

to which Mr. Dines refers by showing that the conditions of the outer atmosphere are isothermal, and Sir James Dewar's experiences with non-conducting power of high vacua are leading to the conclusion that there is a comparatively warm interstellar atmosphere.

C. E. STROMEYER.

"Lancefield," West Didsbury, March 3.

ONE would naturally expect the upper part of any large mass of fluid to be the warmer, because that condition is a possible one, whereas the converse is not possible as a permanent condition, since it involves a warmer, and therefore in general a lighter, portion of the fluid remaining under a heavier. But when dealing with a gas it is necessary to use the term "warmer" in a special sense, for which the convenient expression "potentially warmer" has been used. This means that the temperature is referred to some standard pressure, and taken as what it would be after adiabatic reduction to that pressure. In this sense the air gets rapidly warmer as we ascend, at the rate of about 0.4°C . to each 100 metres, but if there were sufficient mixing we should expect to find the same potential temperature throughout, just as in a pond the heavier water is found at the bottom, but in a fast-running stream the specific gravity and the temperature are the same throughout.

We have no evidence at the present time to show how the isothermal layer is influenced by a mountain range, but there are immense stretches of sea and land so far removed from any high mountains that we can hardly suppose any such influence to exist over them.

It must be remembered that the chief heating and cooling effects on our atmosphere are applied at the bottom by contact with the ground. Pure air is almost pervious to radiation. There may be sources of heat to the upper layers; the electric currents which produce the aurora have been suggested, but I do not see that this affords any explanation of the sudden cessation of the temperature gradient.

The well-known phenomena of shooting stars apparently quite negative the suggestion of a stellar atmosphere; beside which, unless it were moving with the earth, in which case it would cease to be stellar, such an atmosphere would produce an enormously increased pressure on the forward side of the earth as it pursued its course round the sun.

W. H. DINES.

The Penetrating Radiation.

IN a letter to NATURE of February 13, the question is raised by Mr. W. W. Strong whether the larger proportion of the penetrating radiation may not arise from active matter in the air rather than in the ground. Unless the earth's supply of active matter is augmented from without, or unless it arises in a manner at present unknown, the question may be negatived, and a numerical answer given with some approach to accuracy.

Strutt has found about 3×10^{-12} grams of radium as the average amount present in 1 c.c. of soil. I have found about 10^{-16} grams of radium to be a measure of the amount of radium emanation present per c.c. of the atmosphere (*Phil. Mag.*, December, 1907). These two quantities are nearly proportional to the amounts of radium C produced per c.c. in earth and in air. The ratio is 30,000 to 1.

But McClelland and Wigger have found that the coefficients of absorption of the γ rays are proportional to the densities of the absorbers, so that the absorptions of the γ rays from radium C by soil and by air are as their densities, about 2000 to 1.

Now it has been proved (*Phil. Mag.*, September, 1906) that, for a given electroscope near the earth's surface, the penetrating radiations from earth and from air will be in the ratio Q/λ to Q'/λ' , where Q , Q' are the quantities of radium per c.c. in soil and air, and λ , λ' are the coefficients of absorption of the γ rays by soil and air.

Hence the penetrating radiations from the radium C in the ground and from that in the air are in the ratio of the two ratios above stated, namely, 15 to 1.

Moreover, the radium C in the air is carried earthwards, not only by falling rain, snow, dust, or smoke, but by the potential difference in the atmosphere. The active matter

on the earth's surface is thus augmented and that in the air decreased.

Observers in both hemispheres have found evidence of thorium C in the air, the activity being about half that of the radium C present. The emanation of thorium decays about 6000 times as fast as the emanation of radium, and has a poor chance of escaping from the soil, so that (1) the amount of thorium C in the ground probably exceeds the amount of radium C, and (2) the thorium C in the ground will be more than fifteen times that in the air.

We may conclude, then, that at most localities the penetrating radiation due to active matter in the air is less than one-fifteenth of that due to active matter in the earth.

A. S. EVE.

McGill University, Montreal, March 3.

Mosaic Origin of the Atomic Theory.

THE recent correspondence on the subject of the identity of the inventor of the atomic theory has led me to think that the following quotation from one of the foremost English scholars of the seventeenth century is worthy of some passing notice in this connection. Ralph Cudworth, D.D. (1617-1688), was the author of a colossal monument to Greek philosophy, the "Intellectual System of the Universe." A smaller work of that author, which was published posthumously (1731), contains the following paragraphs, which throw a glimmering light (new, probably, to most eyes) on the historic continuity of ancient philosophy and "modern" science:—

"1. Wherefore we have made it evident, that that very *Mechanical* or *Atomical* Philosophy, that hath been lately restored by *Cartesius* and *Gassendus*, as to the main Substance of it, was not only elder than *Epicurus*, but also than *Plato* and *Aristotle*, nay, than *Democritus* and *Leucippus* also, the commonly reputed Fathers of it. And therefore we have no Reason to discredit the report of *Posidonius* the *Stoick*, who, as *Strabo* tells us, affirmed this *Atomical* Philosophy to have been antienter than the Times of the *Trojan War*, and first to have been brought into *Greece* out of *Phenicia*. If we may believe *Posidonius* the *Stoick*, the *Doctrine of Atoms* is antienter than the Times of the *Trojan War*, and was first invented and deliver'd by one *Moschus* a *Sidonian*, or rather a *Phenician*, as *Sextus Empiricus* cites the Testimony of *Posidonius*. *Democritus* and *Epicurus* invented the *Doctrine of Atoms*, unless we make that *Physiology* to be antienter, and derive it, as *Posidonius* the *Stoick* doth, from one *Moschus*, a *Phenician*. And since it is certain from what we have shewed, that neither *Epicurus* nor yet *Democritus* were the first Inventors of this *Physiology*, this Testimony of *Posidonius* the *Stoick* ought in Reason to be admitted by us.

"2. Now what can be more probable than that this *Moschus* the *Phenician*, that *Posidonius* speaks of, is the very same Person with that *Moschus* the *Physiologer*, that *Jamblichus* mentions in the Life of *Pythagoras*, where he affirms, that *Pythagoras* living some time at *Sidon* in *Phenicia*, conversed with the Prophets that were the Successors of *Mochus* the *Physiologer*, and was instructed by them. He conversed with the Prophets that were the Successors of *Mochus* and other *Phenician Priests*. And what can be more certain than that both *Mochus* and *Moschus*, the *Phenician* and *Philosopher*, was no other than *Moses* the *Jewish Lawgiver*, as *Arceus* rightly guesses. It seems that it ought to be read *Moschus*, unless any had rather read it *Mochus* or *Moses*. Wherefore according to the Antient Tradition, *Moschus* or *Moses* the *Phenician* being the First Author of the *Atomical* Philosophy, it ought to be called neither *Epicurean* nor *Democritical*, but *Moschical*, or *Mosaical*."

Dublin, February 26.

JOHN KNOTT.

Tabulated Values of Certain Integrals.

IN reply to the letter of Mr. C. E. Adams in NATURE of March 19, a table of the values of the integrals required will be found in Airy's "Undulatory Theory of Optics" (Macmillan and Co., Ltd., 1877) on p. 158.

HARRY M. ELDER.

41 Netherhall Gardens, N.W., March 20.