

# Christopher Culbreath

Physicist · Software Developer · Educator · Maker

I became a physicist because I love building things that don't exist yet—instruments, automation, the software to drive them—and doing so with a craftsman's care. My PhD work had me machining fifty-odd precision parts, designing LabVIEW control systems, and writing C drivers and image-processing algorithms, all because the tools I needed weren't on any shelf. That same instinct carried me into industry, where I built Python and embedded automation that moved a novel material from lab curiosity to commercial-scale production. I see a clear home for that work at Cirrus Logic: designing the internal test stations, measurement tools, and automation infrastructure that let a silicon team ship with confidence.

📍 Austin, TX

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## Skills

### ★ Physics & Scientific Expertise

*Metrology · Optical Engineering  
Materials Characterization  
Materials Science · Experimental  
Physics Thermodynamics*

### ★ Software Development

*Python · C++ · C · Bash · MATLAB  
Swift · PHP · Mathematica  
JavaScript · Database Design*

### ★ Embedded Systems

*LabVIEW · Oscilloscopes & Test  
Equipment Real-time Control  
Control System Design · Arduino  
I<sup>2</sup>C*

### ★ Engineering & Fabrication

*CNC Machining · Mechanical  
Design Fixturing · SolidWorks  
Sensor Design · Soldering  
Mechatronics*

### ★ Technical Communication

*Technical Writing · Documentation  
Technical Illustration · Data  
Visualization Public Speaking ·  
LaTeX*

### ★ Data Analysis

*Statistical Analysis · Mathematical  
Modeling Image Processing · Signal  
Processing Data Logging · Data  
Pipelines*

## Education

### PhD Chemical Physics

January 2015

*Kent State University*

### BS Physics

June 2008

*California Polytechnic State University*

## Work Experience

September 2016 – June 2024

### Senior Lecturer, California Polytechnic University

- Physics Cloud (Yii2/PHP/MySQL) was a full-stack internal tool I built from scratch to replace the university's legacy LMS, handling submissions, grading, RBAC, and adaptive assessment logic—all deployed, documented, and maintained by me.
- Developed custom data visualization and image processing pipelines in Python and Mathematica to turn raw lab and research data into clear, publication-ready plots and documentation.
- Designed and deployed automated assessment workflows with algorithmic gap detection—requiring careful database schema design, query optimization, and iterative testing—to surface targeted interventions from raw student performance data.
- Created a library of 120+ custom physics animations in Mathematica, translating abstract time-dependent phenomena into clear visual narratives—treating visual design as a core technical communication tool.

January 2015 – June 2016

### Lecturer, California State University, Chico

- Taught hands-on instrumentation and measurement techniques in the introductory Mechanics Laboratory—guiding students through equipment setup, data collection, and real-time troubleshooting of unexpected behavior.
- Redesigned course delivery using direct feedback data and physics education research, establishing a measurable cycle of continuous improvement.
- Delivered core physics curriculum to 500+ students per year with consistently top-tier satisfaction ratings and a reputation for clarity and accessibility.

February 2017 – October 2023

### Materials Science & Automation Engineer (Consultant), TiNi Alloy • Elastium • NRD LLC

- Wrote driver-level LabVIEW software for a continuous casting furnace, integrating sensor feedback to regulate temperature, atmosphere, and pull rate for single-crystal shape memory wire production.
- Built a high-throughput automated temperature cycling system to exhaustively test operating parameters—manual testing would have been impossibly slow—coupling instrumentation control with data acquisition to define production-ready conditions.
- Scaled the Ohno Continuous Casting process from lab prototype to commercial production, bringing a purpose-built furnace online with custom process control software and hardware automation.

April 2019 – December 2020

### Development & Testing Engineer, Nuance Designs

- Designed and built an automated test station for high-throughput temperature cycling of a novel autoinjector prototype, replacing manual methods that couldn't cover the parameter space.
- Developed a foundational thermodynamic model that corrected erroneous assumptions in external simulations of gas expansion in finite volumes, restoring shared understanding across the team.
- Traced a critical flow-regulator clogging failure to propellant oil contamination via root cause analysis; built an in-house purification workflow using centrifugal separation and 0.1µm filtration to eliminate the failure mode entirely.

## Projects

- **Sprung - AI Job Search Copilot** Open-source native macOS tool built in Swift with SwiftUI and SwiftData—integrates multiple LLM APIs, a structured knowledge card system, JSON schema validation, and automated document generation into a single automation platform. Clean architecture across 705+ source files managing complex orchestration and content pipelines.
- **Physics Cloud - Learning Management System** Full-stack internal tool built from scratch in Yii2, PHP, MySQL, and JavaScript that automates the entire course lifecycle—enrollments, submissions, RBAC-based access control, adaptive assessment logic, and custom data visualizations. Continuously maintained and extended since 2016.
- **Slidr - Native macOS Media Gallery with AI & Video Processing** Native macOS media gallery built in Swift and SwiftUI with AES-256 encryption, real-time folder monitoring, and frame-accurate video processing via ffmpeg and AVFoundation. Integrates agentic LLM workflows across multiple providers (xAI Grok, Groq Whisper, Mistral) for AI-powered media analysis with SwiftData persistence.

From first-principles thinking to production code—explore my work at [culbreath.net](https://culbreath.net)