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ANDERS RAPP (1927–1998)

Anders Rapp, Professor Emeritus of Physical Geography at the University of Lund, Sweden, died on 27 December 1998, at the age of 71. Anders was one of the exceptional group of students who carried out doctoral studies under Filip Hjulström at Uppsala University in the 1940s and 1950s. Unlike the others, Anders focused his research on the processes associated with the development of mountain slopes, especially those in areas characterized by the presence of permafrost, such as northernmost Sweden and Spitsbergen.

In 1958, he published a paper in Swedish (summary in German) dealing with rockslides and avalanches in the Austrian Alps, and in 1959, an important paper entitled "Avalanche boulder tongues in Lappland: Descriptions of little-known forms of periglacial debris accumulations" appeared in *Geografiska Annaler* (41:34–48). In this paper Anders discussed the importance of avalanche boulder tongues, as distinct from talus cones, alluvial cones, and rockslide tongues.

However, the two major parts of his dissertation, defended publicly for the *Filosofie doktor* degree in May 1961, both appeared in 1960. The first, entitled "Talus slopes and mountain walls at Tempelfjorden, Spitsbergen" (*Norsk Polarinstitutt Skrifter* 119, 96 p.), was enhanced by abundant photographs. Taken at various times between July 1882 (Gerard De Geer) and the time of Anders' own field work in the summer of 1954, these comparative photographs enabled him to record changes to the rock walls and talus cones over a 72 year period. Perhaps most spectacular is the 1954 photograph showing curved lines of "bump holes" on the raised beaches caused by the bouncing trajectories of huge boulders derived from the mountain walls above.

His second major paper of 1960, and the one which is best known, is Anders' classic study entitled "Recent developments of mountain slopes in Kärkevagge and surroundings, northern Scandinavia" (*Geografiska Annaler* 42:65–200). Kärkevagge, a valley accessible from the Kiruna-Narvik railroad (and now from the highway) in northernmost Sweden, was investigated every year between 1952 and 1960, often on two or three occasions, between April and October. Each year, Anders made detailed inventories of fresh debris. Because of this careful documentation, his research is regarded as a most important contribution to our understanding of rockfalls, rockslides, snow avalanches, and slush avalanches. He also investigated earth slides, mudflows, gullying, talus creep, solifluction, and chemical weathering, to gain a complete picture of how slope denudation occurs under periglacial conditions. For this work Anders received the Kirk Bryan Award of the Geological Society of America, and in succeeding years many geomorphologists have made the pilgrimage to Kärkevagge.

After a few more years of periglacial research and teaching in Uppsala, Anders spent a sabbatical term in the spring of 1965 at Pennsylvania State University, where he taught a graduate-level course in periglacial geomorphology. In August of that year he visited the Yukon, under the auspices of the Geological Survey of Canada. In the company of my late colleague Owen Hughes, he studied various mass-wasting features, especially rock glaciers. Avalanche tracks, solifluction lobes and terraces, altiplanation terraces, and tors were also examined.

Anders Rapp discussing boulders and slopes in Skåne, May 1987.

Anders Rapp then embarked on two decades of work in Africa. First he led a project in Tanzania, financed by the Bank of Sweden as a joint undertaking between Uppsala University and the University of Dar es Salaam, to study the processes that result in widespread soil erosion and the ensuing sedimentation, especially in reservoirs. The results of this research were published in 1972 in a special issue of *Geografiska Annaler* (54A), for which Anders acted as one of three editors, co-authored four articles, and provided the conclusions. Following the field work in Tanzania, from 1973 to 1976**,** he was Deputy Director of the Secretariat for International Ecology, Sweden (SIES),

based in Stockholm. In this capacity he published, as that organization's first report, "A review of desertization in Africa – Water, Vegetation, and Man" (1974). In 1976, Anders Rapp was appointed to the Chair of Physical Geography at the University of Lund, and he remained in this position until his retirement in 1992. He and his students continued research in Africa with special emphasis on land degradation in the Sahel, the southern border region of the Sahara. In 1992, the Royal Danish Geographical Society awarded him its Galathea Medal for his outstanding work in Africa over a period of more than 20 years. A special issue of *Geografiska Annaler* (74A:61–282), entitled *Geomorphology, Environment and Man*, was dedicated to him on the occasion of his retirement in 1992, and in 1997 he was made an Honorary Fellow of the International Association of Geomorphologists.

The professorship in Lund also gave Anders the opportunity to initiate investigations into the landscape of Skåne (Scania) in the environs of Lund, as well as to continue his research in northern Sweden. One project, supported by the Natural Sciences Research Council, was entitled "Nivation and local glaciation in Lappland and Scania." Among other things, this project included a study of some spectacular wind-polished and wind-sculptured boulders near Lund. His article entitled "Kärkevagge revisited: Field excursions on geomorphology and environmental history in the Abisko mountains, Sweden" appeared in 1992 in a special volume (Geological Survey of Sweden Memoir 81:269–276).

In retirement, Anders initiated a series of international conferences at Abisko that dealt with problems of development and research in mountainous regions. One of these, "Arctic and Alpine Geomorphology and Environmental Change," resulted in a series of nine papers in *Geografiska Annaler* (77A(4), 1995), of which he was also co-editor. His introductory paper, entitled "Case studies of geoprocesses and environmental change in mountains of northern Sweden," brought the story of monitoring weather conditions and slope processes in Kärkevagge up to date. Another paper which he co-authored, "Yellow snow over the Alps and Subarctic from dust storm in Africa, March 1991" (*Ambio* 23:233–235, 1994) even managed to link his studies in Africa with those in northern Sweden. In addition, this paper provided a possible explanation for the exceptional melt-off of alpine glaciers that year, including the exposure of the 5300-year-old alpine "iceman" Ötzi at an elevation of 3 200 m near the Italian-Austrian border in September 1991.

Among the honours accruing to Anders was his election to both the Swedish and Norwegian Academies of Science and to the Deutsche Akademie der Naturforscher Leopoldina in Halle. Other positions Anders held along the way were Chairman of the Swedish National Committee for Geography, Chairman of the International Geographical Union's Commission for Geomorphology, Board member of the Swedish Academy of Science's Abisko Research Station (near Kärkevagge), and President of the Royal Physiographic Society in Lund. From 1963 to 1968, he served as editor of *Geografiska Annaler*, Series A, and he was later on the editorial board of this journal as well as those of *Ambio, Geomorphology,* and *Progress in Physical Geography*.

Anders Rapp was an outstanding geomorphologist and teacher, with vast field experience in many parts of the world. His wise counsel and enthusiasm will be sorely missed in Swedish and international geographical circles.

Weston Blake, Jr.
Research Scientist, Emeritus
Geological Survey of Canada
601 Booth Street
Ottawa, Ontario K1A 0E8