exerting a pressure on the ions against the translation resulting from radiation; besides this force an electromagnetic force—of second order of the ratio of velocity of translation to velocity of light—may arise from the moved charges of the ions and act on the vibrating electrons. The experimental research of the light of Kanal-strahlen emitted normally to their direction has given the following results. The observations have been made on hydrogen; the velocity of the Kanal-strahlen was $0{\cdot}9.10^8$ and $1{\cdot}2.10^8$ cm. sec.$^{-1}$. The spectrograms were taken with a prism-spectrograph and with a concave grating of 1 metre radius.

The total radiation of the line spectrum ($H\alpha$, $H\beta$, . . .) is partially polarised, and the electrical vibrations parallel to the direction of translation have a greater intensity than the vibrations at right-angles to the direction of translation. The difference of intensities is very small.

The lines of hydrogen (when observed normal to the Kanal-strahlen) are displaced towards the red, when compared with the lines emitted by the slow ions in the negative glow. The displacement seems to be proportional to the wave-length, and also proportional to the square of velocity. The displacement of the centre of $H\beta$ is approximately 0·8 Ångström unit for a velocity of $1{\cdot}2.10^8$ cm. sec.$^{-1}$.

Besides this displacement there is observed a broadening of the lines; it seems also to be proportional to the square of velocity, and to increase somewhat with decrease of wave-length. The observations as to the splitting up into components of the broadened line, and also as to the polarisation of its edges, are not concordant enough in the different spectrograms, and are therefore not ready for publication.

J. STARK.

Göttingen, January 6.

Inversion-point of the Joule-Kelvin Effect.

IN discussing the Joule-Kelvin effect for a fluid like hydrogen, which shows an inversion point above which heating takes place on free expansion, it is usually assumed that this point is unique. Thus, for example, Olszewski has fixed it experimentally at −80°·5 C. An examination of the consequences of any of the usually assumed equations of state (such as Van der Waals's or Dieterici's) easily reveals the fact that it must in reality be a function of the pressures to which the gas is subjected. But this is not all. If these consequences are examined for the inversion point corresponding to an infinitesimal change in pressure, it is seen that all the equations of state (which at the same time indicate a critical point) demand that there shall be *two* inversion points (if any) for any given pressure, and that, moreover, for sufficiently high pressures no inversion point will exist. Different equations of state, while unanimous in the above respects, indicate very different temperatures at which inversion should occur. I desire to point out, therefore, that a complete determination of the inversion points corresponding to various pressures affords an exceedingly sensitive means of discriminating between characteristic equations and of indicating the direction in which these require modification.

This matter is discussed in detail in a paper shortly to be published.

ALFRED W. PORTER.

University College, W.C., February 19.

A Definition of Temperature.

A BODY containing heat is in a condition from which it tends to release itself (by radiating or conducting away heat), and this tendency only ceases when the body has passed into a heatless condition. The temperature of a body is the *measure* of its tendency at any instant to recover this heatless state (*cf.* Maxwell, "Theory of Heat," 10th ed., p. 32). This suggests a mechanical analogy; a body containing heat is analogous to an elastic medium in a state of strain, from which it tends to release itself in virtue of its restitutional forces; the magnitude of the restitutional force when a body is in a given strained condition measures its tendency to release itself from that strain, and so is analogous to the temperature of a body when in a given thermal condition. The quantity of work stored up in producing this strained condition, and which can be given out again when the body returns to its unstrained condition, is analogous to the quantity of heat the body contains when at a given temperature; it is quite easy to show that we can completely represent the thermal condition of a body by means of a model consisting merely of an elastic rod subjected to a tension. *A temperature, therefore, is analogous to a tension or pressure.* We are now in a position to give a real physical meaning to the "temperature" of a body, and so enable it to be measured in *absolute* units like a mass or a length. Let us take a molecular body devoid of all heat motion and plunge it into a medium the temperature of which is T. Then the medium will exert an intermittent pressure or force on the molecules, thus setting them into motion and generating heat motion in the body. It can easily be shown that this force cannot be infinite, or a cold body placed in a hot medium would *instantly* acquire the temperature of the medium, whereas it always takes a definite time to do so.

The *maximum force* which the medium exerts on a molecule at rest when placed therein is the numerical value of its temperature. Hence we arrive at the following definition of temperature:—

A molecule at rest when placed in a medium possessing temperature is subjected to an intermittent pressure; the greatest value of this pressure is the correct measure of the temperature of the medium in the neighbourhood of the molecule. Another method of stating the same thing is to say that the greatest force required to hold a molecule at rest when placed in a medium is the measure of the temperature of the medium. Still another statement is to say that the temperature of a medium is the magnitude of the force tending to drive heat motion into an absolutely cold body placed therein. A temperature, therefore, should be measured as a pressure in *dynes* per sq. cm. All the ordinary laws of thermodynamics, the flowing of heat from bodies of higher to bodies of lower temperature, Waterston's hypothesis, &c., follow quite simply as a consequence of this definition, as the reader can doubtless work out for himself.

GEOFFREY MARTIN.

Kiel, February 10.

Chinese Names of Colours.

IN reply to the letter of Mr. Alfred H. Crook contained in your issue of January 11, I would say that it is possible that the explanation of the Chinese colour-name is to be found in the violet coloured halo which is very commonly noticed by Alpine climbers surrounding moving objects. Dr. Ellis attributes it, I believe, to fatigue of the eye (see discussion in NATURE, May, 1897).

REGINALD A. FESSENDEN.

IN your issue of January 11, Mr. Alfred H. Crook, of Hong Kong, asks why the Chinese should call a bright purple (almost a mauve) "snow green," and he adds that the term "green" is sometimes applied to the colour of the sky, which I take to mean blue. The following is a possible explanation:—

One of the commonest places in nature to find purplish hues is in shadows, and shadows on the snow, when the sky is clear, are decidedly purple. If purple is to be classified among the colours, it will go with the blues, hence "snow green" as meaning "snow blue" would not be such a misnomer as might at first sight appear.

Pittsburg, Pa., February 7. ALFRED SANG.

Sounding Stones.

MR. ALFRED TINGLE (January 4, p. 222) and Mr. Carus-Wilson (January 11, p. 246) may be interested to know that at the caves of Ellora, near Aurangabad, one of the pillars in the rock-cut temples has the same property of sounding under a blow.

The pillar is a massive one close to, or part of, the doorway leading to an inner shrine, and if struck with the clenched fist emits a deep note.

So far as I recollect, this property was confined to a portion of the pillar.

W. G. BARNETT.

Poona, January 29.