

## William Liddle Brown (1929–2007)

Bill Brown was born on 24th December 1929, in Edinburgh, was evacuated during the war, and then came back to his family in Edinburgh, where he obtained his undergraduate university education. Despite speaking French for most of his professional life, when speaking English, he never lost his slight Edinburgh accent. He studied chemistry at Edinburgh University from 1948 to 1952, obtaining a first class honours degree, then set out to gain a degree in geology, partly, we suspect, because of his love for the Scottish mountains. The university regulations did not allow graduates to hold two honours degrees, so when, after only two years, he obtained first class honours marks in geology, he was given his own one-man section in the lists for the graduation ceremony. The great Arthur Holmes was Regius Professor at the time, and Bill was thrilled by Holmes' work on the age of the Earth and continental drift. Even 50 years ago most geology students complained that crystallography was too difficult, but Bill found it all perfectly obvious and spent much time playing bridge. It was Holmes who spotted his talent in matters crystallographic and recommended that he study for a doctorate (Dr. Sc. Nat.) at the ETH in Zurich, which he obtained in 1958, under the direction of Fritz Laves. This work, published in 1960, on the effect of heating on the cell parameters of plagioclase and the first full characterization of peristerites, set him on a lifetime study of the feldspar minerals. Dr. Robin Nicholson wrote in a letter "I cannot help feeling we lost a great field geologist after he met Laves".

Bill held various posts during his career: Assistant in Mineralogy–Crystallography at ETH (1957–1958), Research Associate in Mineralogy at Pennsylvania State University (1959–1960), Maître assistant titulaire at ETH (1960–1962), Lecturer in geology at the University of Manchester (1962–1966), Maître de Conférences associé (1966–1969) and then Professeur associé (1969–1973) at the University of Paris VI, and Professeur associé at the University of Nancy (1973–1983). He joined the Centre National de la Recherche Scientifique (CNRS) in 1984, as Chargé de Recherche at the Centre de Recherches Pétrographiques et Géochimiques (CRPG) in Nancy, and was promoted to Directeur de Recherche DR2 in 1986, and DR1 in 1991. He served as director of the CRPG from 1991 to 1994. After his retirement in 1997, he continued working in an emeritus position for 10 years. In addition to pursuing his own research, Bill was active in spreading scientific knowledge. He was consulting editor of the Transactions of the Royal Society of Edinburgh and editor of the Journal of Petrology. He directed the organization of the NATO Advanced Study Institute on feldspars and feldspathoids in Rennes in 1983 and was a member of the organizing committee of the following NATO ASI held in Edinburgh in 1993.

During his younger days, Bill was a keen mountaineer and skier, despite having lost one arm, as a teenager falling from a tree. At one time, with a group of Edinburgh friends, he held the speed record for climbing all the British mountains over 4000 ft (1220 m), without stopping. Readers accustomed to the Alps may find 1200 m insignificant, but Scottish mountains start at sea level, and the whole enterprise involved 136 km of walking and 5000 m of ascent, a considerable athletic undertaking. His favourite mountaineering story involved a very fast ascent of the Matterhorn with a friend. After descending to Zermatt in the afternoon Bill went for a haircut, and was duly settled in the barber's chair under the usual cloak. As he snipped away the barber confided that he had heard that "Two British climbers have just climbed the Matterhorn exceptionally quickly ... and one of them has only one arm!" Bill remained silent, as any good Scot would!

After obtaining his doctorate, a year's post-doc at Penn State brought him into contact with a young J.V. Smith, a working relationship that was to become very close 30 years later, when Bill and Joe collaborated on volume 1 of the second edition of Joe's mighty book "Feldspar Minerals" (1988). This remains, without doubt, one of greatest mineralogy books ever written and is still an extraordinary mine of information. Bill's Chapter 17 "Nucleation, growth, melting, dissolution, chemical zoning and morphology" is a marvellously lucid account of these processes. Although it is built around the feldspars it has lessons of general interest to all petrologists. After volume 1 was published, Joe, Bill and Ian Parsons settled down to write volume 2, which was on phase equilibria and natural occurrence of feldspars. By 1993, Bill and Ian had almost completed the phase equilibrium chapters, but Bill became Director of the CRPG, Ian became Head of Department in Edinburgh, and Joe became much involved with the Advanced Photon Source at Argonne. Volume 2 was never completed, and by a sad and remarkable coincidence both Bill and Joe passed away in the same year.

Bill was married to Françoise-Romaine, daughter of the celebrated French organist of Saint-Eustache in Paris, Joseph Bonnet. Five children were born from their marriage: Marie-Claire, Stéphanie, Ian, Lucie and Guillaume. Bill was deeply affected by the death of his son Ian. Bill died on 12th November 2007, after a long illness. We offer our sincere sympathy to Françoise and to his children.



From left to right: Neil Irvine, Bill Brown, Brian Upton, Adrian Finch and Tim Harrison, in the valley of one of the giant dykes on Tugtutôq, South Greenland, in 1988.

## Personal reminiscences

We (my wife Maryse and myself, Daniel) first met Bill in 1973 at the University of Nancy, when he arrived as a professor from Paris and we arrived as DEA students from Grenoble. At that time he was already an eminent specialist on feldspars. We started our careers by investigating Corsican ophiolites, and our frequent discussions of igneous petrology with Bill were precious for our thesis work. After finishing her thesis, Maryse worked with Bill and Jean Macaudière on the deformation of the Harris anorthosite and related pseudotachylites in Scotland. They worked in the wind and the rain that Scotland is famous for, and the other liquid Scotland is famous for helped to support their morale. Fortunately, I worked with Bill in warmer countries, on the ophiolitic gabbroic cumulates of the Kellaki massif in Cyprus, and our field season coincided with the Limassol wine festival! We also worked with Christian Moreau and Daniel Demaiffe on the alkaline ring complexes in the Air, Niger. Together with Christian Moreau and Jean Paul Karche, Bill described a fascinating rock from this area: the monzoanorthosite from the Taguei massif with zoned plagioclase and granitic intercumulus material, with cryptoperthites in the K-feldspar. Our Air field trip in 1991 was particularly memorable. We were intercepted in the Adrar Bous by two pick-ups with Touareg rebels armed with Kalachnikovs and demanding our tyres. We negotiated with the rebels and ended up only with a good scare. In October 1992, Bill and I visited New Caledonia to study the occurrence of boninites, fascinating volcanic rocks devoid of feldspar. Though it might seem the height of absurdity to ask a feldspar specialist to study feldspar-free rocks, Bill's expertise allowed us to understand the origin of these rocks – the absence of feldspar could be explained by the suppression of their nucleation in a water-rich melt under rapid cooling conditions. Bill's last research project, carried out with Mike Toplis, was devoted to studying the microtexture of cumulates from the Skaergaard igneous complex, in Greenland, which they visited in September 2001.

Bill was greatly appreciated by his colleagues and was curious about all aspects of life. As a scientist, he was known for his sound judgement and for his logical and hierarchical organization of the facts. I will always remember the discussion he had with a famous French geochemist concerning granite. The geochemist detailed the chemical composition of granites. Bill replied that they are used as stones to build houses in Celtic countries!

I (Ian) first met Bill in 1964 when I was a post-doc in Manchester where he had a lectureship. He was working with Doug Grundy on the effect of temperature on the cell dimensions of alkali feldspars and they were experimenting with a single crystal X-ray camera inside which was a tiny Bunsen burner, no thicker than a match, which warmed a cleavage fragment glued to a thermocouple. This was my first encounter with the ingenuity of experimental mineralogists. In 1966, Bill moved to France and I lost touch with him until 1977 when, at a meeting, we discussed two-feldspar geothermometry. At the time all geothermometers treated the feldspars as two separate binary systems, which was wrong, because all feldspar phases are ternary solid solutions. In 1981 we published a graphical ternary two-feldspar thermometer, outlining the thermodynamic relationships which underlie all the computerized versions involving Margules expansions that have appeared subsequently. In 1993 Bill wrote the definitive paper on ternary feldspar–liquid–vapour relationships, resolving years of argument about the cotectic or peritectic character of the ternary field boundary. This phase diagram tour de force is not for beginners and its infrequent citation says more about the commitment of modern petrologists than about the outstanding scholarship of the author. Bill's best

known early paper (1974), with Chris Willaime, is concerned with the orientation of coherent exsolution lamellae in alkali feldspars, and must be one of the earliest applications of the then relatively new electronic computer to problems in mineral physics. They calculated the boundary elastic energy for lamellae in specified orientations from cell parameters and elastic stiffness coefficients of each phase, and hence found the orientation with minimum energy. Their predictions have stood the test of time as TEM work has revealed the orientations of lamellae in a wide range of perthitic alkali feldspars.

Bill and I co-authored 23 papers in journals and books, mostly on feldspars. We would sit on opposite sides of a desk and write sections decided upon in advance. We sometimes argued energetically, but once a solution had been agreed, calm good-fellowship would soon be restored. Very occasionally, when he was concentrating hard, Bill would ask me a question in French, an action certain to fail. I suppose he was thinking in French but writing in English, and I sometimes thought his sentence structure revealed which language he was thinking in at the time. Many of our papers involved a remarkable layered syenite in South Greenland, the Klokken intrusion, which turned out to be a Rosetta Stone for alkali feldspar studies. Our first paper (1983), still one of very few large-scale applications of TEM to a field-based problem, required an enormous amount of hard preparatory work, largely on Bill's part, but led ultimately (1990) to our appreciation that coherency strain energy in perthites drives recrystallization reactions affecting large volumes of the crust. Bill took part in four of my Greenland expeditions, was always stimulating and always more than pulled his weight. I have a lasting and affectionate memory of Bill, pumping a kerosene stove beneath a bubbling pot with his one hand, in a flapping, rain-lashed tent.

I spent in total many happy months in Nancy, staying with Bill and his charming wife, Françoise, and watching their delightful children grow up. Thank you so much, Françoise, for putting up with our strange obsession with the feldspars!

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