SOME NOTES ON DOING GEOLOGIC FIELD WORK

While you are doing field work, it is necessary to have a systematic method for recording your data. The fundamental requirement for such a record is that you be able to return to it at any time in the future and understand the data you have recorded. It is essential, therefore, to be neat, organized, and thorough. The following suggestions have been found to be useful.

Suggestions for taking field notes:

1) The fundamental rule of taking field notes is: **PUT IT IN YOUR NOTES, OR FORGET IT** (because you will).
2) It is necessary to be able to reconstruct the location where each observation was made. The most convenient way is to give each location at which you make observations a STATION NUMBER in your notebook that corresponds to a station plotted and labeled on your field map.
3) After each station number heading in your notebook, write a brief verbal description of where the station is located. Use topographic features (hills, stream channels, valleys, etc.), man-made features (roads, buildings, etc.) for reference.

   On a small project with a small mapped area such as a laboratory exercise, this may not seem important. On a large project, however, which involves months of mapping over a period of several years, and tens of square miles of area or more, it is a critical feature to being able to find the location of a particular set of observations; so get in good habits at the beginning.
4) Take notes in outline format with headings that will help you locate data you need later. Indenting helps keep the notes neat and easy to search through for data. The outline below is a convenient format. Modify it and use abbreviations to suit your needs.

   STATION 13: Bad Day Gulch 150 m above confluence with Muddy Creek
   - ROCK: Contact between fine grained bluish muds overlain by a conglomerate containing 1 - 3 cm quartzite pebbles, old boots, coke bottles, and assorted bedsprings in a matrix of quartz sand and yukkie organic material.
   - BEDDING: 036;54SE measured directly on laminations in the mud
     022;44SE measured by sighting across stream valley on stratification in conglomerate
   - JOINTS: measured in consolidated sandy units in the mud
     345;86NE
     065;75NW
     030;61SE (bedding plane partings?)
   - COMMENTS: Contact between the muds and the conglomerate appears to be an unconformity. Morphology of the fossil coke bottles indicates congl. no older than 35 yrs. B.P.
   - INTERPRETATION: Etc., etc.; see discussion below

5) It is important to keep your record of data separate from interpretations, hypotheses, speculations, etc. These latter products of your mental gyrations are important to record, however, and can be included under the heading "Interpretation". **THINKING AS YOU GO IS ESSENTIAL TO EFFICIENT FIELD WORK.**

   The time to dream up explanations is when you are in the field and can check out the predicted consequences. To record your hypotheses as you go will

keep your thinking sharp and will encourage you to think of the testable consequences of your ideas.

6) Do not hesitate to draw sketches in your notebook of features you see in the field. For each sketch, however, INCLUDE THE ORIENTATION OF THE SKETCH AND AN APPROXIMATE SCALE TO SHOW THE SIZE OF THE FEATURE ILLUSTRATED. Label items in the sketch so you can tell what you were trying to draw when you refer back to your notes.

Notes on making a field map:

1) Locate all stations on the map with a dot, write the station number in small numbers beside the dot, and circle the number. Some people like to put a pin hole in the map, circle the hole on the reverse side and write the station number on the back. This requires flipping the map back and forth, however, and makes it more difficult to find the stations back later. On the other hand, it decreases clutter on the front of the map.
2) Plot attitudes of measured features on the map at the point where they were measured. It helps interpretation if you can plot at least some of the measurements in the field as you go.
3) **PLOT CONTACTS ON THE MAP AS YOU ARE TRACING THEM**. Do not wait until you have walked several hundred meters and then sit down and try to remember exactly where a contact went. You will find that you do not know exactly, and you will end up fudging and making mistakes. The time to realize that you dont know exactly where the contact is, is when you can look and see where it is. **DO IT WHILE YOU CAN** (where geologists always do it: ON THE OUTCROP).
4) In areas of relatively poor exposure, it is convenient to plot outcrops on the map with a letter symbol or a color-coded dot indicating the rock type. You should do this for every such outcrop even if there is no specific station number associated with the outcrop.
5) When mapping contacts, use the following symbols:
   solid lines where the contact is definite or located to within the distance represented on the map by the width of a pencil line (you should determine and remember how far this is for any map you are working on)
   long dashed lines where the contact is not exposed but its location is closely limited (within about ±10 times the distance represented by the width of a pencil line).
   short dashed lines where the contact is known but poorly located
   dotted line where the contact is projected but is covered by alluvium.
   Using this system in the field will force you to evaluate your mapping as you go, which is better than having to fudge it after you get home.
6) Where it is necessary to extrapolate contacts through covered areas, pay attention to the rule of v's.
7) Label the units on your map as you find them. Some people like to use colors, others use letter symbols. Be sure you have a key in the margin of your map so that you can tell what your symbols mean when you forget. The standard convention for letter symbols is: First letter(s) in capital(s) indicates the geologic era, period or epoch; the following letters in lower case abbreviate the name of the formation. Thus Tgp would indicate the Tertiary Grizzly Peak formation.

Notebook Etiquette

In industry, your field notebook is property of your employer. A field notebook may be considered a legal document. You must document your findings in a complete, orderly, and legible manner. Years or decades later, you or another person must be able to follow your 'footsteps' through a day of fieldwork, with only field notebook and map in hand.

Requirements for any geologic field notebook

At the top of each page
Page number, location of fieldwork, name of partner(s).

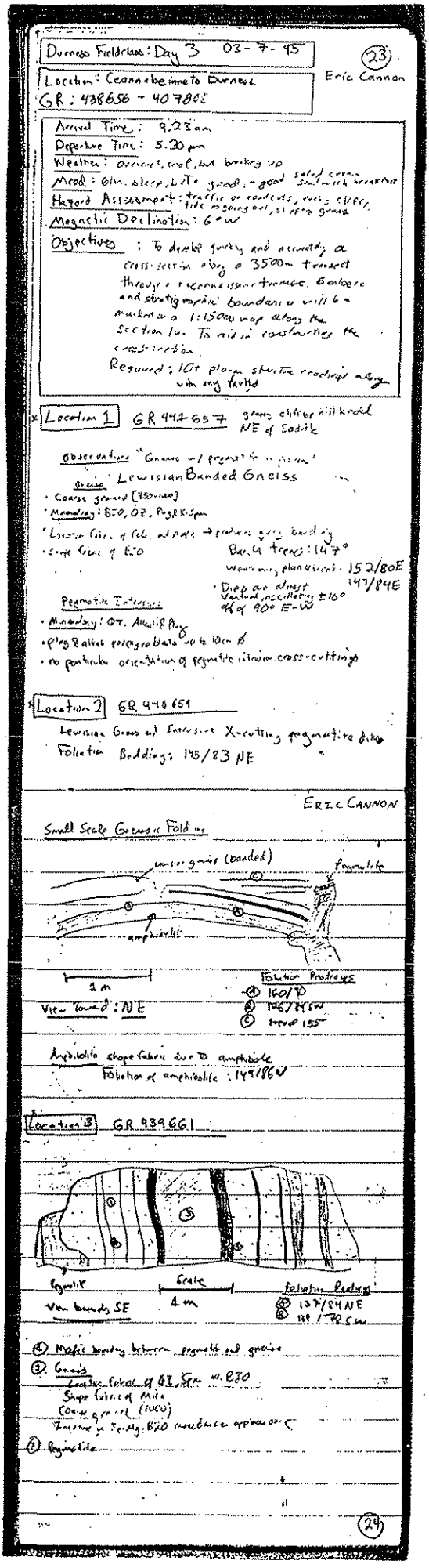
Beginning of each day
Location of field site, date and day, arrival and departure times, weather, mood, special events, hazard assessment, magnetic declination, objectives for the day.

At each outcrop
Outcrop location indicated on map, outcrop location (descriptive sentence, UTM, or latitude and longitude), observations at outcrop, lithology, structure, field sketch with scale and orientation, interpretations and hypotheses must be kept separate from data. Specify type of measurement (i.e. plane, line) and attitude (strike/dip or plunge/bearing). PLOT MEASUREMENTS ON MAP IN FIELD and PLACE COMPASS IN CASE after each measurement.

When appropriate
Photograph of the outcrop with interpretive sketch in notebook, oriented sample collection with orientation sketch in notebook. All sketches must have scales and orientations.

Models
A successful field geologist creates models and constantly modifies them. Create a model or several models initially. Throughout the day, comment in field book on the model and modify when required.

End of Day
Summary of daily work, process and interpret data, suggest areas of difficulty, plan the objectives for the next field day.



Sedimentary Rock Symbols (Tucker, 1996)

LITHOLOGY

siliciclastic sediments

- clay, mudstone
- shale
- marl
- siltstone
- sandstone (undiff.)
- quartz arenite
- feldspathic sst (arkose)
- lithic sst (litharenite)
- greywacke
- clayey sst
- calcareous sst
- alternating strata sst/shale
- pebble-supported conglomerate
- matrix-supported conglomerate

carbonates

- limestone
- dolomite
- sandy lst

symbols to add:

- intraclast
- ooid
- oncolite/pisolite >2 mm diam
- peloid
- fossils (undiff.) for specific symbols see below

others

- chert
- peat
- brown coal (lignite)
- hard coal
- halite
- gypsum-anhydrite
- volcaniclastic sediment

SEDIMENTARY STRUCTURES

- flute cast
- groove cast
- tool marks
- load casts
- shrinkage cracks
- striations/lineations
- symmetrical ripples
- asymmetrical ripples
- parallel lamination
- cross-lamination
- cross-bedding – planar
- cross-bedding – trough
- cross-bedding –herring-bone
- cross-bedding – low angle
- flaser bedding
- lenticular bedding
- wave-ripple lamination
- normal (graded bedding)
- reversed (graded bedding)
- imbrication
- slump structures
- convolute bedding
- nodules
- stylolites
- stromatolites
- slight (bioturbation)
- intense (bioturbation)

bed contacts:

- sharp, planar
- sharp, irregular
- gradational

palaeocurrents:

- azimuth
- trend

FOSSILS

- fossils (undifferentiated)
- fossils – broken
- ammonoids
- belemnites
- bivalves
- brachiopods
- bryozoan
- coral-solitary
- coral-compound
- crinoids
- echinoids
- gastropods
- graptolites
- stromatoporoid
- trilobite
- algae
- plant fragments
- roots
- burrows
- devise others when needed

Fig. 2.2 Symbols for lithology, sedimentary structures and fossils for use in a graphic log.

MAP SYMBOLS (McClay, 1987)

GENERAL SYMBOLS

STRUCTURE	Observed Lithological Boundary	Boundary Position Uncertain	Boundary Position Inferred	Outline of Outcrop with Locality Number	Younging Direction	Moraine Ridge	Break of Slope	Alluvium Boundary
MAP SYMBOL				126				

PLANAR STRUCTURES

STRUCTURE	Bedding	Overturned Bedding	First Cleavage	Second Cleavage	Minor Fold Axial Plane (phase 1)	Minor Fold Axial Plane (phase 2)	Joints (set 1)	Joints (set 2)
TECTONIC SYMBOL	S_0	S_0	S_1	S_2	F_1 AP	F_2 AP	J_1	J_2
MAP SYMBOL	30–110	30–110	60–110	45–115	60–110	45–115	55–115	30–115

FOLD STRUCTURES

STRUCTURE	Syncline with Dip Direction of Axial Plane	Anticline with Amount and Direction of Plunge	Synform	Antiform	Overturned Syncline	Overturned Anticline
MAP SYMBOL	45–150	15–041				

FAULT STRUCTURES

STRUCTURE	Extensional Fault High Angle	Extensional Fault Low Angle	Contractional Fault High Angle	Contractional Fault Low Angle	Wrench Fault	Shear Zone
TECTONIC SYMBOL	E Fault N Fault	E Fault	C Fault R Fault	C Fault T Fault	W Fault	S Z
MAP SYMBOL	70–150	20–445	65–165	15–160	90–160	90–155

LINEAR STRUCTURES

STRUCTURE	Bedding/ Cleavage(S1) Intersection	Cleavage(S1)/ Cleavage(S2) Intersection	Mineral Stretching Lineation on S1	Minor Fold Axis (phase 1)	Minor Fold Axis (phase 2)	M Fold Axis	Z Fold Axis	S Fold Axis
TECTONIC SYMBOL	L_1	L_2	ML	MF_1A	MF_2A	$M\text{-}MF_1A$	$Z\text{-}MF_1A$	$S\text{-}MF_1A$
MAP SYMBOL	10–050	15–055	15–060	45–050	35–051	50–050	60–045	56–045

Geologic Time Scale

ERA	SUB-ERA PERIOD		SUB-PERIOD EPOCH	AGE Ma (DURATION)	
Cenozoic 65	Quaternary 2.0	Q	Pleistocene	2.0	2.0
	Tertiary 63.0 Neogene 22.6	Ng	Pliocene	5.1	3.1
			Miocene	24.6	19.5
	Paleogene 40.4	Pg	Oligocene	38.0	13.4
			Eocene	54.9	16.9
			Paleocene	65	10.1
Mesozoic 248	Cretaceous 79	K	Late	97.5	32.5
			Early	144	46.5
	Jurassic 69	J	Malm	163	19.0
			Dogger	188	25.0
			Lias	213	25.0
	Triassic 38	Tr	Late	231	18.0
			Middle	243	12.0
			Early	248	5.0
Paleozoic 342	Permian 38	P	Late	258	10.0
			Early	286	28.0
	Carboniferous 74	C	Pennsylvanian	320	34
			Mississippian	360	40
	Devonian 48	D	Late	374	14
			Middle	387	13
			Early	408	21
	Silurian 30	S	Pridoli	414	6
			Ludlow	421	7
			Wenlock	428	7
			Llandovery	438	10
	Ordovician 67	O	Ashgill	448	10
			Caradoc	458	10
			Llandeilo	468	10
			Llanvirn	478	10
			Arenig	488	10
			Tremadoc	505	17
	Cambrian 85	€	Merioneth	525	20
			St David's	540	15
			Caerfai	590	50

EON	ERA	EPOCH		
PRECAMBRIAN				
Proterozoic 2500	Sinian 210	Vendian	590	80
		Sturtian	670	130
	Riphean		800	850
			1650	
Archean			2500	1500
Priscoan			4000	1000
			5000	

(Harland et al, 1982)

Cross-Sections (McClay, 1987)