ing their position, point to very complicated conditions of movement. But the counter-influence of "Himmelsluft," as compared with the movement of the earth round the sun, is a necessary consequence, not only of the movements in the highest strata of the atmosphere, but also of the effects of pressure, which could not remain unnoticed in the case of very delicate barometrical measurements. If the daily period of fluctuation of the atmospheric pressure were not influenced by so many different factors, — for example, by the daily warm period and, theoretically at least, by a certain operation of ebb and flow caused by the sun and the moon through their powers of attraction in the atmosphere as well as in the ocean, and perhaps also by the electrical conditions of the atmosphere, — there must be, at that time of day at which a given station arrives, in consequence of the earth's rotation, on the front side of the mighty "vessel" which transports us round the sun with a velocity of nineteen miles a second, a somewhat greater atmospheric pressure. This time of day is, as a rule, between midnight and midday.

In the polar regions the state of affairs is a little more complicated. In these zones an observer can, during the winter, for a longer or shorter period, according to the geographical latitudes, remain on the front side of the earth, while in summer he finds himself turned over on to the back of the earth, viz., on that side which is away from the direction of movement. In lower latitudes the mercury in the barometer must always stand higher during the morning hours than during the rest of the day. In consequence of the collective effect of the various factors which influence the daily period of the pressure of the atmosphere, the result is a very complicated one.

Within the last five or six years a group of phenomena has arisen, which is of the greatest importance in considering the problem of the conditions in the upper strata of the atmosphere. The last of the series of phenomena connected with the Krakatoa eruption are the so-called luminous clouds, which have since that time been observed during the night in the summer months on both hemispheres at a height of about fifty miles. These clouds consist obviously of the smallest molecules of water, which have been projected to their highest point, and which during the summer nights have reflected down upon us from that great height the direct rays of the sun. The long duration of this phenomenon makes it a very remarkable one. During the last two years, for which very accurate photographic determinations of altitude are available, the average height of these clouds has not altered. This can only be explained if we suppose the existence in those altitudes of an opposing force, which nearly overcomes the influence of gravity, in consequence of the giving off of electricity.

In the last few years not only has the density of this collection of matter been very materially lessened, but its geographical and periodical distribution over the different regions of the globe has become more restricted and regular. In Germany these clouds have, during the last three years, only been seen between the end of May and the end of July, towards the north, at a distance of from 310 to 435 miles; on the southern hemisphere, at the southern extremity of America, only during the local summer (December), and then towards the south. It may, therefore, be supposed that this collection of the smallest molecules travels every year from one polar zone of the earth to the other, so that it is found just over that hemisphere where summer is at its height. This periodical movement would be completely unintelligible if the counter-influence of the "Himmelsluft" on those high strata of the atmosphere which participate more or less entirely in the rotation of the earth on its axis and round the sun, did not furnish an explanation. In consequence of the inclined position of the earth's axis, and of the counter-effect of the "Himmelsluft," there occurs from June to December a disposition, reaching its maximum in September, on the part of those strata, to travel from the northern to the southern hemisphere; while from December to June the reverse is the case. It is calculated that for such a periodical journey from pole to pole an average velocity in the north and south direction, or *vice versa*, of only little more than a yard a minute is necessary, a rate which is quite insignificant when compared with the velocity of nineteen miles a second, with which the relatively quiet "Himmelsluft" operates on the upper strata of the atmosphere which move with the earth.

Extensive investigations and measurements are still needed in order to arrive at a result in this matter, and it is only by means of the fullest co-operation of numerous observers in all parts of the world that the necessary data for this purpose will be obtained.

## MILK FROM TUBERCULOUS COWS.

ACCORDING to a report by United States Consul Ryder of Copenhagen experiments have been resumed in Denmark towards elucidating the question whether milk from tubercular diseased cows, even in such cases where the udder was not affected with tuberculosis, can be the means of communicating infection. In these experiments the investigation was made in all with the milk from twenty-one diseased cows, with which forty guinea-pigs were inoculated. It had been intended that two guinea-pigs should be inoculated from each sample; but in two cases, owing to the number of these animals having fallen short, only one guinea-pig could be employed, from two to three cubic centimetres of milk being used on each occasion. The milk samples were taken by the veterinary surgeon of the cattle market, the cows being milked by him and the milk caught up into small bottles. The veterinarian selected only such cows as, on examination during life, could be classed by him as suffering in a high degree from tuberculosis; and in every case the udder and chest intestines of the animals were afterwards sent for examination, so as to obtain full assurance of the correctness of the diagnosis, as well as to ascertain the extent of development of the disease. The inoculated guinea-pigs were kept in isolated cages in such manner that only the two which had received milk from the same cow came into contact with each other. Three of the guinea-pigs were killed by rats, fortunately, however, at such distance of time (24 or 25 days) after inoculation that the inoculated tuberculosis must have shown itself had it been present. Two others died of casual (not tuberculous) lung disease after the lapse of a month and a half and two months, having no sign whatever of tuberculosis.

The results obtained from these inoculations are that milk from seventeen of the examined cows had no influence in producing tuberculosis in the guinea-pigs, while the milk from four of the cows showed itself to be communicative of infection; but in three of these cases, on examination of the udder most minutely, this could scarcely be considered in a perfectly sound state. In the one case two small tumors were found of about the size of a pea; in the two others, o the size of a hazel-nut; but in all the cases, with a sligh

hardening of the tissues in a somewhat extended circuit. When the above-mentioned tumors were cut over, they presented the exact appearance of a fresh tubercular udder inflammation, that is to say, the gland lobes were swollen, firm, and of grayish color, slighly translucent, and with yellow streaks corresponding with the lacteal passages. In dried preparations of tissue from the tumors, as well as from the infiltrated regions, tubercle bacilli could be demonstrated, and sections showed on both sides the presence of typical tuberculous tissue with giant cells containing bacilli. Thus there could be no doubt but that in all three cases a commencement of tuberculosis had to be contended with. The slighter the development of the tubercular attacks in the udder, so much the fewer will be the number of bacilli thrown off from the milk. In full agreement with this, it was found, that, of the two inoculated guinea-pigs, only one was attacked in the case where but two small tumors of a pea-size were found in the udder. The other guinea-pig was killed four weeks after the inoculation and was found to be perfectly sound. In the last of the four cases where the milk was found communicative of infection, no discernible tubercular attack was to be detected in the udder. This case, however, differed in some degree from the others. The cow in question died of tuberculosis of chronic character and in a very advanced stage, several of the organs having been attacked (the lungs, pleura, mesenteric glands, liver, and intestines), while the other cows whose milk had been examined had all been slaughtered. With these the attack had not reached the extreme stage, although in many of them it was found to be far advanced.

While this case would thus seem to prove that the tubercle bacilli can pass over to the milk without the previous existence of any tubercle tissue in the udder, it is at the same time observed that in this case there is all reason for regarding it as one of exceptional character. From the detailed report on these researches it may perhaps be gathered that the matter in question stands somewhat in the following position: If it really be the case that the milk of tuberculous cows is of such great danger as the medium of communicating infection, it might certainly be expected, looking at the great spread of tuberculosis among cattle, that the disease would, at the same time, be conveyed to human beings much more frequently than it seems, in fact, really to occur with the raw milk and (though perhaps in a somewhat less degree) with the dairy produce, especially of butter and cheese. The generally entertained opinion that milk from tuberculous cows, as a rule, only under certain conditions, was really of such dangerous character, would appear to be much more in accordance with the results obtained.

To prevent the conveyance of infection to the human being through the medium of tuberculous cows' milk, it should be the main consideration to watch for the earliest appearance of swelling or tumor of a tuberculous nature in the cow. Such recognition, as a rule, will not be of much difficulty, and at any rate will lead to good grounds of suspicion, such as a firm, painless, and, as a rule, speedily spreading glandular swelling, with the secretion in the first weeks retaining its natural appearance, but later on becoming thinner and more watery, but seldom of a pus nature. The question of danger of infection through the use of such milk is perhaps sufficiently summed up in the following words of the report on these researches, namely, that milk obtained from a tuberculous cow with an apparently sound udder, as a rule, will not be found dangerous; but, at the same time, as in no individual case can it be said with certainty that one may not be dealing with one of the depicted exceptions from the general rule, it would be advisable to regard such milk with suspicion in respect to its infecting powers.

## NOTES AND NEWS.

A LONG time ago, says the *Engineering and Mining Journal*, the distinguished French astronomer Flammarion expressed the belief that communication would be established one day between the earth and the planet Mars. The idea seems to have appealed very strongly to the fancy of an old lady at Pau, France, who died recently, bequeathing a legacy of 100,000 francs as a reward to the first scientist who may devise a scheme for successfully accomplishing the feat. The money, which is payable for ten years only, is to be held in trust by the French Institute.

— Silo experience in the United States now covers more than ten years, and so far as the economy of producing silage and the advantages of feeding it are concerned, there appears to be everywhere, among those who have operated successful silos, a strong conviction that good silage is a superior and cheap feed; but the same experience is now fast demonstrating serious imperfections in the construction of perhaps a majority of existing silos in this country. Some silos have so rapidly deteriorated as to become utterly useless for the purpose for which they were intended inside of three or even two years, unless they are subjected to extensive repairs, while others have never successfully preserved the materials placed in them. With a view to obviating these difficulties in the construction of future silos, and of suggesting remedies for the defects of existing ones, a study of the actual construction and condition of silos now in use has been undertaken by F. H. King, physicist of the Wisconsin Agricultural Experiment station. Thus far he has examined ninety-three silos, and the results of his labors, together with valuable suggestions about the construction and repair of silos, are given in the July bulletin of the station named.

— Mr. O. Chanute, a well-known engineer of Chicago, having during recent visits to Europe gathered much information concerning the methods and results of preparing wood chemically to resist decay, says he is confirmed in the opinion that the time has arrived when great economies may be realized by the adoption of these methods on railroads in many parts of this country. He recently examined some experimental railroad ties of the most perishable kinds of wood, prepared by what is known as the zinc-tannin (Wellhouse) process, in St. Louis, in 1881 and 1882, and laid in the tracks of the Atchison, Topeka, & Santa Fe Railroad, as Topeka, Kan., and La Junta, Col. After nine or ten years' exposure they show excellent results, whereas they would have lasted but from one to four years if unprepared. Unprepared ties of the same kind of timber, laid at the same time, adjoining to the prepared ties, have all decayed and been taken up, while present appearances indicate that the prepared ties (red oak, black oak, and Colorado pine) are likely to show an average life of ten to fifteen years or more. Not only does the zinc-tannin process preserve ties against decay, he says, but it hardens them as well. It is found on one railroad that after three years' exposure treated hemlock ties hold the spike as well and cut less under the rail than untreated white oak. He is convinced by experience that on many railroads, where white oak is getting scarce, an economy of a hundred dollars a year per mile of track can be effected by preparing ties of inferior kinds of wood to resist decay by the process mentioned.

— The Leland Stanford Junior University of California has announced the names of the members of its faculty. The professorships in engineering and scientific studies are held as follows: John Casper Branner, formerly of the University of Indiana, professor of geology (work to begin in 1892); Oliver Peebles Jenkins, formerly of De Pauw University, professor of physiology and histology; John Henry Comstock, formerly of Cornell University, non-resident professor of entomology (resident in January, February, and March); John Mason Stillman, formerly of the University of California, professor of industrial and inorganic chem-