Alex Searle-Barnes

Web: https://alexsb1.github.io

Research Technician – University of Southampton

I work within the NERC funded large grant interdisciplinary PISTON research consortium investigating if developmental plasticity influences speciation as a Research Technician in geochemistry. I bring cohesion to the whole project from the individual specialised work packages at all stages of the analytical process, from sample preparation to data collection and processing through interpreting results.

Using planktic foraminifera (main work using Menardella lineage from ODP site 925) to study variability of phylogeny and geochemistry between individuals and within species, PISTON matures ecology and evolution theories and expands palaeoclimate reconstructions. I work with high temporal resolution sediment core samples and at individual foraminifera chamber resolution to elucidate taxonomic and geochemical changes occurring on the geological and ecological timescales.

I generate an unprecedented amount of novel data to answer these questions around developmental plasticity and climate by developing an optimised method to meet the project constraints of time, sample throughput and facility cost. After collecting ODP core samples (Marum core repository), I have experienced, studied and optimised every stage of sample preparation, X-Ray CT scanning, laser ablation mass spectrometry and stable isotope analysis. I built a relational database to track and share the progress and results of each process.

I independently operate a laser ablation mass spectrometry setup to record time resolved mass spectrums of 540 foraminifera tests at an individual chamber resolution, then have automated in R the processing of ratio concentrations of measured elemental ions (Mg/Ca, Sr/Ca, Al/Ca) as an input for proxy equations to indirectly reconstruct the lifetime habitat of the foraminifera and as a palaeothermometer. In processing the raw counts data (over 10 million data points) to reconstruct habitat environments of individual growth stages and estimates of the thickness of the test at each chamber, I validate the analytical methodology and results using statistical methods and ascend data into knowledge. I have published some of my novel R code functions.

After laser ablation analysis, I weigh each individual foraminifera with a microbalance and subsequently measure its $\delta^{13}C$ and $\delta^{18}O$ stable isotope ratios using an automated Kiel IV Carbonate device coupled to a Isotope Ratio Mass Spectrometer. I combine these multi-proxy data I have generated, along with X-Ray CT data and interpretations, into my relational database with my knowledge of how climate and foraminifera biological constraints are recorded to answer questions about taxonomic and geochemical changes over time.

I designed and curate a relational database to store details about each of the thousands of individual foraminifera in the PISTON project. Tables are structured to identify patterns between geochemical data and foraminifera species, geographical origin and time period (by matching core composite depth with an age model). This relational database is a single repository of data which amalgamates a range of data sources to promote data driven science and integrates into computer software (R, Excel, SQL, Bash and Python), which can be widely shared.

Completed training courses

- NERC ATSC on the Taxonomy and Stratigraphy of Cenozoic Planktonic Foraminifera
- BBSRC Advancing computational and data literacy course
- Thinkwrite writing quality papers – Personal development course
- Interactive Data Analysis and Visualization with R Shiny – Transmitting Science

Key skills

- Experience with working in a laboratory with ISO9001 accreditation, in clean room environments and following Good Laboratory Practice (GLP) at all times.
- Working to deadlines in the laboratory and writing subsequent experimental reports.
- Managing my own time, autonomy booking analytical instrument time.

Education

University of Southampton
MSc Chemistry
2016 – 2017
- Advanced Analytical and Inorganic Chemistry by taught masters and practical laboratory work. A focus on spectroscopy and spectrometry analysis with structural and statistical determination.
- Associate Member of the Royal Society of Chemistry.

National Oceanography Centre, Southampton
2017
- My thesis project is the method development and optimisation of inductively coupled plasma mass spectrometry instruments for quantitatively analysing inorganic elements in seawater.
- The results influence the instrument choice made by Natural Environment Research Council (NERC) and the University of Southampton for future oceanography elemental analysis.

University of Plymouth
BSc Chemistry (Honours)
2013 – 2016
- Graduated with **1st class honours**. Core topics include Organic, Inorganic, Physical and Analytical Chemistry, with a focus on laboratory practical work.
- Organic biogeochemistry dissertation investigating the geographical origin of tar balls collected from beaches in Devon and Cornwall using gas chromatography - mass spectrometry for quantifying naturally occurring biomarkers.

A Levels
2011 – 2013

- Chemistry, Mathematics, English Language and Physics.

Published work

- L. E. Kearns, **A. Searle-Barnes**, G. L. Foster, A. J. Milton, C. Standish and T. H. G. Ezard, "The influence of geochemical variation among *Globigerinoides ruber* individuals on paleoceanographic reconstructions", 2021, submitted to *Paleoceanography and Paleoclimatology*.
- **A. Searle-Barnes**, "Laser ablation mass spectrometry automatic end point blast through detection in R", 2021, in prep for *Journal of Ecology and Evolution*.
- W. Zhang, T. Ezard, **A. Searle-Barnes**, A. Brombacher, O. Katsamenis and M. Nixon, "Towards Understanding Speciation By Automated Extraction And Description Of 3d Foraminifera Stacks", 2020, *IEEE Southwest Symposium on Image Analysis and Interpretation (SSIAI)*.

Notable experience

Demonstrating
2019-2021
- Supporting 3rd and 4th year students contribute to a live research project in their Oceanography and Marine Biology Research Training module by interpreting size and shape changes in foraminifera using 3d X-ray CT scans.

Presenting
2019
- High throughput X-ray computed tomography following the evolutionary development of *Menardella* lineage planktic foraminifera. Presentation at Tomography for Scientific Advancement conference.

Peer Mentor (PALS)
2014 - 2015
- Mentoring and advising undergraduate Chemistry students, developing their study skills in an informal environment.

Summer work – France, Switzerland and England
2014 - 2016
- Independently managed guests in 8 hotels meeting deadlines and experiences.

Achievements

- 1st Prize AstraZeneca Chemistry award for a Biofuel Project at national Big Bang competition.
- Gold CREST award for extended research into the use of non-edible plant matter to develop second-generation biofuel.
- Head of Technology at Plymouth University radio station (UPSU Radio), in charge of training members in the studio and a team leader with a vital role in the executive group.