**The Geological History of the Alps**
Concentrating on the Mont Blanc Region

By Rob Johnson

For much of the last 250 million years, the continental crust on which the French Alps are located formed the continental shelf beneath the northern section of the Tethys Ocean, accumulating thick deposits of marine sediments.

During the last 50 million years collision of the African and European plates closed Tethys, compressing, lifting and folding the continental shelf, and exposing granite plutons which had crystallised below it.

Glaciation carved the surface, the glaciers have now receded to the highest elevations, and are continuing to retreat as the climate warms.

In the Mont Blanc region the resulting landscape is a drama where Triassic, Jurassic, Cretaceous and Tertiary limestone cliffs stand to attention before the ice-capped granite, gneiss and schists of the Mont Blanc massif.

Active glaciers demonstrate how their lower altitude predecessors carved the mountain features in colder times, while torrents and waterfalls wash their way through gorges, and cave systems, leaving karst pavements on the uppermost exposed limestone. (All limestone is vulnerable to chemical weathering, the alkali consistence of the rock reacts with the acidic rain causing it to dissolve slowly and gradually. The rock is removed in solution by running water which in many cases continually passes by it. The chemical weathering widens weaknesses in the rock causing great cracks and blocks to be formed)

**Physical Geography**

Once formed by the compression resulting from tectonic plate collision, the exposed rocks become subject to the shaping forces arising from the climate at the Earth's surface. These are primarily glacial erosion, water erosion, and mass movement or landslip.

There have been up to seven distinct periods of glaciation during the last 2.5 million years, the last one ending about 10,000 years ago. The effects of earlier glacial erosion can be seen on the mountainsides and the valleys of the alps today. However, more significantly, there are still active glaciers on the Mont Blanc massif, where the processes of ice movement, erosion, and resulting features can be witnessed at first hand. Direct observation of this activity can be locally compared with the features formed during the earlier

glaciation periods.

At the base of the glaciers, and in capture areas for snow melt water, mountain torrents arise, and gradually erode the valleys below, by both physical pressure, and dissolution of materials, forming dramatic gorges, before contributing to the wide, flat rivers, which meander to the sea, distributing deposits carried from erosion by torrents.

Cycles of freezing and thawing eventually loosen rocks, by widening fissures, and separating sediments. This process often results in rock falls, or land, slips, gradually reducing dramatic rock faces to gentle hills.

**Human Geography**

Since the end of the last ice age, man has continued to colonise continental Europe. For many centuries human migration followed coastlines and river valleys. However, early hunters in search of chamois and wild boar, established paths and settlements on what would become trade routes between isolated Alpine regions. Such a route connected the Tarentaise with Faucigny, and with the Swiss Rhone Valley, via the Val Montjoie to the West of the Mont Blanc massif, and the Chamonix Valley to the North of the Mont Blanc massif.

Small communities became established along this route, existing by raising goats and cattle, using fertile pastures on alpine plateaux for summer grazing, using natural materials for construction (timber, granite), and producing cheeses and dried meats. These hamlets had an almost autonomous existence until the last few hundred years, but were gradually brought under the political control of the more powerful valley market towns, expanding below (St. Gervais, Chamonix, Sallanches, etc). These towns grew as market centres for regional trade in dairy and farm produce, timber, regional wine etc., powered by Hydro Electric Powers stations, which harness the natural energy of mountain water sources.

**Tourism**

The 19th century saw the growth of Alpine tourism, as wealthy visitors came to witness the grandeur of the Alps, and in particular the Mont Blanc massif,

with its accessible glaciers. Spa Baths at St. Gervais became a popular destination for visitors seeking the healing properties of its thermal waters, and grandiose hotels were built close to the stations of the Tramway du Mont Blanc (TMB), a new mountain railway which was originally projected to travel to the summit of Mont Blanc. The sport of mountaineering attracted those who wished to not just admire Mont Blanc, but stand on top of it and enjoy a view with a difference.

During the first half of the 20th century there was a relative decline in tourism in the French Alps, due to the impact of the two World Wars, which also prevented the extension of the TMB beyond the Nid d'Aigle (The Eagle's Nest) at 2,400 metres altitude. However, since the 1950's the growth of skiing and winter sports has given new momentum to Alpine tourism. The traditional resorts have been expanded to cope with growing numbers of tourists, and new custom resorts have been constructed at locations considered to be ideal for skiing. New facilities and attractions beckon for more summer, or between-season tourists.

**Ecology**

The diversity of habitat around the Mont Blanc massif is immense. Within a small area of the Earth's surface there are altitude differences from 600 to 4807 metres, low-lying meadow, mountain pasture, deciduous forest, pine forest, mountain scrub, marshland, rivers, lakes, slopes with low and high gradient, harsh scree and steep cliff faces, slopes facing each point of the compass, microclimates associated with glacier proximity.

The more obvious flora and fauna in the region include Chamois, Ibex, Golden Eagle, Marmots, Wild Orchids, Gentians, Edelweiss, etc. Although some areas are now classified as protected nature reserves, tourism and local economic development create ever more significant impact to these environments.

**Impact of  Tourism on the Environment**

The Mont Blanc region is increasingly accessible to growing numbers of people as a tourist attraction, for skiing and many other activities.

Expansion of resorts and associated infrastructure often means removal or destruction of local habitats.

Deforestation has been known to remove natural avalanche barriers,

sometimes with disastrous results.

1960s development of custom-built ski resorts resulted in construction of a number of concrete eye-sores in otherwise picturesque locations. More recently environmental issues have been more carefully considered, but resorts continue to expand. Compare custom built resorts (Flaine), with more traditional towns (St. Gervais, Megeve).

Opening a new ski-piste may result in habitat destruction, development of more car parking and associated changes to traffic volumes.

In February 2000 the Mont Blanc tunnel , from Chamonix to the Aosta valley in Italy, was closed due to a fire. It reopened in 2002, first to cars and eventually to lorry traffic in early 2003.The inhabitants of the Chamonix valley still regularly protest the reopening of the tunnel to lorry traffic, because for two years they had enjoyed a significant reduction in exhaust and noise pollution. Visit the tunnel control centre, and find out what changes have been made to improve safety, and how pollution is being tackled.

In 2002 the year round population of St. Gervais was approximately 5000, but the possible population if all tourist beds are filled (hotels, rentable appartments and chalets, etc) was 25000. What effect does this have on local facilities and infrastructure? Discuss!