

theory⁶, the thermal expansion contains the factor $-\delta\theta/\delta V$. For increasing volume, s becomes negative and then becomes zero. At very small densities it may therefore give a positive contribution in $\delta\theta/\delta V$. So the thermal expansion might become negative for very small densities.

Although the formula only holds for crystals, this might still be an indication of how the negative expansion coefficient of 'liquid' helium II is to be explained.

A detailed account will be published in *Physica*. My thanks are due to Dr. A. Michels for stimulating discussions.

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¹ NATURE, 133, 529 (1934); 138, 244 (1936).

² Proc. Roy. Soc., A, 153, 576 (1936).

³ Z. phys. Chem., B, 30, 237 (1935).

⁴ W. H. Keesom and A. P. Keesom, *Physica*, 3, 105 (1936).

⁵ Simon und Lange, *Z. Phys.*, 15, 307 (1923).

⁶ "Vorträge über kin. Theorie der Materie."

Electrification of a Roof during a Thunderstorm

A LETTER from my daughter in Jamaica refers to her house being affected electrically in a curious manner. She was sitting on the verandah during a thunderstorm when she heard "a funny sound like the buzzing of a bumble-bee", and saw that the verandah gutter was emitting sparks and smoke.

Running to the kitchen to get a bucket of water, she found the legs of the stove, where they rested on the stone floor, spluttering sparks. She threw a bucket of water on them, and in doing so "got quite a bad shock and the bucket was torn out of my hands". On returning to the verandah, the gutter was still emitting sparks.

The explanation of this affair appears—from my knowledge of the house—to be as follows. The roof—its ridge about 25 ft. above the ground—is of galvanized iron, and is insulated from 'earth' except via the kitchen stove funnel. The guttering is fastened to wooden verandah pillars and normally is not in contact with the floor. The single down-pipe of the guttering leads to a water tank and presumably is earthed.

I imagine that what occurred is this: somehow the partially insulated roof became charged as one plate of a condenser, and the charge, being insufficient to break through the resistance to earth in one discharge, leaked away gradually via the weak contact of the stove legs with the floor and also via the small gap between the roof and the gutter. The shock my daughter got was obviously due to the thrown water forming another channel for discharge via the bucket and herself.

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Points from Foregoing Letters

DR. BROOM has now prepared a description, with diagrams, of teeth belonging to the fossil skull, *Australopithecus transvaalensis*, described by him in NATURE of September 19, p. 486. It will be recalled that the skull was found at Sterkfontein, Transvaal, and is of presumably Upper Pleistocene age. The teeth differ from those of the chimpanzee and resemble those of man in many respects.

A photograph of a fossil wing-cover of an insect from the Upper Triassic of Queensland, showing transition from characters of the order Homoptera to those of Heteroptera, is submitted by Dr. R. J. Tillyard. The bed from which it was obtained is rich in insects; some two hundred specimens belonging to various orders (Homoptera, Coleoptera, Trichoptera, etc.) have been found in less than a cubic yard of shale.

A continuous land-bridge must have stretched in Permian to Middle Carboniferous times from the Gondwanaland (the Palaeozoic continent which spanned the South Atlantic and Indian Oceans) northwards through the Punjab as far as the Pamir Plateau and possibly beyond. Commenting on the evidence for this view, supplied by the investigations of D. N. Wadia in the Himalaya, Prof. B. Sahni points out its importance to the old hypothesis of a land connexion between Gondwanaland in the south and Angaraland (which included a great part of eastern Siberia) in the north across the Thetis Sea (of which the Mediterranean is a remnant).

Chemical analysis of early Chinese glass indicates that in the period from pre-Han (before A.D. 220) to T'ang times (A.D. 618) Chinese glass tends to change

from lead-barium silicate type to the more common soda-lime silicate type. The investigation was carried out spectrographically on minute samples by Prof. C. G. Seligman, Dr. P. D. Ritchie and H. C. Beck.

Dr. Y. Nishina and C. Ishii have recently made measurements of cosmic ray intensities in a railway tunnel under a vertical thickness of rock (diolite) varying from 1,230 m. to 120 m., water-equivalent about 3,400 m. and 340 m. respectively. At a vertical thickness of 325 m. (minimum thickness 290 m.) a burst of 10^7 ions was observed, which proves the presence of cosmic rays after passing through rock the absorption of which is equivalent to that of more than 800 m. of water.

The chemical identification of radioactive nickel, of nearly 100 minutes period, prepared by irradiation of zinc with neutrons, is described by Dr. C. B. Madsen. Radioactive copper was also obtained, with a period of 17 hours. Bombarding copper and zinc with neutrons, according to F. A. Heyn, leads to expulsion of other neutrons and formation of radioactive isotopes of the elements irradiated.

An equation for calculating specific heats at very low temperatures (near the absolute zero), if the velocity of sound is known, is given by A. Bijl. In the case of helium and hydrogen, the calculated values agree with those experimentally observed, but in the case of heavy hydrogen there is a wide discrepancy. This, the author considers, may be due to the fact that the simplifying assumption—that molecules behave like hard spheres—is not permissible in the case of heavy hydrogen.