PREFACE

This special issue of Acta Geographica is dedicated to **Professor László Jakucs**, the well-known researcher of the karst, on the occasion of his 70th birthday. László Jakucs is the member of the generation of karst researchers that following H. Lehmann, made significant contributions and achieved important scientific results in interpreting the combined karst phenomena. He has been and still is doing versatile research on the surface and subsurface karst genetics. He has discovered several caves and his career can be set as an example for young generations of karst researchers to follow.

László Jakucs was born on 21st January 1926 at Sarkad. His father was a teacher in a country school and taught his son the love of nature and scientific reasoning. He went to secondary school in Debrecen. He was influenced by the work of András Hoffer, a geologist who took him on geologic surveys several times. He was especially interested in mineralogy first. He had a considerable collection of minerals that he had given to the Institute of Mineralogy and Geology in Debrecen later on.

He started his university studies at the Department for Physical Geography and Chemistry in Budapest. Then he specialized in Geology, under the guidance of Elemér Vadász. From 1947 he became a research student at the Geologic Institute of the university and he graduated as a geologist in 1949.

While he was a university student, he surveyed and mapped the cave at Sátorkőpuszta in 1946, and he studied the genetics and morphology of the hydrothermal karst phenomena of the Buda Hills. He published his results in the Természettudomány (Natural Science), Hidrológiai Közlöny (Hydrological Bulletin) and Földtani Közlöny (Geological Bulletin). In 1949 he worked for the Hungarian National Geological Survey, where he was given a one year scholarship at the Geological Research Institute in Moscow. During this year he worked with professors Avchinjicov and Kamjanski on geohydrological and karst morphological projects.

From 1950 he did researches on the karst water system of the Bükk Mountains, applying water colouring methods. In doing so he discovered and surveyed the so far unknown Létrás sink-hole cave.

From 1952 he started working in the Aggtelek Karst Region. Using new methods of research he calculated the location of several, so far unknown caves, among which the 10 km long Béke Cave was the largest. He discovered it in August 1952, and then mapped the cave. When surveying the genetics of the cave system, he proved it to be the product of the erosion of solid sediments transported by the seasonally flooding streamwaters arriving from non-karst areas instead of the product of solvent corrosion.

Besides his scientific researches he made significant contribution to the development of domestic karst research. In 1951 he organized the Karst and Speleology Research Section of the Hungarian Geographic Society. His studies and books published at that time did a great job in making speleology almost a popular movement. In 1953 he and his colleagues discovered and surveyed the Pénzpatak Cave System in the Bükk Mountains.

From 1953 he had been the director of the Aggtelek Dripstone Cave for 10 years. He was engaged in developing the region of the cave and in the scientific surveying of the region itself.

During this time his monography written on Aggtelek and a film entitled Aggtelek were issued. This latter won the 'World's best cave film' title and cup on the 2nd International Speleological Congress in Italy in 1958. Several films were made on his results in karst research, like a Hungarian TV film on the discovery of Béke Cave, and a German film entitled 'Mit Höhlenforschern in Nordungarn II. Lokaltermin nach 36 yahren'.

In 1963 he was appointed assistant professor at the Szeged University, where in 1964 he organized the Department of Physical Geography, which he had been heading for 28 years.

As a university lecturer he organized several research journeys abroad. The most successful ones took place in the karst regions of Yugoslavia, the Krim Peninsula, Podolia, the Alps and Cuba. In 1971 he organized a regional IGU conference entitled 'Karstmorphological Symposium'.

His scientific activity transformed the traditional views on karst morphology. He separated two large groups of limestone karsts. Type 'A', the autogenic one where karst phenomena and morphology are formed through corrosional processes and type 'B', the allogenic karst, the morphology of which is being formed by alluvial erosion. He was the first in an international aspect to establish the erosional model of cave morphogenetics. He developed new principles and methods to discover unknown caves. He proved the biogenic dominance in karst processes. His new views led him to oppose the French School of J. Corbel. In his opinion the role of carbon-dioxide absorbed in precipitation from the atmosphere, is negligible in karst corrosion, because most of the carbon-dioxide content of the water comes from the soil layer covering the karst surface, thus increasing the solvent action of water.

His most important piece of work, the book entitled 'The morphogenetics of the Karst', being published in English too, can be found in every library belonging to karst research workshops all over the world.

László Jakucs worked in other fields of geomorphology as well. He examined the craters of cosmic origin on Earth's surface. He was among the firsts to interpret satellite images of Hungary from the viewpoint of hydrocarbon research in the mid 70s. He constructed the geological and paleogeographical model of a Hungarian crude oil holding structure. He analyzed the changes of water regime of the rivers in the Great Plain that were due to the effects of human activity.

As a university professor he took part in scientific life home and abroad alike. For decades he had been a member of the Meteorological Professional Committee, the Scientific Qualification and the Geographical Committees of the Hungarian Academy of Sciences. He contributed to the work of the Committee on Environmental Change of Karst Areas and the National Committee of IGU. He is the co-chairman and a honorary member of the Hungarian Karst and Speleological Society, the Hungarian Geographical Society, the Szeged Section of the Hungarian Geographical Society and the Szeged Section of the Association for Spreading Scientific Knowledge.

His life-work can be described by more than a dozen scientific books, numerous text books and almost 100 scientific articles.

He is the founder of the Szeged karstmorphological school. Many of his students are now qualified researchers at the Hungarian Academy.

His work in scientific research and education is acknowledged by several awards. He was awarded the medals of Otto Herman, Lajos Lóczy and Sámuel Teleki; the title 'Excellent Worker of Higher Education' and the golden grade of Labour Merit. In 1993, when he retired, he was given the title 'Professor Emeritus' for his several decade long, excellent activity in education.

He is an outstanding lecturer today, and still doing research. His main scientific theses are described below:

Since the carbonate-dissolving potential of water in contact with a rock varies directly as its carbonic acidity, the most important thing to establish in interpreting the corrosion dynamism is the set of conditions controlling the absorption of CO_2 and its concentration in the water. Of these conditions, the abundance of CO^2 in the soil gas entering into contact with the water turns out to be the most important: infiltrating waters derived from precipitation, which by their dissolution of limestone essentially control the entire karst evolution, gain their carbon dioxide content (determining the dynamism of corrosion) almost everywhere and always in the top horizons of the soil.

The gas composition of the soil atmosphere reacts rapidly and sensitively to both macro- and microclimatic influences; it tends to exhibit significant differences even within one and the same test site (e.g. within one doline) depending on the type of plant cover supported by the soil, and even on the individual plant species making up the rhizosphere. That is, the rate of karst evolution by corrosion is determined not only by the abundance of precipitation, but primarily by the biological features and other processes of evolution of the soil mantles of varying thickness covering the rock.

Natural karst corrosion of limestone rocks over most of the earth's land area is simply the formal imprint upon the soluble parent rock of the phenomena of biological and chemical evolution of the soil covering the rock.

Under a cold climate, the calcium carbonate carried in solution and suspension in the streams issuing from karst areas is nearly equal to the amount removed by corrosion. The non-aqueous content of the infiltrating precipitation is controlled by the influence of the soil atmosphere and its enriched CO_2 content (that is, the warmer the climate), however, the volume of precipitation influences the difference between the quantities of dissolved and removed material. This may reach the degree, largely typical of today's tropics, where the calcium carbonate removed in the streams is practically insignificant compared with the high-intensity erosion by karst corrosion.

Owing to the near-equality of the rates of corrosion and calcium carbonate removal in solution, cold-climate karsts develop into leached "skeletal karsts", whereas in a tropical karst the dissolved calcium carbonate is precipitated in the deeper horizons or almost at the site of dissolution, which turns these karsts into compact, massive ones. In these regions, calcium carbonate transportation is largely vertical, and inasmuch as if it is horizontal it is confined to a highly localized small domain.

Karsts of the temperate zones are intermediate between tropical and polar karsts not only in geographic latitude, but also morphogenetically, in the intensity and quality of products of the processes of karst corrosion.

Carbon dioxide of atmospheric origin does not play an important role in karst corrosion except in high mountains, periglacial regions and desert. In the tropical regions it is negligible in comparison with the other factors of karst corrosion. (In the tropics, for example, the biogenic CO_2 is about 100 times more effective than the atmospheric!)

The dominant feature of karst corrosion is the temperate and Mediterranean zones is a marked seasonal control of the nature and dynamism of the processes. It seems probable that the landform-controlling role of microclimatic factors is most efficient in the temperate zone. Owing to the climatic extremes typical of this zone, to the frequent alternation of freeze and thaw in the winter, producing large amounts of rubble lending considerable erosional efficiency to stream action, and to the frequent vehement floods outside the season of vegetation (in the Mediterranean zone), the formation of scour caverns is most intense in this zone of the earth's surface.

Within any given microspace, the corrosive karst process in invariably determined by the microclimatological parameters prevailing, and these of course do not depend only on the macroclimate of the area. The process of karst erosion in a region, then, should be interpreted as a statistic resultant of episodes of erosion in a mosaic of microspaces not necessarily similar in behaviour.

Depending on whether or not the drainage network of a karst carries waters flowing in from alien non-karstic areas, it is necessary to distinguish B-type (allogenic) and A-type (authogenic) karsts. In the hydrography of an authogenic karst, only the precipitation seeping in through the karst surface is available as a fundamental genetic factor, whereas in an allogenic karst linear streams of non-karstic surfaces also contribute to erosion.

In nature, only the authogenic hydrological character may appear as a pure type, the geomorphological facies of an allogenic karst invariably exhibiting hydrological and formal features of the A-type in addition to the B-type ones.

B-type (allogenic) karst erosion is simply the manifestation, with a number of special features, of a non-karstic process of relief sculpture, normal linear erosion, in the depth of the karst. Hence, the cave is not a product of dissolution, but is a simple erosion streambed under the surface. The presence or otherwise of this process in a karst region is purely accidental, depending primarily on the relationship of the karst to its non-karstic environment, and it is not an inevitable stage in the evolution of any karst. The classical interpretation of karstification as the corrosive erosion of limestone did not take into account the possible manifestation of this influence of the environment, nor its morphogenetic consequences, but considered authogenic karstification solely. This is one of the reasons why the classical definition of the karst concept must be assessed as too narrow, and unsuited for the interpretation of the full range of phenomena, since by strictly adhering to this viewpoint it would be necessary to exclude from the karst concept the largest-scale and most majestic cavern formations encountered in the karst depths throughout the world.

In the first stage of evolution of an allogenic karst, streams penetrating the area from the non-karstic surroundings continue to incise valleys by linear erosion of the karst surface. Subsequently, once the three-dimensional system of water passages in the karst has developed, the surface valleys are tapped from below by underground passages (bathycapture), and from then on the linear valley sculpture by the stream is displaced underground, where it contributes to cavern sculpture.

The conspicuous presence of aligned dolines on a karst surface may indicate that the karst in question was more or less covered and confined at he beginning of its erosional process; the traces of the dolines usually follow the traces of former stream valleys caused by linear erosion, epigenetically inherited from the time when the karst was still buried.

Structural preformation, if any, has determined the alignment only is so far as it controlled the drainage pattern in the non-karstic formation originally covering the karst mass.

Aligned dolines are invariably older and deeper-lying than individual dolines, and they are usually larger and better developed.

Retreating underground evolution in the karst under a limestone valley carrying an allogenic stream may lead to repeated, retreating episodes of bathycapture. The process keeps on repeating itself until the youngest swallow-hole attains the limit of the karstic rock mass. Thereafter, retreating erosion reaching out to the surface from the deeper-lying cavern cuts down the non-karstic surface adjacent to the karst mass, resulting in time in its insular emergence as an island.

Degradation resulting in the barrenness of the karst completely changes the set of forms of lapies fields. According to our observations, the phenomenon is so regular that this "lapies metamorphosis" in itself permits a fair estimate of the duration of degradation.

The drippings of water in caverns of a comparatively uniform yield all the year round invariably underlie forest-covered surfaces, whereas the stalactites whose yields fluctuate markedly underlie barren areas almost without exception. Another feature closely related to changes in the plant cover above caverns is the colour of dripstones. Degradation is usually accompanied by a considerable enrichment of clayey material in the dripstones and in the cavern deposit.

15th November 1995, Szeged