

GEOLOGY 5660 – Microstructural analysis of deformed rocks

Instructors – B.R. Frost & A.W. Snoke

Spring 2012 semester

Lecture: T & Th: 9:35–10:50 AM (Berry Center 327)

Laboratory: Th: 2:10–4 PM (GE 202)

Textbook: Passchier, C. W., and Trouw, R.A.J. (referred to as P & T below), 2005, *Microtectonics* (2nd, revised and enlarged edition): Berlin Heidelberg, Springer, 366 p.

All assigned readings are on e-reserve through the University of Wyoming Libraries website.

Lecture Syllabus

1/10 – 1/31/12

Introduction; a brief history of microfabric and experimental studies (AWS)

Principles of microstructural development (AWS); Recovery, recrystallization, etc. – p. 38–56 in P & T.

Reading: Wilson, C.J.L., 1973, The prograde microfabric in a deformed quartzite sequence, Mount Isa, Australia: *Tectonophysics*, v. 19, p. 39–61 (*note this is only the first part of paper*).

Dislocations (AWS)

An introduction to deformation mechanisms (AWS) – Chapter 3 in P & T; also Snoke and Tullis, 1998, p. 9–15 (Deformation mechanisms).

Dislocation creep regimes in quartz aggregates—experimental studies (AWS)

Reading: Hirth, G., and Tullis, J., 1992, Dislocation creep regimes in quartz aggregates: *Journal of Structural Geology*, v. 14, p. 145–159.

Dynamic recrystallization of quartz: correlation between natural and experimental conditions (AWS)

Reading: Stipp, M., Stünitz, H., Heilbronner, R., and Schmid, S.M., 2002, The eastern Tonale fault zone: a ‘natural laboratory’ for crystal plastic deformation of quartz over a temperature range from 250 to 700°C: *Journal of Structural Geology*, v. 34, p. 1861–1884.

2/2 – 2/23/12

Thermodynamic controls of mineral textures (BRF)

Annealing processes and recrystallization (BRF)

Equilibrium textures in metamorphic rocks (BRF)

Nucleation and porphyroblast growth (BRF)

Reaction mechanisms in metamorphic rocks (BRF)

2/28 – 3/6/12

Cleavage/foliation development (AWS)

Porphyroblast/matrix relationships–Part 1 (AWS)

Review and discussion (AWS & BRF)

3/8/12 – Mid-term examination

3/12 – 3/16/12 – Spring Break Week

Other topics—scheduling details to follow

Porphyroblast/matrix relationships–Part 2

Textures of igneous and deformed igneous rocks

Modes of pluton emplacement

Mylonites and kinematic indicators

Microfabrics of specific mineral phases

Lab Syllabus

- I. Crystalloblastic series, granoblastic and recrystallization textures, cold- and hot-working (*due date = 1/26/12*)
- II. High-grade rocks chiefly from the Ivrea–Verbano zone, northern Italy (*due date = 2/09/12*)
- III. Development of cleavage and foliation; multiplied deformed rocks (*due date = 3/01/12*)
- IV. Porphyroblast/matrix relationships (*due date = 3/22/12*).
- V. Some igneous and metaigneous fabrics (*due date = 4/05/12*)
- VI. Mylonites and kinematic indicators (*due date = 4/19/12*)
- VII. To be determined (*due date = 4/26/12*)

<u>Grading scheme:</u>	Lecture – mid-term	= 100 pts.
	final	= 100 pts.
	Laboratory	= 200 pts.
	TOTAL	= 400 pts.