



## DISTANT THUNDER

**Safe landings**

**Geologist and science writer Nina Morgan discovers the key role geology played in the D-Day landings**

During World War I, geologists such as W.B.R. King [1889-1963] and T.W. Edgeworth David [1858-1934] opened the eyes of military planners to the value of geological expertise. So when World War II broke out, geologists, including King, were once again recruited into service.

Another who joined the ranks was Fred Shotton [1906-1990]. Shotton, who served as Lapworth Professor of Geology at the University of Birmingham from 1949 until 1974, is best known for his pioneering work on the Pleistocene geology of the English Midlands. But perhaps not so well known is his work as a military geologist during the Second World War.

**Top secret**

As Captain Fred Shotton of the Royal Engineers, he spent the early war years from 1941 until 1943 based in Egypt, drawing on his knowledge of hydrogeology to provide potable water supplies for the 8th Army in the Western Desert. In October 1943, he was promoted to Major and recalled to the UK to carry out work classified as 'top secret'. It later emerged that Shotton's geological expertise played a key role in identifying suitable beaches in Normandy where heavy vehicles wouldn't become bogged down. In the run-up to D-Day, he also identified British beaches with similar conditions where landings could be practised.

Initially based at the Geological Survey in London, Shotton took advantage of information available from existing aerial photographs, historical French publications and postcards with images of the French coasts supplied by the British public. But needing more information, his daughter, Anne Black (née Shotton) recalled how: "My dad was flown over the beaches at great risk to try and make out the nature of the ground and take photos, but this didn't show enough detail



and commandos had to make forays on to the beaches to get samples". These low-altitude flights were carried out using a modified Mosquito aircraft with a glass bottom on the fuselage.

**Fooling the enemy**

To conceal their activity, for every flight flown over Normandy beaches, 20 flights were flown over other French beaches. To gather further information, midget submarines were used to carry out near-shore hydrographic surveys at night, and crafts such as low-profile motor boats were used to allow volunteers to swim ashore to collect samples of stone and soft sediments and make observations on obstacles that could make movements difficult.

To confuse the enemy, the volunteers took samples from beaches they intended to use, as well as from beaches they didn't. On one of these missions they accidentally left an auger drill bit behind. To conceal the Allied activities, the military planners toyed with the idea flying aircraft along the coast of much of western Europe and dropping augers on other beaches to obscure the preferred choice. Alas, this ingenious proposal was eventually abandoned due to an acute shortage of augers in the UK.

The information gathered enabled Shotton to physically look at the surface of the beaches and identify features that were not shown on the existing maps. As a result, he was able to estimate the load-bearing properties of beach areas by noting the depth of the wheel marks left by cars used to transport German defence stores. The data Shotton collected were used to

create maps at 1:5000 scale to highlight treacherous conditions.

**I told you so!**

As Major-General Sir Drummond Inglis wrote in an article published in 1946, "We [the British] had, fortunately, long appreciated the importance of geology in modern war." However, as Shotton's daughter recalled, this view was apparently not shared by the Americans, who were sceptical about the need for all the detailed planning carried out for the Normandy landings. But, she reveals, her father had an answer to that. One of the photos Shotton retained shows an American truck bogged down "with dad's writing underneath saying 'I told you so!'"

**End Notes:** Sources for this vignette include: Rose, EPF & Clatworthy, J.C., *QJEngGeol and Hydrogeology*, **41**, 2008, 171-188; material available at [www.birmingham.ac.uk/facilities/lapworth-museum/about/object-shotton-map.aspx](http://www.birmingham.ac.uk/facilities/lapworth-museum/about/object-shotton-map.aspx) and [www.birmingham.ac.uk/accessibility/transcripts/les/lapworth-object-shotton-map.aspx](http://www.birmingham.ac.uk/accessibility/transcripts/les/lapworth-object-shotton-map.aspx); Black, Anne, My Father's D-Day Geologist Role, BBC WW2 People's War website [www.bbc.co.uk/history/ww2peopleswar/stories/54/a4101454.shtml](http://www.bbc.co.uk/history/ww2peopleswar/stories/54/a4101454.shtml). I also thank Ted Rose and Eric Robinson for sharing personal memories of Fred Shotton.

\* **Nina Morgan** is a geologist and science writer based near Oxford. Her latest book, *The Geology of Oxford Gravestones*, is available via [www.gravestonegeology.uk](http://www.gravestonegeology.uk)



## *The Scottish Geology Trust*

*Melvyn Giles issues a call to arms for Scotland's geoheritage*

**F**rom a geological point of view, Scotland is something of a superstar. Whether you view it from the development of the science, the range of rocks and processes preserved, the stunning scenery, the quality of the universities or its contribution to the economy and history, Scotland's geology is fundamentally important.

Scotland's past, present and future are intimately linked to geology. The beauty of the country stems from its long geological history, which includes continental collisions raising mountain chains of Himalayan proportions, meteor impacts, rifting, volcanism and glaciation. It is truly a land of ice and fire. The country's prosperity—past and present—is largely or partly derived from its geology. Today most of Scotland's primary industries, including the renewable energy, agricultural, life sciences, oil and gas, mining, forestry, tourism, environmental protection and even the whisky industries, all rely on an understanding of the physical

processes operating on our planet.

### **Geological malaise**

In the land of Hutton, Lyell, Hugh Miller and many other famous geologists, it is surprising that so little is generally known about the importance of the Earth sciences. Few of the many visitors to the Highlands who marvel at the landscape know much of the reasons why it exists or how it came about. Within the pre-university education system, mention of geology by name is rare, and our young people don't aspire to work as geologists. The future impacts of this on our workforce are concerning.

Rather than being celebrated for its value to landscape, industry and culture, geology has become tainted in many people's minds by its connection to the extractive industries. The importance of geology for securing the resources needed for renewables such as geothermal power and technologies that require lithium and other rare metals is overlooked. Crucially, knowledge of the physical processes that make our planet work are fundamental to understanding issues of climate change and to the management of geohazards.

Key conservation sites are woefully

substandard. For example, Fossil Grove in Glasgow is an outstanding yet seriously neglected geological site of national and international importance. Siccar Point (Hutton's Unconformity) is an internationally regarded iconic geological site, and yet you wouldn't even know it was there. The ice age Parallel Roads of Glen Roy is an excellent example of the malaise hanging over Scottish geology. Although a site of international importance, its visitor centre, which is supported by Lochaber Geopark, closed for lack of funding.

Scotland's flagship Geoparks receive no core funding from the public purse, despite being an international model of best practice for geoscience communication and sustainable development, recognised by the United Nations. The four Scottish Geoparks (Northwest Highlands, Lochaber, Arran and Shetland) face a huge challenge to make themselves "self sufficient". With over 50,000 visitors to their visitor centres per year and at least 400,000 visits to their landscapes, they are very much where geology meets the general public.

### **Initiatives**

There have been education initiatives, such as the founding of Geobus by the University of St Andrews—a project that goes into classrooms to deliver practical and career focussed workshops, and





inspires school pupils by teaching field skills at geological sites. GeoBus has visited 70,000 pupils over 8 years, but has struggled with a rocky funding history. Geoparks have also been running their own outreach initiatives. Lochaber, for instance, runs an annual primary schools STEM prize, provided talks to schools and a kids STEM club.

Unfortunately, many of these outreach activities have been curtailed as funds ran short. Ultimately, young Earth scientists come up through the education system and are often inspired by the scenery around them. With no governmental support, little or no interest from industry, it is up to us, the community of Earth scientists, to put right this sorry situation.

There are four regional geological societies in Scotland—Edinburgh, Glasgow, Aberdeen and Highland. Together with the Geological Society of London, they represent most geologists not working in the petroleum industry. The universities of Aberdeen, Edinburgh, Glasgow and St Andrew's have significant undergraduate and research programmes in the Earth sciences. The British Geological Survey, Dundee, Heriot Watt, the University of the Highlands and Islands, Stirling and Strathclyde also contribute to geosciences training and research. Scotland is also an exciting laboratory for international research. Despite the range of bodies covering the science, at a pan-Scotland level there is a failure to get the message about the value

of geology to society across to its people, its politicians, and visitors.

### Unified body

Until now there has not been a body to bring people from across the different geological communities to work together. To fill this gap, starting in 2019 a group of enthusiastic geologists have been working to establish the Scottish Geology Trust. This exciting development provides the only national organisation in Scotland that can act as a focal point for chronically under-resourced activities such as geoconservation and education. In November 2019, the Trust formally came into existence and in June this year superseded the Scottish Geodiversity Forum and took responsibility for the Scottish Geodiversity charter.

The Trust aspires to be the voice of Earth science in Scotland, with key themes covering:

**Promoting Scotland's geology.** Improving access to and information about Scotland's Geology by holding an annual geology festival and raising funds to develop public outreach in the geosciences.

**Education.** Supporting projects like Geobus, and promoting and resourcing the geosciences content of Curriculum for Excellence.

**Supporting Scotland's Geoparks.** Building support for the network of Scottish geoparks.

**Campaigning for Scotland's geology.** Taking forward the Scottish Geodiversity charter and its programme, building multi-disciplinary links, promoting geoscience research, geotourism, and getting the message to policy makers and government.

### Get involved

In each of these four areas we are currently consulting with our members and other bodies, including the Geological Society of London, on short, medium and long-term action plans. We plan to build strategic partnerships to support our aims and provide a unified agenda on the key issues.

If you would like to assist us in this endeavour please take a look at: [www.scottishgeologytrust.org](http://www.scottishgeologytrust.org) and consider joining the group of Founding Members at: [www.scottishgeologytrust.org/join-us/](http://www.scottishgeologytrust.org/join-us/). The Trust launches its first Crowdfunding Campaign in late October. If you can, please donate.

**Melvyn Giles** is Chairman of the Scottish Geology Trust



*The inspirational geology and geomorphology of the Scottish Highlands: Glen Etive from an aerial viewpoint*

**OBITUARY****Kenneth W. Glennie (1926-2019)**

**K**en left a positive footprint wherever he trod and his enthusiasm for the science of geology will not be forgotten. A modest, friendly man, Ken was easy company and his characteristically relaxed manner belied his sharp intellect and passion for geology.

**'The father of Oman's geology'**

Professor Kenneth W. Glennie D.Sc, ex-Shell Chief Geologist and latterly Honorary Professor at the University of Aberdeen, was arguably best known for expanding the science of desert sedimentary systems that became instrumental in a strategy of wealth creation in the exploration and production of gas from the UK Southern North Sea from the 1960s onward.

He gained global recognition for his seminal 1970 book "Desert Sedimentary Environments". Equally significant was his renown as the 'father of Oman's geology.' His pioneering work studying the Oman Mountains earned him the enduring respect of the Omani Royal Family and citizens alike.

Retirement provided Ken with opportunity to expand his geological activities, taking the leading role in producing 'Petroleum Geology of the North Sea' (1986), and being pivotal in the revival of the Geology Department at the University of Aberdeen. His productive

**Renowned sedimentologist with a sharp intellect and passion for geology**



*Ken Glennie in a wadi in the Oman Mountains with Lynda Armstrong OBE, formerly MD of Petroleum Development Oman (PDO).*

academic career included definitive publications on Arabian geology.

**Awards**

Ken received the Major John Coke Medal (1986), the Silver Medal of the Petroleum Group (2000) and the William Smith Medal (2001), all from the Geological Society of London. He was also a recipient of the Van Waterschoot van der Gracht Medal (1999) from the Royal Geological and Mining Society of the Netherlands, the Alfred Wegener Medal (2000) from the European Association of Geoscientists and Engineers, and the American Association of Petroleum Geologists' Sidney Powers Award (2005),

the first time the award was ever made to a non-US citizen living outside USA.

**Infectious curiosity**

Ken delighted in the beauty of diverse natural environments and extolled the virtue of creating and maintaining balance between wealth creation and the sanctity of the natural environment. His infectious curiosity for geology and much more will last beyond his passing within the minds of those he taught and befriended; a great but humble global ambassador for geology and science.

➤ By Caroline Hern, Andrew Hurst and Brian Williams



The Society notes with sadness the passing of:

Bennison, George  
**Copponex, Jean-Pierre \***  
 De Wit, Maarten\*  
 Dickins, Dennis\*  
 Douglas, Tom\*  
 Fookes, Peter  
 Greenleaves, Keith\*  
 Hawkins, Kevin\*  
**Jackson, David Ian \***  
 Max, Michael David  
**Mudge, David Charles \***  
 Naldrett, Anthony James  
 Rostron, Brian\*  
 Ralph, William Thomas\*  
**Symes, Douglas Kean \***  
**Thomas, Michael**  
 Weeks, Alan\*  
 Woodland, Bertram George  
 Worthington, Paul F

In the interests of recording its Fellows' work for posterity, the Society publishes obituaries online, and in Geoscientist. Bold, recent additions to the list; \* Fellows for whom no obituarist has been commissioned; § biographical material lodged with the Society.

If you would like to contribute an obituary, please email [geoscientist@geolsoc.org.uk](mailto:geoscientist@geolsoc.org.uk) to be commissioned. You can read the guidance for authors at [www.geolsoc.org.uk/obituaries](http://www.geolsoc.org.uk/obituaries). To save yourself unnecessary work, please do not write anything until you have received a commissioning letter.

Deceased Fellows for whom no obituary is forthcoming have their names and dates recorded in a Roll of Honour at [www.geolsoc.org.uk/obituaries](http://www.geolsoc.org.uk/obituaries).

**HELP YOUR OBITUARIST** The Society operates a scheme for Fellows to deposit biographical material. The object is to assist obituarists by providing contacts, dates and other information, and thus ensure that Fellows' lives are accorded appropriate and accurate commemoration. Please send your CV and a photograph to [geoscientist@geolsoc.org.uk](mailto:geoscientist@geolsoc.org.uk)

# Sulfur in the Earth system:

## From microbes to global cycles through Earth history

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The cycling of sulfur has been important in controlling the chemistry of Earth's surface environments for billions of years at scales from the microscopic to the whole globe. It plays fundamental roles in many microbial metabolisms, in the transition to the oxygenated atmosphere and oceans of the Phanerozoic, and is a key volatile in volcanic systems. Studies of various aspects of the sulfur cycle have been accelerating in recent years but are spread across a range of scientific communities.

During this meeting, The Earth System Science Group will aim to bring these diverse studies together to foster a holistic understanding of the role of sulfur in the Earth system. We welcome the studies of microbiological and experimental systems, the sulfur chemistry of terrestrial environments and the atmosphere, the marine sulfur cycle including hydrothermal and vent systems, sulfur in the deep Earth and volcanic systems, and records and models of sulfur cycling across Earth history.

### Main Convenor:

Dr. Robert Newton (University of Leeds)

### Convenors:

Dr. Andrea Burke (St. Andrews)  
Geochemistry SG  
Prof. Graham Shields (UCL) Chair,  
Earth System Science SG  
Dr. Sasha Turchyn (Cambridge)  
Chair, Marine Studies SG

### Keynote Speakers:

Tamsin Mather (University of Oxford)  
Ben Mills (University of Leeds)  
Itay Halevy (Weizmann Institute of Science)  
Emma Liu (University College London)  
Aubrey Zerkle (University of St Andrews)

### Registration:

Registration for this event is now open. To register please visit the conference website: <https://www.geolsoc.org.uk/11-gsl-sulfur-2020> or contact the conference office.

### Further information:

For further information about the conference please contact: Conference Office, The Geological Society, Burlington House, Piccadilly, London W1J 0BG  
T: 020 7434 9944 E: [conference@geolsoc.org.uk](mailto:conference@geolsoc.org.uk)  
Web: [www.geolsoc.org.uk/events](http://www.geolsoc.org.uk/events)

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