

89.215 - FORENSIC GEOLOGY
DEMISE OF THE ICE MAN - EVIDENCE FROM AR-AR AGES

I. Introduction

During examination of the remains of Ice Man, a sample of the Ice Man's intestinal content was screened for cereal fragments. The intestinal sample also contained 12 100- to 400 μm white micas (muscovite) that are believed to have been ingested as a result of the grinding of cereal or from drinking water.

Soil is formed by the weathering of rock material. This weathering can be of two types: (1) physical during which the original rock material is broken into smaller fragments and (2) chemical in which various mineral undergo partial or complete breakdown. Some minerals, such as quartz and mica, are resistant to chemical weathering while others, such as olivine or pyroxene, are easily weathered. You may recall that most beach sands are largely composed of quartz, and various minor mineral constituents, because quartz is resistant to weathering. The mica found in the intestines of the Ice Man are residual from the weathering of the country rock (the rock that underlies a particular region). If one can identify the rocks that were the source of the mica, one would have an idea of the area in which the Ice Man lived.

II. Ar-Ar mica ages

Using what is actually a very sophisticated technique, geologists were able to determine the age of individual mica grains. The technique they used was a variation of the K-Ar dating technique know as Ar-Ar dating. A subset of these ages is given in Table 1.

Table 1. Ar-Ar mica ages

Grain	Age (m.y.)
A	201
B	213
C	178
D	195
E	189
F	219
G	161

1. Refer to the geologic map taken from the Ice Man scientific paper. This map will be posted as a separate image on the class web site because we will use this map in several exercises. What are the ages, or age ranges, for the following geologic units:

Polymetamorphic gneisses -

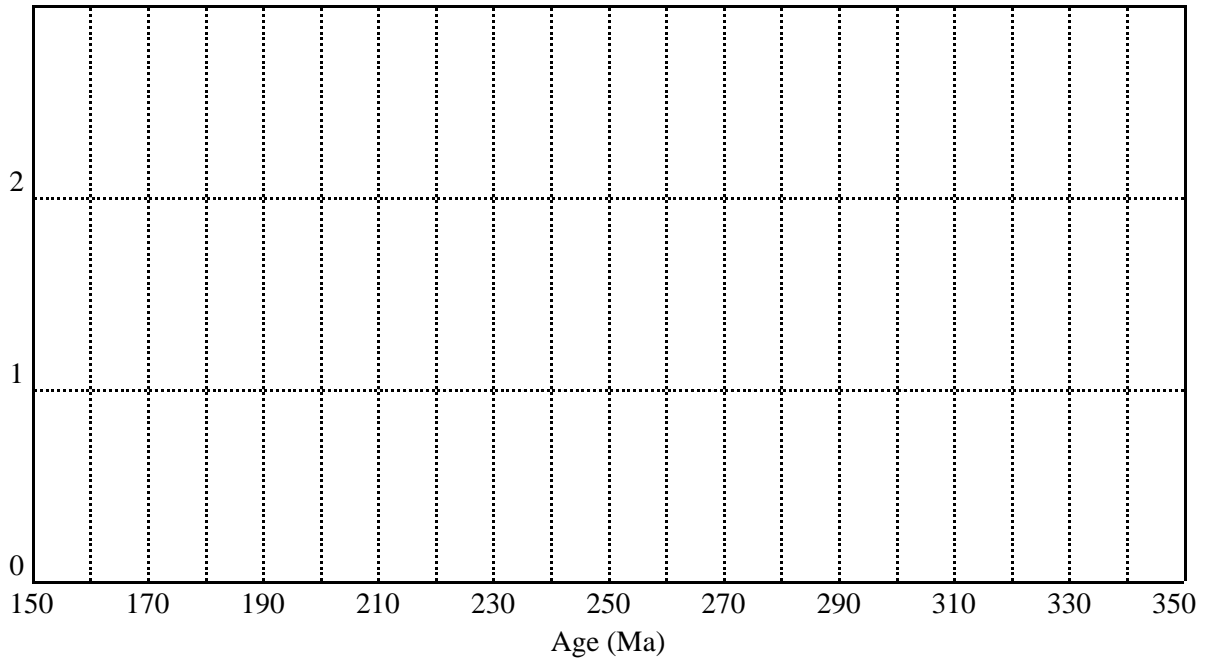
Phyllites -

Permian volcanics -

Permian granites -

Tertiary granites -

2. Plot the ages for the mica from the Ice Man's intestines on the graph below. Also plot the ages (or age ranges) for the various geologic units. Group the mica ages into 10 million year intervals. For example if there are two mica ages between 160 and 170 million years, show these as a box two units high extending from 160 to 170 million years. What you are drawing is called a histogram. Show the ages for the various geologic units either as fields or a single line, whichever is appropriate.



3. Based on these data, and the graph, which geologic unit was the most likely source for the mica grains in the Ice Man's intestines? Explain. What is the most probable home area for Ice Man? Why?