Alexander Przybysz

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Professional Profile	Former Research Specialist at the Sensors Laboratory at KAUST with expertise in rapid prototyping, circuit and PCB design, and microcontroller software development. Experienced in constructing test environments, characterizing materials and devices, and developing analog and digital control systems. Seeking to deepen my understanding of automation, robotics, and embedded systems

Education	**Bachelors in Engineering: Electrical & Electronic Engineering Stellenbosch University 2016** Relevant Modules: Electronics, Control Systems, Analog design, Digital Design, Systems and Signals.

Employment

2020 – 2024: Research Specialist, Sensors Lab, KAUST

- **Lab Management & Operations**: Managed lab safety procedures, including SOP updates, PPE inventory, equipment maintenance, and chemical inventory. Handled procurement for lab equipment and components.
- **Prototyping & Development**: Led the design, fabrication, and testing of electronic devices, including PCB design, enclosure machining, and rapid prototyping. Collaborated on projects involving gas sensing, robotics, and underwater sensor tags.
- **Project Collaboration**: Worked with PhD students to design and implement custom devices, including a handheld gas sensor, plant root phenotyping robot, and speech analysis headgear. Designed control circuits, interfaces, and firmware.
- **End-to-End Prototype Development**: Developed complete systems for field deployments, including coral reef rehabilitation devices and marine animal tracking tags. Managed mechanical design, circuit assembly, firmware development, and field testing.

2018 – 2020: Research Technician, Sensing Magnetism & Microsystems Lab, KAUST

- **Analog Circuit Design & Calibration**: Developed analog circuits for sensor readouts, focusing on amplifying weak sensor signals and ensuring stability through custom calibration algorithms. Supported data collection for various sensor applications, including PhD research projects.

- **Lab Support & Collaboration**: Provided technical support to researchers in the lab, contributing to circuit design, prototyping, and integration of sensor systems with data analysis platforms.
- **Material Characterisation**: Performed in-depth characterization of the magnetic, electrical, and mechanical properties of composite materials, contributing to the optimization of sensor designs and material performance.

2017 – 2018: Graduate Trainee, Glencore Coal Graduate Program

- **Safety Protocols & Risk Management**: Gained practical experience in implementing safety measures and risk management protocols within coal mining operations.
- **Coal Handling & Preparation**: Developed a foundational understanding of coal handling processes, supporting the optimization of mining workflows and preparation systems.
- **Operational Exposure**: Gained a broad perspective on industrial coal mining procedures and safety compliance.

Projects

KAUST Sensors Lab

- Designed and developed a handheld electronic device to measure low concentrations (0-5ppm) of nitrogen oxides using gas transducers.
- Constructed a robotic control system for a 4-axis automated camera to acquire plant root images for phenotyping. Showcased at 7th International Plant Phenotyping Symposium 2022.
- Developed an automatic underwater dispenser to inoculate coral reefs with probiotic solutions in the Red Sea. Showcased at Malaysia Technology Expo 2023.
- Designed a prototype accessibility device for speech therapy and the vocally impaired.
- Developed a submersible marine animal (seal and turtle) sensor tag for data logging and wireless transmission of environmental metrics (depth, temperature, orientation, location).

KAUST Sensing Magnetism & Microsystems lab

- Developed self-calibrating sensor circuits for Laser Scribed Graphene (LSG) transducers used for flow and speed measurements as well as strain and material deflection.
- Developed a marine buoy to collect and wirelessly transmit (via GSM) stationary marine environment metrics such temperature and marine animal behavior. Presented at Sensors Application Symposium 2020.
- Developed a self-calibrating amplification circuit for Anisotropic Magneto Resistive (AMR) sensors for intravenous catheter tip localization.

Undergraduate

- Final year dissertation “Analog Control System for Magnetic Levitation” (With distinction) Stellenbosch University

Technical Skills

- **PCB design and assembly:** Expertise in PCB design (KiCAD, Eagle, Altium) and assembly (hand solder and reflow).
- **Hardware debugging:** proficient in analyzing and testing hardware circuits with various measurement tools (oscilloscope, spectrum analyser, logic analyser).
- **Machining skills:** Skilled in manual machinery and CNC profiling/machining (lathe, end mill, water/laser cutter)
- **Rapid Prototyping:** Hands on experience in 3D printing (filament & SLA), vacuum molding, potting and electronic circuit encapsulation.
- **Micro-controller Firmware Design:** experienced in writing firmware (Arduino, Segger) for various micro-controllers and SOCs (Atmel, Espressif, Nordic Semiconductor, Padauk)
- **Programming Skills:** Proficient in writing applications and software and firmware in C, C++, python and kotlin.
- **IoT development:** hands on experience in developing devices that implement LoRa, Cellular and Satellite (ARGOS) communcation.
- **Modelling and analysis:** Experienced with MATLAB/Simulink and interfacing with laboratory instrumentation using LabVIEW.
- **Mechanical Modelling:** Experience in designing mechanical parts, enclosures and assemblies in Solidworks and Fusion360.
- **Instrumentation operation:** Experienced in operating advanced instrumentation and machinery: Vibrating Sample Magnetometer (VSM), Instron Push-Pull Tester (for material characteriztion), material deposition (Sputtering & Vapor Deposition), hydrostatic pressure testing (deep water simulation).

Publications

- Kaidarova A, Khan MA, Marengo M, Swanepoel L, Przybysz A, Muller C, Fahlman A, Buttner U, Geraldi NR, Wilson RP, Duarte CM. Wearable multifunctional printed graphene sensors. NPJ Flexible Electronics. 2019 Aug 2;3(1):15.
- Lube V, Noyan MA, Przybysz A, Salama K, Blilou I. MultipleXLab: A high-throughput portable live-imaging root phenotyping platform using deep learning and computer vision. Plant Methods. 2022 Mar 27;18(1):38.
- Swanepoel L, Alsharif N, Przybysz A, Fourie P, Goussard P, Khan MA, Almansouri A, Kosel J. A facile magnetic system for tracking of medical devices. Advanced Materials Technologies. 2021 Jun;6(6):2100346.
- Kaidarova A, Vijjapu MT, Telegenov K, Przybysz A, Salama KN, Kosel J. Enhanced graphene sensors via multi-lasing fabrication. IEEE Sensors Journal. 2021 Jun 10;21(17):18562-70.

- Swanepoel L, Przybysz A, Fourie P, Kosel J. Magnetic Catheter Placement in Neonates: A Handheld Solution to Radiation Exposure and Operational Delays. Advanced Sensor Research. 2023 Jan;2(1):2200029.

Conferences

- Przybysz, A., Duarte, C.M., Geraldi, N.R., Kosel, J. and Berumen, M.L., 2020, March. Cellular network marine sensor buoy. In *2020 IEEE Sensors Applications Symposium (SAS)* (pp. 1-6). IEEE.
- Bukhamsin A, Moussi K, Patel N, Przybysz A, Wang Y, Krattinger S, Kosel J. Impedimetric plant biosensor based on minimally invasive and flexible microneedle electrodes. In2020 IEEE 33rd International Conference on Micro Electro Mechanical Systems (MEMS) 2020 Jan 18 (pp. 307-310). IEEE.

Patents

- "High-throughput, modular, portable, live-imaging root system and method" (WO2023057900A1)