## **INDIVIDUAL-BASED MODELS (IBMS)**

## Individual-Based Models (IBMs)

Individual-based models (IBMs) are those that mimic the structure and dynamics of ecological systems based on information at the level of individuals of organisms. There are two groups can be distinguished: individual-based distribution models and individual-based configuration models. The former group lumps individuals together according to some common characteristic, while the latter keeps track of all individuals in a spatially explicit fashion and thus relies heavily on computer simulation. In general, IBMs are important for linking processes operating at different organizational scales around the level of individuals, which is a central piece of the problem of scaling in ecology.

Among the best known individual-based models are gap models, which are a group of computer simulation models of forest dynamics (or succession). The central idea of gap models is that the dynamics of a forest stand can be adequately modeled by integrating those of individual tree gaps. In that sense, it is a specific case of the most general concept, patch dynamics. The first gap model (JABOWA, made up with the first two letters in each of the 3 authors) was developed through a collaboration between Yale ecologists who were participating the IBP's Hubbard Brook Ecosystem Study and computer scientist at IBM's (the real one!) Thomas J. Watson Research Center (Botkin et al. 1972). Based on JABOWA, Hank Shugart and his associates further developed this modeling approach, and have made it one of the most successful ones in the history of ecological modeling (Shugart 1984). These models now are known as FORET and its various modifications. Gap models are usually semi-spatial (see Wu and Levin 1994, 1997), but its spatial extension has been implemented (e.g., Smith and Urban 1988).

## References on IBMs

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