Breiðdalssetur
Málvísindi – Jarðfræði – Sagan
GAMLA KAUPFÉLAGIÐ BREIÐDALSVÍK

Rannsóknarsaga jarðfræði Austurlands
Geological Resarch History of East Iceland

Christa Maria Feucht

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Introduction

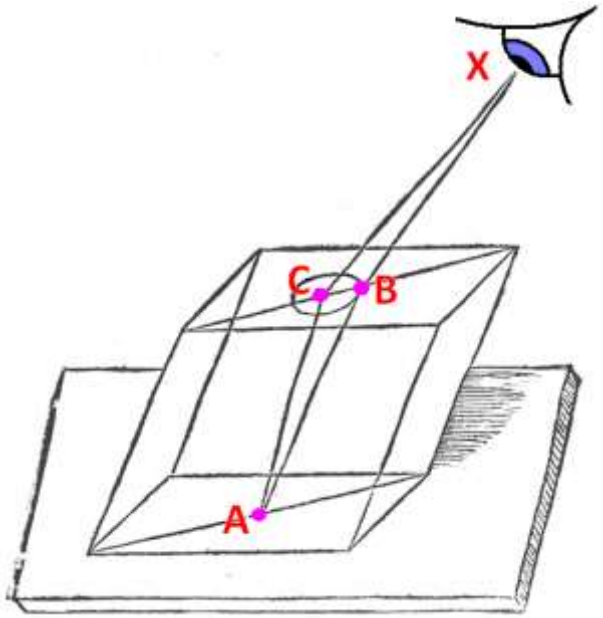
- No active volcanoes in the East

By Skarphéðinn G. Þórisson

17th century

In the middle of the 17th century an unidentified transparent mineral was discovered at Helgustaðir, East Iceland, which turned out to be a double refracting calcite -> Iceland spar, named by its place to be first discovered.

BARTHOLINUS, 1669 (latin)



ERASMI BARTHOLINI

EXPERIMENTA

CRYSTALLI ISLANDICI

DISDIACLASTICI

Quibus mira & insolita

REFRACTIO

detegitur.

HAFNIÆ,

Sumptibus DANIELIS PAULLI Reg. Bibl.

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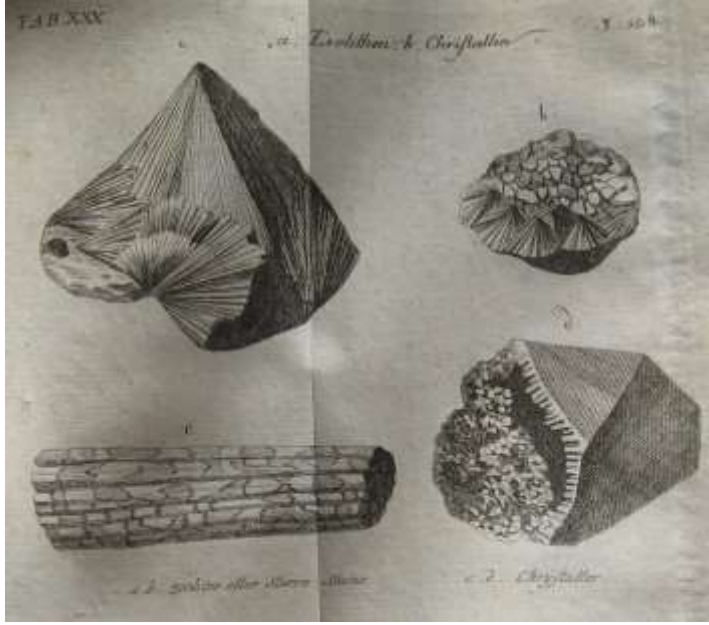
18th century

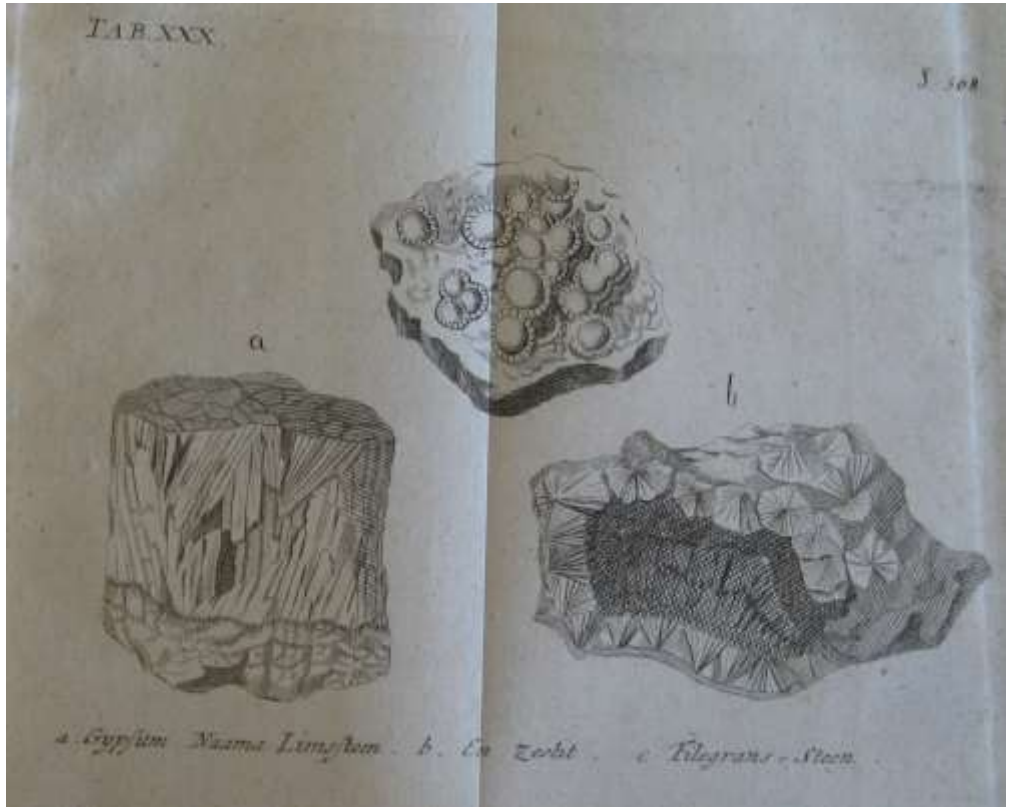


-Eggert Ólafsson and Bjarni Pálsson first to do systematic surveys of Iceland.

-Tours around Iceland 1752-1757 to do scientific research for the science association of the **Danish crown**

-Their focus was on zoo-, ichthyo- and entomology, archeological findings, botany and geology

-Find practical benefits on the island

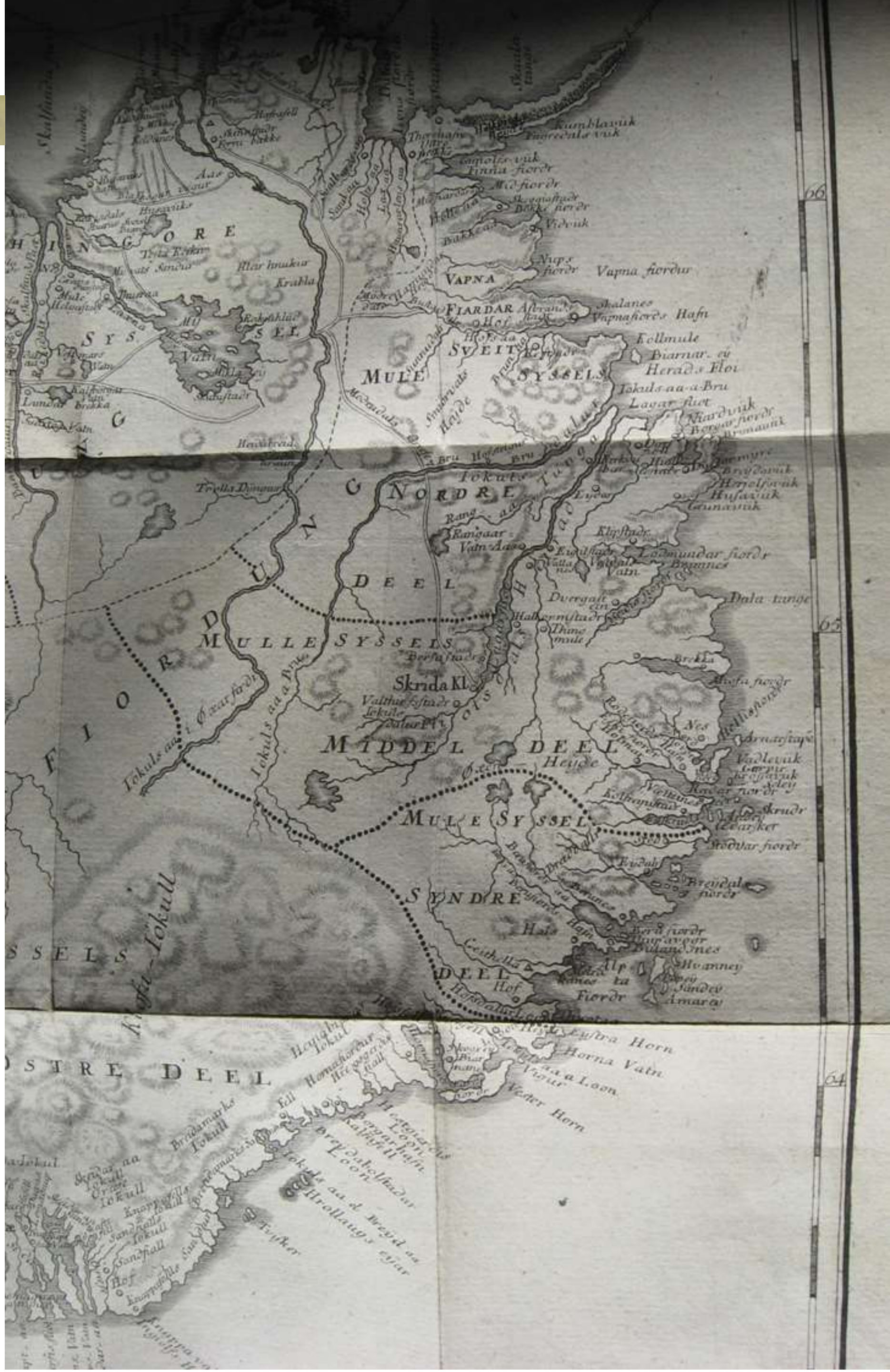


ÓLAFSEN, E. & PÁLSSON, B., 1772 (Danish and German)

Reise igiennem Island, foranstaltet af Videnskabernes Sælskab i Kiøbenhavn, og beskreven af forbemeldte Eggert Olafsen med dertil hørende 51 Kobberstøkker og et nyt forfærdiget Kart over Island. Deutsche Ausgabe: Reise durch Island: veranstaltet von der Königlichen Societät der Wissenschaften in Kopenhagen und beschrieben von bemeldtem Eggert Olafsen. Übersetzt aus dem Dänischen von Joachim Michael Geuss. Kopenhagen, Heinecke und Faber.

Hinter dem neuen und sehr häßlichen Breede

marks · Jökul (§. 783, 784), soll noch die schönste Weide für Schafe befindlich seyn;



19th century

Two British geologists were the first to publish articles about the Tertiary lava pile in East Iceland.

GARDNER, JOHN STARKIE, 1885. The Tertiary Basaltic Formation in Iceland. *Quarterly Journal of the Geological Society* 41, 93-101.

GEIKIE, ARCHIBALD, 1889. The History of Volcanic Action during the Tertiary Period in the British Isles.

GEIKIE, ARCHIBALD, 1896. The Tertiary basalt plateau of North Western Europe. *Quarterly Journal of the Geological Society* 52, 331-406.

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19th century

John Starkie Gardner (1845-1930), English art metal worker, geologist and company owner.

-Strongly interested from an early stage of his life in paleontology and geology

-active participant in debates about the evolutionary theory

-Donated fossils and other specimens to the British Natural History Museum and conducted geological research in Britain.

-A grant from the British government enabled Gardner to visit Iceland to study interbasaltic flora.

-Most investigations are about North Iceland but East Iceland is mentioned in the article, “The Tertiary Basaltic Formation in Iceland“.

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19th century

Sir Archibald Geikie (1835 –1924) a Scottish geologist and writer

- Two articles 1889 and 1896.
- Geikie writes about Laki, Hekla, the lava-desert of Ódáðahraun and Askja, which are all features of the volcanically active zone of Iceland.
- Recognized the origin of the Tertiary basalt plateau in Europe must be similar to active zone in Iceland.

20th century

- **Þorvaldur Thoroddsen** (1855 – 1921) first Icelandic geologist
- **Leonard Hawkes** (1891 – 1981), British geologist & colleagues (**H.K. Hawkes , J.A. Ledeboern, H. F. Harwood, H. K. Cargill og E.M. Guppy**)
- **George Patrick Leonard Walker** (1926-2005), British geologist & students (**A.E. Annels, D.H. Blake, I.S.E. Carmichael, I. L. Gibson, M.J. Roobol**)
- Iceland Research Drilling Project **IRDP**, Reyðarfjörður
- Applied geological research from 1980

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20th century Thoroddsen

Þorvaldur Thoroddsen (1855 – 1921) first Icelandic geologist

-Studied natural history and zoology with a strong interest in geology.

-Served 1876 as a guide for the Danish geologist and paleontologist, Johannes Frederik Johnstrup, in an expedition to Iceland to study Askja and the volcanoes at Mývatn.

-Conducted organized surveys in Iceland 1881 – 1898

-Published the first geological map of Iceland in 1901, 1:600.000 (revised version published 1906 1:750.000

-Travel reports published in a book in 1914.


GEOLOGICAL MAP
OF
ICELAND
BY
TH. THORODDSEN.

20th century Thoroddsen

- THORODDSEN, TH., 1883. Ferð um Austurland sumarið 1882. *Andvari* IX, 17-96.
- THORODDSEN, TH., 1890. Nogle Bemærkninger om de Islandske Findesteder for Doppelspath. *Geologiska Föreningens I Stockholm Förhandlingar,* XII, 247-254.
- THORODDSEN, TH., 1901. Geological map of Iceland 1:600.000. *Copenhagen: Carlsberg Fund*. THORODDSEN, TH., 1906. Geological map of Iceland 1:750.000. *Copenhagen: Carlsberg Fund*.
- THORODDSSEN, TH, 1914. Ferðabók. Skýrslur um rannsóknir á Íslandi 1882–1898 (Reports about research on Iceland from 1882-1898). Þriðja bindi. *Hið íslenzka fræðafélag*, Copenhagen.

20th century
Hawkes et al.

Leonard Hawkes (1891 – 1981), british geologist & colleauges **(H.K. Hawkes , J.A. Ledeboern, H. F. Harwood, H. K. Cargill og E.M. Guppy)**

-geological research in East Iceland 1916-1933

-Research was not extensive but rather focused on certain geological phenomena, e.g. Vestrahorn intrusion and Sandfell Laccolith.

20th century Hawkes et al.

- CARGILL, H. K., HAWKES, L. & LEDEBOER, J. A., 1928. The major intrusions of south-eastern Iceland. *Quart. 97. Geol. Soc. Lond.* 84, 505-39.
- GUPPY, E.M. & HAWKES, L., 1925. A composite dyke from eastern Iceland. *Quart. J. Geol. Soc. Lond.* 81, 325-41.
- HAWKES, L., 1916a. The building up of the North Atlantic Tertiary volcanic plateau. *Geol. Mag.* 3, 385-395.
- HAWKES, L., 1916b. On tridymite and quartz after tridymite in Icelandic rocks. *Geol. Mag.*, 3, 205-209.
- HAWKES, L., 1924. Olivine-dacite in the Tertiary volcanic series of eastern Iceland: the Rauðaskriða. *Quart. J. Geol. Soc. London* 80, 549-567.
- HAWKES, L., 1929. On a partially fused quartz-feldspar rock, and on glomero-granular texture. *Miner. Mag.* 22, 163-73.
- HAWKES, L. & HARWOOD, H.F., 1932. On the changed composition of an anorthoclase-bearing rock-glass. *Miner. Mag.* 23, 163-74.
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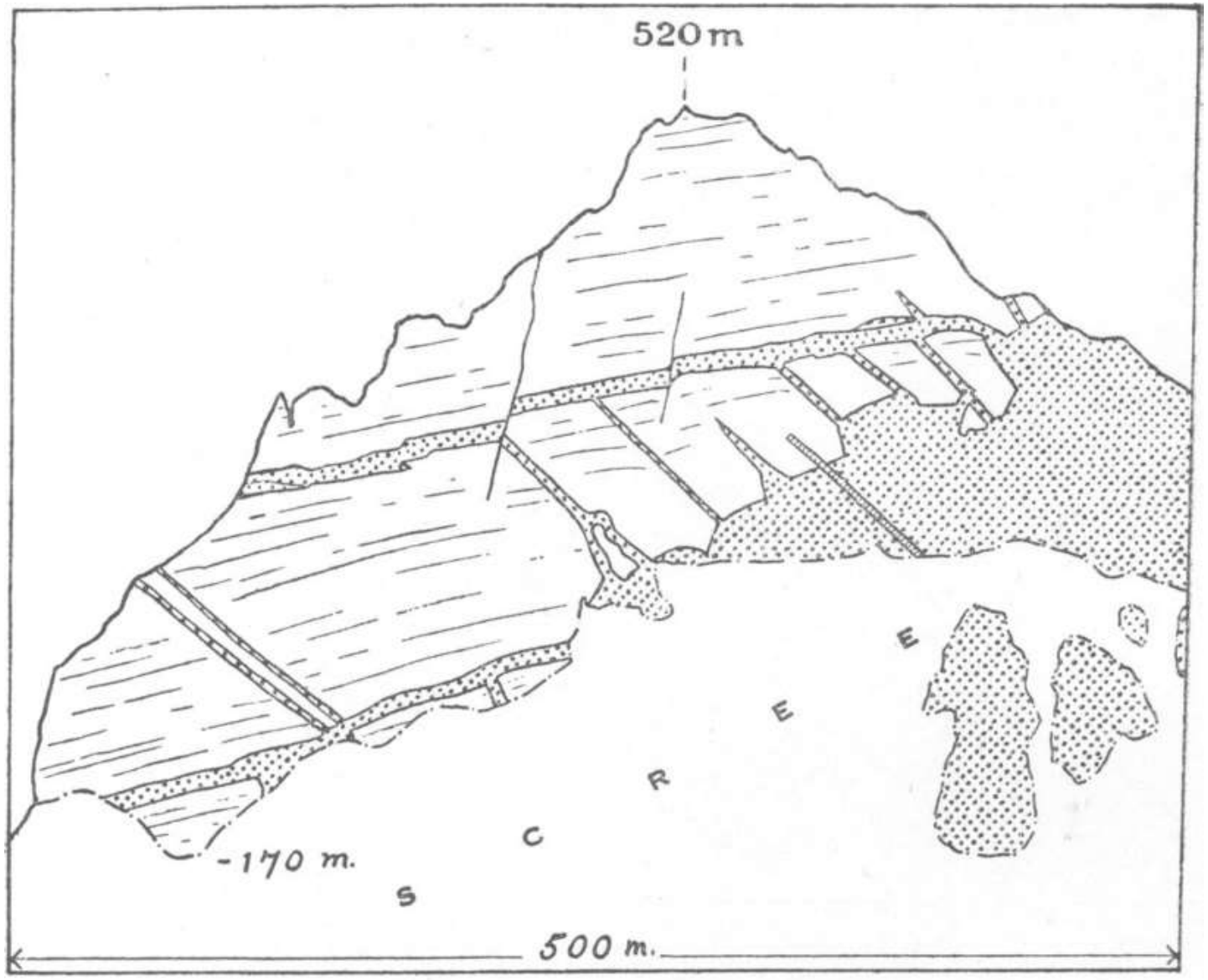

[The sill is continuous, its broken appearance being due to irregularities on the cliff-face.]

Vestrahorn, Cargill 1928

Skarphéðinn G. Þórisson

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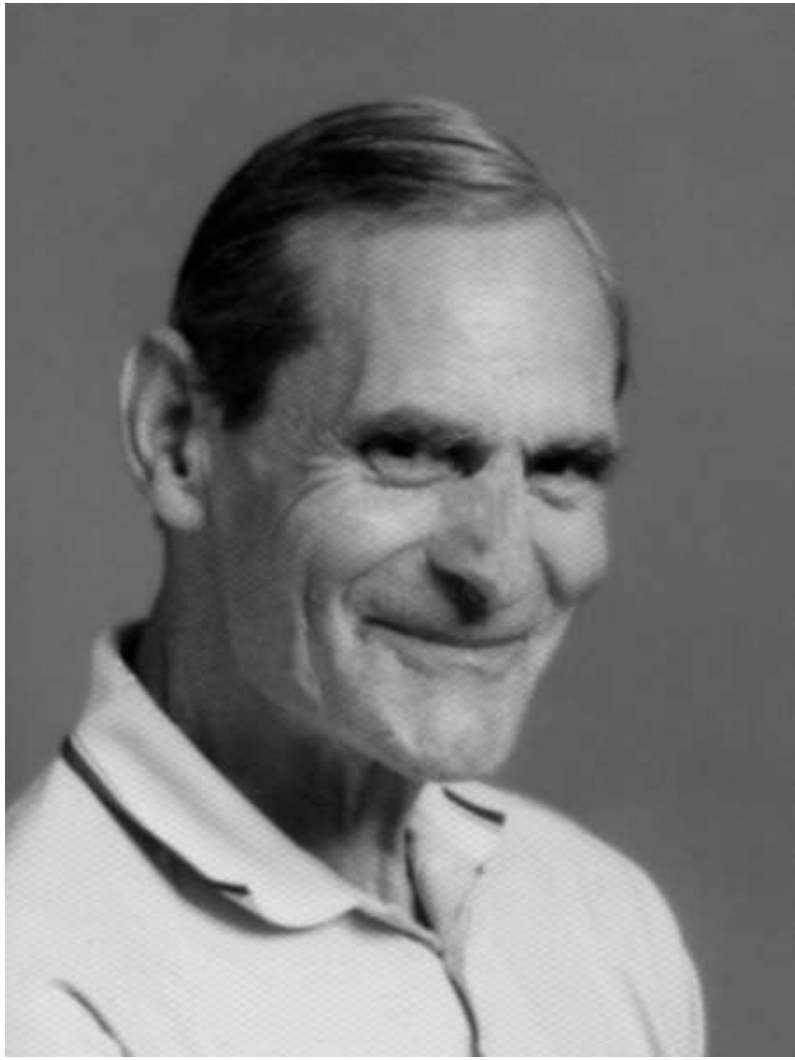
20th century Walker et al.



~1960, probably Fljótsdalur

20th century Walker

George P. L. Walker, 1926-2005), British Geologist & students: (**A.E. Annels, D.H. Blake, I.S.E. Carmichael, I. L. Gibson, M.J. Roobol**)

- First regional mapping of Eastern Iceland
- Secondary minerals and conclusions
- Dyke zones, measurements and conclusions (e.g. Plate tectonics)
- Dip of lava pile and conclusions
- Main geological basic research in Eastern Iceland

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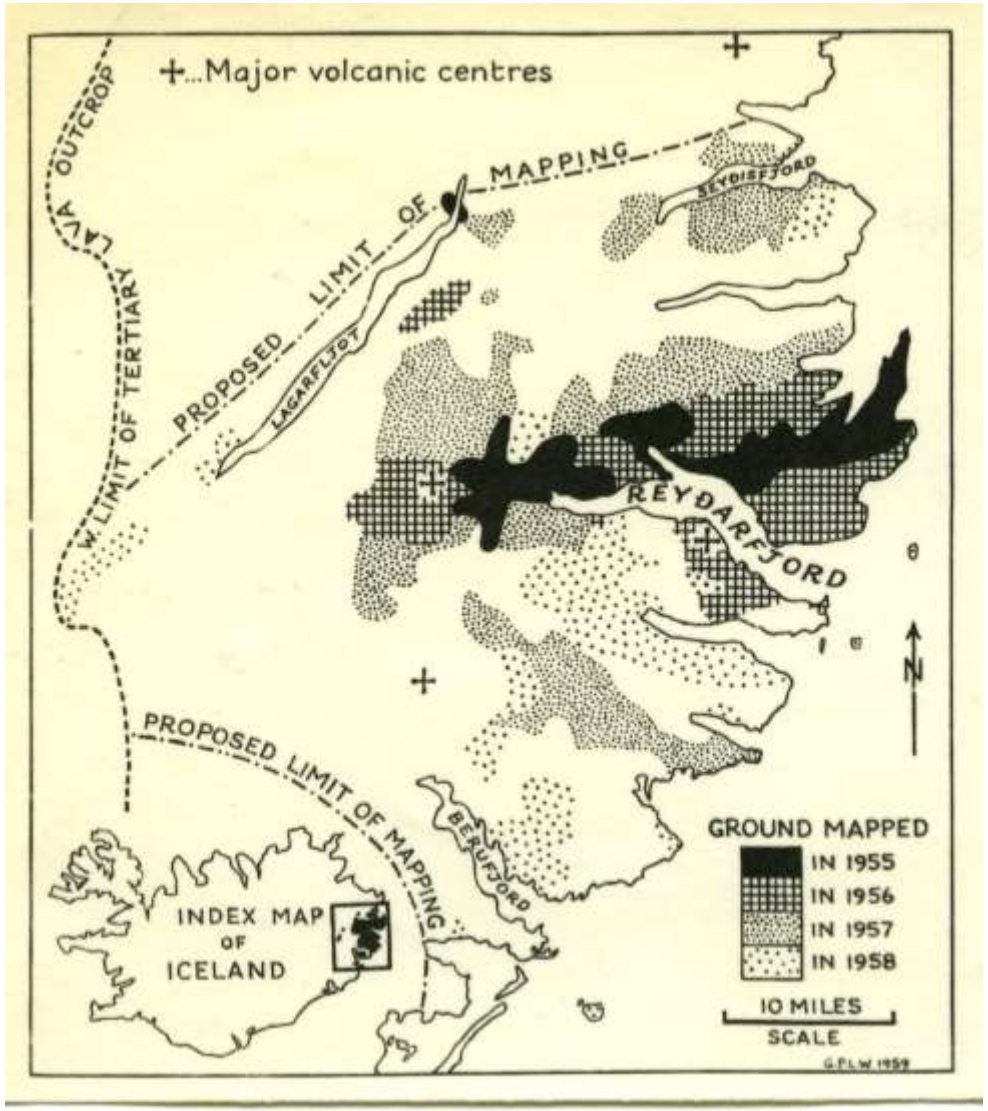
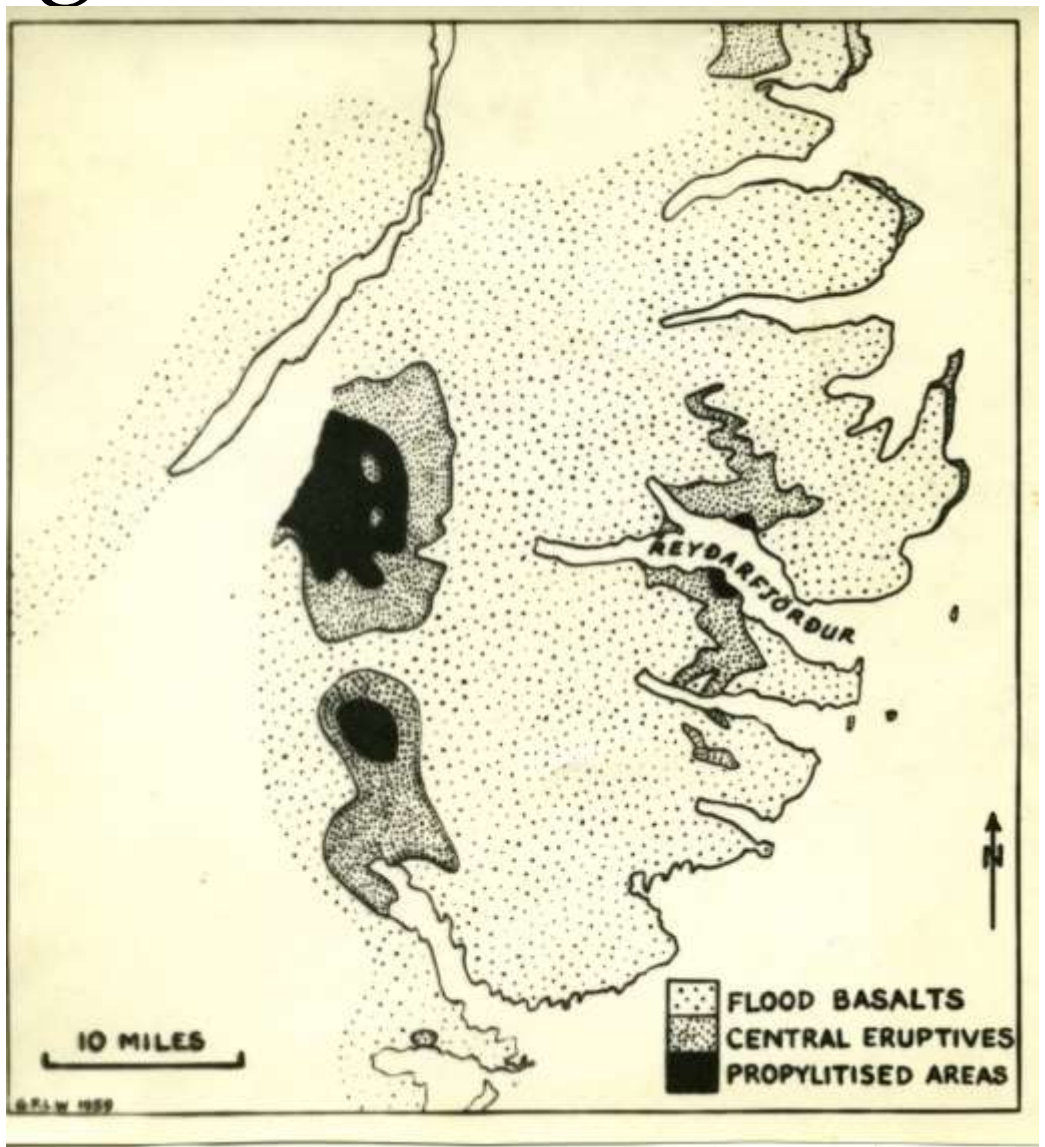
20th century: Walker Regional mapping

Published map??





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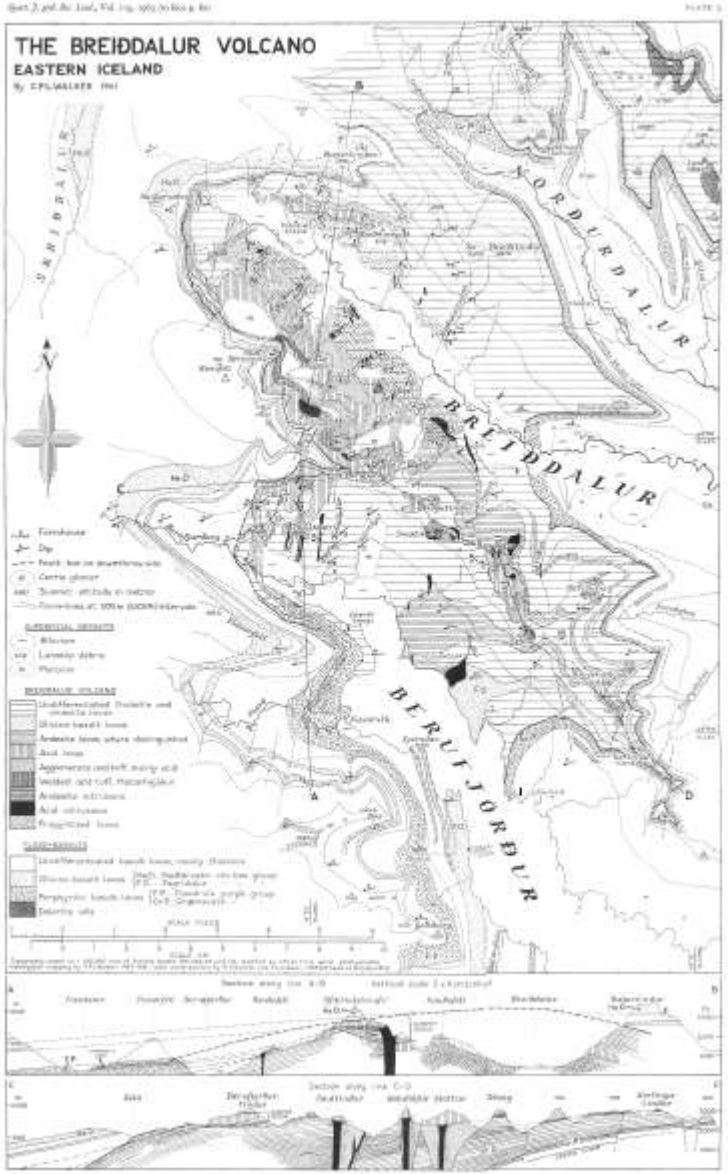
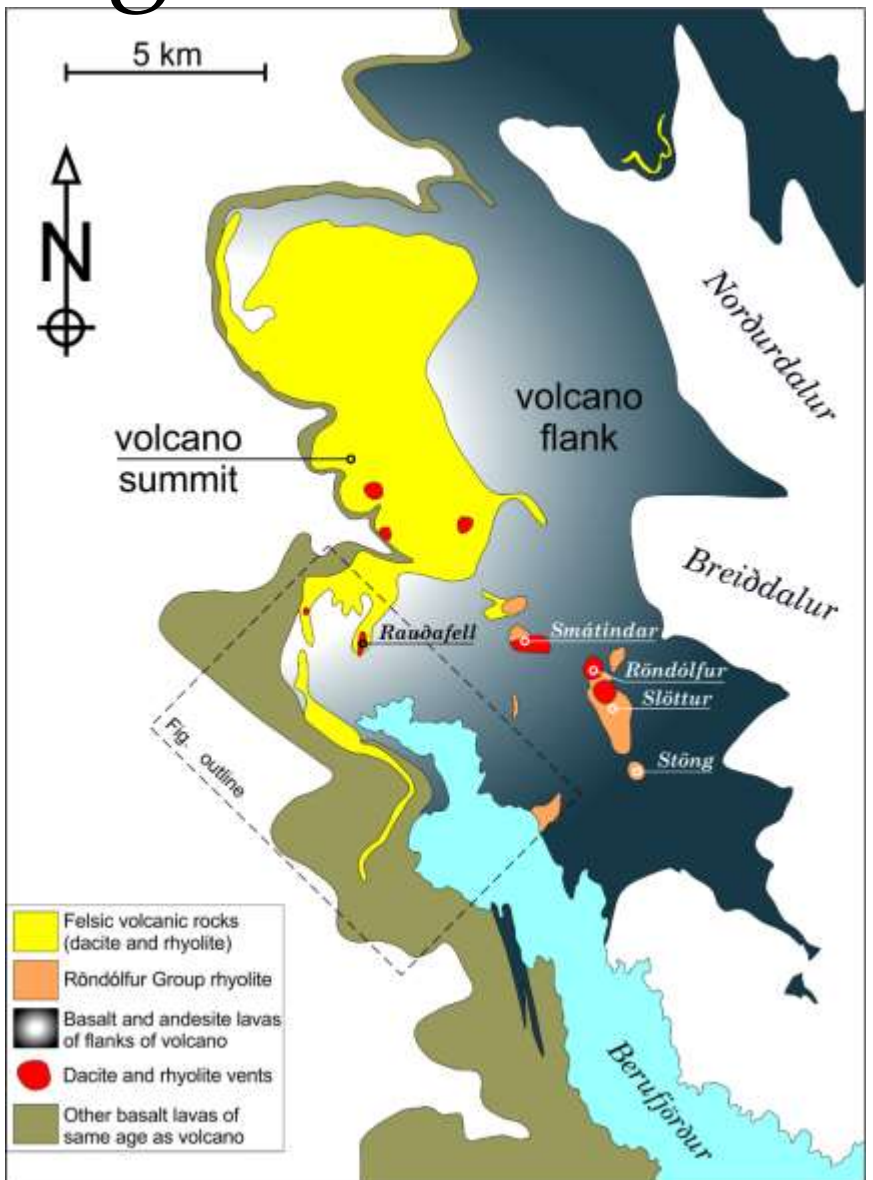
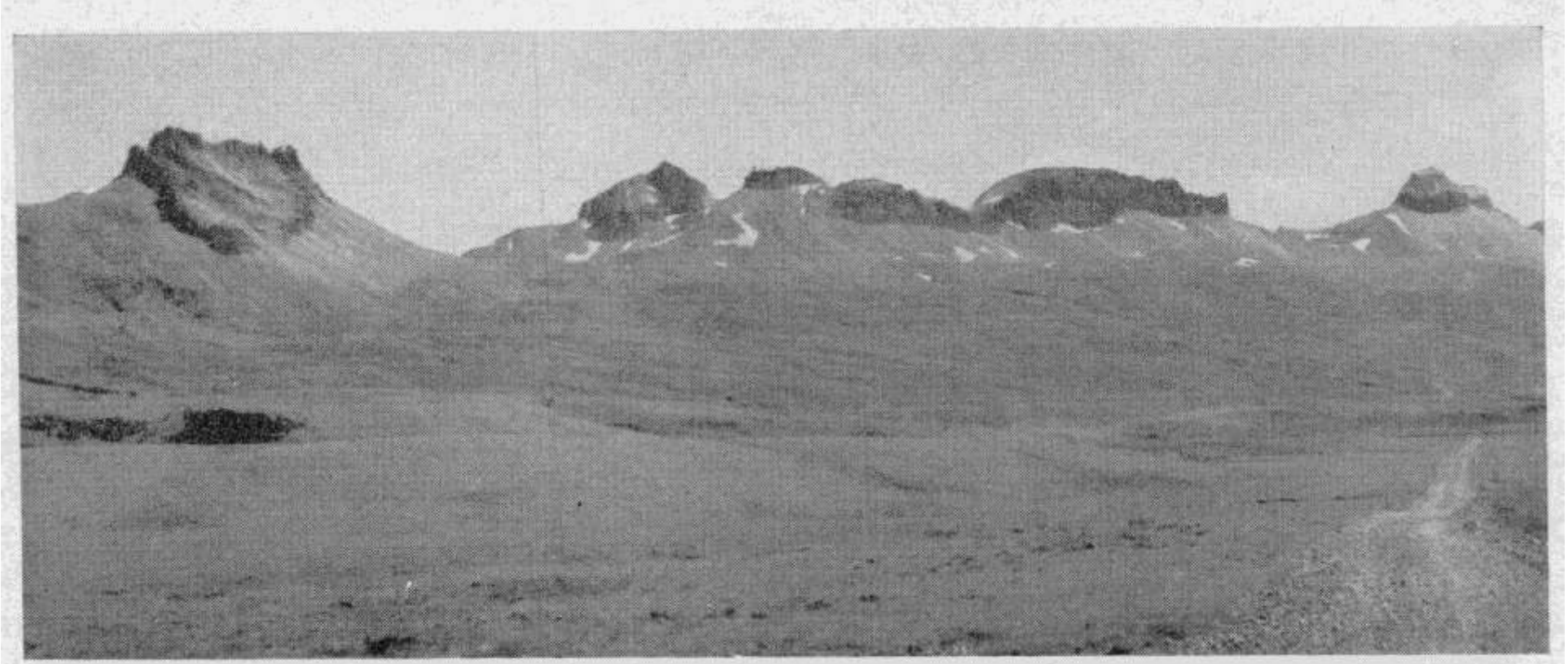
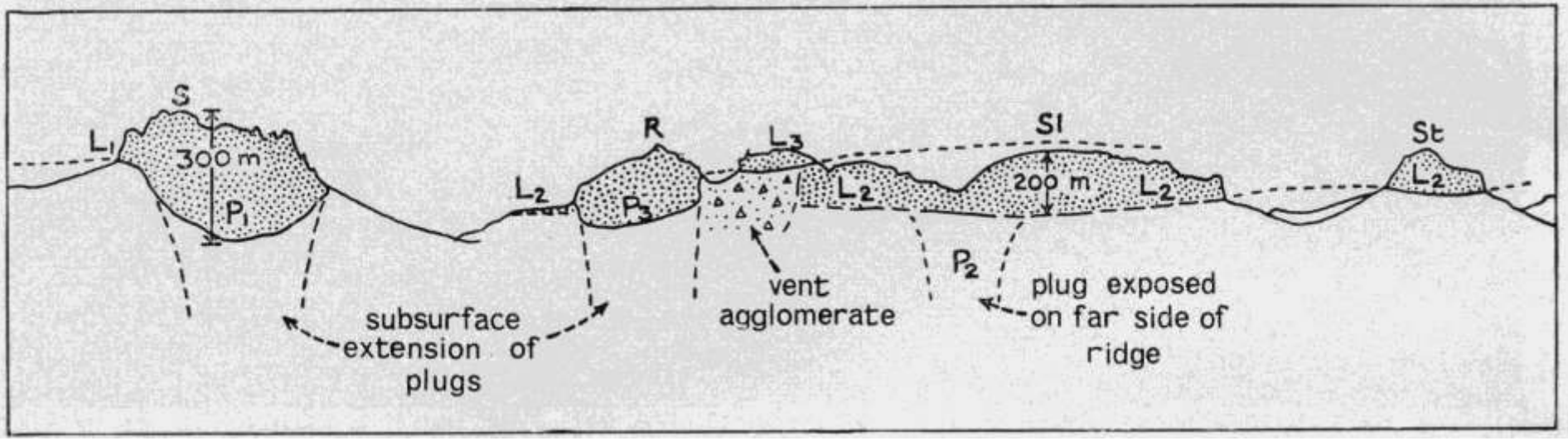
20th century: Walker Regional mapping



Walker 1963, modified by Thordarson et al. 2002, Gasser 2014






S
L1
300 m
P1
L2
R
P3
L3
L2
Sl
200 m
L2
St
L2
P2
vent
agglomerate
subsurface
extension of
plugs
plug exposed
on far side of
ridge

Walker 1963

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20th century: Walker
Dyke measurement and conclusions

Karlsstaðir, photo 2013 M.Gasser

Djúpivogur by Samsýn

20th century: Walker
Secondary minerals and conclusions

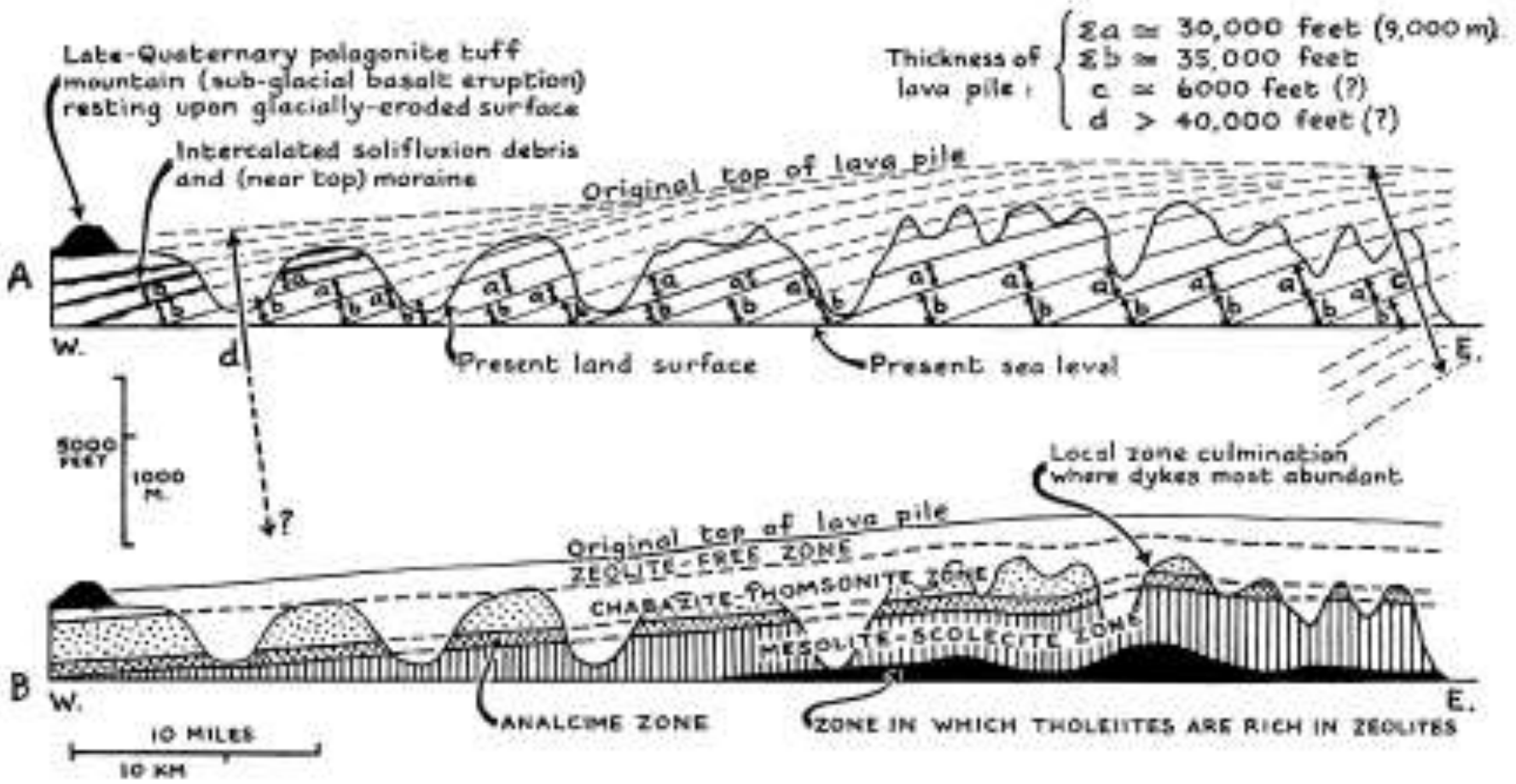

FIG. 5.—Diagrammatic sections across the Tertiary lava pile in eastern Iceland showing the inferred relationship between the original top of the pile and the lava stratigraphy (*A*) and zonal distribution of amygdale minerals (*B*). The western end of the sections corresponds to sections in upper Jökuldalur and Fljótsdalur; the eastern half corresponds to exposures in the eastern foothills.

Walker 1960

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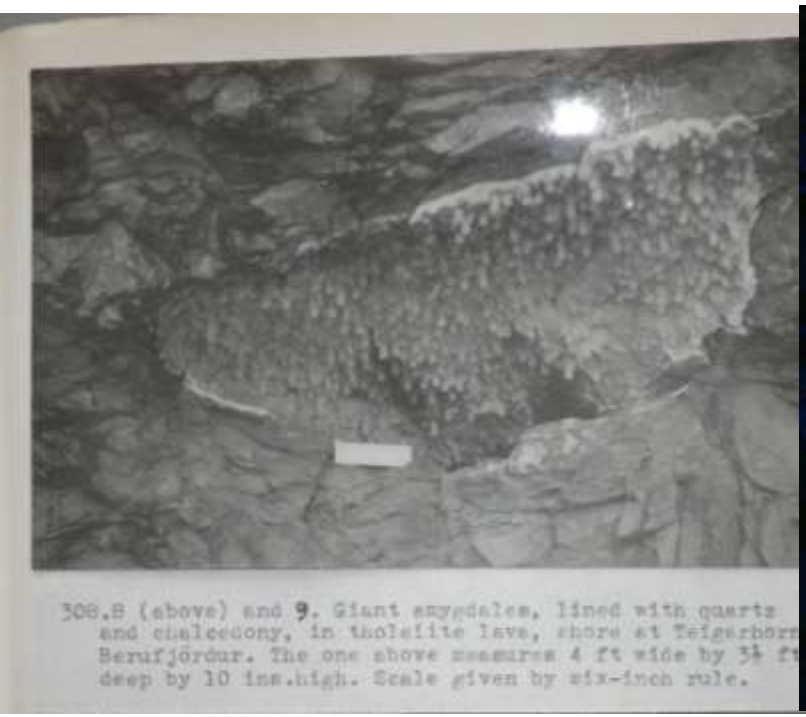
20th century: Walker
Secondary minerals and conclusions



306.8 (above) and 9. Giant amygdales, lined with quartz and chalcedony, in tholeiite lava, shore at Teigarhorn Berufjördur. The one above measures 4 ft wide by 3½ ft deep by 10 ins.high. Scale given by six-inch rule.

1957

2013

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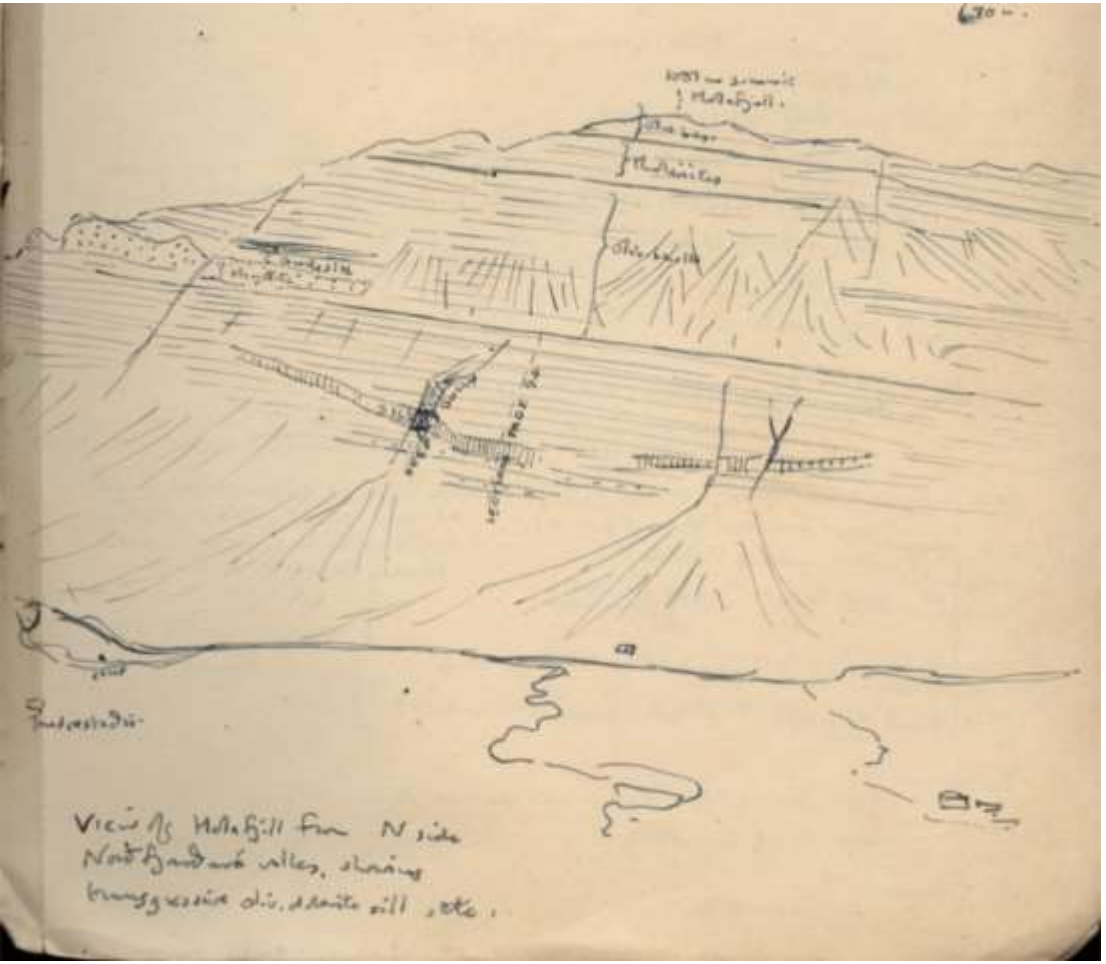
20th century: Walker
Dip of lava pile and conclusions

http://www.drvalsson.com/Walker/

20th century: Walker
Main geological basic research in Eastern Iceland



Feltbók Walker 1957

Fannardalur og byggingasvæðið Norðfjarðargangarinnar 2014
by Ófeigur Ö. Ófeigsson

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20th century Walker et al.

- WALKER, G.P.L., 1959. Geology of the Reyðarfjörður area, eastern Iceland. *Quart. J. Geol. Soc. Lond.* 114, 367-393.
- WALKER, G.P.L., 1960. Zeolite zones and dyke distribution in relation to the structure of the basalts in eastern Iceland. *Journal of Geology* 68, 515-528.
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- WALKER, G.P.L., 1962. Low-potash gismondine from Ireland and Iceland. *Miner. Mag.* 33, 187-201.
- WALKER, G.P.L. & CARMICHAEL, I.S.E., 1962. Garronite, a new zeolite, from Ireland and Iceland. *Miner. Mag.* 33, 173-186.
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- WALKER, G.P.L., 1971. Compound and simple lava flows and flood basalts. *Bulletin Volcanologique* 35, 579-590.
- WALKER, G.P.L., 1974. The structure of eastern Iceland. *In: Kristjánsson, L. (ed.), Geodynamics of Iceland and the North Atlantic area. proceedings of the NATO Advanced Study Institute held in Reykjavik, Iceland, 1-7 July, 1974. Boston: Reidel, Hingham, Mass*, 155-164.
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20th century
Walker et al – Annells and Roobol

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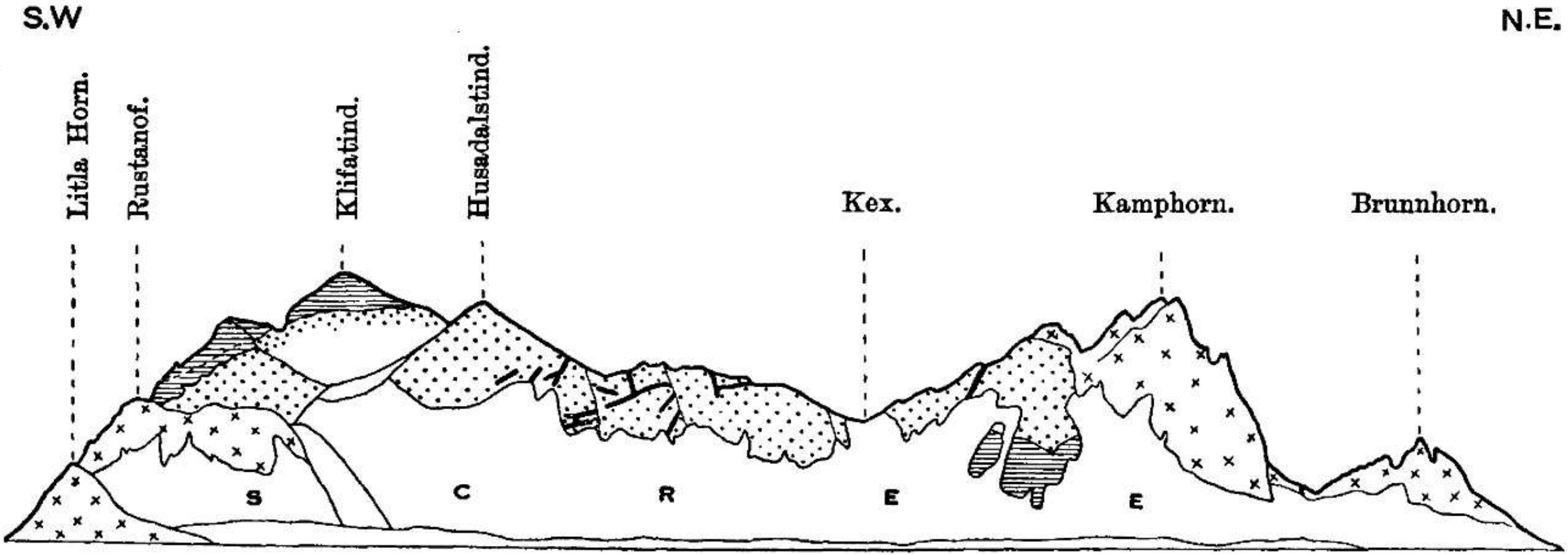
Fig. 5.—*Sketch of the Vestur Horn from the Fyr at Stokksnes (length=5·5 kilometres.)*



[Line shading indicates basalts; dots indicate granite and granophyre; and crosses indicate gabbro. Heavy black lines indicate basic sills and dykes.]

Schematic view from the S onto the Vestrahorn intrusion, length 5,5 km. By Roobol, 1974, redrawn 46 years later showing internal structure of the granite body, from information by Cargill et al., 1928.

20th century
Walker et al – Blake († 2014)

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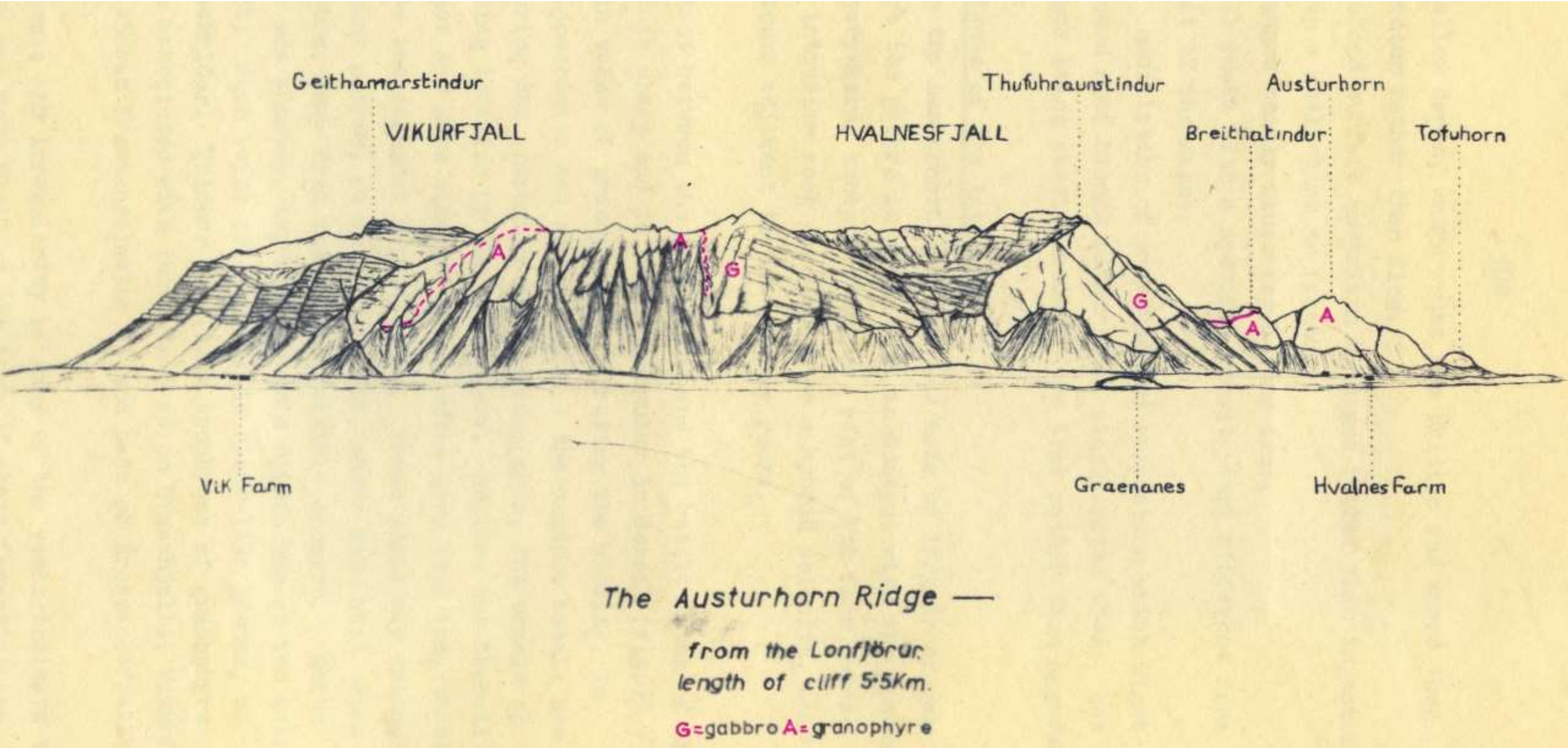
Blake 1964



The Austurhorn Ridge —

from the Lonfjörur
length of cliff 5·5Km.

G=gabbro A=granophyre

By Kilian Schönberger

20th century
Walker et al - Carmichael

- CARMICHAEL, I.S.E., 1960a. The pyroxenes and olivines from some Tertiary acid glasses. *J. Petrol.* 1, 309-36.
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By
Skarphéðinn
G. Þórisson

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20th century
Walker et al - Gibson

- GIBSON, I.L., 1963. The Reydarfjörður acid volcanic centre of eastern Iceland. Unpublished Ph.D. thesis, University of London.
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By university of Edinburgh 2010

20th century
Iceland Research Drilling Project IRDP

- International research project, conducted to learn more about the oceanic crust.
- Reyðarfjörður fjord near sea level, summers 1978 and 1979
- First drilling based investigation with continuous coring of Icelandic crust.
- Drilling leads to ~ 2 km of continuous strata
- Tests on various geological properties
- Drilling by a Canadian company (Bradley Bros.Ltd)
- 28 publications about research projects of the IRDP well in Reyðarfjörður were published in the *Journal of Geophysical Research* from 1982, Vol. 87, pages 6359-6667.

By Jóhann Helgason

20th century
Iceland Research Drilling Project IRDP

The drill site location was chosen by following criteria (FRIDLEIFSSON, I.B. et al. 1982 & ROBINSON, P.T. et al. 1982):

-Advantage was taken of the **deep glacial erosion** of the geologically well known **tertiary lava pile** in Eastern **Iceland to provide a 1 km exposed component at the top of the section.**

-The drill site is **8 km east of the centre of the Thingmuli Central Volcano** at a location within a dyke swarm where crustal dilatation by north-south dikes is 10%.

-Anomalously **high temperature gradient 80°C/km**

- The **regional gravity anomaly is average**

Drill core will soon be stored in Breiðdalsvík

Braggi frá stríðsárunum þar sem kjarnanum var lýst og aðalvinnusvæði vísindamanna. Á myndinni eru: Hans-Ulrich Schmincke, Gerhard Wörner og James Mehegan

By Jóhann Helgason

20th century

Applied geological research from 1980

- Hot and geothermal water
- Future hydro-power projects
- Tunnel Drilling
- Natural hazards, e.g. landslides

Geothermal heat in East Iceland first used **1950** - swimming pool in **Vopnafjörður** (still in use).

Breiðdalssetur
Málvísindi – Jarðfræði – Sagan
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- http://www.sveit.is/asset/6866/Selardalur%20swim.JPG

20th century

Applied geological research from 1980: Water

- First overview of all cold water resources in East Iceland by Árni Hjartarson in 1978, called “Vatnabúskapur Austurlands“
- Geothermal water rare in East Iceland compared to other zones in Iceland, temperature always lower than 100 °C. Prospecting work for hot water used for heating utility was mainly done by Ómar Bjarki Smárason and Orkustofnun (later ÍSOR (Iceland geosurvey).

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LEGEND

- Tertiary bedrock
- Plio-Pleistocene bedrock
- Late Pleistocene lavas
- Late Pleistocene hyaloclastites
- Rhyolite
- Gabbro or granophyre
- Postglacial lavas
- Alluvium
- High temperature area
- Uncertain location or temperature
- Warm spring < 10°C
- Warm spring 10-25°C
- Warm spring 25-50°C
- Hot spring 50-75°C
- Hot spring 75-98°C
- Hot spring 98-100°C
- Cold mineral spring
- Warm mineral spring
- Sinter
- Fumaroles or mud pool

ÍSOR
ÍSLENSKAR ORKURANNSÓKNIR

By ÍSOR Iceland Geo Survey

20th century

Applied geological research from 1980: Hydro Power

- Resarch for hydro-power projects in areas around the glacial rivers Jökulsá í Fljótsdal, south of Egilsstaðir, and Jökulsá á Brú, west of Egilsstaðir.
- The first report about this project was published in 1989 by Skúli Víkingsson “Fljótsdalsvirkjun“.
- Another version of this project was issued in 2006 with the name “Kárahnjúkavirkjun“.
- The main research was done by Skúli Víkingsson and Ingibjörg Kaldal from ÍSOR (former Orkustofnun) and Ágúst Guðmundsson from Jarðfræðistofan.

By Jóhann Ísberg 2002

By Martin Gasser 2006

20th century

Applied geological research from 1980: Tunnel

Ágúst Guðmundsson main researcher for tunnel prospecting in East Iceland.

- **Fáskrúðsfjarðargöng** between Reyðarfjörður-Fáskrúðsfjörður fjords, **5900 m, 2005**

- **Almannaskarðsgöng** 5 km north of Höfn, **1300 m, 2005**

- **Norðfjarðargöng:** In construction (**2013-2017**) Eskifjörður-Neskaupstaður, **7500 m**

- Miðausturland tunnel project: 2 tunnels:

Seyðisfjörður-Mjóifjörður & Mjóifjörður-Norðfjörður fjords

- Fjarðarheiðargöng: Seyðisfjörður-Egilsstaðir

- Vopnafjarðargöng to avoid the 655 m high climb over the Hellisheiði eystri pass

AUSTUR FRÉTT

Leita...

Austurfrétt | Fréttir | Lífið | Íþróttir | Umræðan | Tístið | Göngin | SVAust | Veður

SKRIFAÐ: 27 ÁGÚST 2015

NorÐfjarÐargöng: Framkvæmdirnar séÐar úr

SKRIFAÐ: 21 ÁGÚST 2015

NorÐfjarÐargöng: EskifjarÐará flæddi yfir

SKRIFAÐ: 28 JÚLÍ 2015

NorÐfjarÐargöng: SnjóflóÐavarnargarÐur í

NORÐFJARÐARGÖNG

LOKIÐ

95,8 %

7.255 m

vika 88 í gangagreftri

Fréttir


6.3.2014 → 21.4.2015
3026 m.


metrostav
metrostav

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20th century
Applied geological research from 1980: Hazards

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21th century – In Walker‘s footsteps

Increased interest for geological research in East Iceland

-2004 C. M. Feucht (speaker) fossil bacteria in Jasper, University of Berne, Switzerland

-2008 Breiðdalssetur, idea by Ómar Bjarki Smárason

-2009-now Þorvaldur Þórðarson, University of Iceland, former Prof at Edinburgh and students

-Geological map of Eastern Iceland- Náttúrufræðistofnun – Birgir Óskarsson

-Foreign groups of scientists from Denmark, Japan and Italy have also published some interesting articles about certain aspects of geology in East Iceland

21th century – In Walker's footsteps
Christa M. Feucht

Breiðdalssetur
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Biogene filaments in a chert (jasper) from Breiðdalur Valley. Jasper is occuring about 10 km around the core of Breiðdalur Central Volcano. Black line: 50 microns.

21th century – In Walker's footsteps
Breiðdalssetur opened 2008

Breiðdalssetur
Málvísindi – Jarðfræði – Sagan
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21th century – In Walker's footsteps
Þorvaldur Þórðarson

Breiðdalssetur
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By University of Edinburgh 2009

21th century – In Walker‘s footsteps
Þorvaldur Þórðarson - students

Breiðdalssetur
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By University of Edinburgh 2011

21th century – In Walker‘s footsteps
Þorvaldur Þórðarson - students

Breiðdalssetur
Málvísindi – Jarðfræði – Sagan
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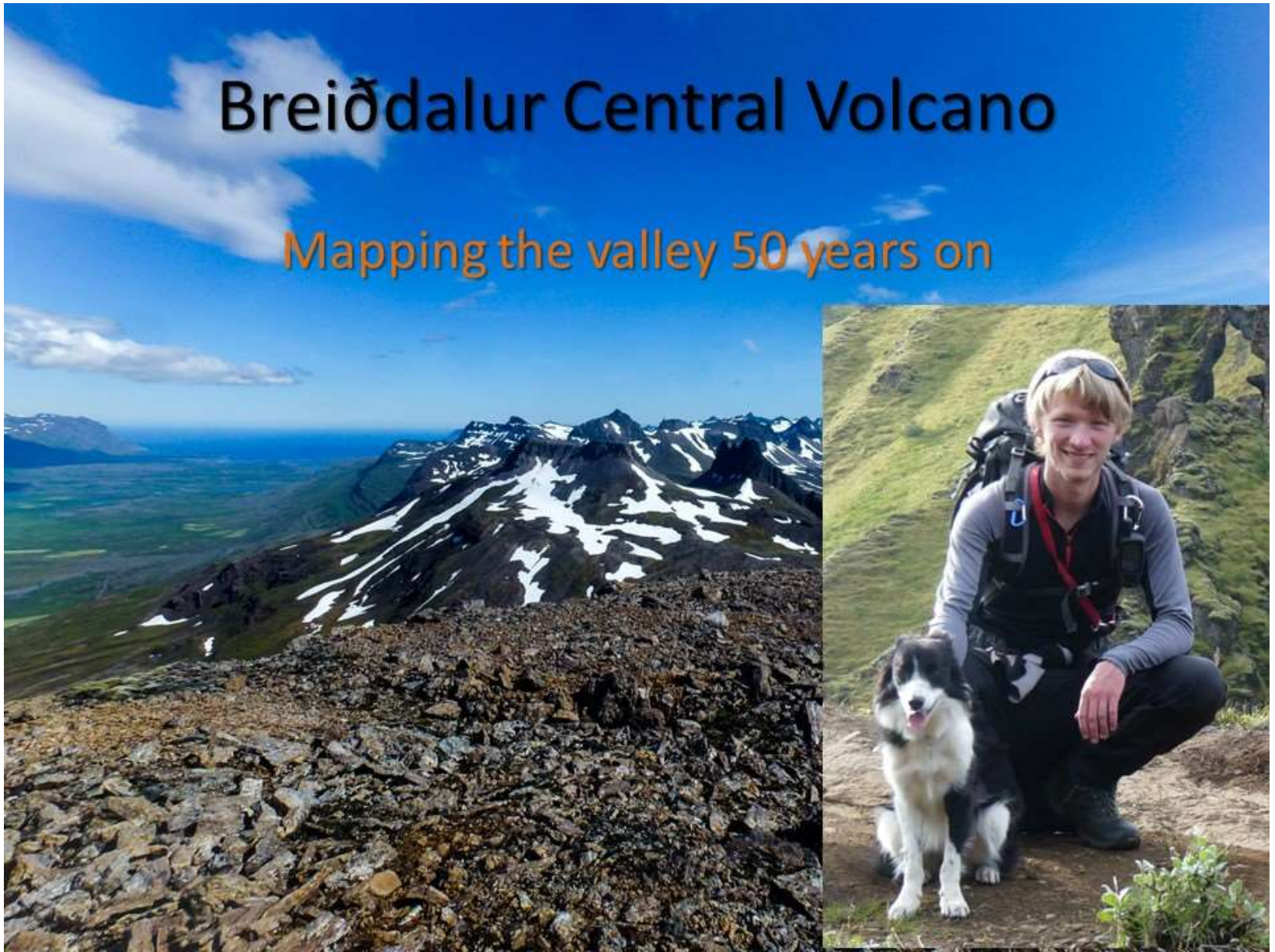
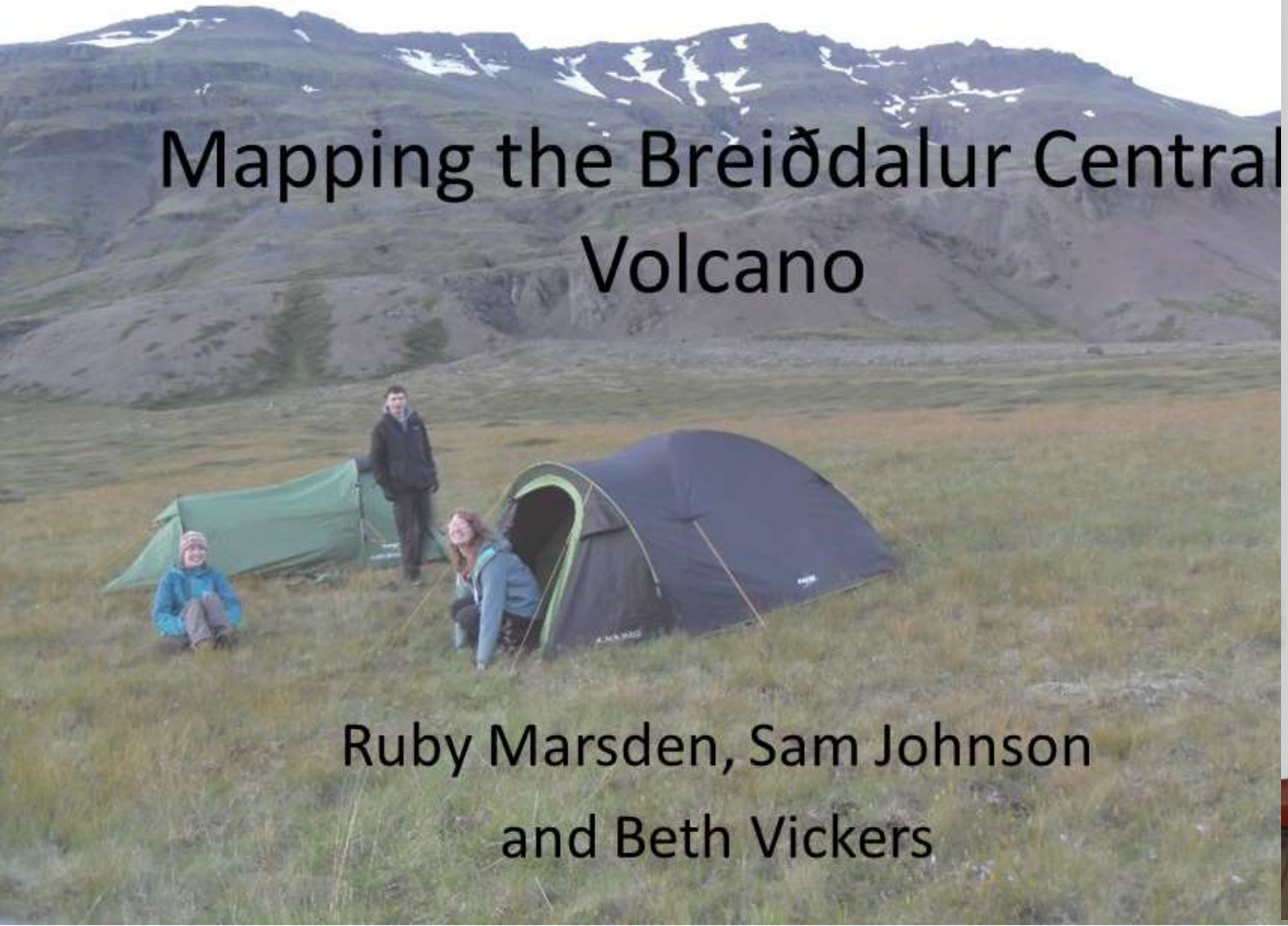


By Rob Askew 2014

21th century – In Walker‘s footsteps
Þorvaldur Þórðarson - students

By University of Cambridge 2014



21th century – In Walker‘s footsteps
Geological map – Birgir Óskarsson

JARÐVÍSINDADEILD

DOKTORSVÖRN

Föstudaginn 19. júní
kl. 14:00 í Öskju, stofu 132

Föstudaginn 19. júní ver Birgir Vilhelm Óskarsson doktorsritgerð sína í jarðfræði við Jarðvísindadeild Háskóla Íslands.

Ritgerðin ber heitið: Eldfjallafræði flæðibasaltsyrpa frá míósen á Austfjörðum (Volcanological studies of Neogene flood basalt groups in eastern Iceland).

Andmælendur eru dr. Sonia Calvari, rannsóknarstjóri við Istituto Nazionale di Geofisica e Vulcanologia, Ítalíu, og dr. Simon R. Passey, sérfræðingur við CASP (Cambridge Arctic Shelf Programme) Research Trust, Cambridge University, Bretlandi.

Leiðbeinandi var dr. Morten S. Riishuus, sérfræðingur við Norræna Eldfjallasetrið, Jarðvísindastofnun Háskólans. Auk hans sátu í doktorsnefnd dr. Þorvaldur Þórðarson, prófessor og deildarforseti Jarðvísindadeildar Háskóla Íslands, og dr. Christian Tegner, prófessor við jarðvísindadeild Háskólans í Árósum, Danmörku.

Dr. Áslaug Geirsdóttir, prófessor og varaforseti Jarðvísindadeildar, stjórnar athöfninni.

HÁSKÓLI ÍSLANDS

21th century – In Walker‘s footsteps
Other

13 pages of References

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GAMLA KAUPFÉLAGIÐ BREIÐDALSVÍK

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References of Research Articles linked to the Geology of Eastern Iceland

Alphabetical by
AUTHORS LAST NAME, published year. Title of publication. *Name of publisher* journals volume, pages.

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THANK YOU