule conflicts with previous clients.

Date: 2006 **Law firm: Ropes and Gray, Palo Alto**
Case: Undisclosed to me
Project: Teach technology relating to audio to attorneys; draft claim charts.
Status: Case resolved, terms unknown to me.

Date: 2006 **Law firm: Wilmer Hale (New York)**
Case: Information Technology Innovation, LLC v. Motorola, Inc. et al., Northern District of Illinois 04-C-7121.
Project: Provide and supervise an expert witness colleague who prepared an expert report on infringement.
Status: Settled.

Date: 2004-2005 **Weil, Gotshal & Manges, New York office**
Case: Antor Media Corporation v. Apple Computer, Inc., Microsoft Corporation, RealNetworks, Inc., Civil Action No. 2:03CV320 (E.D. Texas 2004)
Project: Retained on behalf of Microsoft as a prior art consultant for litigation involving file downloading.
Status: Settled on terms favorable to my client, early 2005.

Date: 2005 **Law firm: undisclosed**
Case: Undisclosed
Project: For a well-known manufacturer of digital hardware, investigate prior art for hardware relating to patents on hardware architecture, virtual memory and cache memory. In addition to library work, provide information from my own files, and gain access to files at private Bay-area institutions.
Status: Prior art research submitted to attorneys in 2005.

Date: 2005 **Law firm: Trop, Pruner & Hu, Austin, TX**
Project: Provide prior art involving signal processors.
Status: My work completed 2005.

Date: 2003 **Law firm: Dechert**

Case: Opposed to Lucent; Dechert's client not disclosed to me.
Project: Read six articles and two Ph.D. dissertations, all in German, on audio compression, scanning for (and finding) specific prior art as requested by attorney.
Status: My involvement concluded in 2003, status unknown.

Date: 2002-2003 **Law firm: undisclosed**
Case: undisclosed
Project: Working directly for a major audio manufacturer (defendant) in an infringement case, identify prior art relating to hardware for placing sound into 3-space. Provide 15-page claim chart.
Status: Settled, terms unknown

Date: 1997-98 **Cesari and McKenna, Boston**
Case: Lucent vs. Young Chang/Kurzweil
Project: Served on the expert witness team helping defend a major music instrument manufacturer against alleged patent infringement relating to music synthesis. I advised attorneys about digital hardware, software, and architecture. I obtained obscure historical documents and information from various public and private sources. I provided provide personal archives from the 1970's, and I helped the attorneys find other expert witnesses for the team.
Status: Settled on terms favorable to my client, 1998.

Date: 1996 **Law firm: undisclosed**
Case: Undisclosed
Project: For a major karaoke manufacturer outside the USA, I conducted prior art research which helped the company successfully fend off patent violation actions in the area of digital graphics.
Status: Settled on terms favorable to my client, 1996

Date: 1995 **Client: Creative Labs**
Case: Undisclosed to me.
Project: For this well-known manufacturer, I conducted prior art research and prepared a claim chart in the area of music synthesis, especially reverberation. This also included manuals for custom music synthesizers, from my own library.
Status: Settled, terms unknown, 1995

Date: 1994 **Law firm: undisclosed**
Case: Undisclosed
Project: For the same major karaoke manufacturer outside the USA as above, I conducted prior art research which helped the company successfully fend off patent violation actions in the area of digital music synthesis, specifically chorus in karaoke background using MIDI and sampling synthesis. I used contacts in the Bay area to find manuals for hardware

Status: prior art for which the manufacturer had gone out of business.
 Settled on terms favorable to my client, 1994

Date: 1994 **Small, Larkin, Los Angeles**
 Case: Digital Theatre Systems (DTS) v. L.C. Concepts (plaintiff)
 Project: For this well-known manufacturer of cinema sound equipment, I participated in the successful resolution of a patent infringement action. I studied and commented on patents and correspondence in English and German. I met with German- and English-speaking corporate and engineering staff in the Bay Area and Las Vegas. Through personal contacts in German-speaking areas in Europe, I located prior art hardware in various private firms.
 Status: Settled on terms favorable to my client, 1994

Education and Training

<u>Year</u>	<u>College/University</u>	<u>Degree</u>
1973	Oberlin	B. Mus, double degree in organ performance and music theory. Experience with analog synthesizers and digital music synthesis, BASIC, FORTRAN, MUSIC V on an IBM 360.
1973-1975	Technical University, Berlin	Fulbright Scholar. Graduate-level coursework in music theory/history, audio engineering, electronics, information theory, cybernetics, Japanese; all coursework in German. Extensive recording studio and live concert sound reinforcement experience. PDP-11 and PDP-8 assembly and machine language. Travel throughout Europe.
1975-1976	IBM Thomas Watson Foundation	Grant to study electronic music, Tokyo, Japan, 1976. Live performances on piano and Roland System 700 analog synthesizer. Also travel through Turkey, Iran, Afghanistan, Pakistan, India, Thailand, and Hong Kong.
1985	Stanford	Ph.D., CCRMA. Advisor: John Chowning. Graduate course work in music, computer and processor architecture, assembly-language processing, digital audio, acoustics, and digital hardware. Dissertation on analysis of music instruments with the short-time Fourier transform. Software development experience listed elsewhere in this resume.

Employment History

- From: 1992 **S Systems, Inc.**
To: Present Larkspur, CA
Position: *Owner*
Duties: Full-time independent consultant:
 - **Programming** hand-crafted audio and music software for signal processing, written in C, C++, JAVA, and especially assembly language for digital signal processing chips. Consulting on processor architecture and networking. See Consulting Assignments, below.
 - **Testifying Expert witness** in patent litigation relating to software, computers, signal processing. See Expert Witness, above.
 - **Recruiter** filling technical positions in hardware and software engineering and management.
- From: 1987 **Yamaha Music Technologies USA**
To: 1991 Larkspur, CA
Position: *1989-1991: President; 1987-1989: Vice President*
Duties: Helped establish and manage a nine-person Ph.D.-level research group, including site search, architectural design, construction, move-in, and hiring. Conducted original research on electronic musical instruments, software, micromachining, networking, and recent technological developments. Extensive experience designing scientific, engineering, and musical object-oriented applications, especially C++ (UNIX). Patents listed below.
- From: 1986 **S Systems**
To: 1988 Larkspur, CA
Position: *Full-time Consultant*
Duties: This was my first stint as a consultant. See Consulting Assignments, below.
- From: 1985 **Lucasfilm/Droid Works**
To: 1986 San Rafael, CA
Position: *Programmer*
Duties: Full-time programming experience as an employee, designing signal-processing modules and writing (96-bit VLIW) microcode for the ASP/SoundDroid developed by James A. Moorer. Experience in audio and video post-production. Extensive work in C (Unix). Another six months full-time experience writing tightly packed assembly code for the TI TMS32010 signal processor, especially for a two-channel hard-disk audio record playback unit that played without bugs on the exhibit floor of the National Association of Broadcasters convention, 1986.
- From: 1976 **Stanford University**

To: 1985 Stanford, CA
Position: *Doctoral Student*
Duties: Nine years programming experience developing code in high-level languages (Algol, Fortran, SAIL) and PDP-10 assembly language for musical and audio signal processing applications during doctoral thesis work. Includes original published research in spline fitting and pattern recognition, a 30,000-line two- and three-dimensional graphical editor for waveforms and spectra, implementation (with John Gordon) of the short-time Fourier transform, device drivers, and libraries for graphic user interfaces. Part-time consulting work also for clients such as:

- SRI International (FORTRAN for mechanical engineering).
- Mattel Electronics (music in consumer electronic toys).
- IntelliGenetics (ALGOL-like code for biotechnology).
- Digital Keyboards (product specification and complete manuals for GDS and Synergy Synthesizers).

From: 1972 **Revox**
To: 1972 Long Island, New York
Position: *Summer intern*
Duties: Solder cables, write German- and Dutch-English translations, manufacture PC boards, assemble hardware.

Consulting Assignments

From: 2008 **Client: DTS Digital Cinema**
To: 2008 Agoura Hills, CA
Duties: For DTS Digital Cinema's new XD20 eight-track cinema media player (this is the box that sits in the movie theater projection booths for playback of multi-channel audio and video), adapt audio algorithms from an earlier DTS Digital Cinema device. In particular, port DTS Coherent Acoustics decode (two versions, one 8-channel, one stereo), DTS Digital Cinema 8-channel decode, and DTS Neo6 5.1 decode from DTS Digital Cinema's existing XD10 cinema media player. This required me to extract Motorola DSP563xx assembly language source code from the earlier XD10 environment; isolate the four algorithms by stripping away unneeded code; integrate the four algorithms into Motorola 56721 dual-core processor; and write new wrapper code in assembly language. Responsible for approximately 25,000 lines of assembly-language source.

From: 2007 **Client: undisclosed**
To: 2008 Location: Asia
Duties: For this (repeat) client review literature and prepare summary report reviewing current graphic visualization of audio data. The 160-page final report discusses about one-half of the 200 or so documents and other items that I investigated.

- From: 2007 **Client: undisclosed**
 To: present Location: southern California
 Duties: For this (repeat) client implement, in C, with the help of a filter design subcontractor, a novel algorithm for sound processing.
- From: 2007 **Client: Berkeley Design Technology, Inc. (<http://www.bdti.com/>)**
 To: 2008 Location: Oakland, CA
 Duties: Contribute to research and writing of the following articles on processor architecture at BDTI's website Inside DSP (<http://www.insidedsp.com/>):
- TI Offers OMAP3 Application Processors to the Mass Market
 - Avnera releases ASSPs for wireless audio applications
 - XMOS Introduces Low-cost Multi-core Chip Family with Programmable I/O
 - VeriSilicon's New Silicon IP Solution for HD Audio
 - Behind the scenes: Dolby's acquisition of Coding Technologies
 - Tips and Tricks for Debugging Audio
- Other BDTI assignments are listed below.
- From: 2007 **Client: undisclosed**
 To: 2007 Location: Asia
 Duties: Review literature on auditory stream separation, computational auditory stream analysis, voice activation decision for speech, and Wiener filters. These techniques are at the cutting edge for improving cell phone sound. Using publicly available Matlab code for Wiener filters (Ephraim/Malah) as a basis, implement Davis et al's voice activation decision in Matlab, delivering a speech enhancement system to the client.
- From: 2007 **Client: undisclosed**
 To: 2008 Location: San Francisco Bay area
 Duties: For this startup just leaving stealth mode, advice on licensing and implementing audio algorithms; assist in integrating audio into portable consumer product.
- From: 2006 **Client: undisclosed**
 To: 2007 Location: Bay Area, CA
 Duties: For a well-known provider of audio software, provide and supervise a subcontractor to port a complicated digital signal processing algorithm into the Digidesign TDM Environment, in Motorola 56K assembly language.
- From: 1995 **Client: Yamaha**
 To: 2007 Location: Hamamatsu, Japan
 Duties: Chair, AES standards working group SC-02-12 on digital audio networking via IEEE-1394 (Firewire), with the support of Yamaha. Involved a trip to AES conventions twice a year, including one in Europe.

Past member, IEC TC100 TA4, Digital System Interfaces. Various public appearances worldwide and various company site visits on behalf of Yamaha to discuss multimedia networking, audio over 1394 and Yamaha's mLAN.

- From: 2005 **Client: Sonic Network, <http://www.sonicimplants.com/>**
To: 2006 Location: Somerville, MA
Duties: For this well-known provider of wavetables, synthesis software, and cell phone ring tones (among others), provide and supervise subcontractors for these projects:
- Design and implementation of filters for sample rate conversion;
 - Design and implementation of filters following the DLS-2 specification (used in cell phones for ring tones);
 - Port synthesizer code to Tensilica HiFi2 audio engine.
- From: 2004 **Client: Bias, <http://www.bias-inc.com/>**
To: 2006 Location: Petaluma, CA
Duties: For this well-known provider of audio software, provide and supervise a subcontractor to port a complicated digital signal processing algorithm into the Digidesign TDM Environment, in Motorola 56K assembly language.
- From: 2005 **Client: Audio Research Labs, [http:// www.audioresearchlabs.com/](http://www.audioresearchlabs.com/)**
To: 2005 Location: Scotch Plains, NJ
Duties: For ARL founder Schuyler Quackenbush provide and supervise a subcontractor to design and implement a digital filter algorithm in Motorola 56K assembly language.
- From: 2004 **Client: Verance, <http://www.verance.com/>**
To: 2005 Location: San Diego, CA
Duties: Working closely with Verance R&D staff, implement the Verance Content Management System/Audio-Visual (VCMS/AV) watermarking technology for motion picture sound (www.verance.com/news/releases/MSFT_Release_2-10-2005.pdf) in Motorola 56300 assembly language in the TC Electronics M6000 environment. This program is used by major film studios starting early 2005 to watermark nearly every DVD released. Travel at client's request to TC Electronics headquarters in Denmark to facilitate integration. Provide and supervise a subcontractor to assist with filter design, filter implementation, and other tasks. More than 30,000+ lines of 56K assembler source, several hundred pages of documentation, a dozen CD-ROMs of debugging data and lab notebooks.

- From: 2002 **Client: Universal Audio (<http://www.uaudio.com/>)**
 To: 2004 Location: Santa Cruz, CA
 Duties: For this well-known manufacturer of audio plugins, port two audio processing algorithms (Pultec filter, LN1176 stereo compressor) from C/C++ to Motorola 563xx assembly language in the DigiDesign ProTools TDM environment, including numerical approximation and streamlining the original C/C++ implementation. Publicly released 2004. Contribute extensively also to port of an extremely complicated high-end reverberator, and to another equalizer.
- From: 2003 **Client: undisclosed**
 To: 2004 Location: Bay Area, CA
 Duties: For another well-known manufacturer of audio plugins, extensive contributions to the TDM port of a multi-band, multi-channel compressor.
- From: 2003 **Client: Stretch (<http://www.stretchinc.com/>)**
 To: 2004 Location: Mountain View, CA
 Duties: For this software configurable processor startup, study how to port MPEG-2 AAC and MP-3 decode reference C++ code to 16- and 32-bit integerized C. Do the same for MP-3 encode based on publicly available source. Learn their software configurable architecture well enough to write optimizations.
- From: 2003 **Client: RIC International Precision Translation Services**
 (<http://www.ricintl.com/>)
 To: 2003 Location: Cambridge, MA
 Duties: For this major translation house, proofread German-English translations involving, among other things, audio compression (including German-language doctoral dissertations).
- From: 2003 **Client: Analog Devices**
 To: 2003 Location: Santa Clara, CA (Audio Rendering Technology Center)
 Duties: Port music synthesis algorithms assembly language for the ARM7/TDMI processor, following ARM's C calling conventions. This project ran under very tight time constraints, cost only 2/3 of the projected budget, and resulted in code that runs much faster than the original implementation.
- From: 2002 **Client: Dorrough Electronics (<http://www.dorrough.com>)**
 To: 2003 Location: Chatsworth, CA
 Duties: Implement in C and Analog Devices Sharc 21161 assembly language a novel scheme based on their patented technology to improve the perceived loudness of audio signals sent over broadcast. Provide a subcontractor who made significant contributions to filter design.
- From: 2002 **Client: undisclosed**
 To: 2003 Location: Santa Cruz, CA
 Duties: For a major manufacturer of wireless telecommunications hardware, help

create a development environment using Texas Instruments' C54XX, Code Composer Studio, and Reference Framework 3.

- From: 2002 **Client: undisclosed**
To: 2002 Location: Japan
Duties: For an Asian manufacturer of audio chips, assemble, manage, and contribute technically to a group of US consultants to specify and help design an audio-related chip used in broadcast applications. Establish contact between the Asian client and stateside holders of appropriate licensable technology.
- From: 2002 **Client: Analog Devices**
To: 2002 Location: Wilmington, MA (Ray Stata Technology Center)
Duties: After an on-site visit to learn more about the technology and meet the team, I made recommendations on changes to architecture for a new version of an idiosyncratic signal processing chip. I also provided code examples for the new architecture.
- From: 2001 **Client: undisclosed**
To: 2002 Location: Silicon Valley, CA
Duties: For a configurable processor manufacturer in Silicon Valley, implement a highly optimized version of the modified discrete cosine transform (MDCT) for audio compression. Extensive investigation of theory and variants of the MDCT. Also port MPEG-2 low-complexity AAC decode and MP3 encode from Fraunhofer/Thomson reference C++ code to 16-bit integerized C. Prepare various optimizations closer to the hardware than C++ usually allows.
- From: 2001 **Client: undisclosed**
To: 2002 Location: Europe
Duties: For this developer of a custom processor based on ARM architecture, investigate licensing of and make recommendations for porting AC-3, DTS, Dolby ProLogic.
- From: 1999 **Client: Berkeley Design Technology, Inc. (<http://www.bdti.com/>)**
To: 2001 Location: Oakland, CA
Duties:
 - For BDTI's Buyer's Guide to DSP Processors, 2001 Edition, contribute major portions of the text analyzing processor architectures including the Analog Devices TigerSharc, and contribute also to the analyses of Motorola 56300, 56800, and 56800E processors; verification and in some cases re-writing assembly-language implementations of BDTI's benchmarks;
 - Prepare written analyses of Hitachi SH-DSP, SH3-DSP, SH-4, and SH-5 processor architectures. This again included verification and in some cases re-writing assembly-language implementations of BDTI's benchmarks;
 - Implement assembly-language routines related to multimedia

- compression in ARM7/ARM9 processor assembly language;
- Develop and present a four-hour presentation on audio compression, given first at Embedded Processor Forum, June, 2000; contribute to a four-hour presentation on digital audio and music given by Dana Massie at the same Embedded Processor Forum; revised and presented both talks at Microprocessor Forum, October 2000; both talks revised again with emphasis on streaming audio and presented at Embedded Processor Forum, June, 2001.

- From: 1995-1996 **Client: Audio Precision (<http://www.audioprecision.com>)**
- And 1998-1999 Location: Portland, Oregon
- Duties: Audio Precision (Portland, Oregon). For their System 2 audio measurement device, developed double-precision Fourier transform (FFT) in assembly language for Motorola 56002 processor, including (Microsoft) C code to study where to maintain double-precision. Also, extensive code for AES/EBU and square wave measurement test suite, including jitter and eye pattern (assembling bit map for graphics display in 56002 data memory space). 28K+ lines of assembly language source. 1998-1999: Revise Audio Precision System 2 code for new 96 kHz Cascade hardware (Motorola 56303).
- From: 1997 **Client: Euphonics (later part of 3COM)**
- To: 1999 Location: Boulder, CO
- Duties: Implement Dolby AC-3 decoder (used in Dolby Digital cinema sound) in 16-bit integer assembly language on new Analog Devices 16-bit integer AD1818 processor (PCI SoundComm). 20K+ lines of assembler source. Passed first round of Dolby testing on first try. Integrate with Euphonics' Real-Time Kernel operating system.
- From: 1998 **Client: undisclosed**
- To: 1999 Location: Silicon Valley, CA
- Duties: Assist a startup specializing in real-time music software in its attempts to be acquired. Included introducing company staff to personal contacts in various music companies, and participating in various meetings.
- From: 1998 **Client: undisclosed**
- To: 1998 Location: Silicon Valley, CA, and southern CA
- Duties: For a major chip manufacturer, I served as the sole outside member of the due diligence technical team evaluating a small but well-known synthesizer company ultimately acquired by the chip manufacturer. After visiting the synthesizer company's office with a team from my client, I provided a detailed written report on software, music synthesis chip architecture, and various management questions.

From: 1996 **Client: Digital Technics (DTI)**
 To: 1997 Location: Baltimore, MD.
 Duties: Implementation of CCITT R2 telephony encoder/decoder (similar to DTMF) in Motorola 56002 assembly language, based on Goertzel algorithm. 13K+ lines assembler. Deployed in the field in Asia and South America.

From: 1996 **Client: VM Labs**
 To: 1996 Location: Los Altos, CA
 Duties: For this multimedia chip startup, provide detailed critique of their proprietary DSP chip architecture.

From: 1994 **Client: undisclosed**
 To: 1995 Location: Asia
 Duties: For a major manufacturer of audio hardware, commissioned to write a study of audio over networks. Investigate and deliver a 40 page report analyzing MIDI, ZIPI, 1394, PCMCIA, Ethernet, ATM, Lone Wolf, USB, and others.

From: 1993 **Client: Oculix**
 To: 1995 Location: Switzerland
 Duties: Motorola DSP 56000 assembly language for numerical and FFT analysis of real-time data gathered by laser from the human eye for medical applications. 150K source.

From: 1993 **Client: Centigram Communications Corporation.**
 To: 1994 Location: Silicon Valley CA (apparently now part of SS8 Networks)
 Duties: Port of speech synthesis code from TI TMS320E17 assembly language to Motorola DSP 56002 assembly language on Motorola PC Media card; port to Analog Devices ADSP 2115 assembly language on Echo Personal Sound System.

From: 1993 **Client: Atari**
 To: 1994 Location: Sunnyvale, CA
 Duties: implement physical modeling music synthesis techniques on custom RISC/DSP chip inside Jaguar game console. Prepare written comments on a new custom DSP architecture.

From: 1993 **Client: undisclosed**
 To: 1993 Location: New England
 Duties: For a US audio manufacturer, write audio recording, storage, and playback functions in assembly language for Analog Devices ADSP 2105. Farmed out DAC/ADC device drivers to subcontractor. Also farmed out front-panel code on Philips/Signetics 80C51 family of controllers to different subcontractor.

From: 1993 **Client: Euphonics**
To: 1993 Location: Boulder, CO
Duties: For this software music synthesizer company, write C routines to emulate certain hardware elements in the target architecture. This allowed the company to study aspects of caching parameter updates, for optimizing real-time performance.

From: 1993 **Client: undisclosed**
To: 1993 Location: Bay Area, CA
Duties: For a research project involving DSP architecture, write a series of Java classes to emulate the typical components of a DSP chip.

From: 1987 **Client: Shure**
To: 1988 Location: Evanston (now Niles), IL
Duties: Working from the written specification for a proprietary algorithm, develop C and TI TMS 32010 assembly language for a multi-channel consumer audio product prototype.

From: 1987 **Client: NeXT, Inc.**
To: 1988 Location: Silicon Valley, CA
Duties: NeXT Inc. Developed, debugged, and documented more than 50 routines in the Motorola DSP 56000 assembly language vector library (with Julius O. Smith; source code printout is 2" thick.). While working off-site for over a year before NeXT was publicly released, maintain secrecy about the fact that NeXT would include a 56000 processor.

From: 1986 or **Client: Sonic Solutions**
1987
To: 1986 or Location: San Francisco CA
1987
Duties: As one of the first consultants hired by Sonic Solutions (located in their first office in San Francisco), port their C-language noise-reduction code from one flavor of Unix to another.

Other experience:

- Studies of micromachining and nanotechnology.
- Experience with the Star Semiconductor SPROC chip, the IBM MWAVE chip and operating system, OS-9, and Spectron's SPOX operating system.

Patents

<u>Patent Number</u>	<u>Date Issued</u>	<u>Title</u>
5,569,871	October 29, 1996	Musical tone generating apparatus employing microresonator array (co-inventor; micromachining) As Vice-President and President of Yamaha Music

Technologies Inc., I supervised the patent applications by my employees that resulted in US patents 5,245,130, 5,288,938, 5,386,568, 5,422,956, 5,536,902, and 5,541,358.

Teaching appointments

From: 2003 **University of Colorado at Denver, College of Arts & Media**
To: 2008 Denver, CO
Position: *Lecturer, College of Arts & Media*
Duties: Teach special topics course on audio data compression to upper-level undergraduate and graduate students.

Major Publications

- "Approximation and Syntactic Analysis of Amplitude and Frequency Functions for Digital Sound Synthesis." *Computer Music Journal* 4(3):3-22, 1980.
- *Modeling Musical Transitions*. Ph.D. Thesis, Stanford University, 1985. 243 pp.
- (with C. Roads). *Foundations of Computer Music*. MIT Press, 1985. 600 pp.
- *Digital Audio Engineering: An Anthology*. Madison, WI: A-R Editions, 1985. 144 pp.
- *Digital Audio Signal Processing: An Anthology*. Madison: A-R Editions, 1985. 283 pp.
- "Orchestral Instruments: Analysis of Performed Transitions." *Journal of the Audio Engineering Society* 34(11):867-80, 1986.
- "Editing Time-varying Spectra." *Journal of the Audio Engineering Society* 35(5):337-51, 1987.
- "Analysis and Synthesis of Musical Transitions Using the Discrete Short-time Fourier Transform." *Journal of the Audio Engineering Society* 35(1/2):3-14, 1987.
- "Implementing Table Lookup Oscillators for Music with the Motorola DSP56000 Family." Presented at the 85th Convention of the AES, 1988. Preprint No. 2716.
- "Digital Audio Representation and Processing." *Multimedia Systems*, edited by John F. Koegel. ACM and Addison-Wesley, 1993.
- "Technological Change: The challenge to the audio and music industries" (written version of AES keynote address). *Journal of the Audio Engineering Society*, March 1997.

- (with James Grunke, Ben Novak, Bruce Pennycook, Zack Settel, Phil Wiser, and Wieslaw Woszczyk). “AES White Paper: Networking Audio and Music using Internet2 and Next Generation Internet Capabilities.” *Journal of the Audio Engineering Society* 47(4):300-310, April 1999. Presented (with Betsy Cohen and AES President Marina Bosi) to White House National Economic Council, December 1998. <http://www.aes.org/technical/i2.html>.
- (with Yamaha’s Mike Overlin). “Playing with Fire,” *Electronic Musician*, May 2003, pp. 31-38 (http://emusician.com/ar/emusic_playing_fire/index.htm, on audio networking over 1394).

Professional Associations and Achievements

- Assistant Editor, *Computer Music Journal*, 1978-1982.
- Co-founder (1980), International Computer Music Association.
- Founder and Series Editor (1984-1996), *The Computer Music and Digital Audio Series*.
- Conference Chair, 1987 Audio Engineering Society (AES) International Conference on Music and Digital Technology (Los Angeles).
- Technical Papers chair, 1992 AES Convention, San Francisco (first AES San Francisco Convention). Technical Papers co-chair, 2002 AES convention, Los Angeles.
- Elected member of the AES Board of Governors, 1992-1994; again 2005-2007.
- Keynote Speaker, November 1996 Audio Engineering Society Convention.
- Fellow (1996), Audio Engineering Society.
- Honorary Member (since 1998), Midi Manufacturers Association (MMA).
- Convention Chair, 2004 AES Convention, San Francisco. Recipient of an Anderton Award, Pro Sound News, December 2004, p. 30.
- Convention Chair, 2006 AES Convention, San Francisco.
- Convention Co-chair, 2008 AES Convention, San Francisco.
- Chair, Audio Engineering Society Convention Policy Committee, 2006-2008.
- Technical presentations and session chair at various conferences such as Audio Engineering Society, Acoustical Society of America, International Computer Music Conference, DSP World.
- Member of review board, *Journal of the Audio Engineering Society*.
- Conference paper reviewer for many International Computer Music Conferences (ICMC).
- Member, Acoustical Society of America. Senior Member, IEEE.

Further qualifications

Functionally bilingual in German. Reading ability in French, Dutch. Some experience with Spanish, Italian, Japanese, Latin. Separate list of foreign language experience available on request. Extensive experience travelling abroad and communicating with foreigners.

Other activities

I currently enjoy spending time with my family and hiking. In earlier years I have especially enjoyed travel, aikido, weightlifting, operating a Maerklin Z-gauge model railroad, performing a wide variety of folk and classical music, and attending musical events. Member of Toy Train Operating Society of America.

References

Full vita and references from industry and academia available on request.

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