

## COMMENTS ON DR. DEMOREST'S PAPER\*

By J. W. GLEN

(Cavendish Laboratory, Cambridge \*\*)

THE process of instantaneous recrystallization described by Demorest in this paper represents an attempt to explain the deformation of a polycrystalline mass of ice. Such a mass, in which the basal glide planes are not parallel in all the various ice crystals, is similar to a polycrystalline metal, particularly one with a hexagonal structure such as zinc or magnesium. In a metal in which mechanical twinning is not the chief deformation process, the deformation can occur in two ways, either by deformation of the various grains by slip along their respective glide planes or by relative movement of the grains. In the first process, the slip of one grain will impose forces on the neighbouring grains and these will set up a series of internal stresses, while the second process can only occur if the grain boundaries are smooth and regular or if molecules transfer from one grain to the other, thus making the grain boundary appear to move through the material.

Now it is well known in the case of metals that if after (or during) straining the temperature is raised high enough, the process known as recrystallization occurs. In this process (on which an excellent summary article has recently been written by Burke and Turnbull<sup>1</sup>) new unstrained grains appear and grow at the expense of the strained grains, the final grain size depending on the number of nuclei formed and their rate of growth. There seems little doubt that this process occurs also in ice, and that the change of appearance of glacier ice is due to this process.

Thus the modern view agrees with Demorest's reasoning except in so far as Demorest imagined an instantaneous appearance of the new strain-free grain, whereas recent experiments have shown that such grains grow at a definite, and sometimes quite slow, rate.

## REFERENCE

1. Burke, J. E., and Turnbull, D. Recrystallization and grain growth. *Progress in Metal Physics*, 3, Pergamon Press, London, 1952, p. 220-92.

REPORT ON THE SNOW SURVEY OF GREAT BRITAIN  
FOR THE SEASON 1951-52

By E. L. HAWKE and D. L. CHAMPION

THIS Report is based, as usual, mainly on data contributed by a corps of keen volunteer observers who supply the Society each month from September to May with daily records of snowfall and of any snow cover within their range of vision. These collaborators, who now number more than 300, keep their watch at a network of land sites well spread over England, Wales and Scotland, on light-vessels in the neighbouring coastal waters, and on merchant ships at sea. The very extensive body of material thus obtained is supplemented by day-to-day observations of the state of the ground at a large number of the weather stations which furnish regular returns to the serial publications of the Meteorological Office. This important information is made available to the Society through the courtesy of Sir Nelson K. Johnson, Director of that Department. Further valuable data come from mountaineers and travellers, as well as from the road patrols working for the Automobile Association and the Royal Automobile Club. The directors of the Survey again

\* See p.219.

\*\* Now at Metallurgy Division, Atomic Energy Research Establishment, Harwell, Berks.

(Continued on p. 222)





express sincere gratitude to all who by their co-operation have laid the foundations of this Report—the private observers, the Director of the Meteorological Office and his staff, the Elder Brethren of Trinity House and the Commissioners of Irish Lights with their lighthouse and lightship personnel, the shipping companies and the masters of their vessels, the climbers, the travellers on the roads, and the numerous casual informants. Special reference should be made to the valued services of Mr. T. J. Ransley (Fort William) and Mr. Peter F. Green (Holmside, Co. Durham) in taking careful note as opportunity offered of snow conditions on Ben Nevis and on the Cairngorms respectively. The detailed descriptions of the monthly incidence of snowfall and snow cover on the British mainland that have hitherto appeared in these reports are replaced on this occasion by a table presenting abstracts of the observations at about 60 selected stations for each month from October to May (Table I).

E. L. H.

#### METRIC EQUIVALENTS OF INCHES AND FEET

1 in. = 0.025 m.	1 ft. = 0.305 m.
3 in. = 0.076 m.	2 ft. = 0.609 m.
6 in. = 0.152 m.	4 ft. = 1.219 m.
100 ft. = 30.5 m.	2500 ft. = 762.0 m.
500 ft. = 152.4 m.	3000 ft. = 914.4 m.
1000 ft. = 304.8 m.	3500 ft. = 1066.8 m.
1500 ft. = 457.2 m.	4000 ft. = 1219.2 m.
2000 ft. = 609.6 m.	

In general, measurements of snow-depth cited in this Report refer to 09.00 hr. G.M.T., or thereabouts.

#### SUMMARY OF THE 1951-52 SEASON

Over Great Britain as a whole the season ranked as one of moderate snowfall. Records from the ten representative stations at altitudes between 400 ft. and 1200 ft. (five in England, one in Wales, four in Scotland) that have been used for inter-seasonal comparison since the re-institution of the Survey in 1946 give an average of 34 days with snow lying from September 1951 to May 1952. During the same nine months the corresponding figures of previous seasons were 66 in 1946-47, 26 in 1947-48, 13 in 1948-49, 15 in 1949-50 and 54 in 1950-51. There were few snowfalls of outstanding intensity at low and moderate levels in 1951-52. The most notable were those of late January in Scotland, northern England and North Wales and that of *March 29th-30th* in the southern English midlands. From *January 24th to 28th* Glen Shiel (Ross and Cromarty) had a 20-24 in. cover at 500 ft. and drifts 24 ft. deep at 1000 ft. On *March 30th* drifting to 15 ft. in the Cotswolds and to 12 ft. in the Chilterns was reported after a blizzard accompanied by north-easterly gales. No part of Britain appears to have escaped snow at one time or another during the season, though here and there in the Devon-Cornwall peninsula it occurred on one day only. Complete absence of cover was, however, not uncommon in that corner of the country.

#### BRIEF NOTES ON THE MONTHS

##### SEPTEMBER 1951

Sleet was observed at Fairhaven, Lancashire, down to sea level on the *24th*. Many small but thick snow patches left from the previous season's snowfall survived throughout the month on Ben Nevis. On the *30th* the largest of these, below the main crag in Observatory Gully, averaged about 150 ft. in length by 100 ft. in width and had an estimated depth of 9-10 ft.

##### OCTOBER 1951

Light snowfalls were widely distributed from the *20th to 22nd* at and above 500 ft. in Scotland, Wales and northern England. Some of the mountains bore a cover for several days. On the Fannich Hills (Ross and Cromarty) this lasted from the *20th to 27th*, extending to base level on the *22nd*.

## NOVEMBER 1951

Snow was rare during this very mild month except on the higher mountains. A few stations in Ross and Cromarty had a 3 in. cover down to about 500 ft. on the 24th, as also did Chew Mount (Yorkshire) at 1600 ft.

## DECEMBER 1951

There were fairly frequent snowfalls on high ground, particularly in Scotland and North Wales, but as a rule they were of no great intensity. About the 10th and 11th average depths of 9 or 10 in. occurred locally at moderate levels on Scottish hills. Harthope (2250 ft.), Co. Durham, had 12 in. on the 9th and an accumulation of 18 in. on the 26th. Early in the month there were drifts exceeding 10 ft. in depth in corries at 1500 ft. on the Braes of Balquhidder (Perthshire).

## JANUARY 1952

Over the greater part of Britain this was a month of abundant snow. Falls were noted on as many as 26 days at Ardverikie (1000 ft.), Inverness-shire, and on 20 to 24 days at a number of upland stations in the northern half of the country. Cover persisted throughout the month at Ardverikie and on most of the higher mountains in Scotland. Among the maximum average depths reported were 24 in. at Glen Shiel on the 27th and at Wearhead (1104 ft.), Co. Durham, on the 31st. From the 24th to 28th there were drifts up to 24 ft. deep at 1000 ft. above Glen Shiel. Transport suffered serious interference from time to time. On the 20th lying snow or surface ice impeded road traffic in every county of England and Wales. The 28th brought to the Glasgow district a blizzard which produced some 40 casualties, at least six of them fatal.

## FEBRUARY 1952

Widespread and locally rather heavy snowfalls were frequent until about the 15th. Cover left by the storms of late January averaged 13 in. deep at Bwlchgwyn (1267 ft.), Denbighshire, on the 1st and 12 in. deep at Elphin (571 ft.), Sutherland, on the 2nd. There was drifting to 15 ft. at Harthope on the 2nd, to 14 ft. on some of the secondary moorland roads in northern England on the 4th, and to 20 ft. on Crossfell (2930 ft.), Cumberland, on the 9th. Snow lay on many of the northern mountains above 2000 ft. all through the month, and for 23 days at Hirnant (1250 ft.), Radnorshire. On three mornings during the first week a cover was reported at Ruan Minor, near Helston, Cornwall.

## MARCH 1952

Mild weather ruled until 25th, but from the 27th onwards snow was widely distributed each day, and on the 29th-30th many southern districts of England had the heaviest fall of the season. This reached maximum intensity in the Cotswold and Chiltern Hills, where average depths ranged upwards to 12 in. Some of the drifts on the 30th were estimated to be 15 ft. high near Stow-on-the-Wold, Gloucestershire, while several of about 12 ft. were measured on Dunstable Downs near Whipsnade (720 ft.), Bedfordshire.

## APRIL 1952

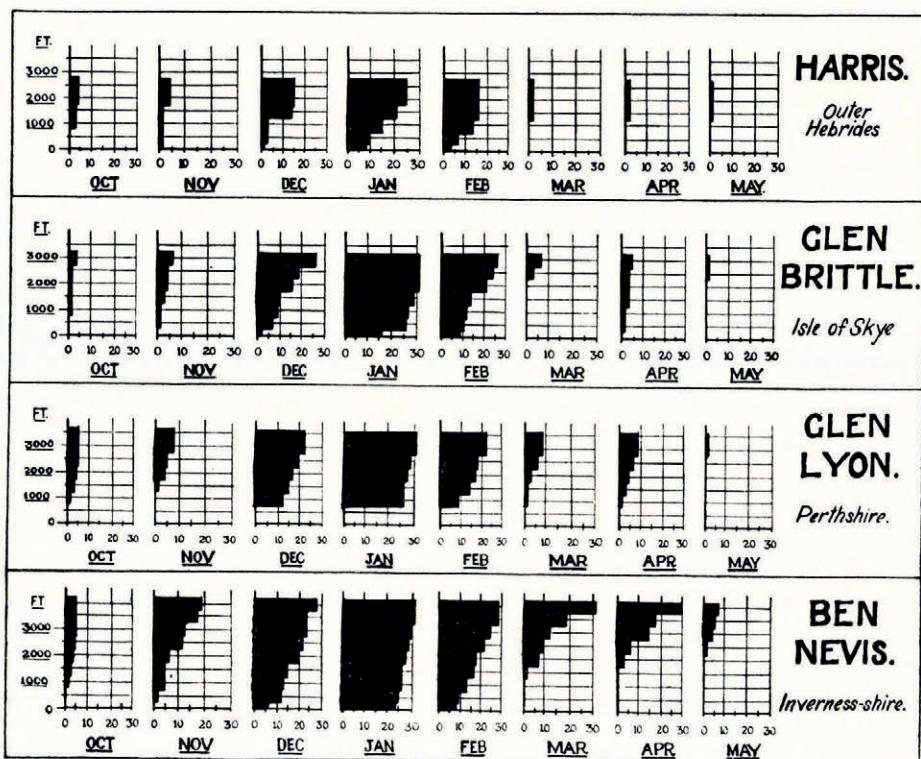
This was in general a notably warm month, and, except during the first few days, snow was mainly confined to the northern mountains. At low and moderate levels the greatest depth of cover reported was that surviving from the heavy falls in the southern English midlands at the end of March. Around Whipsnade drifts were still up to 11 ft. deep on the 1st, and the neighbouring road between the villages of Studham and Dagnall was blocked by big drifts until the 4th. At Easter-tide (mid-April) cover on the Cairngorms was not continuous even above 3500 ft. The snow there was soft and "boggy," and the stretches of bare ground were sodden with melt-water. Ski races held in Coire Cas on Easter Sunday (13th) were run with difficulty.

## MAY 1952

Warm weather again predominated. There were occasional scattered showers of snow and sleet at low and moderate levels, chiefly in Scotland, but cover appears to have been restricted to the mountains. Despite the prevailing geniality of the spring, the Fannich Hills retained their winter coating of snow to below 2500 ft. throughout April and May.

## SUMMER 1952

The amount of snow that persisted into July on the higher Scottish mountains was a great deal smaller in 1952 than in 1951. On Ben Nevis the state of the beds and patches when spring merged into summer appears to have been much as it was four weeks later in the previous year. By *June 22nd* the summit of Ben Nevis was snow-free and all drifts had disappeared from around the

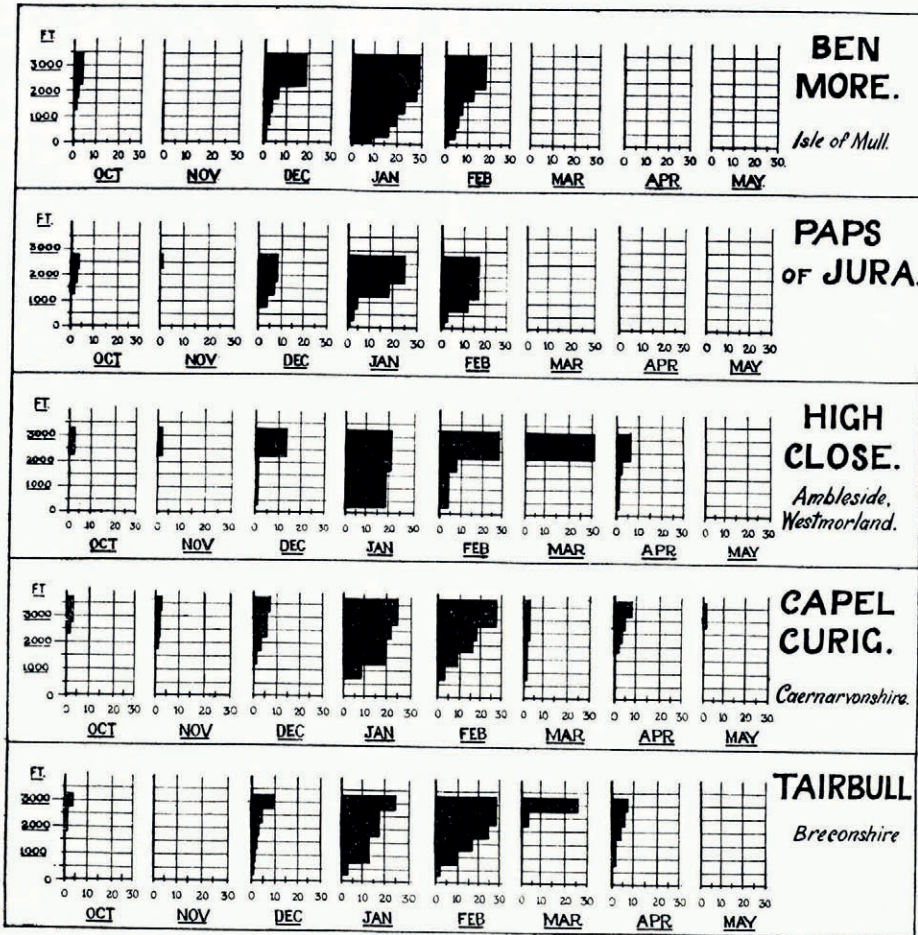


ruins of the observatory, although some remained inside. A very warm spell during the second half of July produced rapid shrinkage of the main accumulations in the gullies. On *August 18th* the lowest patch lay at a height of about 2300 ft., between Observatory Ridge and Observatory Buttress; from a distance it was estimated to have an area of approximately 900 sq. ft. This patch was still in being, though with reduced dimensions, on *September 14th*, ten days after the first real snowfall of the autumn (there had been some sleet on *August 3rd*). Early on *September 18th* a second fall brought the snow line temporarily down to 2000 ft.

On the Cairngorms numerous snow-beds of substantial size and depth were observed during the later stages of the summer, although none of them was comparable for area with that found on the east face of Ben Macduh towards the close of July in 1951 (see Fig. 2 in the 1950-51 Report).\*

\* Journal of Glaciology, Vol. 2, No. 11, 1952, p. 38.

A photograph taken from above Loch Etchahan on *July 5th, 1952* of the same side of the mountain shows only a few snow patches, the lowest lying at 3600 ft. On *July 12th* snow showers came to Ben Macdhui and sleet to Lairig Ghru. On *July 30th* fairly extensive accumulations still occupied the corries between Braeriach and Cairn Toul—chiefly gully-fillings, some of them more than 10 ft. thick. The Braeriach plateau was free, however, and the stream from the Wells of Dee was not bridged at any point in its descent to the corrie. As on Ben Nevis, the first appreciable snow-fall of the autumn reached the Cairngorms very early in September, at which time a number of the previous season's beds were still in existence. On *September 17th* snow fell almost continuously above 2600 ft.; by the morning of the *18th* it was about 4 in. deep at 3000 ft. with many drifts.



The Fannich Hills became clear of cover on *June 19th*. "Snow lying" to a depth of several inches was reported and photographed at Orton, on the Spey near Fochabers, Morayshire, on *August 15th*, but from the meteorological conditions prevailing in Scotland at the time it seems certain that this deposit must actually have been some form of hail.

E. L. H.