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In Memoriam

Geoff Eglinton 1927–2016. A father of modern organic geochemistry

Geoff Eglinton (or Geoffrey to Pam, his dedicated wife of over 60 years), Professor of Organic Geochemistry in the School of Chemistry at the University of Bristol until 1993 and then Senior Research Fellow in the School of Earth Sciences died at home on March 11th after a short illness.

Geoff was born in was born in Cardiff, Wales and later attended Sale Grammar School in Manchester, England. It was there that he developed an interest in science, having bought a second hand book describing details of chemistry experiments. He said recently that he was delighted to have used the book, as it would probably be banned nowadays on the grounds of Health & Safety! Later, at Manchester University he was awarded the degree of PhD in 1951 for work which involved the synthesis of acetylenes. Indeed, it is not too widely known that he has a synthesis reaction named after him – the "Eglinton Reaction". He then spent a year at Ohio State University with Melvin Newman, working on synthetic routes to steroid hormones. On return to the UK, he was an ICI Fellow at the University of Liverpool for two years, working on the isolation and structural elucidation of ergoflavin.

In 1954 he was appointed Lecturer in Organic Chemistry at the University of Glasgow. In the early stages of this appointment his interests were almost entirely in IR spectroscopy. However, the first seeds of his career in organic geochemistry started to be sown there. For example, there are some of the earliest examples of the use of GC in separating natural products (e.g. Eglinton et al., 1959) and a sabbatical leave in 1963, collaborating with the Nobel Laureate, Melvin Calvin, led to a milestone contribution describing the hydrocarbons in a Precambrian sediment (Eglinton et al., 1964), although it's fair to say that the scourge of molecular organic geochemistry, contamination, was not widely appreciated at that time. Around then, he coined the term "chemical fossil" for a compound whose structure could be related in whole or in part to a compound in living organisms, although this terminology was later essentially replaced by the term "biomarker". On Geoff's return to Glasgow, he and Charles Brooks were responsible for bringing the first GC–MS instrument to a UK University in 1966 (a ladies toilet in the Department of Chemistry had to be taken out of commission to house it!), and the tiny organic geochemistry group was bolstered by the arrival of Archie Douglas, who brought analytical expertise and wise guidance for the PhD students. The instrument was soon put to good use in a plethora of studies describing the distributions of lipids from a variety of sources, including a prophetic application to determining the distributions of steroid and triterpenoid hydrocarbons in an ancient sediment, prophetic not only because of the significance to be realised later of such compounds in molecular organic geochemistry but also because in this case it was one of the very first applications of capillary GC in organic geochemistry (Henderson et al., 1968). The first mention of compounds later to be known widely to organic geochemists, the botryococcenes, appeared by way of partial structure elucidation of botryococcene and isobotryococcene (Maxwell et al., 1968). Around this time a seminal contribution also appeared, describing the *n*-alkane distributions of higher plant leaf waxes (Eglinton and Hamilton, 1967). Even today this work is widely referenced by researchers applying the *n*-alkane distributions in marine sediment cores to determine aspect of climate change.

Everything was now in place for a stellar career at the University of Bristol, when he joined the School of Chemistry as Senior Lecturer at the end of 1968 and Head of the Organic Geochemistry Unit, or OGU as it was to become known worldwide, becoming Reader in 1968 and Professor of Organic Geochemistry in 1973. Retirement in 1993 was anything but retirement and he moved to the School of Earth Sciences in 1995 as Senior Research Fellow.

In a career including over 500 research papers, more than 50 were post 1993 – so much for retirement! Given so many contributions, it is difficult to choose highlights from the OGU years. Many of the early efforts went into elucidating the carbon chemistry of the moon, first with Apollo 11 fines; these early efforts appeared to show the presence of trace amounts of methane on the Moon because acid dissolution released methane plus tiny amounts of ethane (Abell et al., 1970); however, treatment with isotopically labelled acid showed that the Moon's carbon chemistry could be essentially explained by way of carbon ions from the solar wind becoming implanted into lunar silicates to give a species behaving just like iron carbide on acid hydrolysis (e.g. Cadogan et al., 1971), which was simulated in the laboratory (e.g. Pillinger et al., 1972). Lunar studies at the OGU continued up to Apollo 15, when Colin Pillinger moved to Cambridge to continue the lunar work there.

Meanwhile, in parallel with these extraterrestrial studies, terrestrial studies continued apace in the OGU under Geoff's leadership. An important precursor of the importance of stereochemistry in molecular organic geochemistry came from using (−) menthyl esters to separate stereoisomers of acyclic isoprenoid acids in the Green River Shale via capillary GC, thereby demonstrating a chlorophyll origin for the acids (Maxwell et al., 1973). A milestone in understanding sterol diagenesis came from a ^{14}C labelling approach to demonstrate the rapid biological reduction of cholesterol in a recent sediment, again a still widely quoted reference (Gaskell and Eglinton, 1975). The environmental fate of DDT in recent sediments was also unravelled (Albone et al., 1972; Zoro et al., 1974; Marei et al., 1978). The later distinguished algal sterol career of John Volkman was first launched in the study of the lipids

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of a diatom (Volkman et al., 1980a,b), as was the distinguished chemical archaeology career of Richard Evershed in the identification of the source of the pitch from the sunken but recovered flagship of Henry the Eighth, the Mary Rose (Robinson et al., 1987). A little, almost now forgotten contribution was demonstrating a dinoflagellate origin for 4-methyl steroids, given the importance appreciated much later of such compounds in organic geochemistry (Robinson et al., 1984). Around the same time, one of Geoff's more special achievements came from a series of contributions, by way of finding the famous long chain alkenones in *Emiliania huxleyi*, other prymnesiophytes and marine sediments, showing their temperature dependence with growth temperature and using them as palaeotemperature indicators, leading to famous the U^{k}_{37} index (e.g. Volkman et al., 1980a,b; Marlowe et al., 1984; Farrimond et al., 1986; Conte et al., 1992; Rosell-Mele et al., 1995). Despite a few glitches over the years, Simon Brassell said in a presentation at the Prague IMOG Meeting in 2015 that he believed that $U^{k}_{37}/U^{k'}_{37}$ was still the most effective marine molecular palaeothermometer. With the above examples, I have mentioned only a very few of Geoff's contributions from an almost bewildering array, simply to give the briefest indication of part of the wide array of his interests.

It should come as no surprise, therefore, that these and many other examples of Geoff's research led to a staggering number of awards and honours. Apart from election to the Royal Society in 1976, these include:

1973 The NASA Gold Medal for Scientific Achievement (for lunar carbon chemistry.
1974 The Hugo Müller Silver Medal of the Chemical Society.
1981 The Treibs Gold Medal of the Geochemical Society.
1986 The Coke Medal of the Geological Society.
1992 The Theophilus Redwood Medal of the Chemical Society.
1997 The Urey Medal of the European Geochemical Society (shared with John Hayes).
1998 The Royal Gold Medal of the Royal Society.
2000 The Goldschmidt Medal of the Geochemical Society.
2004 The Wollaston Medal of the Geological Society.
2008 The Dan David Prize (shared with husband and wife, Lonnie Thompson and Ellen Mosley-Thompson).

Needless to say, with Geoff's leadership there were, *inter alia*, a number of associates not exactly unknown to the organic geochemical community, including PhD students (Simon Brassell, Paul Farrimond, Kath Ficken, Joan Grimalt, Yongsong Huang, Graham Logan, James Maxwell, Toni Rosell Mele, Bernie Simoneit and Meixun Zhao), Postdocs (Maureen Conte, Richard Evershed, Roger Harvey, John Hayes, Martin Jones, Paul Philp, Colin Pillinger, Fred Prahl and John Volkman) and academics on sabbatical leave (Bob Alexander, Fu Jiamo, David Ward and Roger Summons).

So, what kind of man was Geoff Eglinton? He was slightly shy, but a gentleman and a gentle man, never nasty, and with loads of boyish charm. In some ways he was an old fashioned scientist, with an insatiable curiosity in matters scientific; he was a true research animal, full of enthusiasm and brimming with research ideas. On the other hand, he was a man well ahead of his time, in that he was a networker *par excellence*, thereby predicting how so much of academic research is carried out nowadays via networking. Networking tends to involve a great deal of travel and it could certainly be said that Geoff was an inveterate traveller. Indeed, there is an apocryphal story that a recently arrived nosey neighbour asked Pam the identity of the strange man seen entering the Eglinton residence at 7 Redhouse Lane late one night! With so much travelling, Geoff's supervision of PhD students tended to be more hands-off than hands-on, perhaps no bad thing because it meant that students had to be self sufficient and there were always postdocs around to offer assistance.

Geoff also served the community in a variety of ways, for example as Associate Editor Abroad – *Geochemical Journal* (1980–82), Managing Editor – *Chemical Geology* (1984–89), Scientific Board – *Oceanologica Acta* (1977–88), Chairman of the EAOG (1989–95), Council of the European Environmental Research Organization (1990–96), etc.

In summary, while it is widely accepted that Alfred Treibs is the Father of Organic Geochemistry, I would go as far to say that, given the depth and spread of Geoff Eglinton's contributions over the last half of the 20th century, he deserves to be recognised as the Father of *modern* Organic Geochemistry.

Laterally, as Geoff's health began to deteriorate rapidly, he was comforted by the constant attention and selfless devotion from Pam, who also rarely left his side, as well as frequent visits from his sons, David and Timothy (also a Fellow of the Royal Society), and their families. Pam and David were at his bedside as he passed away peacefully.

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