

THE BRODIE CLUB



Established 1921

Website: <http://thebrodieclub.eeb.utoronto.ca>

THE 1,127th MEETING OF THE BRODIE CLUB

The 1,127th meeting of the Brodie Club, held on Tuesday, 2 November 2021, was the club's first meeting in its 100th year, and its first ever virtual meeting, held via Zoom.

Chair: Katie Thomas
Secretary: Ricky Dunn

The meeting began at 7:00 pm and was attended by 26 members and 1 guest.

Roll Call:

Present: E. Addison, R. Addison, Aird, Bell, Bertin, Bryant, Curry, Dengler, Dunlop, Dunn, B. Falls, Hussell, Hutchinson, Iron, King, Kortright, LaForest, Larsen, Martyn, Miller, Pittaway, Rapley, Rising, Seymour, Slessor, Thomas
Guests: Catherine Falls (guest of Falls)
Regrets: DeMarco

Minutes: Minutes of the previous meeting (February 2020) were accepted.

Committee Reports: Business items were moved to end of meeting to accommodate speaker.

SPEAKER

Katie Thomas introduced the speaker. Stephen Morris is an almost-emeritus professor of Physics at the University of Toronto. His research involves experiments on emergent patterns in fluids, granular media, ice formations and fracture. He is also interested in natural patterns, and in the history of physics. In his younger days, he appeared intermittently on the Discovery Channel. He has sometimes passed off his scientific images as art.



Giant's Causeway (Ireland)

Cracking the Giant's Causeway or how to solve a 300 year old geology problem using kitchen materials

Most of us are familiar with basalt columns such as the Giant's Causeway in Ireland, but Stephen took on a photographic tour of examples from all over the world – and even from the planet Mars.

Basalt columns are striking in their regularity and size; often a meter in diameter and tens of meters tall. Legends abound in how these were formed, but only recently have the physics been worked out in detail.

Columnar jointing in basalt results from cracking vertically as a lava flow cools. The surface shrinks and cracks as it cools, usually into hexagonal shapes, but shapes with 5 or 7-8 sides are not uncommon, and even the odd square is formed. Surface cracks then propagate downward as the lava continues to cool. Short sections that have reached the same temperature may crack suddenly (sometimes even audibly), leaving boundary marks between cracking events that can be seen as horizontal striations on columns (photo). If the top portion is cooled rapidly, (especially by water) there may be disordered structure at the top, forming an ‘entablature’ above the columns.



Striated columns (Armenia)



Entablature atop columns (Iceland)

Studies that help explain why the columns are typically hexagonal have been conducted using other materials, some of them by scientists who spend their time watching mud dry. Analysis of time-lapse films has shown that the first cracks in drying mud are typically long, curving tracks across the surface. Further drying leads to formation of cracks at right angles to the first ones, joining up parallel cracks into ladder-like strings of 4-sided shapes. Then, as the mud goes through repeated cycles of rewetting and drying, the T-junctions where cracks initially met tend to break down and reform at a slant, in effect smoothing the squared corners and causing the shape to tend toward hexagonal – the shape you get if you diagonally slice off each corner of a square. The same process of episodic cracking is the cause of patterned ground found in areas of permafrost that repeatedly thaw and refreeze. It has even been found in Nile crocodiles, whose thick skin on the head and face repeatedly cracks and heals as the animal grows, resulting in unique patterns of facial scales.

Stephen and his students have done a lot of work on the dynamics of column formation using cornstarch as their study material. Writings of Thomas Huxley in the 1800s mention that household starch can form hexagonal columns when it dries out, but it is only now that laboratory procedures allow a close look at the way this works. In a long series of experiments, small blocks of wetted cornstarch were placed on a scale and dried at rates and heat levels controlled by a computer. Series of blocks that had reached different stages of column formation were subjected to X-ray tomography. When data were all put together, it was found that rate of cooling was a key feature in column formation, but also the amount of water left in the sample. The reason that cornstarch forms columns as it dries when so many other materials do not is because water does not



Cornstarch columns, c. 1 mm

diffuse well among cornstarch grains. The grains are ‘sticky,’ preventing the water from dispersing throughout. There is a threshold of water content and heat at which columns form, rather than there being a continuous and smooth transition to that state. Columns could be small at one end and large at the other, only forming at uniform diameters if the drying rate was constant.

Questions asked of the speaker have been incorporated into the account. The speaker was thanked by Trudy Rising, and by all of us present as the speaker signed off.

CLUB BUSINESS

Given that this was the first meeting in 19 months of pandemic restrictions and committees have lapsed, we discussed future options. General conclusions and decisions taken by the group were as follows.

Dues will not be collected for now, as we have sufficient funds and few expenses. We have not been asked to continue our usual support for an attended to Ontario Nature’s annual youth conference, as that event was run virtually.

We want to continue meeting as a Club, which will require people to lend a hand when called upon. Next steps as understood by the Recording Secretary are that Katie will circulate a list of potential speakers she has on hand, asking for additional suggestions, including offers by members to speak. The idea is to call for a volunteer to take on each potential speaker, making contact and arranging a date. Notices of arranged meetings will include calls for volunteers to chair, take minutes, introduce and thank speaker – all the things we used to do on the spot at physical meetings but which now need to be arranged ahead of time.

We hope to arrange another meeting for January.

OBSERVATIONS

Kevin announced that the ROM is opening its new ‘Dawn of Life’ gallery on 4 December, which will cover Burgess Shale and other subjects from before the days of dinosaurs.

Trudy reported a second leafing of oak trees in late summer and asked if anyone knew why and how often that happens. On 6 Nov., Ricky found a Jack-in-the-Pulpit that had a fresh pulpit and ‘jack,’ something normally seen only in spring. Does anyone know how common this sort of ‘spring recap’ happens?

Trudy also noted lots of caterpillar damage to White Pines this year, and a complete lack of cones. Unlike pines, spruce trees in southwestern Ontario were impressively laden with cones this year and Ricky predicted that 2021-22 should be a strong irruption year for finches and nuthatches.

Ricky recommended a very readable and informative book by Isabella Tree, titled ‘Wilding: the return nature to a British farm’(see review [here](#)).

Oliver had observed large flocks of migrating Turkey Vultures, and reported higher proportions of pale brown, ‘blond’ cormorants than he remembers seeing before.



Jean gave an account of the Groove-billed Ani seen near Stratford, for which viewing was very well organized and managed. The bird was so tame it occasionally foraged among the feet of the viewers.

Bonus photo: Warren Dunlop, his sister and various other relatives at Giant's Causeway c. 1968!



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