

NOTES FOR TEACHERS.

CHANGES IN THE EARTH'S AXIS.—Of all the astronomical problems under discussion of late years, one of the most interesting has been that of changes in the earth's axis. It has been found that the imaginary line about which the earth rotates once a day is not invariably fixed with reference to the earth, but is continually changing its position in that body. The term "pole" has, therefore, to be taken in two different senses: First, as the end of the shortest diameter of the earth—this is a fixed point, with reference to the earth, as long as the earth keeps its shape, and may be called the "pole of figure;" second, the pole may be defined as the end of the diameter, about which the earth is revolving, and this pole may be called the "pole of rotation." It is found that the pole of rotation is continually shifting its position with reference to the pole of figure, along a curved line of considerable complexity. The distance between the poles is very small, never as much as 40 feet. Largely through the unwearied researches of Dr. S. C. Chandler the motion has been shown to be mainly composed of two parts. One part is the motion of the pole of rotation about the pole of figure in a circle of radius 12 feet, with a time of revolution of about 428 days. The second motion is of somewhat the same character, but with a period of one year, and the amplitude of this motion has varied during the last half-century from 4 to 20 feet. Some idea of the actual motion may be got by imagining a crank-arm 12 feet long attached to the pole of figure and revolving once in 428 days. To the moving end of this crank-arm is attached another which gradually changes in length and revolves once a year. The free end of this traces out

the path of the pole of rotation. The actual path is apparently quite complicated. One of the principal effects of this shifting of the pole is that the latitudes of all places on the earth are continually changing. In fact, it was by this periodic variation in the latitude that the motion of the pole was detected. All parallels of latitude are continually shifting, with a range of motion of less than 40 feet from the mean position. There is little or no astronomical evidence of any progressive change in the position of the pole of rotation, by virtue of which it occupied a position greatly different from the present. Apparently the former existence of tropical plants and animals in what are now polar regions of the earth could be explained on such a hypothesis; but no one has yet been able to suggest a probable cause adequate to produce any great shift in the axis of rotation, and an explanation must be looked for elsewhere. The small periodic variations are the only ones about which we can be at all certain. —Malcolm McNeil, in the *Popular Science News*, New York.

MORAL QUESTIONING.—A young man had graduated from Yale College and had been appointed to teach in an academy in New York. He had been brought up in a village where profanity was not uncommon, and where the young man heard obscene stories. He had a class of young men and women to teach and became aware of his moral unfitness, though he possessed an adequate knowledge of facts. His conscience gave him perplexing questions to answer and he determined to leave teaching at the end of the year and study law. One day he was walking with a young man from his class and was perplexed to hear him say: "I am in a state of