Isotropy/anisotropy

An environment or medium is said to be isotropic if its physical properties are identical in all directions. A Â«systemÂ» will be termed isotropic if its (macroscopic) properties are invariant in relation to a particular direction, and therefore none of these properties is directionally dependent. Should one of its properties be directional, the system is not isotropic, but anisotropic. A physical magnitude can also be said to be anisotropic or isotropic according to whether or not it is dependent upon the direction according to which it is measured. In the primary, restricted meaning of the terms, isotropy and anisotropy are properties of macroscopic bodies or ensembles. In this general acceptation, given that time and space are physical magnitudes, since they are measurable, it is usual to talk about isotropy or anisotropy in reference to them.

Geographical space is heterogeneous and anisotropic. Here the notions of heterogeneity and anisotropy are close. The notion of homogeneity describes the degree of similitude or "equalness" of a variable or a combination of characteristics in a geographical ensemble. The heterogeneity of a geographical system thus resides in the fact that its parts, elements or places are differentiated. Its anisotropy refers to the orientations in space, to differentiations arising from directional dependencies that are constituent parts of its structuring. Hierarchised nodes and axes that organise circulation flows, Â«gradientsÂ» and asymmetries are signs of anisotropy.

In relation to geographical space, isotropy (or anisotropy) is always defined in relation to a certain level of resolution or generalisation of the geographical units involved. Isotropy, observed on a certain scale and for a defined number of criteria, is a measure, always relative, of directional independence.

The question of isotropy in geographical space has arisen in various contexts of reflection or action.
One of these is the field of spatial management. It is approached by way of the issues of "territorial equity", that is to say the spatial dimensions of social justice. The aim is to define a geographical configuration liable to provide all people with the same conditions of access to public services, employment, and the various advantages of life in a society. Territorial equity and isotropy of a given space are relevant when the issue is to determine whether certain dimensions of anisotropy lead to unfair differentiations in access within a given territory.

A very different context is that of the theories and models used in spatial analysis. To explain the localisation and the distribution of human activities, these models generally introduce the hypothesis of an isotropic space, at least from the point of view of some of its properties. Distance, which slows Â«interactionsÂ» and causes the "value" of places to vary according to their relative geographical situation, is then allocated a dominant differentiating influence. The hypothesis of an isotropic space is found for instance in the centre-periphery theory, the Â«central place theoryÂ», the theory of the diffusion of innovation, or again the theory of returns from property ownership. In the models that have been developed from these theories, as in models of more narrowly gravitational form, Euclidian measurement, well suited to the representation of distance in an isotropic space, has in general been used to give an account of distances measured within that space. The hypothesis of an isotropic space has been widely criticised as being unrealistic. It has often served as a pretext for rejecting outright any proposals for spatial analysis aiming to develop a more nomothetic geography.

Bibliographie