Brandt Weary

Naturalist & Systems Engineer

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SOFTWARE & TECHNICAL PROJECTS

Almanac

Creator and sole developer · September 2023 – Present

Almanac is an open-source, voice-first, privacy-first reference assistant for DIYers, homesteaders, and anyone off-grid, live at brandtweary.com/almanac <https://brandtweary.com/almanac>. An open-weights language model and an offline library of public archives run entirely on a single 32 GB consumer GPU — no cloud, no accounts; its one optional online feature is web search. Ask a question while you're under the sink or halfway into an engine bay: it searches the collection, reads the passages that matter, and talks you through the repair by voice while your hands stay on the work.

- Assembled and indexed an offline reference library of roughly 100,000 documents: full English Wikipedia, the complete English Project Gutenberg collection, iFixit's 103,000+ repair guides, Appropedia, and more
- Built hybrid retrieval over the collection, combining keyword search with semantic search over document embeddings, with optional reranking of the results
- Designed the agent loop to run in the browser: it chooses what to search and read, follows up when it needs more, and backs every answer with a linked sources list
- Built the voice pipeline locally: faster-whisper speech-to-text and Pocket TTS synthesis
- Protected the corpus with an RFC 6962 Merkle manifest, background scrubbing, per-document quarantine, and repair from parity or upstream copies
- Open source under the MIT license, written in TypeScript and Python

Embedded systems

Personal projects · April 2025 – Present

Hardware and firmware work built from stock electronics, programmed in Rust and C.

The largest is minibot, an open-source, voice-controlled robot car built February to May 2026: a Maqueen chassis driven by a BBC micro:bit, with a HuskyLens camera running custom firmware. Say "go forward" or "turn red" and it just does it, the command recognized and executed on the hardware itself with no internet involved; ask for something more involved — "patrol the room and tell me if anything gets close" — and a language model works out how to carry it out. It can also be taught: new behaviors, uploaded as scripts, persist across power cycles and run entirely on-chip.

- Wrote the robot's firmware in embedded Rust, including a scripting engine small enough to run on the micro:bit itself, so uploaded behaviors execute on-chip at ~30 ms response with no computer attached, and a hardware watchdog that reboots the robot automatically if its firmware ever locks up
- Implemented speech recognition that runs entirely on the camera's K210 coprocessor, recognizing roughly 50 spoken commands with no internet or server involved
- Streamed live camera video over Bluetooth, and made the robot directly controllable by an AI agent
- Built a working phone app that drives the robot, with the phone serving as its wireless link

Other embedded work:

- Mushroom signal monitoring: ESP32 firmware reading microvolt-scale bioelectric signals from living *Hericium erinaceus* (lion's mane) mycelium through a 16-bit ADC, alongside CO2, temperature, and humidity sensing, streamed over WiFi to host servers
- Termite vibration monitoring: a two-channel piezo rig listening for substrate vibration in a *Reticulitermes*-colonized log against an uncolonized control — capturing headbanging, the drumming signal termites use to communicate through the wood itself
- Soil moisture sensing: a capacitance-based soil moisture sensor read by an ESP32 and displayed on an LCD with dry/wet calibration constants

FIELD EXPERIENCE

Essig Museum at UC Berkeley

Entomology Field Technician · February 2023 – August 2023 · Berkeley, CA

Worked as a full-time field technician at the Essig Museum of Entomology as part of a grant to collect DNA barcodes from every insect species in California.

- Organized and conducted entomological surveys across California using a range of collecting techniques (pitfall, malaise, sweeping, beating)
- Sorted, identified, and processed arthropod specimens, often preparing them for DNA barcoding and extraction
- Secured federal and state research permits, including National Park Service permits for Point Reyes and Pinnacles and an authored research proposal for Six Rivers National Forest
- Conducted post-construction biodiversity surveys at Apple Park under contract between Apple and the Essig Museum
- Coordinated field operations across the UC Natural Reserve System: site scheduling, reserve invoicing, travel reporting, and budget tracking
- Liaised with researchers and reserve managers across the state of California

Monarch Joint Venture

Monarch Monitoring Field Technician · March 2021 – October 2021 · CA

Full-time field technician on a statewide survey of western monarch butterflies and their habitat across California BLM land.

- Performed vegetation and butterfly surveys across remote California public land
- Traveled overnight to remote sites statewide to assess and evaluate habitat restoration and enhancement projects
- Served as primary liaison with Bureau of Land Management staff
- Communicated with and trained land managers, partners, and colleagues
- Selected sites using ArcGIS; navigated by GPS, paper map, and compass, frequently hiking 5+ miles a day
- Identified plants, recorded detailed field data, and maintained and repaired equipment

UC Santa Cruz, Natural Reserves

Field Researcher · October 2020 – December 2020 · CA

Field researcher on a project studying the effects of the 2020 California wildfire season on burned University of California reserves.

- Served as arthropod specialist on a team conducting ecological surveys at burned and unburned habitats across six UC reserves
- Owned implementation and execution of all arthropod sampling, and trained other crew members in the methodology
- Conducted soil, vegetation, and small mammal sampling

Orana Sanctuary Biodiversity Survey

Lead Entomologist · January 2020 · Victoria, Australia

Contracted by Odonata, a bush regeneration and sustainable land management non-profit, to conduct a biodiversity survey.

- Designed and conducted a 3-day survey assessing insect diversity at Orana Wildlife Sanctuary, collecting and identifying insects in the field
- Liaised with conservationists, landowners, and contractors
- Authored the full insect diversity report delivered to the client

Will Lab, UC Berkeley

Research Assistant · February 2016 – May 2019 · Berkeley, CA

Insect systematics lab under Prof. Kip Will, studying fire effects on arthropod assemblages at Mt. Diablo State Park.

- Trained and managed other undergraduates; streamlined lab protocol
- Organized the project database, analyzed results, and authored annual reports
- Conducted twice-monthly field work; identified arthropods and curated specimens

USDA-ARS Invasive Species and Pollinator Health Research Unit

Field Technician · June 2018 – December 2018 · Albany, CA

Biological control research on exotic weeds using insects as control agents.

- Cultivated exotic weed species for experimental use
- Reared insect colonies for biological control and performed field releases in the California Central Valley

RESEARCH

Cyanide resistance and predatory behavior of *Promecognathus* beetles

Lead Researcher · January 2018 – July 2020 · Berkeley, CA

Independent research project on a California ground beetle's predation of cyanide-producing millipedes.

- Designed and executed the study, performing gas chromatography-mass spectrometry analysis on gut contents and defensive secretions
- Funded by the College of Natural Resources SPUR program and the Save Mt. Diablo Mary Bowerman Science and Research Program
- First author on the resulting paper in *Annals of the Entomological Society of America*
- Study featured in the KQED Deep Look episode "This millipede and beetle have a toxic relationship" <https://www.youtube.com/watch?v=s5ocDRUFUIE>

Performance of ramp and pitfall traps

Lead Researcher · March 2016 – April 2019 · Berkeley, CA

Comparative methods study on trap performance for arthropods and non-target vertebrates.

- Designed and executed the study across Californian oak woodland and chaparral habitats
- First author on the resulting paper in *The Pan-Pacific Entomologist*

PUBLICATIONS

Weary, B., Will, K. (2020) The Millipede-Predation Behavior of *Promecognathus* and Exceptional Cyanide Tolerance in *Promecognathus* and *Metrius* (Coleoptera: Carabidae) <https://doi.org/10.1093/aesa/saaa023>. *Annals of the Entomological Society of America*, saaa023. doi:10.1093/aesa/saaa023

Pavlov, J., Xu, S., Will, K., Weary, B., & Attygalle, A. (2020) HCN emission by a Polydesmid Millipede Detected Remotely by Reactive Adsorption on Gold Nanoparticles Followed by Laser Desorption/Ionization Mass Spectrometry (LDI-MS) <https://doi.org/10.1007/s10886-020-01177-3>. *Journal of Chemical Ecology*, 46(4), 455-460. doi:10.1007/s10886-020-01177-3

Weary, B., Mendez, P., Lew, S., Nyman, B., & Will, K. (2019) Performance of Ramp and Pitfall Traps for Arthropods and non-Target Vertebrates in Californian Oak Woodland and Chaparral Habitats <https://doi.org/10.3956/2019-95.1.21>. *The Pan-Pacific Entomologist*, 95(1), 21-32. doi:10.3956/2019-95.1.21

LEADERSHIP

Berkeley Entomology Club

Co-Founder and President · March 2016 – May 2018 · Berkeley, CA

Co-founded the organization and led it for two years.

- Led weekly meetings, collecting trips, and events; managed club finances
- Ran public outreach at CalDay and the Bay Area Science Festival (30,000+ visitors)

EDUCATION

University of California, Berkeley

Bachelor of Science · Class of 2018

Major: Molecular Environmental Biology. Department of Environmental Science, Policy, and Management.

SKILLS

Entomology

Arthropod identification and systematics; specimen collection, pinning, curation, labeling, and collection databasing; specimen preparation for DNA extraction and barcoding; insect rearing and live colony maintenance; behavioral assay design

Field Survey Methods

Malaise, pitfall, pan, ramp, and light trapping; sweep netting, beating sheets, Berlese funnels, aquatic sampling, baiting, and hand collecting; vegetation cover and fuel load estimation; canopy fire damage assessment; small mammal trapping (Sherman traps); soil cores, mini disk infiltrometer, hydrophobic testing; laser range finder

Botany & Restoration

Native plant identification; wildlife identification; habitat evaluation and restoration project assessment; ecological restoration; horticulture and cultivation of plants for experimental use; oyster and lion's mane mushroom cultivation

Laboratory

Sterile laboratory protocol; gas chromatography-mass spectrometry; sample processing and chain-of-custody handling; specimen and sample shipping to partner institutions

Research & Scientific Practice

Independent experimental design; data analysis; scientific writing and peer-reviewed publication; technical reporting for clients and agencies; federal and state research permitting (NPS, USFS, BLM); public science outreach

Field Operations

ArcGIS; GPS, paper map, and compass navigation; remote and backcountry fieldwork; 4x4 operation; multi-site scheduling, budget tracking, and travel logistics; training and supervision of field crews. Wilderness First Aid (2023), CPR (2021)

Programming Languages

Python, Rust, TypeScript / JavaScript, embedded C/C++, Nix, Bash, SQL, Lua, GDScript

AI & Machine Learning

LLM application development; agent architectures and multi-agent orchestration; long-term memory systems for AI agents; deep reinforcement learning; spiking neural network simulation; artificial life; retrieval systems (term-matching, embeddings, vector search); speech-to-text and text-to-speech pipelines; LoRA fine-tuning; PyTorch; evaluation and benchmark design

Embedded & Hardware

Embedded Rust and C/C++ on ESP32; ESP-IDF toolchain; sensor integration and signal acquisition; piezo and electrode instrumentation for biological signal capture

Other

Macro photography, Adobe Photoshop and Lightroom, Godot engine