

SIO 249: Advanced Petrology

Location – Vaughan 300 (lectures and discussion) and Vaughan 147 (labs)

Lecture and discussion times – M,W 1-2 p.m.

Lab times – Variable

Instructors - James Day – Vaughan Hall 306, Tel: 858-534-5431

Jeff Gee – Ritter Hall 300D, Tel: 858-534-4707

Welcome to Advanced Petrology! The goal of this class is to make you better understand magmatic and metamorphic processes and their association with tectonics and mantle convection. This course will involve study of a range of petrological, geochemical and allied methods for understanding rock formation processes. The format of this class will be a mixture of lectures, tutorial-style discussions, some staring down microscopes and looking at rocks and lab and some field work. The syllabus for the class is provided below.

1. Introduction to Advanced Petrology (M, 3 Apr) JD/JG
2. Physical approach to basic (*s.l.*) magma genesis/Field Trip Prep (W, 5 Apr) JD/JG

FIELD TRIP – Friday 7 to Sunday 9 – ANZA BORREGO

3. *Discussion and techniques (fabrics, textures)* (M, 10 Apr) JG
4. The link between formation of arcs and new continental crust (W, 12 Apr) JD
5. *Anisotropy of magnetic susceptibility studies applied to granitic rocks* (M, 17 Apr) JG
6. Study Peninsula Range and Sierra Nevada as case studies (W, 19 Apr) JD
7. *Trace elements and geochemical analytical techniques* (M, 24 Apr) JD
8. Layered intrusions (W, 26 Apr) JD/JG
9. *Geochemical modelling and textural modelling techniques* (M, 1 May)
10. **Layered intrusion lab** (W, 3 May)
11. Ocean crust and ophiolites (M, 8 May)
12. *The layering debate* (W, 10 May)
13. Mid-ocean ridge basalts (M, 15 May)
14. **MORB, Abyssal Peridotites and ophiolites lab** (W, 17 May)
15. *Gabbro glacier versus sheeted sills and hybrid models debate* (M, 22 May)
16. Intraplate oceanic magmatism (W, 24 May)
17. **Intraplate lavas lab** (W, 31 May)
18. *Mantle convection discussion* (M, 5 June)
19. *Discussion topics* (W, 7 June)

Reading – Throughout the course a mixture of classic and up-to-date papers will be required reading (for discussion) and recommended reading (for your own interest and/or in preparation).

Up-to-date advanced texts on igneous petrology are relatively few, mainly because of the specialization and speed-of-change in the subject, but I can recommend two good reads. First, although possibly in need of a new edition, the book '**Igneous petrogenesis: a global tectonic approach**' by Marjorie Wilson (Chapman and Hall, 1989 and re-release by Springer in 2007) is an excellent read and comes highly recommended. It is hard to get this book for a reasonable price (~\$135 on Amazon), however, so if you don't succeed, a good alternative and slightly cheaper book (~\$85) is '**Igneous rocks and processes: a practical guide**' by Robin Gill (Wiley-Blackwell, 2010). These books provide a useful framework for our discussions throughout the quarter, but I do not suggest them as required reading because of the expense. Perhaps you can get 2nd hand copies or request from the library.

Grading – (1) We will conduct regular discussions of classic and state-of-the-art literature in igneous petrology and participation in these discussions will form part of the grade. (2) We will also be conducting mapping, petrography and analytical techniques and these and reports on the data you collect will be significant part of the grad. (3) Each person will be tasked with selecting a topic for which they are unfamiliar; to provide an expert 12 minute presentation, along with an associated 2 page hand-out. This topic will be selected in the second week and delivered in week 9. Grading will be either as a letter grade (MS/Undergrads) or as a P/NP or S/U (PhD).