Changes in the Appearance of Jupiter.

Writing with reference to the strange belt on Jupiter, in a communication dated September 28, Mr. J. A. Brashear, of Pittsburg, Pa., says:

"I first saw it at 2:45 A.M. on the 26th of June. A nine inch silvered glass Newtonian telescope was used in this observation. The belts on the equator were of a beautiful pinkish brown color. The broken belt noticed by your correspondent was so vivid and clear that it reminded me of a coke fire seen on a dark night. It made such an impression on my mind that I at once made a sketch of it, which has been of great value in subsequent observations. In referring to my note book I find I have eight drawings of the planet since the above date. Comparing the last drawing with previous ones, I am led to believe that the spot has slowly diminished in size, though not in general outline. Another and still more strange phenomenon has occurred, and to this I should like to call the special attention of observers. In my drawings I have located the white spots plainly visible between the equatorial belts, and by comparing the consecutive sketches I find that either the spots or the red belt has shifted in reference to one another about one-fourth the length of the red belt.

"Any one who has read Camille Flammarion's interesting article on Jupiter in the last number of your SUPPLEMENT, will see that this shifting of the spots is no new thing, but the question is, Which belt or spot has shifted? I am inclined to think, with my esteemed friend, Mr. F. W. Very, assistant to Prof. Langley at the Alleghany Observatory, that it may be some terrific action is going on in a local spot beneath the red belt which has dissipated or torn away the vaporous envelope of the planet over the place of local disturbance, and we possibly see the *actual surface of the planet* beneath or through the rift in the vaporous envelope. If this conjecture be true, then it is more than likely that the shifting has been in the white spots beneath the equatorial belts, as the local action which gives us the red belt would hardly be of a shifting character. I have used 6·5 inch, 9 inch, and 12 inch aperture silvered glass telescopes, and 4 inch and 13 inch achromatics, at different times of observation, and have had some exquisite views of this marvelous planet and its attendant panoramic phenomena."

A FUNGOID GROWTH—THE CAUSE OF WHOOPING COUGH.*

(*Tussio Convulsiva, Pertussis.*)

BY HENRY A. MOTT, JR., PH.D., E.M.

The idea has prevailed, and in fact is still prevalent now to a very great extent, that whooping cough must run its course, or that it has a definite limit; and if the cough is broken up it would be much worse for the child, for it would be laying the foundation for some fearful disease in the child's system. To this conclusion, I fully believe, can be attributed much of the mortality among children. The deaths from whooping cough, according to Condie, are 1 to 82 of the entire mortality in Boston, 1 to 46 in Charleston, 1 to 95 in Baltimore, 1 to 63 in Philadelphia, and 1 to 64 in New York.

When we consider such figures as these, surely any effort made to discover the cause of this terrible disease, and to point out the proper line of treatment, should be met with a hearty reception. Much diversity of opinion has existed in regard to the pathology of whooping cough. Fortunately, however, owing to the investigations of Dr. Letzerich, of Germany, in 1871, and the confirmation of his results by myself, our knowledge of this disease has been greatly enhanced. Condie says: "A majority of the most authoritative writers refer it to bronchial inflammation, which, by few, is considered to be of a specific character. By some, however, who have written very ably upon the disease, the bronchial affection is viewed as a mere concomitant, or effect of the whooping cough; and not in any degree essential to its existence. Most of the writers refer it either to disease of the pneumogastric or phrenic nerve, or to disease of the brain affecting the origin of the respiratory nerves; while others consider cerebral irritation to be secondary to the bronchial disease, and oftener absent.

"That the essential symptoms of whooping cough are the result of a spasmodic closure of the glottis there can be but little doubt, but whether this is owing to an irritation seated in the larynx or trachea, or in the brain, it is difficult to determine." In pathology so uncertain as this, how are the proper remedies to be selected? Are they to be addressed to the brain, the origin of the nerves, or to the larynx or trachea?

The question having only recently been answered, among the former remedies are found purgatives, astringents, emetics, expectorants, narcotics, vesicants, tonics, depletants, antispasmodics, caustics, revulsents, antiperiodics, ablutions, etc. As Dr. J. O. Hamilton, in his able article* on whooping cough, remarks: "How can we imagine such a hydra-headed disease, requiring such fearful instruments for its decapitation?" From the above it is certain that Dr. R. Dugleson, in his work on disease of children,† stated the truth when he said, "But little is known of the cause of whooping cough."

As stated before, in 1871 Dr. Ludwig Letzerich commenced a series of microscopical investigations as to the real cause of whooping cough, and his original investigations are to be found in full in Virchow's *Archiv*, vol. 49, p. 530.

* Read before the New York Academy of Sciences, November 24, 1879.

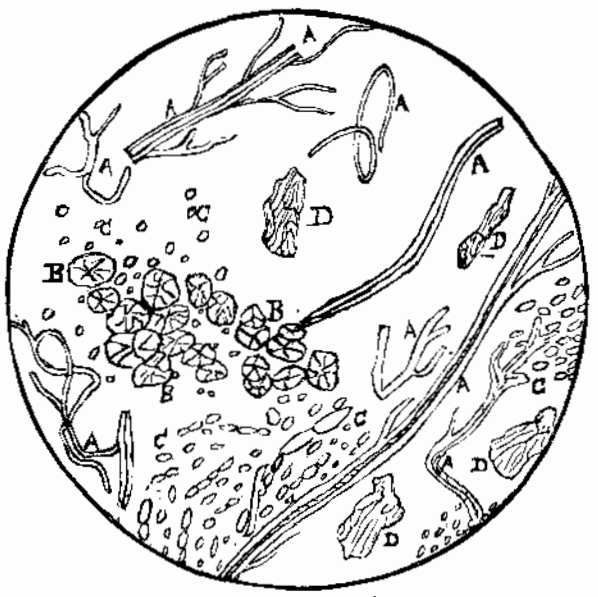
† Illinois State Med. Soc. Rep., p. 48, 1875.

‡ Page 299.

Letzerich showed, for the first time, that if the expectorated mucus whooped up during the short duration of the first catarrhal-like stage of the disease, be examined under the microscope, there will be seen, besides the portion of phlegm, etc., etc., small elliptically-shaped brownish-red fungus spores, some of which have partially germinated and brought into existence mycelium. This discovery gave a clew at once to the cause of pertussis, and opened a new channel for its treatment.

As the editor of the *Quarterly Journal of Microscopy* stated that this observation of Letzerich had not as yet been confirmed by any other investigator, and having an opportunity offered to study the disease in my own children, I concluded to do so, and after a careful microscopical investigation of the phlegm whooped up at various stages in the development of the disease, I can now state that in the main my investigations confirm those of Letzerich.

The following is an illustration of the fungus spores and the mycelium. Of course no one slide gave the field here presented, but it is the result of the examination of a very



large number. A represents the mycelium; B, cells thrown off from the epithelium; and C the fungus spores, which exist in great numbers; D represents a film of epithelium from the under surface of the epiglottis. Letzerich represents the fungus spores when developed as brownish-red. These I did not detect.

The ripe spores of whooping cough differ from those of diphtheria in not being circular, and in not showing any finger-like protuberances. The growth of the mycelium in the masses of phlegm goes on very rapidly, and the threads acquire considerable length, especially when the disease is at its height. The expectorated mucus is also very thick at this stage, and on drying becomes of a glassy appearance, although quite tenacious. In these latter stages the mycelium are very plentiful, and there is an energetic formation of spores. If the fresh spores are treated with iodine and concentrated sulphuric acid, the mycelium are colored beautifully blue, and the unripe spores, which are white, now appear brown. To show how this theory was received by Dr. Hamilton, who made such a careful investigation of all theories, I will quote what he says: "The only theory that seems to me tenable, and I think the success of certain remedies bear it out, is that whooping cough is the direct result of a fungous growth; that the spores are thrown off by the individual coughing, and are received by another in the saliva of the mouth, which retains them until they have time to attach themselves to the underside of the tongue, where the mucous membrane is the thinnest and softest of any part of the mouth, and at the same time are not so liable to be dislodged by drink or food. In this situation they remain until they are able to germinate and spread along the sides of the tongue and backward until they reach the larynx and pharynx, when the full whoop is established. Elevations or lumps can very plainly be seen under the tongue before the patient begins the whooping, but the catarrhal symptoms at this time are quite prominent; discharges from the nose, suffused eyes, headache, some fever, and general lassitude. The time of incubation is from nine to fifteen days, though varying in the different subjects. These elevations on either side of the frænum linguæ are small, and might escape observation unless carefully sought for, as it is quite difficult to induce the young subject to turn the point of the tongue up long enough to make proper observations."

Letzerich made numerous experiments on rabbits with the spores from whooping cough. The spores were cultivated on pieces of bread soaked in milk, and then introduced into the trachea of young rabbits for future development. This was affected by tracheotomy, but the animals rapidly recovered from the effects of the operation, and in a short time became affected with a cough—the same as whooping cough. The rabbits were killed, and their air passages and lungs were found to contain enormous quantities of fungus; the expectorated mucus was also the same as in man.

From Letzerich's valuable investigations he was able to show the difference between the action of fungus in diphtheria and that in whooping cough. He says: "Disease produced by the vegetation of fungi in the epithelium stratum of the respiratory organs are of two kinds. 1 *Diphtheria:* The vegetation of the fungus originates at the head of the windpipe and trachea, seizes and destroys the epithelium with startling rapidity. 2. *Whooping Cough:* The fungus germinates in the epithelium web; at first in the upper part, and then over the whole respiratory organs, without destroying the web, produces whooping cough and its manifest complications. If the growth of the fungus is confined to the epithelium of the epiglottis, of the larynx, and trachea, then it is simply whooping cough; but if the fungus enters into the delicate bronchial tubes and the cavities of the lungs, then the dreaded complications arise."

It is therefore best to meet the disease in its earliest stages and treat it properly; that is, with an object to kill the fungus and prevent its further development; and then we shall seldom have the complications of bronchitis, cholera infantum, or cerebral difficulties to contend with.

What, then, shall be the proper remedy? Quinine has been used for a long time with excellent results, but its use was not founded on the fact that it kills fungus plants. It was not so used until 1869, when Professor Binz made numerous experiments to show that it would check very markedly the alcoholic fermentation in various fluids; and that the antiseptic action was due to the poisonous influence of the drug upon the fungi, which are the cause of such fermentations. According to his experiments the largest infusoria are killed by a solution of quinine of the strength of 1 in 800 immediately, and upon the ordinary mould penicillium, upon vibrios and bacteria the drug acts with a similar fatality.* In the latter part of 1870 Prof. Binz, and later in the same year Breidenbach, published articles on the beneficial action of quinine in the convulsive stage of pertussis.

Their application of this drug indicated that they thought pertussis was due to the growth of fungi; but still this had never been demonstrated until Letzerich undertook the investigation. In 1871 Steffin confirmed in the main the accuracy of the observations of the savants mentioned above, and two years later Dr. B. F. Dawson reported eighteen cases in a valuable pamphlet, and advocated strongly the value of quinine in curing the whooping in this disease. Since then the use of quinine has been ably defended by Dr. Hamilton, of Jerseyville, Ill., and by Dr. Charles W. Earle, of Chicago. My experiments lead me to the same conclusion, as after administering quinine to my children, and in fact to numerous other children, they all speedily recovered, not whooping more than once a day after the second day it was given them, and discontinuing to whoop entirely by the end of the fifth to sixth day. The time could be made much shorter if children could be induced to take it in a powder directly on their tongue and let it dissolve slowly; but owing to its extremely bitter taste they object. So I found by dissolving the quinine in "gum"—that is to say, sugar and water—they soon became accustomed to the taste and craved for it, as as it afforded them relief.

The best time to administer it is just after a coughing spell and just before retiring at night. As regards the size of the dose, this should depend on the age and severity of the case. To a grown person, from three to five grains of powdered quinine can be put right on the tongue and allowed to dissolve itself. To a child from two to five grains may be dissolved in two ounces of gum (sugar and water), and one teaspoonful can be given as stated above. The gum helps to keep it in contact with the parts longer. Quinine administered in gelatine or sugar-coated pills is of no use whatever.

* Virchow's *Archiv*, 1869, p. 68. Wood's Therapeutics, Materia Med. and Toxicol., p. 62.

Sound Waves.

C. Decharme has extended the investigation of nodal systems, and drawn some interesting comparisons with the earlier researches of Chladni, who indicated three systems of nodal lines: the diametral, the concentric, and the compound. He substitutes a thin layer of water or some similar liquid for the sand which Chladni employed, and finds many interesting relations among the peripheral and eccentric networks, the number of sonorous vibrations, the breadths of the striæ, the areas of the internodal sectors, and the numbers of nodal divisions. By means of these equations it becomes easy to estimate the wave lengths of different sounds.

K. H. Schellbach and E. E. Boehn have experimented with waves of sound, in illustration of the wave theory of light. Connecting two Leyden jars with the conductors of a Holtz electrical machine, so as to produce sparks of 1 centimeter (0·39 inch) between the balls of the discharger, concentric rings were formed in coal dust sprinkled on a glass plate 4 centimeters (1·57 inch) from the balls. The longer the spark the more strongly marked were the rings. By reflecting the reports of the discharges, by means of parallel walls and mirrors of various kinds, the dust waves were made to assume such forms as are theoretically deducible from the reflection and refraction of light, thus visibly confirming the views of Huyghens and Young. That the results are not modified in any way by mere electrical action can be readily shown by substituting explosive gas or powder for the sparks. From ten to twenty sparks or explosions were generally sufficient to show the character of the waves and of their nodal intersections.—*Ann. d. Phys. und Chem.*