Table 1. Precambrian (Proterozoic) time scale for the Haliburton Highlands, Ontario.

Age in m.y.	Dominant events
900	Post-metamorphic intrusions (pegmatite and diabase)
1000 – 1200	Metamorphism with formation of granite, pegmatite and migmatite
1200 – 1300	Pre-metamorphic intrusions (nepheline syenite, gabbro, diorite)
1300 – 1400	Grenville group sedimentary and volcanic rocks laid down

The amphibolite facies

The mineral facies concept has on the whole been a powerful aid to the study of metamorphic rocks. However, individual facies are not unambiguously defined (see Lambert 1965), and in the case of the amphibolite facies this fact becomes obvious on examining the boundaries of the facies at low and high grades.

The low-grade boundary is marked by Eskola (1939) with the breakdown of epidote and the appearance of plagioclase and hornblende existing together. Ramberg's (1952) boundary is an isograd along which epidote coexists with a plagioclase of composition An_{30} Ab_{70}. In real terms these two boundaries may not be significantly different if Ramberg's (1952, p. 51) epidote-plagioclase phase diagram is to be believed, but in any case it is probably more sensible to recognize that the low grade boundary is transitional in nature, a point made clearly by Turner (1968, pp. 303 ff).

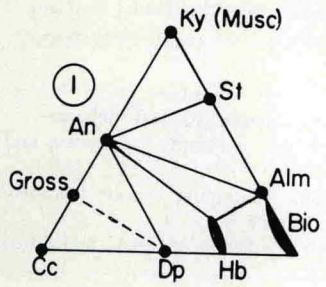
The high grade boundary of the amphibolite facies is not so much ambiguous as meaningless for all practical purposes. Eskola (1939) marked this upper limit by the breakdown of all hydrous phases – a breakdown that could be marked by such reactions as

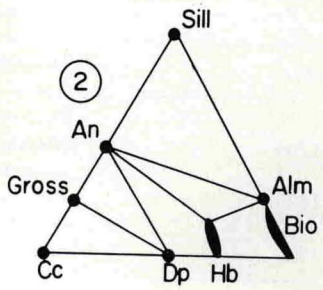
Hornblende = pyroxenes + water

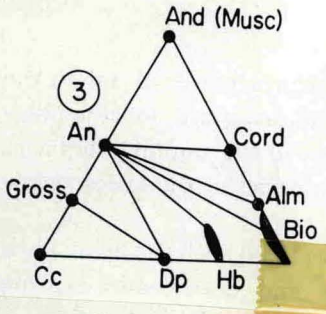
Biotite = almandine + orthoclase + hypersthene + water

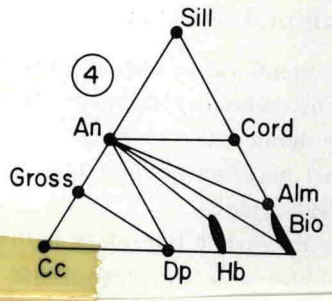
taken from Turner & Verhoogen (1960, p. 557). The absolute, upper stability limit for these hydrous phases would pertain to a condition in which equilibrium partial pressure of water is equal to load pressure ($P_{E_{H_2O}} = P_s$), a condition under which biotite and hornblende could be expected to remain stable beyond the point where melting and magmatic processes become dominant in the crust of the earth. Even though the condition $P_{E_{H_2O}} = P_s$ is unlikely to be encountered in an environment of regional metamorphism (a point recognized by Francis 1956, in his tentative metamorphic grid) it is still questionable whether at depth there exists a temperature high enough, or $P_{E_{H_2O}}$ low enough, for all hydrous phases to break down before the onset of melting. Certainly it appears that the assemblages of Eskola's (1939) granulite facies are not found except in the presence of hydrous phases (see for example the short review in Hsu 1955).

Further confusion arises with the various internal subdivisions that have


Ky (Musc)
1
St
An
Gross
Alm
Bio
Cc
Dp
Hb


Sill
2
An
Gross
Alm
Bio
Cc
Dp
Hb


And (Musc)
3
An
Cord
Gross
Alm
Bio
Cc
Dp
Hb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Cord
Gross
Alm
Bio
Cc
Dp
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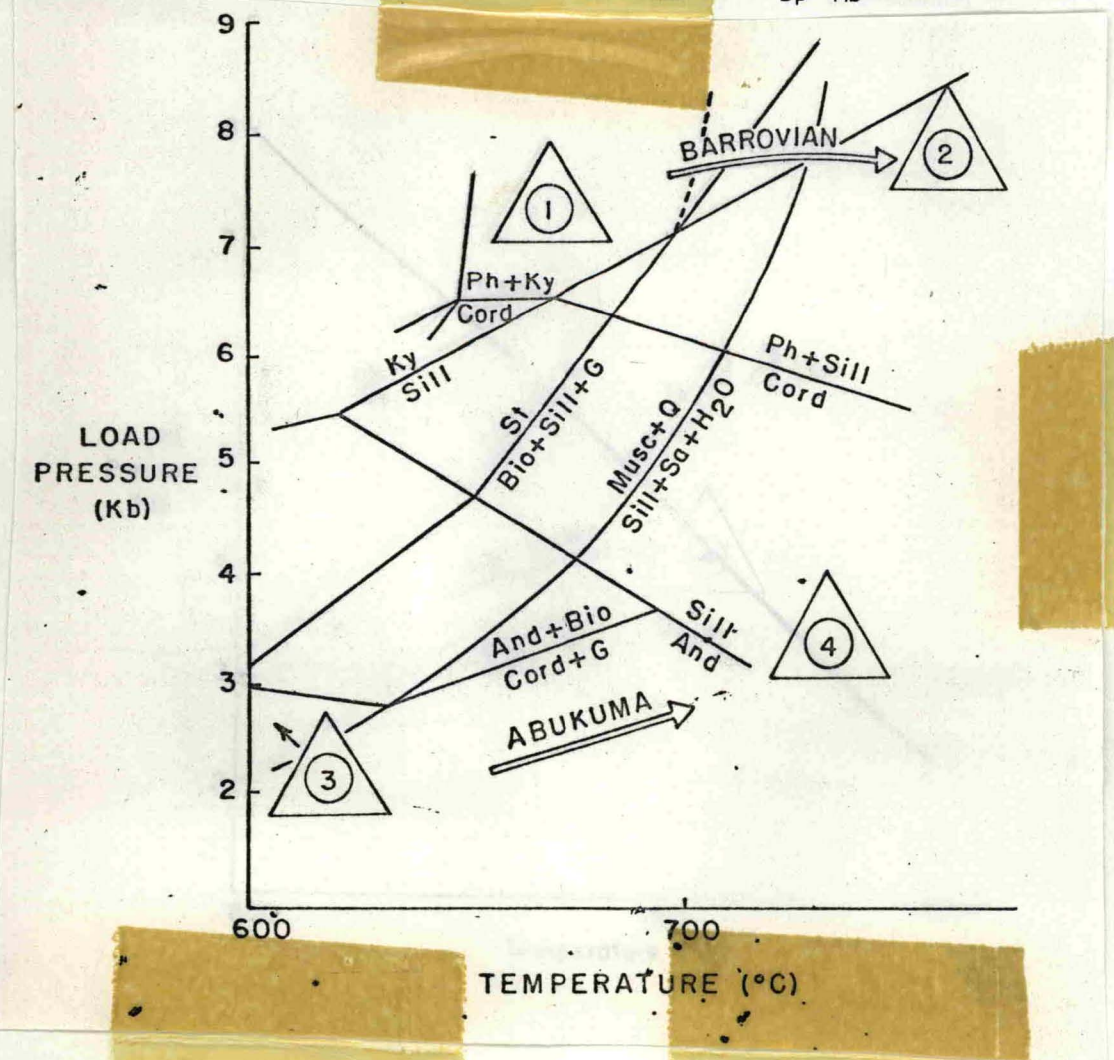
LOAD PRESSURE (Kb)
9
8
7
6
5
4
3
2
600
700
TEMPERATURE (°C)
BARROVIAN
ABUKUMA
1
2
3
4
Ph+Ky
Cord
Ky
Sill
St
Bio+Sill+G
Musc+Q
Sill+Sa+H2O
Ph+Sill
Cord
And+Bio
Cord+G
Sill
And