SOUND

Two distinct sounds accompanied the passage of the meteor. One of these was the explosive noise often heard in this connection. This sound was of such intensity as to distinctly jar the buildings and to cause the rattling of windows at localities over an area approximating forty miles in east-west by sixty miles in north-south direction. The time required for this explosive sound to reach the earth varied from possibly thirty seconds for those immediately under the meteor at the termination of its visible course to one and a half or two minutes for those at a distance of fifteen or twenty miles from its overhead position. Aside from the intensity no other unusual features are reported in connection with this explosive sound.

The second sound reported to accompany the meteor is wholly unexplained, and this note is written chiefly for the purpose of recording these reports. This unexplained sound is described as a whizzing and whining sound and as like the passage of a skyrocket through the air, and as a "shhh" sound. In all instances this sound is reported as having occurred instantaneously with the flash of light. Reports of this noise come from observers at various places, some being as much as two hundred miles apart, and one hundred miles or more away from the locality where the meteor was overhead. The following observations indicate how definitely this noise is reported. The distances given in the following notes are from Laguna, near which place the meteor was overhead. An observer at Leakey, twenty-five miles northeast of Laguna, states that at the time of the appearance of the meteor he was repairing a wire fence and was stooping over close to the ground fastening the lower wires of the fence. In this position he heard distinctly a whizzing sound which he at first supposed to be made an aeroplane with the engine shut off preparatory to lighting in an aeroplane field nearby. Upon looking up, however, he saw the flash of the meteor. An observer at Hondo, about fifty miles east of Laguna, says: "I saw it fall, but would not have seen it had I not been attracted by the sound it made. It sounded 'shhh,' and shot across the sky from southeast to northwest." A lady driving southeastward by car some seventy-five miles northeast of Laguna writes: "My husband, daughter and myself were driving from Kerrville to San Antonio that Saturday afternoon. I heard a buzzing noise, and looking out of the car window saw a big ball of fire shooting across the sky in a northwest direction. I called my husband and daughter's attention to it and before they could get to the west side of the car the ball of fire was nearly all gone but they saw the sparks and smoke that it left behind." An observer at Winter Haven, sixty miles south of Laguna, says: "I was sitting with my back to the northwest when I heard a noise—a hiss or a whiz. A dog standing near growled and then barked." A lady at Uvalde relates that she was lying on the bed by her north window when she heard a "whining, whistling noise" which continued for a second or so before she looked up. Just after turning her head to look out of the window there was a long flash of light across the sky, so quick she was not sure at which end it began and at which it finished. She got the impression of two long, slender streaks of flame with a slit between them. Almost immediately after the flash, white smoke began to form along the line of the flash. The whining noise continued for an appreciable interval after the flash. The explosive sound of the meteor was heard one and one half or two minutes later. An observer near San Antonio, and about seventy-five miles east of Laguna, "heard a sizzling noise overhead and looking up saw a very brilliant object tearing through the air."

The writer has not been able to search the literature. However, in at least one previous instance a similar noise in connection with the fall of a meteor is recorded, this being a meteor which fell on October 1, 1917.[1] Since the rate of travel of a meteor is much in excess of the rate of travel of sound, it is impossible that the sound wave propagated in the usual way could have arrived coincidently with the light from the meteor. As already noted this noise is reported coincident with the flash at localities as much as two hundred miles apart. One must either consider some other possible explanation for the noise or must discard a considerable number of observations made independently, at various places and under varying conditions, all of the observations being in essential agreement. Any suggestions that may be made explaining such reported sound in connection with the meteor will be welcomed.

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OBSERVATIONS OF GREEN FLASH

FRANK T. DAVIES, physicist on board the *City of New York*, en route to the Antarctic regions with the Byrd Antarctic Expedition, reports as follows on a green flash observed off Bermuda on the evening of August 29, 1928: "At sunset a green flash was observed very clearly by the writer, Captain Melville and about six members of the crew. Meteorological conditions: Weather, fine; clouds, fairly high, stratocumulus about 0.3, nearly all circling around horizon and leaving western horizon clear except for smoki-

[1] J. A. Udden, "The Texas Meteor of October 1, 1917." University of Texas Bulletin 1772, page 45; also SCIENCE, December 21, 1918, pp. 616–17.

ness; wind southwesterly, freshening during night and bringing short-duration rain-squall from west at 4 A. M., August 30. Very smoky dull-red sunset; as sun was about five sixths set, it turned yellow and then merged into green for about two seconds before tip sank under horizon. It did not look to me like a flash but a definite change from yellow to green lasting about two to three seconds."

JNO. A. FLEMING

WINTER ACTIVITY OF THE ROOTS OF PERENNIAL WEEDS

IN a recent number of SCIENCE, F. J. Crider[1] recorded that roots of certain plants commonly thought of as having a dormant period in southern Arizona continued to grow throughout the cooler season. During the winter of 1924–25 at Iowa State College while the writer[2] was excavating roots of the Canada thistle (*Cirsium arvense*) for chemical analysis, he noted the behavior of the roots of this plant with reference to the activity of the buds upon the horizontal regenerative roots.

Buds which grew into shoots as long as the ground was warm continued to develop upon the horizontal roots of the Canada thistle from the middle of September until the middle of November. As these shoots appeared above ground they formed rosettes only, and did not send up stalks. When the rosettes were killed by frost early in November, those shoots which were still developing in the as yet unfrozen ground were unaffected. The part of the shoots between the roots and the surface of the soil in these fall shoots was, however, slender and delicate and sparsely covered with long black scales. The freezing of the soil killed these shoots quickly, and after the middle of December no uninjured shoots were found upon the roots taken from cold but incompletely frozen soil. Regions of underground stem that had been killed by temporary freezing of the surface of the soil were black and partly decomposed down to the depth of penetration of the frost, but were succulent below. In some cases they had died back to their connection with the horizontal root. No new shoots were formed in December, and the ground was frozen solid to a depth of 50 cm during the latter part of this month. On January 3, 1925, when more samples were being taken for analysis, the latent buds on the larger roots of the Canada thistle were noticeably increased in size over what they had been three weeks previously. The soil was frozen so that it had to be removed with a pick and mattock and taken to the laboratory to be thawed out. This made possible rapid and accurate observation of the root systems and conditions of the shoots upon the roots.

A break across the root at the point of attachment of the bud revealed ice crystals in the intercellular spaces, both in the root and in the bud. By the middle of January similar buds on other roots had developed into thick, vigorous, pointed shoots 15 to 20 mm long and 3 to 5 mm in diameter, with heavy, whitish scales completely covering the outside of the shoot. These were not fall shoots arrested by cold, because they were more than twice as large in cross section as the lower parts of the slender fall shoots which were still intact upon the same root and which were connected by black dead stems to the rosettes above. The new shoots had a free, sharp, growing point. The lower part of the shoots produced from September to November remained white because they were frozen during the cold period of December, 1924, and had had no chance to disintegrate.

According to Lund and Rostrup,[3] who have made an exhaustive study of the root systems of this plant, the roots of the Canada thistle radiate from a downward bend of a regenerative and storage root. They grow horizontally for one to two meters before they too turn down. This process is repeated several times in a season. The observations of Lund and Rostrup have been found to hold for the conditions of the United States as well as Denmark, but these authors seem to have made no study of the roots during the winter and hence failed to note the development of the buds upon the roots, or the new horizontal roots upon the old storage organs.

On February 3, 1926, new, light-colored, horizontal roots only 1 to 1.5 mm in diameter and 10 to 20 cm long were found upon old roots, and upon the newer downward bends of the last roots of 1924, where they had been entirely absent from similar roots in December, 1924. At this same time, February 3, the shoots were from 4 to 7 cm long and from 5 to 7 mm in diameter, greatly exceeding the size of the shoots on the roots taken in January from the frozen ground. There were also more buds on the "kinks" of the horizontal roots. The shoots and roots were succulent when not frozen, and when frozen were full of ice crystals in the intercellular spaces. The remaining parts of the fall shoots quickly blackened upon thawing and were not turgid. The horizontal roots which

[1] F. J. Crider, "Winter Root Growth of Plants," SCIENCE, 68: 403–4, 1928.

[2] Charles F. Rogers, "Carbohydrate Metabolism in the Roots of the Canada Thistle." Thesis, Iowa State College, 1925.

[3] Samsøe Lund, and E. Rostrup, "Marktidselem, *Cirsium arvense* en monografi." *K. D. Vidensk. Selsk. Skr.*, 6R, n–m. Afd. X, 3: 1–152. 1901. Résumé en française, pp. 153–165.