nounced the appointment of Dr. Robert A. Lambert as professor of pathology and director of the School of Tropical Medicine in Porto Rico; Dr. Nathaniel R. Norton as professor in the department of diseases of children, and Drs. William C. Johnson and William C. Von Glahn, assistant professors of pathology to be associates in that department.

DISCUSSION AND CORRESPONDENCE

THE KENNELLY-HEAVISIDE LAYER

IN connection with the transmission of electric waves, we now hear much concerning a reflecting atmospheric layer some forty kilometers above the earth's surface, and quite generally known as the Heaviside layer. It is not so generally known that Professor A. E. Kennelly announced the probable existence of such a layer prior to its announcement by Oliver Heaviside. The latter some time in December, 1902, in Vol. XXXIII, tenth edition, Encyclopedia Britannica, in an article on telegraphy, suggested a conducting layer in the upper air.

Kennelly published his paper "On the elevation of the electrically-conducting strata of the earth's atmosphere" in the *Electrical World and Engineer,* New York, March 15, 1902. It deals directly with the problem of long distance wireless wave transmission, and includes a remark which is of significance to aerographers; namely, that

> As soon as long distance wireless waves come under the sway of accurate measurement, we may hope to find from the observed attenuations, data for computing the electrical conditions of the upper atmosphere.

An interesting sidelight on the matter is the remark of C. Bouthillon, in *L'Onde Électrique,* June, 1923, where, in a critical review of the theory of propagation of these waves, it is stated:

> Le premier savant qui ait précisé l'idée est Kennelly, qui, dès 1902, fixait à 80 km. environ la hauteur de la coche refléchissante. Vers la même époque, O. Heaviside, Henri Poincaré, A. Blondel, Ch.-Ed. Guillaume, émettaient des hypothèses semblables.

This layer is destined to play an important part in future studies of the stratification of our atmosphere, especially at great heights.

I have in some lectures compared the atmosphere to a six-story building.

The first story, with ground floor, is the troposphere, in which the temperature falls at a fairly constant rate with elevation. This story is not of equal height around the world, but bulges up near the equator and slopes down near the poles. In our latitudes the ceiling is about 10 km (6 miles) above the floor. There is a mezzanine gallery about 0.5 km above the floor; and just as in the big buildings we are familiar with, the accounting offices are placed here. Notwithstanding those who regard variation in solar radiation as the source of weather and take the elevator to the roof, we will continue to do business and settle our weather accounts at these offices on the lower floors.

The second floor is the stratosphere, discovered and named by Teisserenc de Bort. The temperature gradients are horizontal instead of vertical. There are no clouds on this floor.

Somewhere about 40 km high is the third story; and in all probability this will be found to be the Kennelly-Heaviside region.

As yet the floor and ceiling are conjectural.

The fourth floor is the domain of meteors—and if we are to follow recent estimates, the temperature is actually warmer than in the mezzanine offices thirty-six miles below. This also is conjecture.

The fifth floor is the old top of the atmosphere—the twilight arch region, which comes out by triangulation about 80 km, but is more likely 65 to 70 km because of refraction errors.

The sixth floor is the region of auroral displays. The upper edges of auroral arcs according to Störmer are as high as 150 km; but the rays go still higher, often to 300 km.

The sixth story is also the roof. All above we call the Empyrean and turn the space over to astronomers.

So it seems that our six-story airshell is not such a skyscraper, after all. If we represent the distance from the earth's center to the surface by 1,000 bricks laid end to end, then the thickness of the sensible atmosphere could be represented by one brick. The highest level yet reached by man would need a trifle more, the highest actual record obtained by man would need about six bricks; and to reach an aurora sixteen bricks would be needed.

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MUSICAL ECHOES

SOME time ago there appeared in SCIENCE an interesting article on "Musical echoes." The author of the article might be glad to have his attention called to another example of such echoes reported in the April number of *Blackwood's Magazine,* on page 469, "In Lapland," by Jan Gordon and Cora J. Gordon.

> Under the high and purplish cliffs of the other side of the lake, we had a peculiar experience in acoustics; the clatter of the motor was gathered up and reflected back by these scarped rocks in a hundred echoes, but by some strange trick blended in so peculiar a fashion that the vulgar rattle and roar came to us sweetened into the chiming of cathedral bells, pastoral England's Sunday morning unbelievably imitated, now surging louder, now