

# BERGY BITS AND GROWLERS

## 1. BULLET-SHAPED ICE CRYSTALS

By V. von Brunn

In a recent article in the *Journal of Glaciology* (1965) Anthony J. Gow of the U.S. Army Cold Regions Research and Engineering Laboratory, New Hampshire, commented on the origin of bullet-shaped ice crystals at the South Pole. He suggests that "... the bullet crystals originate as clusters of prismatic columns attached to some central seed or nucleus. Individual bullets are then formed as a result of the disintegration of this primary growth structure. The disintegration is attributed to a gross weakening of the structure caused by sublimation-evaporation at the centre of the cluster of bullets..." (p. 464). Gow also quotes U. Nakaya (1954, p. 50) who indicates that a bullet type of crystal is a column with a "pyramidal head like a rock crystal", which thus implies an independently crystallised form.

Amongst the various types of ice crystals examined and photographed at SANAE Base ("Norway Station") during 1960, were found numerous columnar and bullet-shaped forms, precipitated at temperatures ranging from  $-25$  to  $-35^{\circ}\text{C}$ . From these observations it was noted that there are at least two apparently related modes of origin of the bullet crystals:

1. Simple bullets, resulting from the separation into two halves of a single hexagonal prism (six-sided columnar crystal). A parting line develops across the middle of the column and becomes a constriction which both deepens and broadens. Weakening of the crystalline structure could thus be followed by breaking apart, or separation, of the two halves. Each of these bullet-shaped forms has a pointed tip, while the remaining part of the crystal has retained its perfect six-sided columnar form. On the various specimens examined no crystal faces (pyramidal faces) could be noted on any of the head (or pointed) ends. This supports Gow's observations, who, in discussing Nakaya's statement in his article, gives a series of photo-micrographs (p. 462, fig. 1) of bullet crystals to show that crystal faces are absent on bullet-heads, unless they have been destroyed by sublimation processes. It is therefore apparent that bullet-shaped ice crystals have not crystallised independently as such.

2. Composite bullets (which have repeatedly been observed in different parts of Antarctica (e.g. Liljequist, 1956), are shown by Gow in photo-micrographs in fig. 2 (p. 463) of his article. These forms consist of a cluster of 3 to 6 bullets attached to each other at their tips (or heads). In his paper Gow points out that Nakaya (1954, p. 53) postulates "that these compound forms are formed by an actual gathering together at their heads of two or more separately crystallised bullets..." (p. 463). Gow suggests, however, that a radiating cluster of crystals may grow from a compound nucleus or "central seed". Radial growths of this nature are observed in the symmetrical star-type crystals where axes or arms originate from a common central nucleus.

An excellent opportunity for the study of the various stages of formation of composite bullet crystals over a nine-hour period was afforded at SANAE Base during a snowfall on 4th August, 1960. Amongst the precipitating hydrometeorites were noted, first of all, simple columnar forms with a symmetrical internal air-bubble-inclusion pattern. Other columnar crystals again showed the development of a constriction across the middle, while the internal air-bubbles appeared to be migrating towards the basal (tail) ends

of the columns, where cavities or hollows were formed. A symmetrical pattern of the air-bubble-inclusions on either side of the constriction was retained. At a further stage, secondary, smaller columns began to develop at the deepening constriction of the parent (host) crystal. The ends attaching them to the latter were distinctly pointed, thus simulating other bullet forms. Unlike the regular axes of the symmetrical star crystals, the secondary columns (or bullets) showed a differential rate of growth in different directions giving thus an asymmetrical appearance to the composite bullet-aggregate. Upon disintegration (perhaps due to impact) individual bullets constituting such body, become separated from their common centre.

From these observations it has become apparent that the composite bullet forms develop from a parting column, rather than from a central nucleus, as suggested by Gow. However, further research work, aided by a Universal Stage microscope, could possibly indicate whether or not some "nucleus" forms at the point of constriction of a parting columnar crystal, and would also throw some light on the mechanism of composite bullet growth.

## REFERENCES

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- NAKAYA, U.: Snow Crystals. Cambridge, Mass., Harvard University Press, 1954.
- VON BRUNN, V.: Glaciology: Provisional notes on the accumulation of snow at Norway Station, Antarctica 1960. W.B. News letter, No. 149, 1961.

## THE R.S.A. VISITS GOUGH ISLAND AND TRISTAN DA CUNHA

By A. B. Crawford

The Department of Transport's supply vessel R.S.A. left Cape Town for Gough Island on 13th April, arriving at 0700 on the 20th. Five days were spent off the island waiting for an improvement in the weather before offloading could begin, and on one day over six inches of rain fell in five hours.

By the 28th the mission was completed, and Mr. Louis Naude, the returning officer-in-charge, his six men and twelve flightless rails were safely on board, the latter destined to the Pretoria Zoological Gardens.

On this occasion the R.S.A. was also on part-time charter to the British Government and on the following day arrived at Tristan da Cunha to offload 200 tons of cargo mainly for the building of the new harbour. Fine weather is at present essential for offloading operations on the exposed N.W. coast of Tristan da Cunha and it was two weeks before the bulldozer, excavator, two dump trucks and all the rest of the cargo could be successfully put ashore. Also on board were Mr. G. Whitefield, the new Colonial Office Administrator, a Pakistani doctor and a diesel engineer, and when the R.S.A. left for Cape Town on 12th May the returning Administrator, Mr. Day, together with the doctor were all safely on board. After a reasonably uneventful passage back, R.S.A. docked in Cape Town on 18th May.