Dr. Alistair Frank Pitty
Research biography

Professor Ian Douglas

Alistair had a brilliant career as a student, gaining a place at William Hulme's School in Manchester, where he passed four A Levels with flying colours. He then was awarded an Exhibition at Brasenose College, Oxford and achieved first class honours in geography (one of only six in a class of over ninety to do so). He stayed at Oxford to write a D.Phil. thesis about *Landform Studies in the Peak District of Derbyshire* (Pitty, 1966a). It was a challenging time for a young geomorphologist. There was a strong, entrenched tradition of analyses of evolution of landforms dominated by a belief in the existence of sequences of peneplains that was being challenged by a new wave of understanding the processes currently fashioning the landscape and the ways they had worked in the past. Alistair successfully straddled both camps. He became a master of the details of the landscape, often seeing things that both his predecessors and his contemporaries had missed. He read extremely widely and was able to trace the evolution of ideas on every topic he examined. His working career had two parts: an effective, highly productive fourteen years at the University of Hull, followed by some thirty years of wide-ranging consultancy achievements. He also, like many of his contemporaries, spent time in retirement examining the evolution of the Norfolk landscapes around where he lived.

UNIVERSITY RESEARCH

Five of his important studies were:

1) **Idea of down-dip breaching**
   In 1965 Alistair reviewed hypotheses about escarpment gaps in the Southern Pennines near Buxton (Pitty, 1965). Evaluating previous ideas, he eliminated them and developed a new theory: selective undercutting by down-dip shift and the lateral erosion of progressively higher horizons as funnel embayment developed. The breach would have enlarged and cut back the scarp until it eventually over-topped the divide. Much later he applied the idea to similar phenomena in Kuwait and Saudi Arabia.

2) **Slope pantometer**
   Alistair's slope pantometer (Pitty, 1966a, 1967) was designed to be lightweight and usable by one person to get a series of measurements at 1.52 metre intervals down a slope. The short unit lengths make realistic surveys of microrelief possible (Pitty, 1968), while the relative speed of the measuring process makes the prospect of surveying large-scale slopes undaunting (Pitty 1968b). Slope pantometers are mentioned in fieldwork for schools by RGS. https://www.rgs.org/schools/resources-for-schools/coasts-fieldwork-techniques

Instructions for making a pantometer can found at: https://www.instructables.com/How-to-make-a-pantometer-for-slope-measurements-an/ and in the appendix of his book (Pitty, 1971)
Later researchers have used the pantometer in diverse locations such as: the *Wasatch fault zone, Utah;* the *River Wye catchment and the Lake District, UK; Baja California, Mexico ;* the *San Pedro region* and *Rondônia, Brazil; Peninsular Malaysia;* and *Jotunheimen, Norway.*

3) **Biotic influences on karst water chemistry**
In his systematic sampling of water from springs in Poole's cavern, Buxton, Alistair found that peak concentration of calcium carbonate in the water, occurring in November, was related to high levels of biologically generated carbon dioxide in the surface soil during the previous spring and early summer. The slow passage of the groundwater through the limestone caused the time lag. He termed this warm period peak in solution: the "Spring burst" (Pitty, 1966b, 1971). While other factors than soil carbon have been shown to influence spring water chemistry, the spring-burst effect has been observed in many karst areas world-wide.

4) **Contrasts in fluctuations of surface and groundwater temperatures in karst areas**
Alistair found that in the southern Pennines, temperatures of emerging groundwaters and their geographical pattern revealed characteristics of water movement underground. The gross permeability of limestones in north-west Yorkshire was greater than that in Derbyshire, the rate of flows in sink-resurgence systems taking 1.4 times longer in Derbyshire than in Yorkshire. Alistair's student, John Crowther, found similar contrasts in karst areas of Malaysia, with deeper groundwaters having minor variation in temperature, and water higher in the karst affected by air circulation having much greater variation in temperature (Crowther and Pitty, 1982).

5) **Saharan dust**
Alistair's ability to spot the significant factors in the environment led to an important paper in *Nature* (Pitty, 1968c). Rain in Britain on July 1, 1968 brought down large quantities of dust which, according to Meteorological Office reports, had travelled northward from Morocco where unusually strong thermal currents had carried the dust to heights of up to 35,000 feet. Such occurrences are unusual in Britain, and the dust fall aroused considerable popular interest. It also provided a rare opportunity for studying the particle size and degree of sorting in a natural dust, known to be transported by wind, unaltered by post-depositional modifications, and unlikely to be the product of reworking of an existing loess deposit.

CONSULTANCY WORK

1) **Geographical abstracts**
   In 1960, Keith Clayton, the founder of Environmental Science at the University of East Anglia and a member of the National Radiological Protection Board, set up GeoAbstracts, an abstracting and indexing enterprise that, in those pre-internet days, allowed geographers and environmental scientists to discover one another's work more easily. Alistair had long prepared abstracts while at Hull and in the mid-1980s, when he had moved to Norwich, he was the editor for abstracts for economic geography and sedimentology. Keith also asked him to assist with work on the geomorphic problems related to potential nuclear disposal sites.

2) **Nuclear waste disposal**
   a) Early work on the geomorphological processes affecting potential waste at the Dounreay site in Caithness, Scotland sought to ascertain what might affect the containment of waste. In 2024, at Dounreay, the former atomic power station was still being taken apart and removed for the Nuclear Decommissioning Authority (NDA). During the 1990s Alistair collaborated in several enquiries about the future suitability of Dounreay and other sites for storing nuclear waste.

   b) Later, Alistair became involved in investigations of the potential impact of geomorphological processes in the safe geological disposal of higher activity radioactive waste deep in the bedrock, which is a process now on the verge of implementation, solving the last step in the nuclear fuel cycle. In the UK, the organisation responsible for the implementation of the Geological Disposal Facility (GDF), NWS, is examining different potential host rock types and disposal concepts. Because high-level nuclear waste must be managed safely for up to a million years, scientific knowledge must be acquired for long-term process understanding from old archaeological artefacts or natural analogues (NA) from the geological record. Alistair helped to examine a variety of sites where the rocks had similar geochemical characteristics to the materials which would be used to contain nuclear waste. He went to sites in Jordan and Cyprus, not only making studies of geomorphological processes, but also becoming involved in editing some of the key reports.

3) **Geoarchaeological research**
   For many years from the 1980s onward Alistair worked closely with Geoarchaeological Research Associates in the USA, contributing to the understanding of the natural processes that helped to fashion and change prehistoric sites. Much of the work, especially in Pennsylvania, Georgia and Florida, concerned low-lying coastal sites where accurate measurement of the

low-level relief was essential. His pantometer was a vital tool in this work. He gave a paper on landform mapping and archaeology in the Sandhills, North Carolina to the 2000 Southeastern Archaeological Conference.

4) **Collaboration with the Kuwait Institute for Scientific Research**
Alistair worked with scientists in Kuwait to identify and map sand and gravel resources. In seeking to explain the gravel of the Ad-Dibdibba drainage system in the north of the country (Al-Sulaimi and Pitty,1995), he identified escarpment gaps that had been created by the type of down-dip breaching he had found near Buxton in Derbyshire thirty years earlier.

RETIREMENT EXPLORATIONS

Alistair's nuclear waste disposal work led to the use of gamma radiation measurements in detecting changes in soil and surface sediment characteristics (Pitty, 2009). Using a portable instrument for measuring extremely low counts of radiation, he made regular observations for six years along a traverse of 24 measuring sites each 60 metres apart at Itteringham, 20 km northwest of Norwich. His data confirmed the contrasts between surface soil and subsoil properties. Significantly, the radiation measurements differed between soils developed on the tills of three Quaternary glaciations, suggesting that the youngest, Devensian, till might be more extensive than previously thought. As always, his attention to detail and alternative explanations remained sharp and critical.

SUMMARY

Alistair's career of two parts and his local research in Norfolk showed a consistent dedication to, and enormous enthusiasm for, field work. It also demonstrated how the first part produced an outstanding grasp of the scientific literature, the diversity of theories, and potential explanations which were of great help when faced with the practical issues of fitting geomorphology into wider geoscientific and geoarchaeological enquiries. On top of all that, Alistair helped generations of students by writing a series of textbooks:

1971 *Introduction to Geomorphology*, London: Methuen

1979 *Geography and Soil Properties*, London: Methuen

1982 *The Nature of Geomorphology*, London: Methuen

1984 *Geomorphology (and Geography Applied)*, Oxford: Blackwell

1985 *Structure and Relief,* London: MacMillan Educational

1987 *Landforms and Time,* Oxford: Wiley-Blackwell

(The Methuen books were re-issued by Routledge in 2021).

He also edited two volumes of essays on geomorphology

1979 *Geographical approaches to fluvial problems*, Norwich: Geobooks

1985 *Themes in Geomorphology,* Beckenham: Croom Helm

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Pitty, A.F. (1968c) Particle Size of the Saharan Dust which fell in Britain in July 1968, *Natu*re, 220, 364-365.

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