

## OUT OF OLD BOOKS

By HELEN SAWYER HOGG

### BLUE SUN

Inhabitants of southern Ontario were startled on Sunday, September 25, 1950 at a brief glimpse of the sun as a pale, bluish-mauve disc. At the same time the western sky became a dark, terrifying mass of cloud and haze, as though a gigantic storm were approaching, while to the north and east the sky toward the horizon was a clear steel-blue. The darkness was so marked at 3:30 in the afternoon that the writer observed a group of six wild ducks going to sleep quietly in the middle of a pond, with their heads nodding or tucked under their wings.

On the following day, Monday, September 26, the celestial phenomena were remarkable in a heavy haze or dry fog which permeated the whole sky. In the afternoon for several hours, at least in the region around Toronto, the blue-mauve sun could be seen in the heavens, casting no shadow and shining without rays.

We learned on Sunday even as the eerie darkness descended, that all this was attributable to smoke from heavy muskeg fires in distant Alberta, two thousand miles away. In subsequent days the smoke pall moved eastward, causing similar phenomena to be seen in eastern Canada and the United States, and in the British Isles several days later.

It should be noted that this remarkable apparition of a blue sun was missed by many people. Since the light was so dim, a casual observer would think that the sun was completely obscured. Only if one's glance was directed to the sky was one rewarded with a sight which few of us had ever previously seen. Many people for the first time became acquainted with the fact that the old expression "once in a blue moon" had a basis in scientific fact, designating an event which is likely to occur only once in a lifetime.

Unfortunately the haze and clouds were so heavy that the eclipse of the moon was clouded out in the Toronto region except for occasional glimpses, and no blue moon was observed here.

Now that we have had the good fortune to experience a blue sun, it is interesting to look back at other records of coloured appearances of the sun or moon. Reference to a blue moon has already

been made in this column, (this JOURNAL, vol. XL, p. 164, 1946) in connection with the great explosion of Krakatoa in 1883, which gave the world the greatest spectacle of coloured suns and moons that has ever been recorded. These reports were gathered together and summarized in the splendid volume "The Eruption of Krakatoa, and Subsequent Phenomena," the Report of the Krakatoa Committee of the Royal Society, London, 1888. A whole section of this volume, by Mr. E. Douglas Archibald, is devoted to "The Blue, Green, and Otherwise Coloured Appearances of the Sun and Moon in 1883-84."

The violent eruption of Krakatoa occurred on August 26-27, 1883. The weird and beautiful sky phenomena resulting from the cloud of dust and ash hurled into the atmosphere lasted for many months over most of the earth. The coloured suns and moons, however, were confined to the tropical regions, and were remarkable in that the appearances of the blue sun travelled around the earth from east to west in thirteen days, making two complete circuits of the world before the dust had dissipated in the atmosphere. The sun was not constant in its colouring. Though it was usually described as green or blue in the tropical regions, metallic descriptions were also applied to it, as coppery, silvery, or leaden. In the above-mentioned section we read that

It appears that the "blue" sun was chiefly seen at great distances from Java. - - - The "green" sun was visible at first only in the Indian Ocean, but afterwards more generally than either of the other colours, and finally the "silvery sun", when at a high altitude, appears to have been almost entirely confined to a narrow zone near the Equator, and more especially on its southern side. If to this we add the cases in which the sun appeared coppery, dim, and sensibly obscured, we find that they were all close to the Equator in each hemisphere.

At any one place the colour of the sun was not necessarily constant during the day, but varied markedly with altitude. A fine description of this phenomenon is given by a Government officer who was travelling in Ceylon from Mannâr to Trincomalee, September 12th, 1883.

The sun for the last three days rises in a splendid green when visible, *i.e.*, about  $10^\circ$  above the horizon. As he advances he assumes a beautiful blue, and as he comes further on looks a brilliant blue, resembling burning sulphur. When about  $45^\circ$  it is not possible to look at him with the naked eye; but even when at the zenith the light is blue, varying from a pale blue to a light blue later on, somewhat similar to moonlight, even at midday. Then, as he declines,

the sun assumes the same changes, but *vice versa*. The moon, now visible in the afternoons, looks also tinged with blue after sunset, and as she declines assumes a very fiery colour  $30^\circ$  from the zenith.

In the same volume the Hon. Rollo Russell traces the geographical course of the coloured suns, as well as of the peculiar sky glows, and shows how the coloured sun phenomena actually circled the earth twice, going from east to west with velocity of more than seventy miles an hour. The first records of a green sun came from Batavia and Ceylon on the 27th of August and must have been caused by a heavy current of thick dust, moving northward from the eruption.

The mass of the ejecta was carried with great velocity westwards and south-westwards at a very high level. - - - The green sun of the 27th at Ceylon and Labuan lasted only a short time, and was not generally observed in any large area. In fact, the absence of green or blue suns in the Indian Ocean before September 8th deserves particular notice. - - - On September 1st the blue sun band extended across the Atlantic from east to west, reaching even to Guayaquil at  $80^\circ$  W. in the latitude of  $2^\circ$  S.; and between  $12^\circ.7$  S.  $27^\circ.3$  W. and  $10^\circ 40'$  N.  $26^\circ 30'$  N. in the mid-Atlantic. - - -

On September 2nd the whole northern part of South America, between the Antilles and Peru, and between Panama and Paramaribo, seems to have had a blue sun; - - - South of the Equator there is little mention of a blue sun, but much of a persistent grey haze in the upper air. - - - On September 5th the zone of blue or green sun in the Pacific reached as far north as  $21^\circ 30'$  N. for a short time, and southward at least as far as  $13^\circ 17'$  S., and in breadth was wider than hitherto. - - - From September 9th to 12th a green or blue sun was visible over a great part of India.

There can be no doubt, from a comparison of the data given in the general list, that the blue sun and yellow haze passed round the world from east to west in a gradually widening zone, and that the matter concerned in producing them was unequally distributed in clouds or streams of different density. The wonderful red twilights were seen only where the haze was much thinner, either before the dense main cloud of matter covered the sky, or after it had passed, or at its edges on the northern and southern borders. - - -

The denser part of the main cloud of matter in the first circuit, causing a blue, green, or silvery sun, and a yellow or white haze, covered a much narrower area than the after-glows. In the Indian Ocean it seems to have extended from Diego Garcia to the Seychelles on August 28th—that is, between  $20^\circ$  S. and  $5^\circ$  S., and probably some degrees further north; in the Atlantic, between  $10^\circ 40'$  N. and  $14^\circ$  S., and in the Pacific between  $10^\circ 19'$  N. and  $13^\circ 17'$  S. - - -

On September 9th when the main cloud of matter had reached India after a circuit of the earth, its breadth appears to have been greater in the northern than in the southern hemisphere. A green sun was visible over Southern and Central India on September 10th. - - - On September 22nd the green sun had returned to Southern India after a second circuit of the globe, and lasted two

or three days as before. After this no well-attested observation of a green or blue sun, except at Duem,  $14^{\circ}$  N.  $32^{\circ}$   $30'$  E. on September 24th, when it rose green, and at  $9^{\circ}$  S.  $35^{\circ}$  W. on September 28th, when it set pale blue, occurs in any contemporary record. - - -

On the whole, the tendency of the matter causing the twilight phenomena was to spread northwards and southwards as well as westwards during the rapid circuit of the blue sun matter from east to west within the tropics. - - - We find the northern limit near the end of the first circuit to have been about  $22^{\circ}$  N. at Honolulu, or  $28^{\circ}$  north of Krakatoa, and the southern limit about  $33^{\circ}$  S. at Santiago, or  $27^{\circ}$  south of Krakatoa. - - - At the end of the second circuit, about September 22nd, the glows may be roughly stated to have extended from between  $20^{\circ}$  and  $30^{\circ}$  N., to between  $30^{\circ}$  and  $40^{\circ}$  S., but their distribution was not regular within these limits.

This volume also tells of other instances of coloured suns more local in nature. Mr. Archibald remarks that he witnessed a blue sun produced experimentally by Professor Kiessling of Hamburg from a cloud of chloride of ammonium, and from aqueous vapour mixed with ordinary dusty air. He lists several appearances of a blue sun due to dust storms in the Sahara and in central Asia, and at a plant in Eastbourne, England where fine dust rising from stone-crushing operations gives the sun a blue tinge. We might also note that persons living on this continent in the midst of prairie dust storms have seen the sun as a clear pale blue.

Records of blue suns seen over widespread parts of the globe, however, are quite rare. The table near the end of the Krakatoa volume lists all known volcanic explosions since 1500, and unusual atmospheric phenomena. In general there is a close correlation between the two. Records of red and coppery suns and brilliantly coloured twilights are relatively common, but widespread reports of the blue, green, or rayless sun are few in number. Twice before the explosion of Krakatoa in 1883 are there numerous records of a rayless sun, both times after gigantic volcanic explosions. The first was in 1783, the year of two great eruptions, one of Asama, Japan and the other of Skaptar Jökull, Iceland. Again in 1831 was the sun seen as rayless, or blue or violet. There were three major eruptions in this year, as well as several smaller ones, those of Graham's Island, Babujan Islands, and Pichincha being exceedingly noteworthy. In this year, on August 4, at Canajoharie, New York

The sun at 5 p.m. was dim and violet. At Albany, from August 12 to 31, the western sky was deep red after sunset. One afternoon the sun was pale, like the moon, and slightly green. - - -

The extraordinary dry fog of 1831 was observed in the four quarters of the world. It was remarked on the coast of Africa on August 3, at Odessa on August 9, in the south of France and at Paris on August 10, in the United States on August 15, etc. The light of the sun was so much diminished that it was possible to observe its disc all day with the unprotected eye. On the coast of Africa the sun became visible only after passing an altitude of  $15^{\circ}$  or  $20^{\circ}$ . M. Rozet, in Algeria, and others in Annapolis, U.S., and in the south of France, saw the solar disc of an azure, greenish, or emerald colour. The sky was never dark at night, and at midnight, even in August, small print could be read in Siberia, at Berlin, Genoa, etc. On August 3, at Berlin, the sun must have been  $19^{\circ}$  below the horizon when small print was legible at midnight.

Because of the recent blue sun, the unexplained appearance of a blue sun in 1821 takes on added interest. The authors of the Krakatoa volume could find no volcanic explosion to account for it, and apparently did not look for any other cause.

On August 18 a blue sun, seen in London, Sussex, Worcester, etc. There was a haze and the sun looked like quicksilver. At 9.20 on August 18 the blue sun was observed by a great number of persons in the streets. It lasted about half an hour. The atmosphere on the following days was hazy. At Paris, on August 18, the sun at 5 p.m. was enfeebled by dense vapours, and absolutely white.

I suggest that this unexplained blue sun may have been caused by a heavy forest fire on this continent, just as the blue sun of 1950 was so caused. The middle of August is in the forest fire season. I have hunted some early Canadian records for the year 1821 with the hope of finding a reference to such a fire. None has yet been found, but it is possible that one of our readers might come across one. In those early days, however, the burning of some one's shed was thought more worthy of record than the burning of a vast forest.

However, on the microfilm copy of the *Kingston Chronicle* for August 17, 1821, in the University of Toronto library, we read that the weather during the last three weeks has been uncommonly dry as well as oppressively hot. The ground is parched, and the vegetables in the garden droop and wither from the want of moisture.

Over a certain section of Canada, then, conditions were certainly ripe for a fire which might have caused the blue sun of 1821.