

# Alex Clarke

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**Institute:** Johannes Gutenberg–Universität Mainz,  
J. J. Becher-Weg 21, D55128 Mainz, DE

*Structural geologist studying fault & shear zones across scales, & developing field methods for the 21<sup>st</sup> century. Engaging educator focussed on individualised teaching & innovative teaching methods.*

## Employment

### **2025 – present | Postdoctoral Research Fellow (RESTLESS Project)**

*Johannes Gutenberg–Universität Mainz, Germany. Working with Prof. Dr. Virginia Toy.*

- Systematically characterised heterogenous fault zones associated with the Upper Rhine Graben Fault.
- Performed diligent fieldwork, 3D digital structural analysis, & statistical evaluation of fracture networks.
- Assessed the risk of induced seismicity from exploitation of geothermal resources.

### **2023 – 2025 | Alexander von Humboldt Research Fellowship**

*Johannes Gutenberg–Universität Mainz, Germany. Working with Prof. Dr. Virginia Toy.*

- Investigated mechanical heterogeneity of the Chrystalls Beach subduction channel mélangé, New Zealand.
- Performed structural analysis of 3D outcrop models, micro-textural analysis using electron microscopy, & in-situ & lab-based rock mechanics.
- Developed techniques to quantitatively evaluate 3D photogrammetric models.

### **2022 – 2023 | Lecturer (Teaching) (100% teaching position)**

*University College London, UK*

- Taught & coordinated 4 modules including lectures, practicals, assessments, & field trips for >140 students.
- Created entirely new programs of lectures, practical exercises, & supplementary material.
- Overhauled & coordinated a long-standing field trip including planning new learning outcomes, designing new activities, finding new localities, & overcoming logistical challenges.

### **2021 – 2022 | Senior Teaching Assistant in Virtual Field Trips (100% teaching position)**

*University College London, UK*

- Developed engaging virtual & blended-learning videos, outcrop models, exercises, & virtual field trips.
- Overhauled existing content & developed innovative new programs of lectures, practical exercises, & supplementary material suitable for online & hybrid teaching.
- Overhauled international field trips for new UK localities while maintaining existing learning objectives.

### **2019 – 2020 | Visiting Lecturer (100% teaching position)**

*Royal Holloway University of London, UK*

- Led teaching & administration for undergraduate, masters, & distance learning modules.
- Developed significant improvements to teaching materials & exercises.

### **2018 – 2020 | Freelance Typesetter at Smashing Media AG**

### **2014 – 2019 | Postgraduate Teaching Assistant**

*Royal Holloway, University of London, UK*

- Taught practical classes, field trips, lectures, & tutorials & provided individualised support to students.

### **2017 – 2018 | Applications Advisor at Careers Service**

*Royal Holloway, University of London, UK*

### **2014 | Website Coordinator for Volcanology at Leicester**

*University of Leicester, UK*

- Developed & coordinated outreach materials for the volcanology research group.

# Education

## 2014 – 2018 | **PhD – Heterogeneous Input in a Subduction System & Its Effect on Plate Boundary Processes: Structural Analysis of the Osa Mélangé, SW Costa Rica**

*Royal Holloway University of London, UK. Supervised by Prof. Paola Vannucchi*

- Recognised Osa Mélangé as the product of a hitherto-unknown setting of subduction zone accretion.
- Identified that mélangé blocks may be weaker than the matrix with profound implications for seismicity.

## 2010 – 2014 | **MGeol Geology (First Class Honours)**

*University of Leicester, UK*

FINAL YEAR RESEARCH PROJECT: Discerning the Age of NW – SE Trending Mafic Dykes at Llanbadrig, N. Anglesey through Geochemical & Structural Analysis. *Supervised by Dr. Mike J. Norry.*

DISSERTATION: Can a Workable Genetic Classification System be Developed for Mélanges?

# Technical Skills

- **Field work:** Geological data acquisition & sample collection using traditional & digital methods.
- **Mapping & surveying:** Geological mapping using traditional methods, drone aerial imagery & RTK-GNSS.
- **Digital cartography:** Map construction & geospatial analysis using QGIS & ArcGIS.
- **Virtual outcrop analysis:** 3D annotation & analysis of virtual outcrops models using VRGS.
- **3D modelling:** High-quality photogrammetric models from terrestrial & drone images using Agisoft Metashape.
- **Microstructural analysis:** Multi-scale, multi-sensor microscopic annotation & analysis using QGIS.
- **Image analysis:** Using ImageJ & Python to process & analyse geological data from varied image types.
- **Microscopy:** Petrological & microstructural analysis of deformed rocks by optical & electron microscopy.
- **In-situ rock mechanics:** Systematic measurements & geospatial analysis of Schmidt hammer strength variation.
- **Rock mechanics:** Lab-based UCS & triaxial strength, friction, P & S wave anisotropy, & porosity experiments.
- **Geochemical analysis:** Major & trace element analysis altered meta-igneous & meta-sedimentary rocks.
- **Rock preparation:** Cutting, coring, grinding, polishing, crushing, powdering & fusing rock samples.

# Transferrable Skills

- **Teaching & training:** Planning & delivering teaching to UG & PG students, school pupils & the public.
- **Mentorship:** Providing practical mentorship & pastoral support for study & career plans.
- **Rapport-building:** Establishing strong & effective working rapports, even in high-pressure situations.
- **Big data analysis:** Synthesising, analysing & visualising large sets of qualitative & quantitative data.
- **Creative software:** Highly proficient at Adobe Illustrator, InDesign, Photoshop, & Premiere Pro.
- **Media creation:** Creating attractive, engaging & professional video, web & printed media content.
- **Computation:** Writing Python scripts for 2D & 3D image processing and analysis.
- **Travel logistics:** Organising group travel plans for field classes, research field trips, lab-work & conferences.
- **First Aid:** Competent first aider with experience of physical & mental health emergencies in remote areas.
- **Driving:** Full, clean U.K. Driving Licence (cat. B). 4x4, off-road, & 9 seater minibus experience.

# Grants & Awards

- 2023 | Humboldt Foundation Research Fellowship
- 2016 | RHUL, Research Committee Grant: £1000 x2.
- 2016 | RHUL, Research Committee Grant: £600.
- 2016 | Geological Society of London Grant: £750.
- 2015 | RHUL, Research Committee Grant: £1000.
- 2015 | RHUL, Kirsty Brown Memorial Prize: £1000.
- 2015 | RHUL, Research Committee Grant: £1500.
- 2014 | University of London Travel Award: £400.
- 2014 | RHUL, Reid Scholarship: £15,726 per year.
- 2013 | BNOC-Conoco-Gulf mapping prize.
- 2012 | Mineralogical Society Award.
- 2012 | University of Leicester Travel Scholarship: £500.

# Professional Memberships

- Fellow of the Geological Society of London, UK.
- Associate Fellow of Advance Higher Education, UK.

# Volunteering

## 2016 – 2023 | **St John Ambulance**

- **TRAINER:** Taught life-saving first aid skills to students from varied backgrounds.
- **UNIT TRAINING LEAD:** Planned & delivered weekly first aid training sessions & coordinated unit activities.
- **ADVANCED FIRST AIDER:** Provided emergency medical care at events & in the community.
- **COVID-19 RESPONSE:** Volunteered as a vaccinator & a healthcare assistant in my local hospital.

*Alex Clarke*

# Publications

- Clarke, A.P., Haas, R., Hawemann, F., Toy, V.G. 2026. **Systematic Evaluation of the Influence of Camera Placement and Settings on the Quality of Photogrammetric Models of Rocks.** *EarthArXiv [Pre-Print]*.
- Vannucchi, P., Clarke, A.P., de Montserrat, A., Ougier-Simonin, A., Aldega, L., Morgan, J.P. 2022. **A strength inversion origin for non-volcanic tremor.** *Nature Communications*, 13, 1, 2311.
- Clarke, A.P., Vannucchi, P. 2020. **Structural anisotropy: Using image analysis to quantify block-in-matrix fabrics.** *Journal of Structural Geology*, 131, 103939.
- Clarke, A.P. 2018. **Heterogeneous input in a subduction system & its effect on plate boundary processes: Structural analysis of the Osa Mélange, SW Costa Rica.** Doctoral thesis, Royal Holloway, University of London, Egham, UK.
- Clarke, A.P., Vannucchi, P., Morgan, J.P. 2018. **Seamount chain–subduction zone interactions: Implications for accretionary and erosive subduction zone behavior.** *Geology*, 46, 4, 367–370

# Presentations

\* presenting author

- Clarke, A.P.\*, Di Vincenzo, S., Weiler, M., Mitchell, T.M., Toy, V.G. 2026. **The Other Ductile – Brittle Transition Zone: Syn-Deformational Lithification Within the Shallow Subduction Shear Zone and its Implications for Earthquake Nucleation.** *EGU General Assembly 2026*, Vienna, Austria, 4 April – 9th May 2026 (Poster)
- Toy, V.T., Thomann, J., Clarke, A.P.\* 2025. **Integrating real & virtual field experiences for geoscience education.** *GSNZ Annual Conference 2025*, Dunedin, New Zealand, 25 – 28th November 2025 (Oral)
- Clarke, A.P.\*, Fenske, S., Toy, V.G. 2025. **A Glimpse into the Subduction Zone Plate Interface: 3D structural and mechanical mapping of the Chrystalls Beach mélangé, New Zealand.** *EGU General Assembly 2025*, Vienna, Austria, 27 April – 2nd May 2025 (Poster)
- Clarke, A.P.\*, Haas, R., Fenske, S., Hawemann, F., Toy, V.G. 2024. **Quantifying Resolution of Digital Outcrop Models using Synthetic Test Objects.** *24th International Conference on Deformation Mechanisms, Rheology and Tectonics*, Barcelona, Spain, 9 – 11th July 2024 (Poster)
- Clarke, A.P.\*, Vannucchi, P., Morgan, J.P. 2024. **Weak Blocks in a Strong Matrix: Exploring parameter-spaces for the biggest controls on subduction interface mechanics.** *EGU General Assembly 2024*, Vienna, Austria, 14 – 19th April 2024 (Oral)
- Morgan, J.P.\*, de Montserrat, A., Vannucchi, P., Clarke, A.P., Ougier-Simonin, A., Aldega, L. 2020. **The strength inversion origin of non-volcanic tremor: models and observations.** *EGU General Assembly 2020*, Online, May 2020 (Oral)
- Vannucchi, P.\*, Morgan, J.P., Clarke, A.P., Ougier-Simonin, A., de Montserrat, A., 2019. **Shallow rheological transition along the subduction plate interface and their impact on tremor and earthquake nucleation.** *EGU General Assembly 2019*, Vienna, Austria, 7 – 12th April 2019, (Oral)
- de Montserrat, A.\*, Morgan, J.P., Clarke, A.P., Vannucchi, P. 2019. **Numerical Investigation of a Novel Rheology-linked Origin for Seismic Tremor and Low-Frequency Earthquakes.** *EGU General Assembly 2019*, Vienna, Austria, 7 – 12th April 2019, (Oral)
- Vannucchi, P.\*, Morgan, J.P., Clarke, A.P., Ougier-Simonin, A., 2018. **The impact of shallow rheological transition along the subduction plate interface on tremor and earthquake nucleation.** *American Geophysical Union, Fall Meeting 2018*, Washington DC, USA, 10 – 14th December 2018, (Oral)
- Clarke, A.P.\*, Vannucchi, P., Morgan, J.P. 2017. **Strong Matrix & Weak Blocks: Evolutionary Inversion of Mélangé Rheological Relationships During Subduction and Its Implications for Seismogenesis.** *American Geophysical Union, Fall Meeting 2017*, New Orleans, USA, December 2017 (Oral)
- Clarke, A.P.\*, Vannucchi, P., Morgan, J.P. 2017. **Seamount Chain – Subduction Zone Interactions: influence of subducting seamount complexes on accretionary and erosive subduction zone behaviour.** *Geological Association Student Symposium*, London, UK, 19h May 2017 (Poster)
- Clarke, A.P.\*, Vannucchi, P., Morgan, J.P. 2017. **Seamount Chain – Subduction Zone Interactions: Localised subduction accretion and erosion in response to subduction of high relief seafloor.** *Subduction Interface Processes Conference*, Barcelona, Spain, 19 – 21 April 2017 (Oral)
- Clarke, A.P.\*, Vannucchi, P., Morgan, J.P. 2017. **Seamount – Subduction Zone Interactions: Impact of ocean floor relief on subduction accretion/erosion & subduction channel heterogeneity.** *Tectonic Studies Group Joint Assembly*, Liverpool, UK, January 2017 (Oral)
- Clarke, A.P.\*, Vannucchi, P., Morgan, J.P. 2016. **Subduction of High Relief Seafloor Driving Subduction Accretion: A seamount flexural moat origin for the Osa Mélange, Costa Rica.** *UK-IODP Annual Conference*, London, UK, November 2016 (Poster)
- Clarke, A.P.\*, Vannucchi, P., Vinciguerra, S. 2015. **Seamount Chain – Seismogenic Zone Input: The Upper Plate Contribution in Costa Rica. Structural Analysis of the Osa Mélange.** *UK-IODP Annual Conference*, Newcastle, UK, September 2015 (Poster)

# Supervision

**2026 – present:** Friedrich Lingemann. Multi-scale structural analysis of vesicular pseudotachylites in the Alpine Fault, New Zealand. *BSc*.

**2025 – present:** Melanie Klups. Transition from phreatomagmatic to magmatic eruptive activity at the Nastberg scoria cone (East Eifel). *BSc*.

**2025 – present:** Claudia Fekler. The evolution of the Nastberg scoria cone revealed by drone-based 3D imaging. *MSc*.

**2025 – 2026:** Diana Daubner. Lithological Framework, Geochemical Characteristics & Volcanic depositional Processes of the Schwarze Wand Scoria Cone (Nickenich, EEVF). *MSc*.

**2024:** Richard Haas. Not all models are created equal: Optimized viewing angles for geological photogrammetry: A systematic assessment of camera network geometry & the influence of noise, compression & format of input images. *MSc*.

# Teaching

**2024 – present: Postdoctoral Fellow, Johannes Gutenberg–Universität Mainz**

- **Field teaching:** Endogene Geology, Switzerland field trip (MSc)
- **Field teaching:** Geodynamics, Switzerland field trip (MSc)
- **Field teaching:** Ahrtal field trip (UG)
- **Field teaching:** Bad Dürkheim quarry field trip (UG)
- **Development and teaching:** OutcropViewer virtual field trip (UG)
- **Teaching Assistant:** Tektonik 1 (UG)

**2022 – 2023: Lecturer (Teaching), University College London, UK**

- **Module lead:** Maps, Images, & Structures (2<sup>nd</sup> year UG)
- **Module lead:** Surface Processes (1<sup>st</sup> year UG)
- **Module lead:** Petrology to Petrogenesis (1<sup>st</sup> year UG)
- **Module lead:** Crustal Dynamics, Mountain Building & Basin Evolution (3<sup>rd</sup> & 4<sup>th</sup> year UG, MSc)
- **Field trip lead:** Betics field trip (3<sup>rd</sup> & 4<sup>th</sup> year UG, MSc)
- **Field teaching:** Dorset field trip (1<sup>st</sup> year UG)
- **Field teaching:** Cornwall field trip (1<sup>st</sup> year UG)
- **Field teaching:** Scotland field trip (2<sup>nd</sup> year UG)
- **Personal tutor** (1<sup>st</sup> & 2<sup>nd</sup> year UG)
- **Teaching Assistant:** Undergraduate Mapping (3<sup>rd</sup> year UG)

**2021 – 2022: Senior Teaching Assistant, University College London, UK**

- **Development and teaching:** Pembrokeshire field trip (2<sup>nd</sup> & 3<sup>rd</sup> year UG, MSc)
- **Development and teaching:** Bradgate Park field trip (2<sup>nd</sup> year UG)
- **Development and teaching:** Maps, Images, & Structures (2<sup>nd</sup> year UG)
- **Development and teaching:** Undergraduate Mapping (3<sup>rd</sup> year UG)
- **Development and teaching:** Dorset virtual field trip (1<sup>st</sup> year UG)
- **Development and teaching:** Cornwall virtual field trip (1<sup>st</sup> year UG)

**2019 – 2020: Visiting Lecturer, Royal Holloway, University of London, UK**

- **Module lead:** Regional Geology (2<sup>nd</sup> year UG)
- **Module lead:** Stratigraphy (2<sup>nd</sup> year UG)
- **Module lead:** Tectonics & Lithosphere Dynamics (MSc)
- **Module lead:** Tectonics & Lithosphere Dynamics (distance learning MSc)

**2014 – 2019: Postgraduate Teaching Assistant, Royal Holloway, University of London, UK**

- **Teaching assistant & lecturer:** Regional Geology (2<sup>nd</sup> year UG)
- **Teaching assistant:** Global Tectonics (1<sup>st</sup> year UG).
- **Teaching assistant:** Advanced Concepts & Techniques in Geology (3<sup>rd</sup> year UG)
- **Teaching assistant:** Rocks & Minerals (1<sup>st</sup> year UG)
- **Field teaching:** Almeria field trip (2<sup>nd</sup> year UG)
- **Field teaching:** Devon field trip (1<sup>st</sup> year UG)
- **Personal tutor** (1<sup>st</sup> year UG)