context the Polytrichales are held to be primitive. A significant observation in this connection has been made by R.N. Chopra *et al.*, that in *Splachnobryum* the archegonia are borne individually and laterally along the axis. Such a distribution of archegonia recalls a similar condition in the primitive liverwort *Takakia*.

Among recent additions to the bryoflora of India. Udar *et al.*, (1970) have reported *Buxbaumia* from Western Himalayas (Deoban: altitude a. s. l. 10,500 feet). This plant, highly significant in its morphology and nutrition has been shown to approach *B. minakatae* of Japan in its taxonomic features.

ECONOMIC IMPORTANCE OF BRYOPHYTES

A few bryophytes are economically important.

Ecological importance. The liverworts, mosses and lichens are supposed to be the pioneers in establishing vegetation where other vegetation seems to be practically impossible. They colonize the barren rocks and exposed areas of hills, and make them suitable for growing angiospermic and other plants by depositing humus soil and plant debris. In the beginning the forms and grasses grow, and ultimately shrubs and trees also establish, and the whole area converts into dense wood.

However the *Sphagnum* plants are of great ecological importance. When these plants establish themselves in some lake or other areas full of water, sooner or later they cover the whole surface of the water. Due to deposition of plant debris the surface may be raised. The *Sphagnum* plants along with other hydrophytes form a dense surface covering over the water below. This covering gives the appearance of the soil from the surface. These areas are known as quacking bogs. Later on these bogs are converted into swamps. Ultimately these swamps are replaced by the forest growth of mesophytic type.

A few bryphytes play an important role in checking the soil erosion. They are capable of holding the soil by their extensive carpets, and prevent the soil erosion to some extent. (Also see page 196 'ecology of bryophytes').

Packing material. Most of the mosses are used as packing material after being dried. They make a fairly good packing material in the case of glass ware and other fragile goods. Especially the dried peat mosses (*Sphagnum* spp.) are used to pack bulbs, cuttings and seedlings for shipment.

Used in seed beds. Since the peat mosses have remarkable power to absorb and hold water like a sponge, they are extensively used in seed beds and green houses to root cutting. The peat mosses (Sphagna) are also used to maintain high soil acidity required by certain plants.

As a source of fuel. The peat is also a potential source of coal. Dried peat may be used as fuel. In Ireland, Scotland and other European countries the peat is used for fuel. In colder parts of the world where peat reaches its greatest development, the lower layers of peat become carbonized, and after the ages have passed, becomes available to human kind in the form of coal.

Absorbent bandages. The *Sphagnum* plants are slightly antiseptic and possess superior absorptive power. On account of these properties they may be used for filling absorbent bandages in place of cotton, in the hospitals.

PHYLOGENY OF BRYOPHYTES

There are *two* theories : (1) The first theory is known as up-grade or progressive evolution theory. (ii) and the second one is called down-grade or regressive evolution theory. According to these theories the evolution in bryophytes is as follows :

range from the arctic zone to the tropics and grow in the vicinity of hot springs. They reach their greatest development in cool, moist forests in temperate countries and the mountains of the tropical countries.

The bryophytes are an important component of the flora of the earth and play a significant role in the economy of nature. This is partly the result of the great number of individual plants produced by vegetative propagation. Mosses are so prolific that they form great masses or carpets covering the soil. Another characteristic of ecological importance is the ability of mosses to hold water, which is trapped among the leaves and stems. Many woodland mosses and species of *Sphagnum* absorb water through their leaves. By their structures and their mode of life, mosses contribute in many ways to the modification of their own environment.

The significance of mosses as solid formers following lichens or other lower forms of plant life on bare rock surfaces is of much importance in the succession of vegetation. Lichens are followed by mosses, which, like lichens, are able to survive in a dry environment. The mosses shade the lichens and successfully compete with them for water and nutrients. The death and decay of older mosses often produce a mat over the rock surface. As this mat becomes thicker and develops a water-holding capacity a new stage in the plant succession follows. This stage consists of annual and perennial herbs. The retention of water by mosses of leafy liverworts and mosses growing on fallen trees and other organic material hastens the processes of decomposition and hence the organic enrichment of the soil. Absorbing but little water from the substratum, they do not dry out the soil but protect it from desiccation. As a result of their ability to retain water, natural beds of mosses undoubtedly act as seed beds for herbaceous and woody flowering plants and for conifers.

One of the roles of the bryophytes is in the retardation of erosion. Carpets or felt like mosses possess a greater water retaining power than do layers of dead leaves. They therefore slow down the rapid run off rain water and melted snow. In addition to this, dense strands of moss collect and hold particles of soil. Insignificant as the individual plants of this group may appear, they play a part, together with other and more advanced forms of plant life, in making and changing man's environment.

BRYOLOGY IN INDIA

Researches on the Indian bryophytes begin with the publications of Hooker (1818,1820) n mosses and on liverworts of India and Nepal (Lindenberg and Lehman, 1832). Royle (1839) eported 113 species of mosses from India and Nepal. Later on Gottsche, Lindenberg and Nees 1844, 1847) recorded some Indian liverworts from the Himalayas. Griffith (1849) contributed lot to Indian bryology in its early days. Mitten (1859) published a comprehensive account f Indian mosses (85 genera; 800 species). Mitten (1860, 1861) also published an account of e Indian liverworts. C. Muller (1878) wrote several articles on the Indian mosses. Brotherus 898) described the mosses of the North-western Himalayas and in 1899 he also published account of the mosses of South India.

Our present knowledge of Bryophytes is the result of the pioneering efforts of Professor R. Kashyap. The more urgent task in our country is the preparation of a country-wide flora bryophytes.

This was year 1914 when Kashyap published the first paper on some liverworts from stern Himalayas. Prior to this, contributions had been made by foreign workers. Kashyap's rk was published in two volumes (Kashyap, 1929 ; Kashyap and Chopra, 1932). He discovered e well recognized genera-*Aitchinsoniella*, *Sewardiella* and *Stephensoniella*-all of which are nic and endemic to India.