# A pictorial summary of the life and work of George Patrick Leonard Walker

SCOTT K. ROWLAND[1]* & R. S. J. SPARKS[2]

[1]*Department of Geology and Geophysics, University of Hawaii at Manoa, 1680 East–West Road, Honolulu, Hawaii, USA*

[2]*Department of Earth Sciences, University of Bristol, Bristol BS8 1RJ, UK*

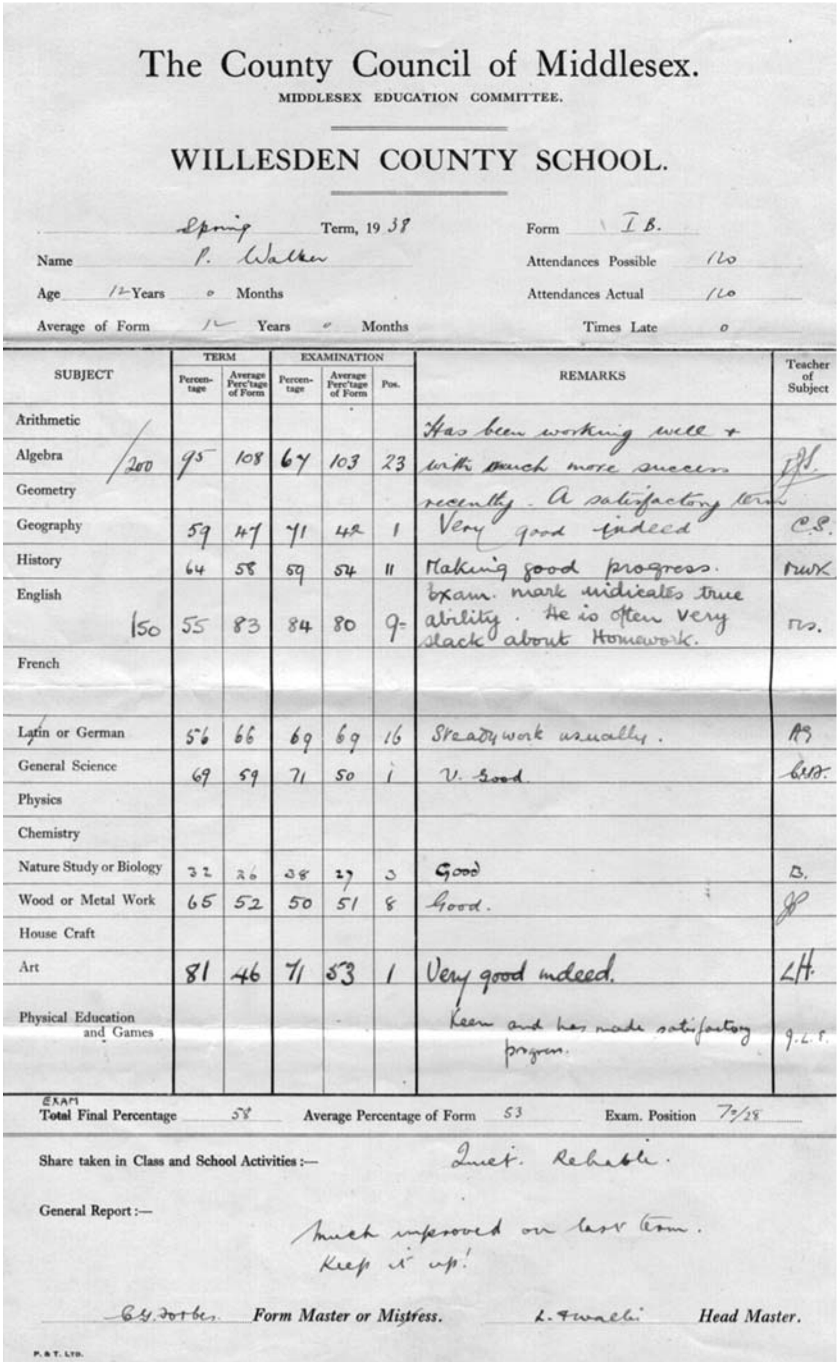
**Corresponding author (e-mail: scott@hawaii.edu)*

**Abstract:** George Patrick Leonard Walker was one of the fathers of modern volcanology. He worked in many parts of the world and contributed to the understanding of a huge range of volcanological processes. He was a field geologist at heart, and one of his greatest skills was the ability to quantify volcanological ideas – not with obscure statistical treatments or complex numerical models, but with clear graphical relationships supported by tremendous amounts of carefully collected field data. Here we present some glimpses of his life and work in photographs and diagrams.

George Walker was born on 2 March 1926 in London. In 1939, when he was 13, the family moved to Northern Ireland. In 1948 and 1949, respectively, George received his Bachelors and Masters degrees from Queen's University, Belfast. In 1956 he completed his PhD at the University of Leeds with a dissertation on secondary minerals in igneous rocks of Northern Iceland. Overlapping with his dissertation, George began teaching at Imperial College, where he stayed until 1978. His field work during these years took him back to Iceland, as well as to India, Italy, the Azores and Africa, among other locations. In 1978 George moved to the University of Auckland and in 1982 he moved to the University of Hawaii. Over the span of his career he visited almost every volcanic region in the world, including Australia, the Azores, the Canary Islands, Chile, China, Costa Rica, Ecuador, Greece, Guatemala, Hawaii, Iceland, India, Indonesia, Iran, Ireland, Italy, Japan, Korea, Madeira, Mexico, Micronesia, New Guinea, New Zealand, Nicaragua, Peru, the Philippines, Portugal,


**Fig. 1.** This photograph from 1935 shows George as a nine year old at Acton Lane Elementary School, London. George said that he found a lesson about the making of iron particularly memorable.

*From*: THORDARSON, T., SELF, S., LARSEN, G., ROWLAND, S. K. & HOSKULDSSON, A. (eds) *Studies in Volcanology: The Legacy of George Walker.* Special Publications of IAVCEI, **2**, 371–400.
Geological Society, London. 1750-8207/09/$15.00 



The County Council of Middlesex.

MIDDLESEX EDUCATION COMMITTEE.

WILLESDEN COUNTY SCHOOL.

Spring Term, 19 38 Form I B.

Name P. Walker Attendances Possible 120

Age 12 Years 0 Months Attendances Actual 120

Average of Form 12 Years 0 Months Times Late 0

| SUBJECT | | TERM Percentage | TERM Average Perc'tage of Form | EXAMINATION Percentage | EXAMINATION Average Perc'tage of Form | Pos. | REMARKS | Teacher of Subject |
|---|---|---|---|---|---|---|---|---|
| Arithmetic, Algebra, Geometry | /200 | 95 | 108 | 67 | 103 | 23 | Has been working well + with much more success recently. A satisfactory term | J.S. |
| Geography | | 59 | 47 | 71 | 42 | 1 | Very good indeed | C.S. |
| History | | 64 | 58 | 59 | 54 | 11 | Making good progress. | MWK |
| English | 150 | 55 | 83 | 84 | 80 | 9= | Exam. mark indicates true ability. He is often very slack about Homework. | M.S. |
| French | | | | | | | | |
| Latin or German | | 56 | 66 | 69 | 69 | 16 | Steady work usually. | AS |
| General Science | | 69 | 59 | 71 | 50 | 1 | V. Good | G.W. |
| Physics | | | | | | | | |
| Chemistry | | | | | | | | |
| Nature Study or Biology | | 32 | 26 | 38 | 27 | 3 | Good | B. |
| Wood or Metal Work | | 65 | 52 | 50 | 51 | 8 | Good. | JP |
| House Craft | | | | | | | | |
| Art | | 81 | 46 | 71 | 53 | 1 | Very good indeed. | LH. |
| Physical Education and Games | | | | | | | Keen and has made satisfactory progress. | G.L.F. |

EXAM Total Final Percentage 58 Average Percentage of Form 53 Exam. Position 7/28

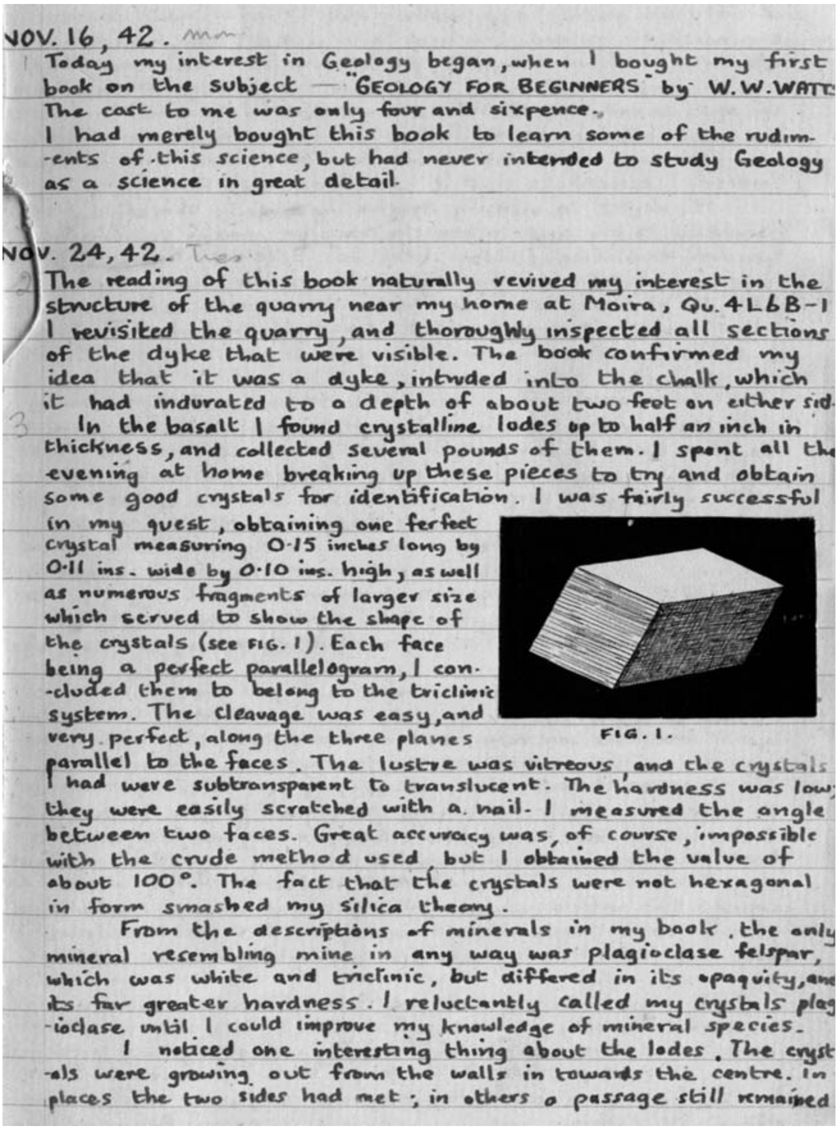
Share taken in Class and School Activities:— Quiet. Reliable.

General Report:— Much improved on last term. Keep it up!

G.Y. Forbes Form Master or Mistress. L. Tweedie Head Master.

P. & T. LTD.

**Fig. 2.** This report from Willesden Country School, where George won a scholarship in 1937, shows that he was the top student in the class in geography, general science and art, but had an ambivalent attitude toward homework!



NOV. 16, 42.
Today my interest in Geology began, when I bought my first book on the subject — "GEOLOGY FOR BEGINNERS" by W. W. WATT[S]
The cost to me was only four and sixpence.
I had merely bought this book to learn some of the rudiments of this science, but had never intended to study Geology as a science in great detail.

NOV. 24, 42.
The reading of this book naturally revived my interest in the structure of the quarry near my home at Moira, Qu. 4L6B-1
I revisited the quarry, and thoroughly inspected all sections of the dyke that were visible. The book confirmed my idea that it was a dyke, intruded into the chalk, which it had indurated to a depth of about two feet on either sid[e].
In the basalt I found crystalline lodes up to half an inch in thickness, and collected several pounds of them. I spent all the evening at home breaking up these pieces to try and obtain some good crystals for identification. I was fairly successful in my quest, obtaining one perfect crystal measuring 0·15 inches long by 0·11 ins. wide by 0·10 ins. high, as well as numerous fragments of larger size which served to show the shape of the crystals (see FIG. 1). Each face being a perfect parallelogram, I concluded them to belong to the triclinic system. The cleavage was easy, and very perfect, along the three planes parallel to the faces. The lustre was vitreous, and the crystals I had were subtransparent to translucent. The hardness was low; they were easily scratched with a nail. I measured the angle between two faces. Great accuracy was, of course, impossible with the crude method used, but I obtained the value of about 100°. The fact that the crystals were not hexagonal in form smashed my silica theory.
From the descriptions of minerals in my book, the only mineral resembling mine in any way was plagioclase felspar, which was white and triclinic, but differed in its opaquity, and its far greater hardness. I reluctantly called my crystals plagioclase until I could improve my knowledge of mineral species.
I noticed one interesting thing about the lodes. The crystals were growing out from the walls in towards the centre. In places the two sides had met; in others a passage still remained

FIG. 1.

**Fig. 3.** As might have been guessed by his school grades in geography, George was fascinated by maps. This continued into his teenage years. However, he knew nothing about geology, so he bought a book on the subject, *Geology for Beginners*, by W. W. Watts. Here, in a field notebook entry from 16 November 1942 (he would have been 16 at the time), he describes his own careful observations and measurements in an attempt to identify crystals that he collected near his home.

Samoa, the UK, the USA and the West Indies. At almost every step of the way, George was accompanied and assisted by his wife Hazel, who typed manuscripts, sieved pyroclastic samples and guarded the office door when George had a pressing deadline. George retired in 1996, and moved back to England, where he worked closely with colleagues at Bristol University and Cheltenham and Gloucester College. Near the end of his life, he spent considerable time studying the stone that was used in old English buildings. George Walker passed away on 17 January 2005, at the age of 78.

An official biography (Self & Sparks 2006), a detailed legacy (Sparks 2009), and many summaries and obituaries (e.g. Altonn 2005; HVO 2005; Kristjánsson 2005; Wilson & Houghton 2005;

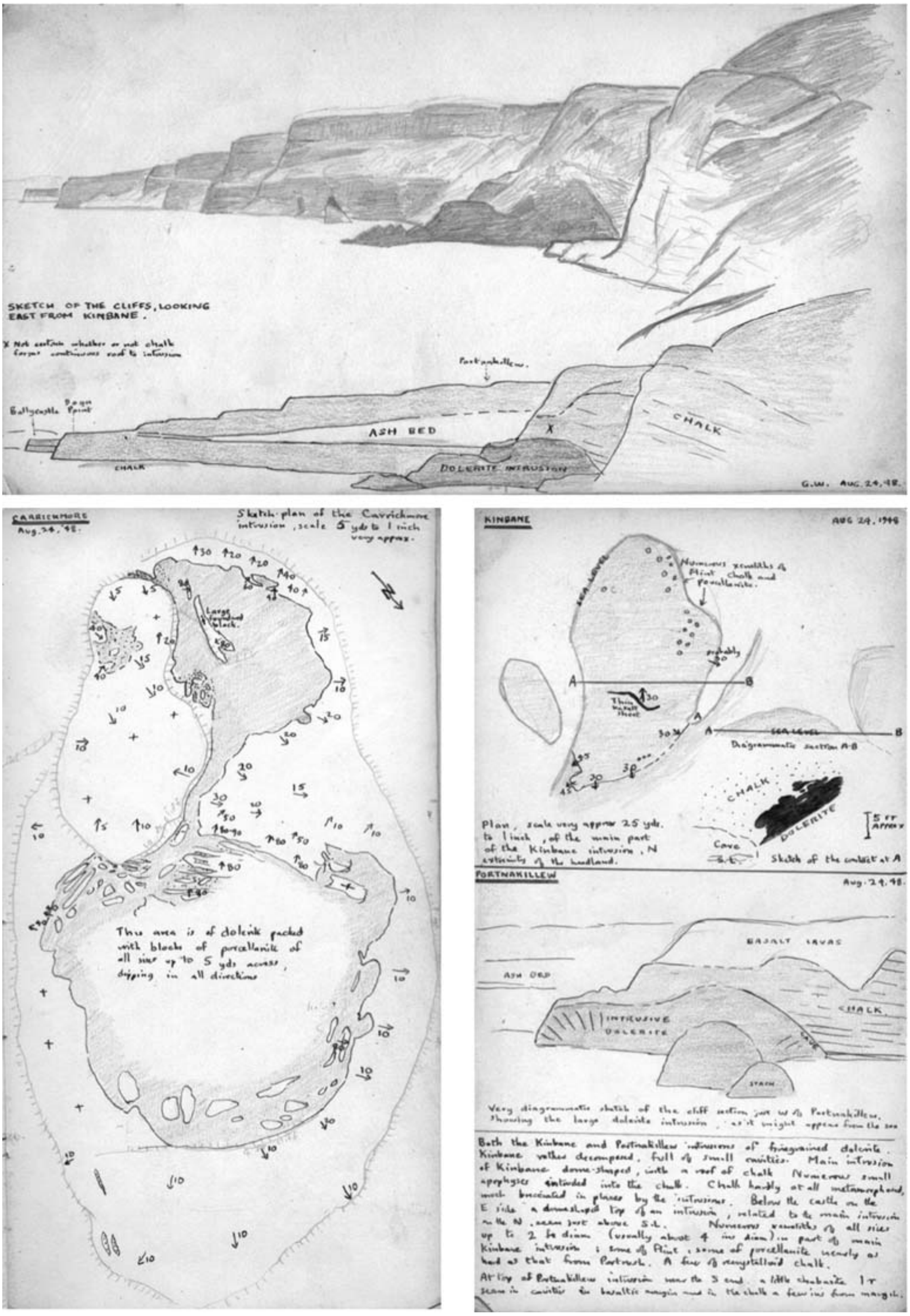



**Fig. 4.** George spent a lot of time during his teenage years in the quarries and outcrops of Antrim collecting minerals, making his own maps and geological sketches, and studying minerals in the Belfast Museum. Here are some remarkable field sketches and maps that he produced, also at the age of 16.

**Fig. 5.** George started his professional career as a mineralogist. His first major scientific contribution was to recognize zeolite zones as indicators of burial depth. He could recognize over 60 zeolites in the field, and many more under the microscope, as he is seen doing here at Imperial College. He mapped out zeolite zones in Eastern Iceland and established how the lavas were tilted, uplifted and eroded as they moved away from the spreading rift. George also reconstructed the original morphology of ancient volcanoes in Scotland from the distribution of zeolites.

Wilson 2005; Self 2006) have been published about George Walker. In this chapter we are not replicating the information in these contributions. Instead, because so much of George's work was of a visual nature (observations, photographs, maps, diagrams, etc.), we are attempting to present examples of what the world saw of George at the places he worked, and a small sample of the visual work he produced. George was by far happiest while out in the field, so this is mostly a collection of field photographs taken by colleagues, students and friends, as well as by George himself. This chapter is based on a series of posters that were produced to commemorate George's life and work. These posters were displayed at the George P. L. Walker symposium on Advances in Volcanology, Reykholt, Borgarfjörður, western Iceland, 12–17 June 2006.

This chapter is dedicated to Hazel Walker, who followed her beloved husband around the world and back. Her quiet support was behind almost all of what George accomplished. Much of the material in this pictorial homage to George was kindly provided by Hazel and daughter Alison Walker for the posters that were presented in Iceland. The posters were developed by Stephen Sparks and Gabriela Anabalon, whose graphic design skills were paramount. Laura Hobbs also provided assistance. We thank all the colleagues who provided additional material for this article, including Peter Mouginis-Mark, who provided duplicates of George's slides, and John Sinton, Steve Self and Thor Thordarson for helpful editorial suggestions. This is SOEST Contribution no. 7747.

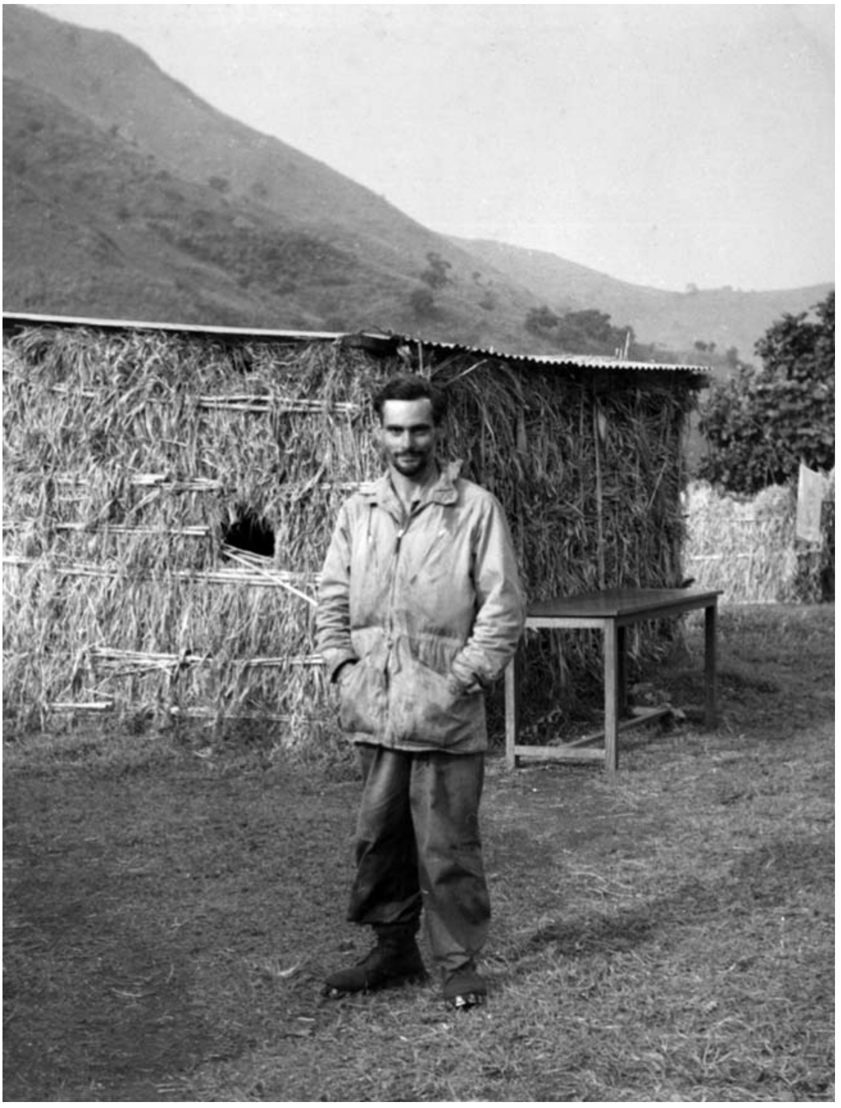


**Fig. 6.** During and after his PhD work, George spent summers on geological expeditions in what was then the Belgian Congo, in the Ruwenzori Mountains of Uganda (as seen here in 1953) and at Alto Ligohna mine in Mozambique.

**Fig. 7.** George was happy and tireless in the field and would never let any misfortune, such as his car becoming stranded in an Icelandic stream, detract from his work. He was famous for prioritizing work over meals, usually barely slowing down to eat a candy bar 'lunch', and on occasion prioritizing work over sleep. Between 1970 and 1975, based on George's own careful records, he worked an average of 73 days per year in the field, and visited more than 30 different volcanoes in 15 countries.

**Fig. 8.** Physical discomfort, such as cold water in Dow Cave, Kettlewell, never deterred George from making an observation or measurement.

**Fig. 9.** George's field camp in Iceland shows the spartan living conditions during much of his work there.

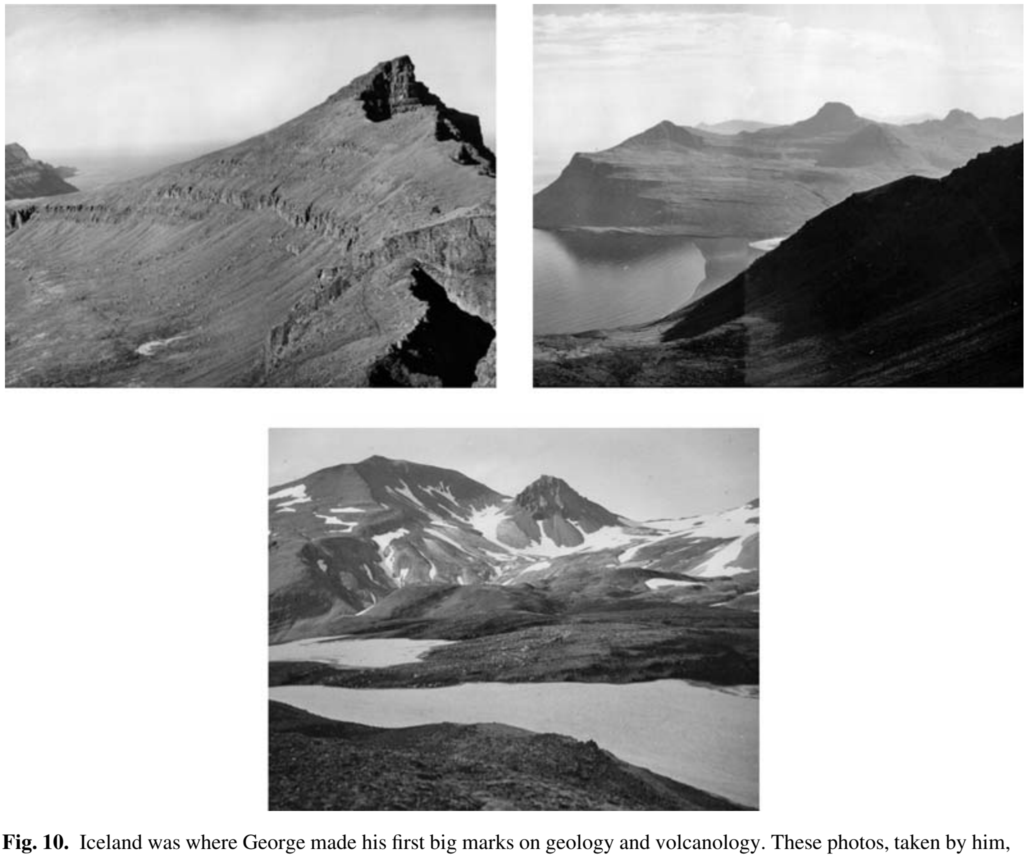


**Fig. 10.** Iceland was where George made his first big marks on geology and volcanology. These photos, taken by him, show the stratigraphic features, topography and landscape in impressive detail, as well as George's skill as a photographer.

**Fig. 11.** Icelanders made an impression on George, particularly Professor Sigurdur Thorarinsson, whose pioneering work on pyroclastic deposits had a strong influence on George's work.

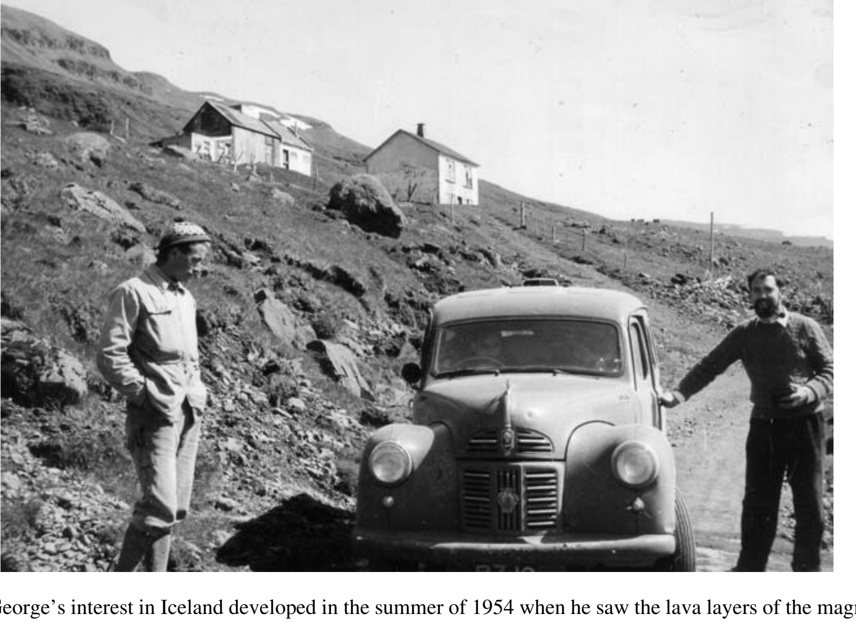


**Fig. 12.** George's interest in Iceland developed in the summer of 1954 when he saw the lava layers of the magnificent Eastern Fjords. He returned in 1955 and carried out field research every summer until 1965. Here, during one such trip, are Ian Gibson, left, Ray Curtis, right, and George (driving) in 1962. Photo provided by Ómar Bjarki Smárason.

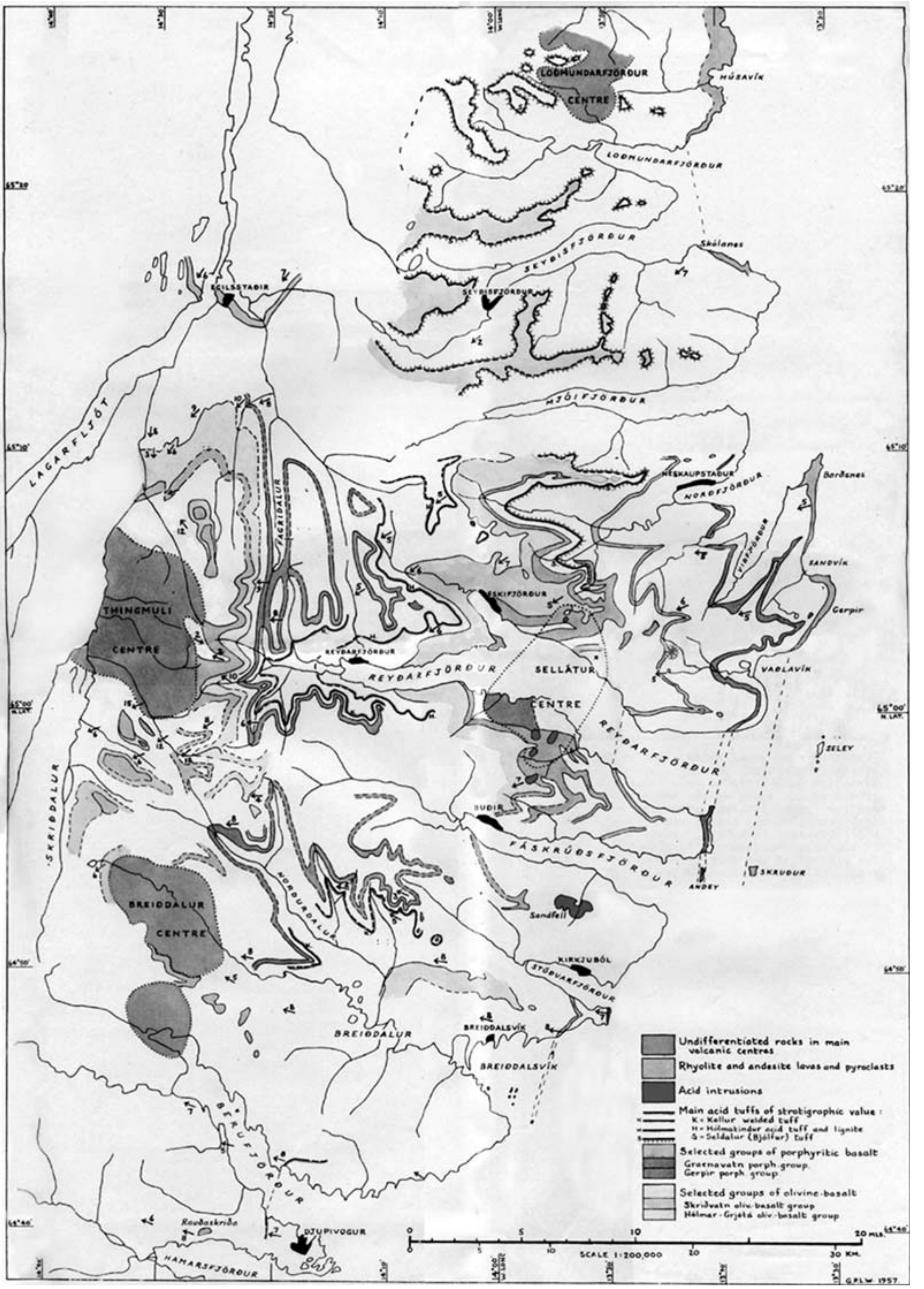



**Fig. 13.** George mapped the area north of Reyðarfjörður, as seen in this beautiful hand-drawn map (the original is in colour). He found that the inclination of the lavas was consistently greatest at sea level and decreased upwards, as did flow thickness. Dyke intensity was also greatest at sea level. The generally horizontal zeolite zones cross-cut the tilted lava sequence and the intensity of zeolitization decreased upward.

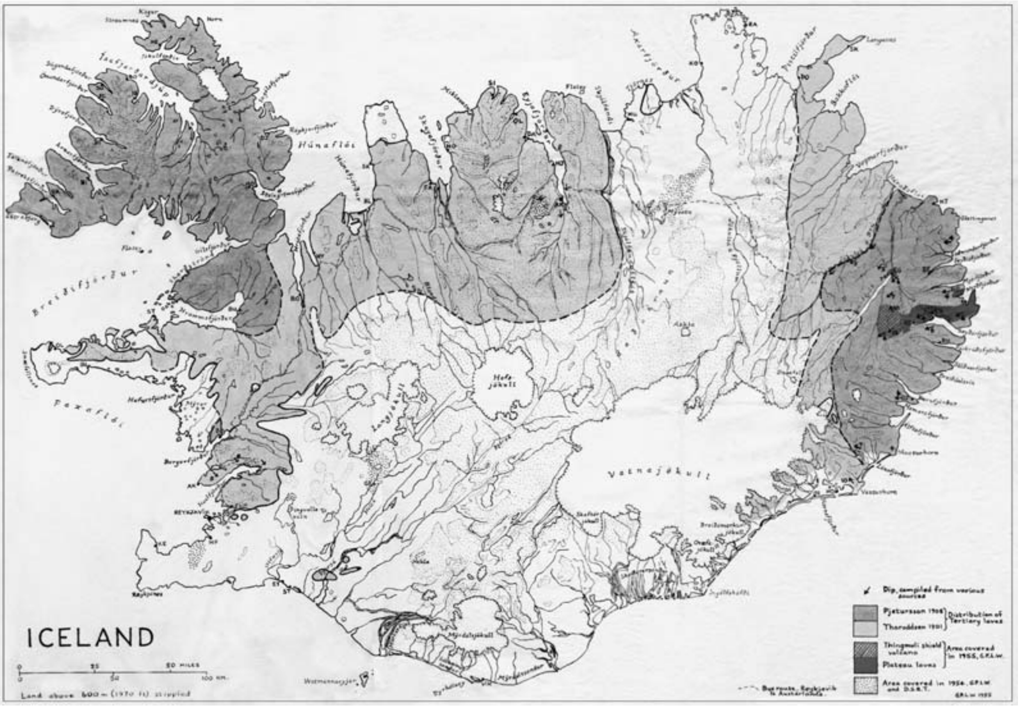



**Fig. 14.** This is George's geologic overview map of Iceland, hand-drawn in 1955, showing selected volcanic units. George's work provided some of the first strong geological evidence in support of the theory of sea-floor spreading that had been proposed by Harry Hess (1962) and established independently by Vine and Matthews (1963).

BLAÐIÐ, LAUGARDAGUR 22. OKTÓBER 1988

# Ísland kenndi mér jarðfræði

## – segir George Walker, eldfjallafræðingur og heiðursdoktor

**ÞEGAR George Walker kom fyrst til Íslands árið 1955 voru varla fleiri en 5 starfandi jarðfræðingar í landinu og austfirskum bændum hefur líklega þótt hann vera kynlegur kvistur þar sem hann tjaldaði í túnfætinum hjá þeim og hljóp á fjöll til að athuga grjót og berglög. Nú er Walker einn fremsti jarðfræðingur og eldfjallafræðingur heims og tekur við heiðursdoktorsnafnbót við Háskóla Íslands í dag. Það er engin tilviljun; í tilkynningu frá Háskólanum segir að Walker hafi lagt meiri skerf til íslenskra jarðvísinda en nokkur annar erlendur maður. Ísland hefur líka sett sitt mark á Walker. Hann segir að landið hafi kennt sér jarðfræði og Surtseyjargosið orðið til þess að hann sneri sér að**

ekkert vandamál við jarðfræðiathuganir.

Walker segist ekki hafa haft umgengist íslenska jarðfræðinga mikið, en hafa unnið með eðlisfræðingunum Trausta Einarssyni og Þorbirni Sigurgeirssyni við rannsóknir á segulstefnu í hraunlögum. Hann hitti Sigurð Þórarinsson stuttlega, en vann aldrei með honum, enda rannsakaði Sigurður eldfjöll þá en Walker hina útkulnuðu Austfirði. Walker kynntist þó

Morgunblaðið/Sverrir

**George Walker, prófessor í eldfjallafræði við Hawaii-háskóla, var sæmdur Fálkaorðunni árið 1980 og verður sæmdur heiðursdoktorsnafnbót í dag fyrir brautryðjendastarf sitt í jarðfræði**

**Fig. 15.** George's Icelandic work won him considerable acclaim, including the Order of the Falcon (Knight's Class) medal in 1980 (upper left), a rare award for a non-Icelander. The upper right photo shows George and Hazel at the award ceremony. The newspaper interview was published in 1988 upon George's receipt of an honorary Doctorate from the University of Iceland. The headline and subtitle translate as follows: 'Iceland taught me geology – says George Walker, volcanologist and Honorary Professor', and the first few lines say 'When George Walker arrived in Iceland to begin his field work in East Iceland in 1955 there were only five working geologists in the country. It is likely that the farmers in East Iceland viewed this foreigner that camped in their fields and then ran up and down the mountains to look at rocks as a rather peculiar individual. Now [i.e. in 1988], Walker is one of the world's greatest geologist and volcanologists and today he will be awarded a Honorary Professorship at the University of Iceland. This is not a coincidence, because in the announcement released by the University it says that George has contributed more to research in Earth Sciences in Iceland than any other visiting researchers. Iceland has also had its influence on Walker. He says that that the country taught him geology and the eruption of Surtsey (1963–1967) was the main influence in turning his interests to volcanology.'

**Fig. 16.** Surtsey, which erupted from 1963 to 1967, provided George with his first view of active Icelandic geology. George liked to say, only half in jest, that the quality of a volcanologist's work is inversely proportional to the number of eruptions witnessed, but ironically it was the experience of an eruption that caused him to embark on the second major part of his career – the study of pyroclastic deposits. His comment about the quality of a volcanologist's work was usually said to prod students who were more interested in watching active flows than making measurements of ancient flows, but he meant it in at least one way. In his landmark paper about classifying explosive volcanic eruptions (Walker 1973*a*), he pointed out that a typical volcanologist will probably witness only a few eruptions in a career, but during that same career will have the opportunity to study many tens of deposits. Photo by G. P. L. Walker.

**Fig. 17.** The quantitative study of large pyroclastic deposits demands patience, careful documentation, and many long days both in the field and in the laboratory; George excelled in all of these. Moreover, his highly creative mind was able to anticipate and tease out important results from the many hundreds of measurements and geological observations that each individual study required. This September 1976 photo shows George taking notes in a newly dug water cistern in the Bandas del Sur region of southern Tenerife. The deposit is the 309 ka Fasnia Member of the Diego Hernández Formation, Tenerife. The deposit is described briefly by Edgar *et al.* (2007), but the outcrop no longer exists. Photo by John Wolff.

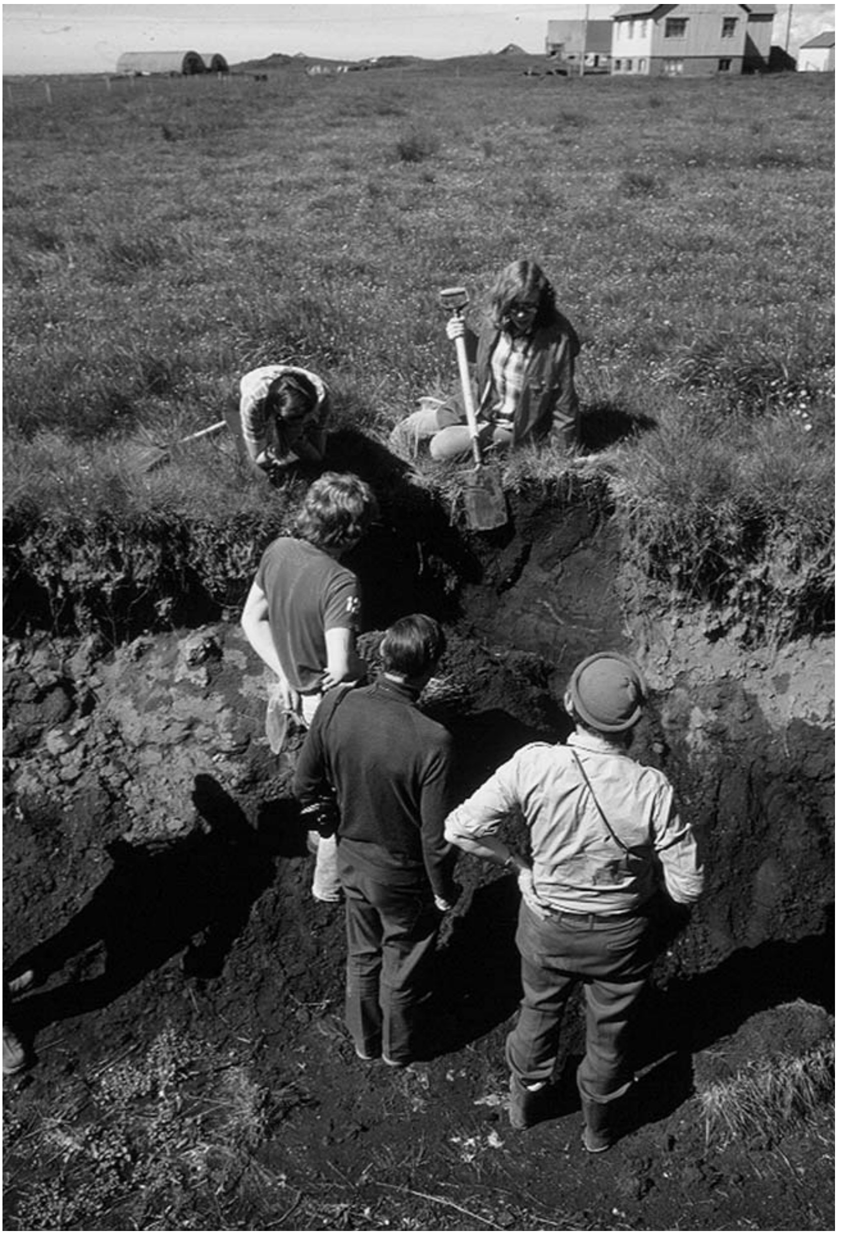


**Fig. 18.** This is a field trip during the 1980 Tephra Conference at Laugavatn, Iceland, sponsored by the International Union for Quaternary Research and the North American Treaty Organization (INQUA–NATO). With the shovel is Gudrun Larsen and next to her (kneeling in the grass) is Ingibjörg Kaldal. Standing are, right to left, Sigurdur Thorarinsson, George Walker and Steve Sparks. Photo by S. Self.

**Fig. 19.** George's major impact on the volcanological world in the late 1970s and early 1980s was in the study of large pyroclastic fall and flow deposits. However, he did not overlook lava flows, and wrote what have turned out to be two very fundamental lava flow papers (Walker 1972, 1973*b*) just as his more famous pyroclastic work began to be published. This 1978 photo shows George posing for scale in front of a pile of small pahoehoe lobes exposed in a road cut on Tenerife, near the town of Chio. The flow is prehistoric, does not have a name, and is of late Pleistocene or Holocene age from the Santiago volcanic field on Tenerife. This outcrop no longer exists. Photo by John Wolff.

**Fig. 20.** In 1978, George moved to New Zealand, to become a James Cook Research Fellow of the Royal Society of New Zealand at the University of Auckland. Here he could study some of the youngest and best preserved large silicic pyroclastic fall and flow deposits on Earth. Along with student C. J. N. Wilson, George continued to advance the understanding of these spectacular geologic features. For example, he recognized that the aspect ratio of pyroclastic flows was a measure of their mobility at the time of deposition, and that even at distances >50 km from their vent, some pyroclastic flows could over-top mountains that were 1500 m high. Much of this research was done on deposits from Taupo volcano, seen here, which is a very large and gently sloping basin. George recognized that this basin had formed by withdrawal of magma during the huge Taupo eruptions, and that here (and elsewhere), some of the most powerful volcanoes are actually negative topographic features. George termed these 'inverse volcanoes'. Photo by G. P. L. Walker.

**Fig. 21.** Gullies in the early phase of the AD 180 eruption of Taupo were interpreted by George to have formed during violent floods related to rainstorms during the eruption. The water source was Lake Taupo. Photo by G. P. L. Walker.

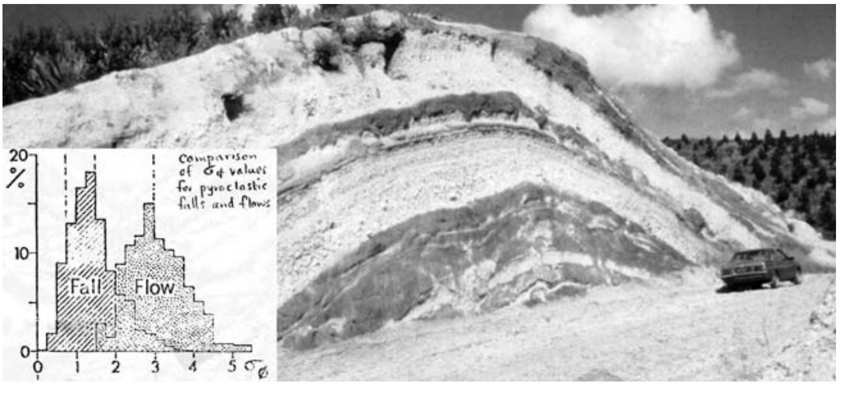



**Fig. 22.** These are pyroclastic fall deposits in New Zealand, exposing a number of layers from multiple eruptions and pulses of eruptions. The draping of the countryside by deposits of essentially uniform thickness is a telltale sign that these were deposited by material falling vertically as opposed to horizontally. Photo by G. P. L. Walker. The inset, taken from one of George's laboratory books and based on his and his students' work, shows how the deposits of pyroclastic falls and flows can be differentiated quantitatively, which is important in cases where field relationships are obscured or unavailable.

**Fig. 23.** This July 1979 photo shows George digging a pit in order to reach the base of the 3400-year-old Waimihia Plinian pumice fall deposit. This location, along Highway 5 at Rangitaki, is *c*. 40 km east of the vent. Photo by C. J. N. Wilson.

**Fig. 24.** George was immensely talented, but not quite *that* talented. Here he is wading the mouth of Hinemaiaia stream, as it flows into Lake Taupo. Photo by C. J. N. Wilson.

**Fig. 25.** In 1981, George moved to the University of Hawaii to become the first Gordon A. Macdonald Chair in volcanology. Not long after that, Kilauea began what has turned out to be one of its longest eruptions on record, affording George and countless others the opportunity to study lava flow emplacement in real time. Here, George is demonstrating the strength of the rapidly chilled skin on an active pahoehoe flow unit. George did not place much value in determining lava temperatures, and once remarked that the temperature of a lava flow was always inversely proportional to the discomfort of the geologist making the measurement.

**Fig. 26.** On 25 March 1984, Mauna Loa erupted and over the next 3 weeks sent large aa lava flows in the general direction of the town of Hilo. Because of the perceived risk, access to the flows was strictly limited, but George was able to talk his way into gaining a one-day Civil Defense pass. He also managed to talk one of his graduate students into scrambling with him up the *c*. 5 m high margin of an active aa flow onto the top. Here, near the margin of the few hundred metre-wide flow, motion was perceptible only by slow shifting of the larger clinkers and blocks. However, many of these blocks were partly incandescent and it was quite warm, so we did not linger. Photo by S. Rowland.

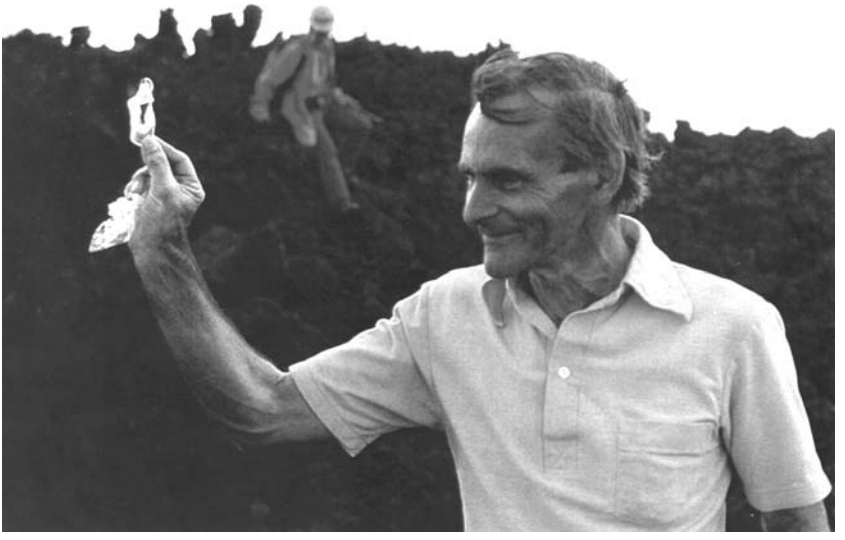


**Fig. 27.** With a typical grin, George shows off what remains of his plastic protractor after inadvertently leaving his knapsack on the hot margin of one of the active 1984 Mauna Loa flows. A package of crackers inside the knapsack was quite toasted, and George thought the whole situation was very amusing. Photo by B. Keating.

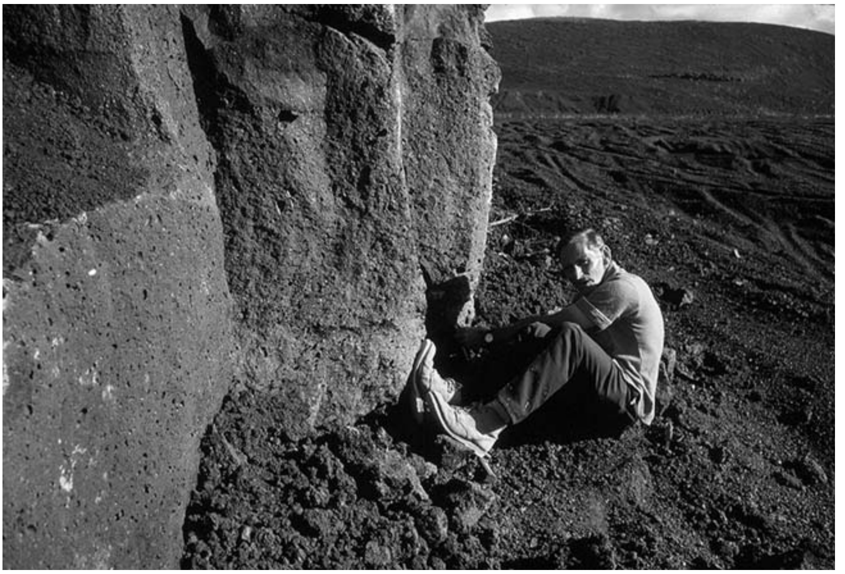


**Fig. 28.** George was as meticulously quantitative with his lava flow studies as with his pyroclastic studies. Here he is counting olivine crystals in the 1960 Kapoho lava flow for a study of crystal settling. Photo by S. Rowland.

**Fig. 29.** George contributed considerably to the understanding of lava flow inflation, both localized at tumuli, and generalized within entire flow fields. Here, George examines one of his favourite tumuli on the floor of Kilauea caldera. He particularly liked this tumulus because the pahoehoe ropes (to the right of his hand) indicate that the lava surface had to have been emplaced before inflation occurred. Otherwise the ropes would indicate that lava had flowed uphill. Photo by M. Yoshioka.

**Fig. 30.** Not all Hawaiian volcanology is effusive. While at the University of Hawaii, George continued his study of explosive volcanism, both within the state and elsewhere. This work included detailed mapping of the Keanakakoi ash deposit (Kilauea) with visiting scholar Jocelyn McPhie, as well as studies of violent Strombolian deposits in Mexico, littoral deposits in Hawaii and large silicic fall deposits in New Zealand, all with Zinzuni Jurado-Chichay, his last official graduate student. Here, George is perched on a crumbly outcrop of dune-bedded surge deposits above a busy highway along the Koko rift, Oahu. Notably, he is wearing an aloha shirt rather than his typical orange, tan or yellow polo shirt. Photo by J. McPhie.

**Fig. 31.** George rarely used mechanical or electronic equipment, partly because he felt that the time required to learn how to use and set up such equipment could be better spent on making measurements with his trusty straight-edge, tape measure and protractor modified with thread and a weight to function as a clinometer. Word processors were treated similarly, so although George was fond of pointing out that he was the second person in the Hawaii Institute of Geophysics to own their own computer (an Apple II, in his case), there is no evidence that he ever used it, preferring instead to produce all his manuscripts on a typewriter. However, he did not spurn modern devices without consideration, and if they could make his work faster or even possible in the first place, he would not hesitate to use them. One of the best examples of this is his use of anisotropy of magnetic susceptibility (AMS) measurements to determine the palaeo-flow directions of pyroclastic flows, lava flows and intrusions. This work was started with his graduate student Michael Knight, and continued with Emilio Herrero-Bervera and Edgardo Cañnon-Tapia. This photo by M. Knight shows George orienting a drilled sample of the Toba tuff, Sumatra.

**Fig. 32.** George's meticulous work ethic was well suited to a study of the rift zone dyke swarms of Koolau volcano, including AMS-derived magma flow directions with Mike Knight. Here, during a field trip to the Mokulua Islands, George discusses the orientation and intensity of the dyke swarm in a location that he interpreted to have been just outside the old caldera. Photo by P. Fan.


**Fig. 33.** George led innumerable field trips for his classes, for other instructors' classes, for school groups, for conferences and many others. Typically he carried a home-made chalkboard on which he could sketch cross-sections, diagrams and terminology. In the upper left photo, he is speaking to a volcanology class on the floor of Kilauea caldera. At upper right is one of his field chalkboard sketches during a departmental field trip to a cluster of rejuvenation-stage vents of Koolau volcano (photo by S. Rowland). At lower right, near Makapuu, Oahu, he is showing some spectacular pahoehoe outcrops to a volcanology class (photo by T. Thordarson). At lower left, he is explaining the Koolau dyke swarm to a departmental field trip to the Mokulua Islands.

**Fig. 34.** George loved to teach, particularly in the field, and would take any visitor or school group out on a field trip at the drop of a hat. Here he was transformed from a shy, reserved man to a figure of authority and brilliance. He was also well known for extensive collaboration with other scientists, particularly those from developing countries. His work included volcanic hazards in South America for the UN Disaster Relief. At left he is explaining hydromagmatic deposits of the Honolulu Volcanic Series while Fred Duennebier records the lecture on video. At centre he is explaining the relationship between dyke intrusion and volcanic subsidence during a class visit to Kapaa quarry, in the centee of the ancient Koolau caldera. At right he is discussing pyroclastic stratigraphy to Zinzuni Jurado-Chichay (left) and Anna Lilian Martín del Pozo (right) near El Chichón, Mexico. Photos by S. Rowland.

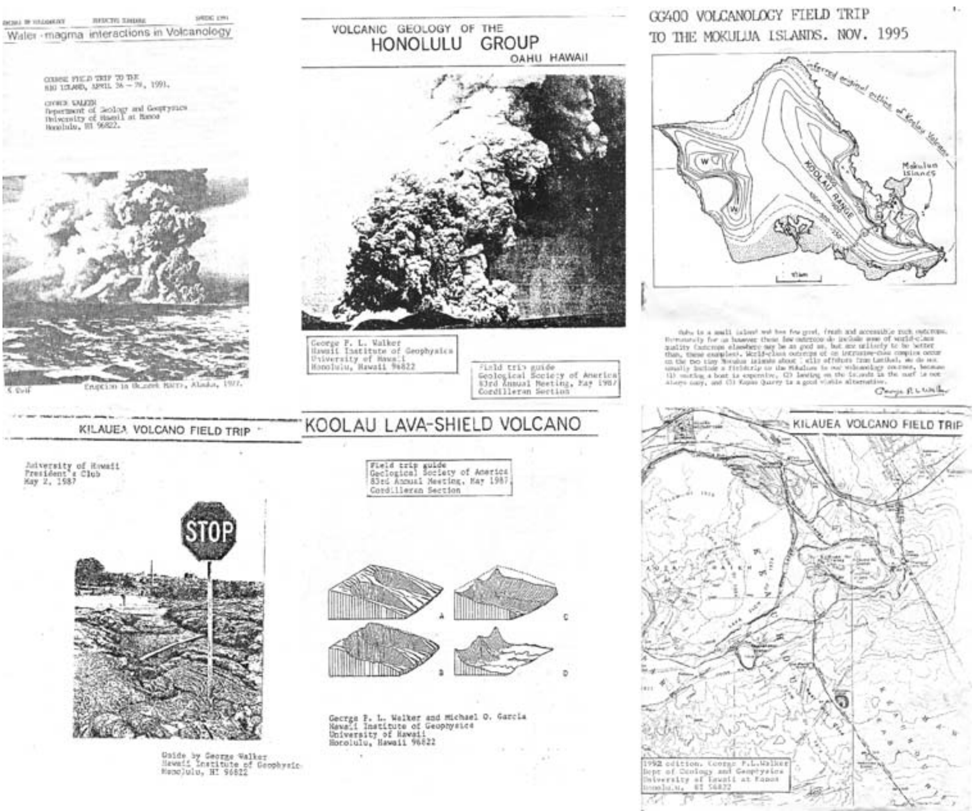



**Fig. 35.** No matter how formal or informal the field trip, George always provided a field guide. He (or Hazel) did all the cutting, pasting, typing, collating and photocopying. These guides were not fancy but each page was filled from top to bottom and margin to margin with useful maps, diagrams, and background text about the places that were to be visited. Clockwise from top left are field guides to Hawaii island for a University of Hawaii course on magma–water interactions, the Honolulu volcanic series for the 1987 Geological Society of America (GSA) Cordilleran Section meeting, the Mokulua islands for an informal departmental field trip, Kilauea for introductory geology courses, Koolau volcano (with M. Garcia) also for the 1987 GSA meeting, and Kilauea volcano for the University of Hawaii President's Club.

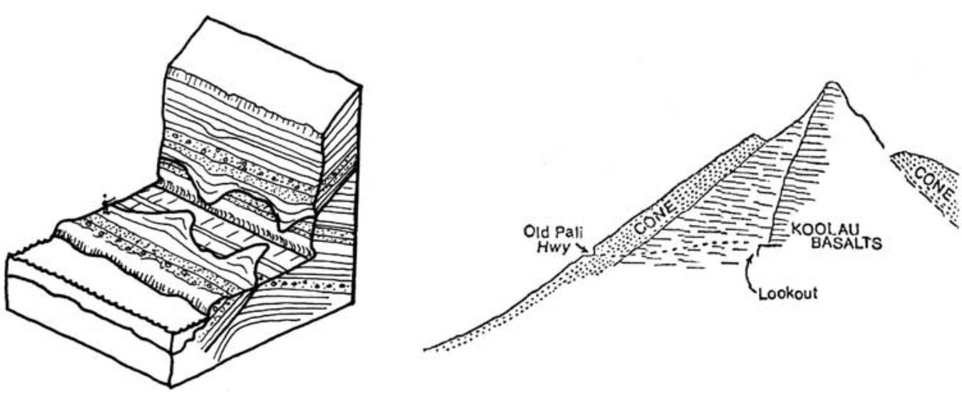



**Fig. 36.** George's field guides often included hand-drawn pen and ink sketches that were invaluable for visualizing geologic features and relationships. A few of these figures eventually made it into George's publications (e.g. Moberly & Walker 1987), but many did not. Here, he shows gullies and gully-fill deposits along the coastal shelf at Hanauma Bay, SE Oahu (left), and rejuvenation-stage pyroclastics at the head of Nuuanu valley, also on Oahu.

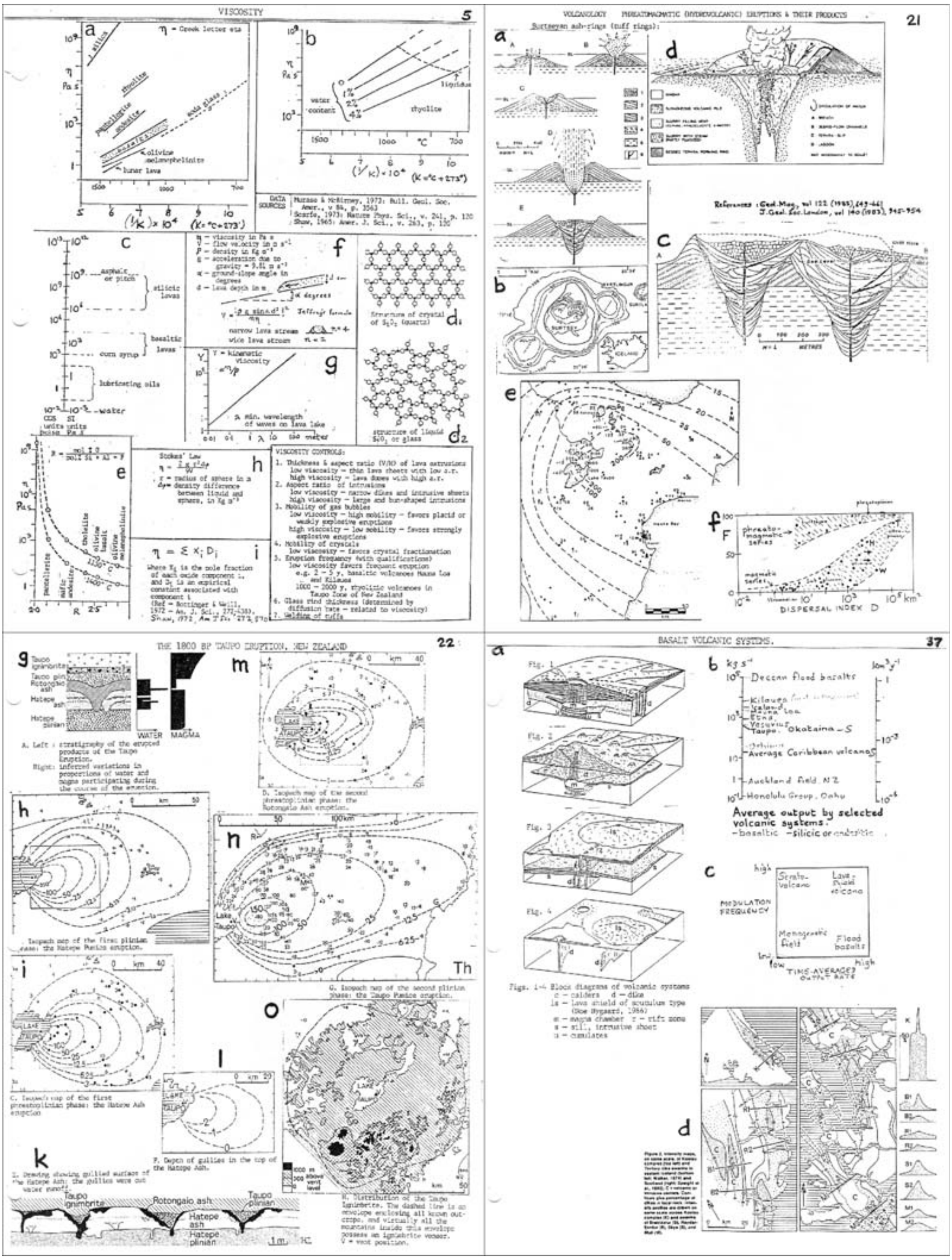



**Fig. 37.** George loved posters as a medium for sharing geological information. He would glue together postcards from distant volcanic regions to help liven up the walls of classrooms. He also produced booklets of page-sized posters for his volcanology classes. Each page was filled with diagrams, maps, hand-drawn sketches and explanatory text. These sets of class posters are probably as close as George ever came to writing a book. Shown here are a few of the posters for Geology and Geophysics (GG) 400, Volcanology, a class that George developed, covering (clockwise from top left) viscosity, hydrovolcanic eruptions, the 180 AD Taupo eruption and basaltic volcano systems.

**Fig. 38.** Hawaii's central location gave George ample opportunities to travel to many points on the Pacific rim of fire, including Mexico, where he had worked previously. In 1991, he travelled to the southern part of the country, where he visited, among other volcanic sites, El Chichón. At the top left, he is examining a distal exposure of the 1982 El Chichón ash, unperturbed by a territorial turkey. At the top right, he is posing on the rim of the caldera. At the bottom right, he is searching (unsuccessfully, as it turned out) for a way to cross iron-stained streams running through lahar deposits. And at bottom left, George (kneeling) is studying an exceptional lava inflation feature just outside one of the cafeterias on the campus of the Universidad Nacional Autónoma de México (UNAM), in Mexico City. Photos by S. Rowland.

**Fig. 39.** During the same trip to Mexico, George, accompanied by graduate student Zinzuni Jurado-Chichay, visited welded ignimbrites on Isla Espiritu Santo, a short boat trip from the southern Baja California city of La Paz. Note the different outerwear during the trip to the island (left) and the trip back (right). The return voyage passed through a thunder and lightning storm, which in an open boat was unpleasant. George said afterwards 'All my worst experiences have been on boats'. Photos by S. Rowland.

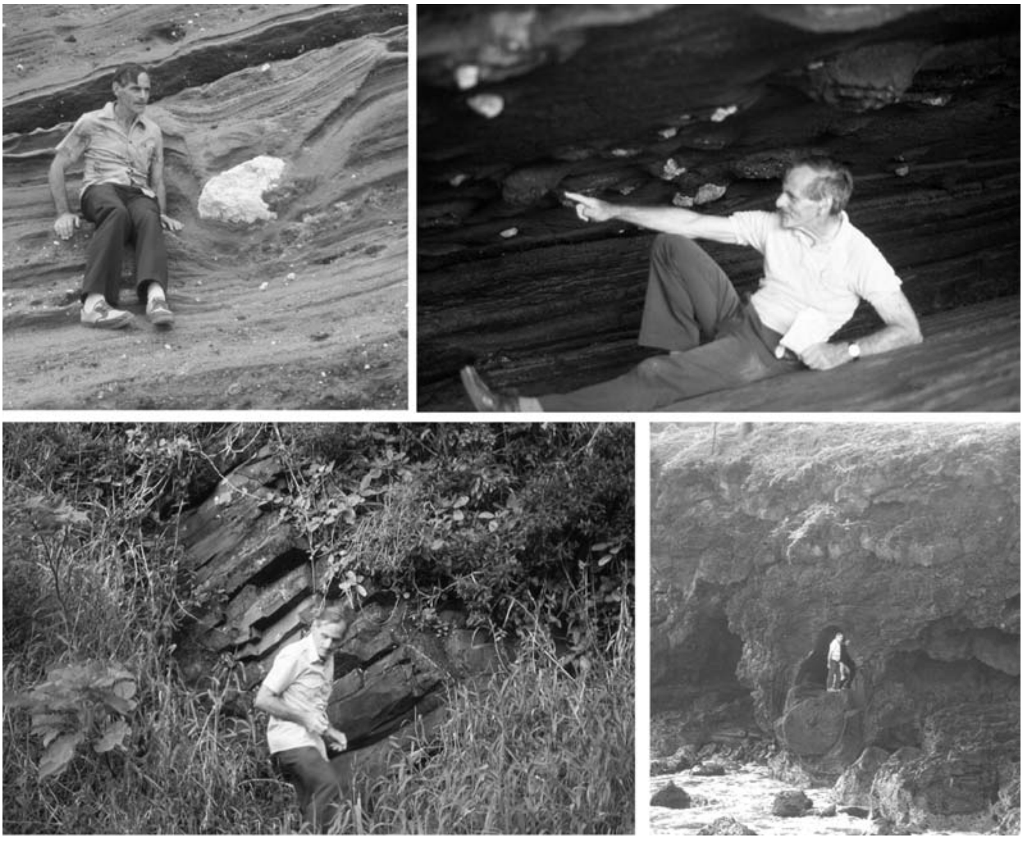


**Fig. 40.** In the field, George was always more comfortable right up against an outcrop rather than standing back. Consequently he became the scale in many a geologist's photographs. At top left, he is sitting next to a large coral lithic within the rejuvenation-stage Koko rift deposits of Koolau volcano, Oahu (photo by S. Self). At top right, he is pointing out coral and basalt lithics, the bottoms of which are exposed in the ceiling of a wave-cut cave (photo by Z. Jurado-Chichay). At bottom right, at Honuapo, Hawaii, he is standing in a half-drained lava tube that thermally eroded its substrate – the extra set of legs belongs to T. Thordarson (photo by S. Rowland). At bottom left, he has scrambled up a weedy slope to point out the joint pattern on a dyke along the Old Pali Road, Oahu. Photo by P. Fan.

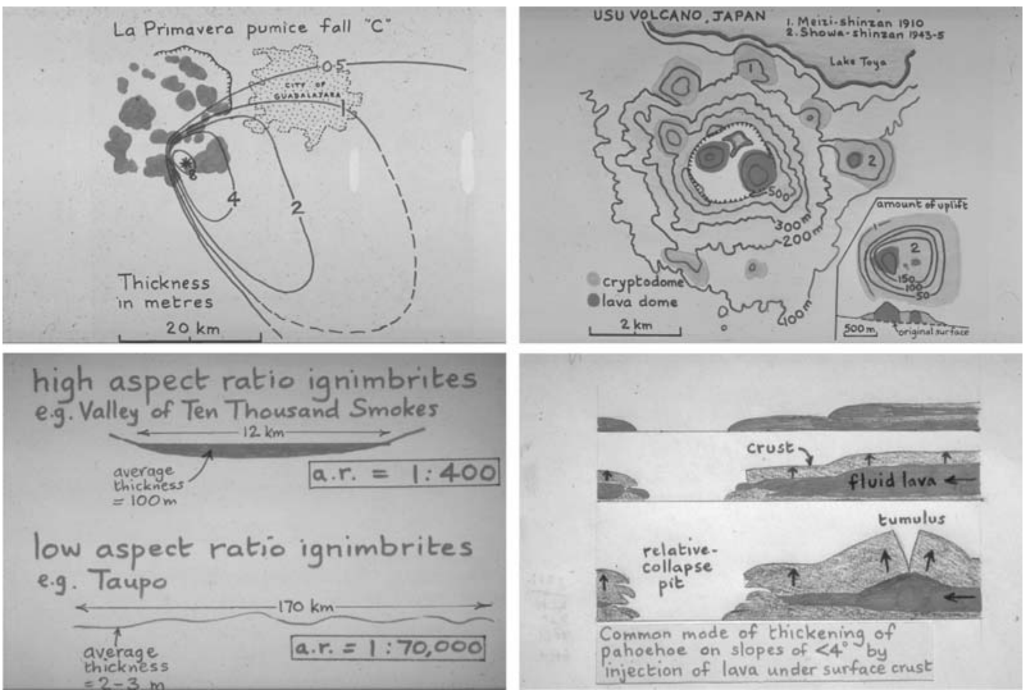



**Fig. 41.** George's career only slightly overlapped the era of PowerPoint, which he almost certainly would not have used. Instead, the slides he showed in classes or at conferences consisted mostly of hand-drawn and hand-coloured diagrams, often with captions written on scraps of manila folder. Despite, or more likely because of, their lack of technological flair, these slides conveyed George's ideas clearly and concisely. Clockwise from upper left, these examples show isopachs of a fall deposit at La Primavera (Mexico), domes and dome growth at Usu (Japan), inflation features of pahoehoe lava flows, and low- and high-aspect ratio ignimbrites.

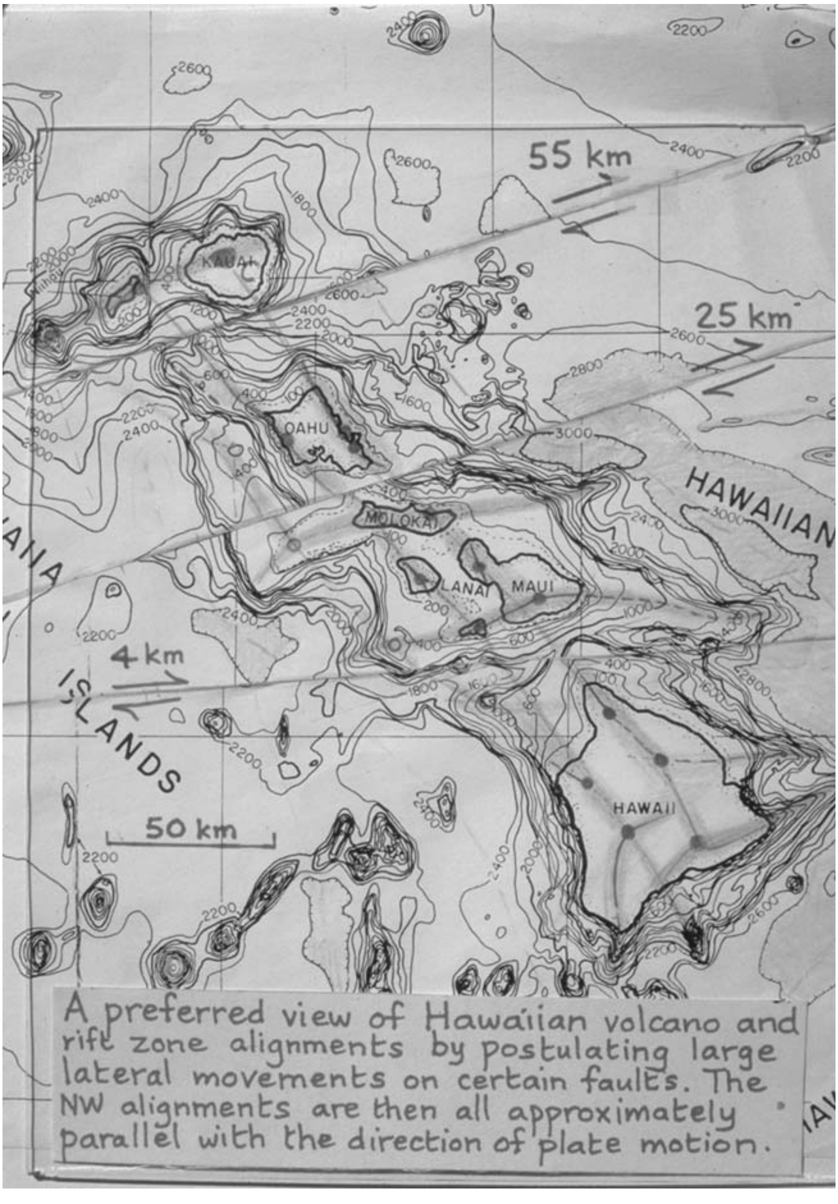



**Fig. 42.** George had a keen geologic imagination, which included the ability to illustrate his ideas with simple demonstrations and experiments. Shown here is the original formulation of his hypothesis that Hawaiian rift zones were once more aligned than they are today, having been offset by strike–slip faults, which he demonstrated with map, scissors and glue. This figure was re-drawn and published in Walker (1990).

**Fig. 43.** In the late 1990s, George returned a few times to New Zealand to help supervise the PhD work of Zinzuni Jurado-Chichay. Once more he could wade the cold waters of caldera lakes to measure thick outcrops of rhyolitic ash (left) and sort out the largest pumices and lithics for granulometry (right). Photos by Z. Jurado-Chichay.

## References


ALTONN, H. 2005. George P. L. Walker/1926–2005, UH scientist pioneered volcano studies. Obituary published in the *Honolulu Star Bulletin*, 27 January 2005. World Wide Web Address: http://archives.starbulletin.com/2005/01/27/news/story13.html.

EDGAR, C. J., WOLFF, J. A. *ET AL*. 2007. The late Quaternary Diego Hernandez Formation, Tenerife: volcanology of a complex cycle of voluminous explosive phonolitic eruptions. *Journal of Volcanology and Geothermal Research*, **160**, 59–85.

HESS, H. H. 1962. History of ocean basins. *In*: ENGEL, A. E. J., JAMES, H. L. & LEONARD, B. F. (eds) *Petrologic Studies: a Volume in Honor of A. F. Buddington*. Geological Society of America, 599–620.

HVO. 2005. Dr George Walker studied nearly every aspect of volcanoes. *Volcano Watch*, 15 December 2005. World Wide Web Address: http://hvo.wr.usgs.gov/volcanowatch/2005/05_12_15.html.

KRISTJÁNSSON, L. 2005. George P. L. Walker and his geological research in Iceland. *Jökul*, **55**, 147–154.

MOBERLY, R. & WALKER, G. P. L. 1987. *Coastal and Volcanic Geology of the Hanauma Bay area, Oahu, Hawaii*. Geological Society of America Centennial Field Guide – Cordilleran Section, 5–10.

SELF, S. 2006. George Walker, 1926–2005. *Eos, Transactions, American Geophysical Union*, **87**, 328.

SELF, S. & SPARKS, R. S. J. 2006. George Patrick Leonard Walker: 2 March 1926–17 January 2005. *Biographical Memoirs of the Royal Society of London*, **52**, 423–436.

SPARKS, R. S. J. 2009. The legacy of George Walker to volcanology. *In*: THORDARSON, T., SELF, S., LARSEN, G., ROWLAND, S. & HOSKULDSSON, A. (eds) *Studies in Volcanology: The Legacy of George Walker*. Special Publications of IAVCEI, Geological Society, London, **2**, 1–15.

VINE, F. J. & MATTHEWS, D. H. 1963. Magnetic anomalies over ocean ridges. *Nature*, **199**, 947–949.

WALKER, G. P. L. 1972. Compound and simple lava flows and flood basalts. *Bulletin of Volcanology*, **35**, 579–590.

WALKER, G. P. L. 1973*a*. Explosive volcanic eruptions – a new classification scheme. *Geologische Rundschau*, **62**, 431–446.

WALKER, G. P. L. 1973*b*. Lengths of lava flows. *Philosophical Transactions of the Royal Society, London*, **274**, 107–118.

WALKER, G. P. L. 1990. Geology and volcanology of the Hawaiian Islands. *Pacific Science*, **44**, 315–347.

WILSON, C. J. N. 2005. George Walker. Obituary published in the *Geological Society of New Zealand Newsletter*. World Wide Web Address: http://www.gsnz.org.nz/gs_archive/gsobits.htm#gplw.

WILSON, C. J. N. & HOUGHTON, B. F. 2005. George Patrick Leonard Walker. *2005 Annual Report of the Royal Society of New Zealand incorporating the 2005 Academy Yearbook*. World Wide Web Address: http://www.royalsociety.org.nz/Site/About/Governance/yearbooks/2005/walker.aspx.