

OBJECTIVE Develop new experiences that require fundamental problems to be solved.

- SKILLS**
- Passionate about algorithms and optimisation from application to hardware level, with particular focus on closing the gap between theoretical and actual throughput.
 - Experience with digital logic design: developed C-Models of hardware pipelines from algorithmic to cycle accurate level when appropriate.
 - Intimate understanding of ray tracing and rasterisation graphics algorithms.
 - Extensive GPGPU development experience, including *CUDA* and *OpenCL*.
 - Implementation and use of *OpenGL* and *OpenGL ES w/ GLSL*.
 - Hands-on experience writing to the metal with many ISAs, specifically:
 - *SSE, AVX, VideoCore II and III, PPC, AltiVec, m68k, PIC.*
 - Fluent with higher level languages including: *C, C++, Objective C, Delphi, Pascal.*
 - Hardware bring-up experience: Early silicon, FPGA's, JTAG debug, power.
 - ISA emulation experience.
 - API design experience – backward compatibility, conformance, standardisation.
 - *Cocoa/UIKit* experience, recently targeted to iPhone/iPad development.
 - Startup company experience – technical leadership, fundraising, presentation.
 - Large audience presentation skills – presented at Apple's WWDC for 3 years and done many venture capital, tradeshow and technical presentations.
 - Ability to build a strong patent portfolio around ideas that deserve patents, in conjunction with a skilled patent lawyer.
 - Other skills include: Common sense, Car engine design, TIG welding, piano performance, basic fabrication.

EXPERIENCE **INVENTOR** – *MINE Innovation Engineering, San Francisco and Berlin* 2014–
 Developing software, hardware and algorithms for a next-generation communication experience.

DIRECTOR OF R&D,

POWERVR RAY TRACING – *Imagination Technologies; San Francisco, CA* 2011–2014
 Caustic Graphics, Inc. was acquired by Imagination Technologies, Plc. to continue to develop efficient ray tracing graphics hardware and software IP. Led integration effort with Imagination resulting in “Wizard” PowerVR mobile GPU core which pairs high-efficiency ray tracing 3D visibility queries, memory coherence gathering and efficient hardware acceleration BVH assembly. Worked with customers and partners on explaining the architecture and developing consumer ray tracing use cases.

CTO, FOUNDER – *Caustic Graphics, Inc; San Francisco, CA* 2006–2011

Founded company to bring cinema quality ray tracing to the mainstream. Co-invented several patented algorithms to dramatically improve memory bandwidth and SIMD efficiency of multi-core hardware architectures when processing scattered rays for real-time performance in consumer applications. Deployed algorithms in both 90nm ASIC @ 350Mhz and FPGA form. Developed and shipped “*OpenRL*”, a proposed industry standard, fully programmable graphics API for ray tracing. Built a team of 30 individuals, interviewing many engineers in both software and hardware.

**EXPERIENCE
CONTD.**

MOBILE 3D GRAPHICS ARCHITECT – *Apple Computer, Inc; Cupertino, CA* 2004–2006

Implemented an innovative high performance OpenGL ES tile-based software renderer for the Broadcom VideoCore II DSP – a 150Mhz, 16bit integer, 16 wide SIMD vector processing chip originally designed for video processing. The result was an ultra low power OpenGL ES software stack with fill rates exceeding 80Mpixels/second. This enabled the graphics and mobile gaming on the 5th generation iPod video and the upper level OpenGL stack was used on the iPhone.

SENIOR 3D GRAPHICS ENGINEER – *Apple Computer, Inc; Cupertino, CA* 2001–2004

Implemented a fully programmable, OpenGL software renderer for Mac OS X including complete support for GLSL. Developed Apple's JIT shader compiler that stitched hand written Altivec code segments for real-time rendering performance. Developed OpenGL Shading Language specification and its earlier precursors as a member of the Khronos body, working with individuals at several IHVs. Designed "*ShaderBuilder*", a tool to allow real-time shader development and debugging, which shipped with Mac OS X.

SOFTWARE ENGINEER – *Firepad, Inc; Mountain View, CA* 2000–2001

Designed and implemented a mobile vector graphics rendering engine and encoding scheme optimised for PalmOS devices. This enabled vector street maps and 3D engineering wireframes to be viewed in real-time on low cost mobile devices.

PARTNER – *Sinewave Computing, Belfast, Northern Ireland, UK* 1999–2000

Developed "*Dreadling*", the worlds first fully texture mapped, multi-level grayscale 3D game for the Palm Pilot, featured in the New York Times. Developed "*Vexed*", a popular puzzle game for PalmOS, now an open-source project on many platforms.

PROGRAMMER – *TGM Computer Systems, Hillsborough, Northern Ireland, UK* 1997–1998

Developed "*Kingswood Sheep*", a Windows GUI based pedigree sheep farm management program, written in Borland Delphi with SQL database links.

**OTHER
PROJECTS**

TSUNAMI – A bridge to open software developers to hardware temporal debug tools.

GLTERMINAL – Complete terminal emulator that simulates old CRT display anomalies and reduced baud rates using OpenGL. Won Apple demo competition.

IKALEID – Real-time kaleidoscope simulation using the GPU.

4A-GE TURBO – Developed and hand crafted complete engine design to augment the famous Toyota 4A-GE engine with a high response turbo charger system and complete programmable engine management.

IP 23 Patents in the areas of parallel computation, hardware and computer graphics.

EDUCATION

METHODIST COLLEGE BELFAST – *1 Malone Road, Belfast, Northern Ireland* 1993-2000

A-levels in Pure Mathematics, Electronics and Computer Science

PIANOFORTE – *Associated Board of the Royal Schools of Music*

Grade 8, maximum honours