

the vanishing of charcoal placed in a fire-grate and heated to redness, the change of grape-juice into wine, and of wine into vinegar, etc.; and although in all of these there is a motion of ultimate particles assuming new arrangements, the human eye, not being able to see the particles, does not detect the motion, but in the results. Had there been only one kind of substance or matter in the universe, the laws of physics would have explained all the phenomena; but there are iron, sulphur, charcoal, and about fifty others, which, when taken singly, obey the laws of physics; but when brought together under certain circumstances, enter into combinations according to peculiar affinities. The innumerable phenomena of this class are now arranged under a small number of general laws of affinity, and the study has become proportionately simple. It is to be remarked, however, that during the changes the substances are not withdrawn from the influence of the physical laws, for no substance ever loses its weight or inertia. What are called chemical states and motions are therefore only modifications of physical states and motions, and many chemical changes are merely beginnings of physical change, as when the altered chemical arrangement of particles in ignited gunpowder produces the physical explosion. And nearly all the manipulations of chemistry, as weighing, measuring, transferring gases from vessel to vessel are directed by physics alone. Chemistry, then, cannot be to any considerable extent understood or practiced by a person who is ignorant of physics.

15. (3.) *Life, or Biology or Physiology.* The only changes or phenomena not comprised in the two classes of physics and chemistry, are some of those occurring in living bodies, and which, being the most complicated of all, have been the last to be studied and methodized; and much has yet to be learned respecting them. Such phenomena are growth, nutrition, decay, death, nervous action, etc. These occur in the midst of structures subsisting and acting in accordance with the laws of physics and chemistry, and laws of life, therefore, appear influencing the other two sets, and cannot be studied independently of them. The science of life, or physiology, has the two divisions of *animal and vegetable physiology*.

16. (4.) *Mind.* There remains still to be considered one class of phenomena or changes in nature which are cognizable to man, not by his actual organs of sense, but by his own consciousness or internal perception, and by his observation of the actions of other persons in different mental states—namely, the changing states of human mind. These, also, are found to proceed in accordance with laws. But it is to be remarked that the laws of mind, which man can discover, are laws connected with body, too, and influenced by bodily conditions, for how differently is the same mind manifested in youth and age, in health and disease! Mental science is by far the most important department of science, and it stands eminently distinct from all the others on several accounts. Unlike that of *organic or bodily* life, which could not be fundamentally understood until physics and chemistry had been previously investigated, this made extraordinary advances in some departments at a very early age, when the others, as methodized sciences had scarcely begun to exist. In proof, we may refer to the admirable writings of the Greek philosophers on logic, morals, government, etc.

17. The established order or laws of change in regard to sequences of mental states are well exemplified in the processes of *giving names* to objects, and of counting and measuring them. A single object, an orange for instance (as already described at Article 7), if placed

near a person, by acting on the different organs of sense and through the connecting nerves on the brain, causes in the mind a different sensation for each sense. The touch of the land gives the impression of size and shape, the sight gives that of color, the nose of fragrance, the palate of taste. These different impressions, called simple ideas, being made nearly at the same time, become associated or grouped together, and form the complex idea of the fruit, which remains afterwards permanently in the memory, and is reproducible at any future time by any other idea which has accidentally or purposely been associated with it, as of the person who brought it, or of the sound or word *orange name*. Any variety of simple ideas or of complex objects or motions producing complex ideas may be so observed, classed, and named. Then, further, it is found, that when any new object is met with resembling one already known, it suggests or recalls to the person that known one; and the idea ranging itself with others similar, previously known, joins a class formed in the mind, which class also may get a name. And thus language grows.—*N. Y. Journal of Education.*

To be continued.

How to teach Children.

BY A. BERGMANN.

The teaching of the first grade has been for some time the object of my study, because I look upon it as the foundation of all our work.

In every-day life we meet with comparatively few people who can not read, and, if reading were the sole criterion of intelligence, we might unhesitatingly call this decade a very intelligent one; yet, if we examine critically the language many use to express their thoughts, or consider how they understand the ideas of others, presented to them orally or in print, in a word, how they speak and reason, we shall find ourselves under the necessity of confessing that our generation is rather behind in that beautiful and pointed laconic mode of expression, in which the Spartans of three thousand years ago excelled.

The art of reading is certainly a key by means of which we may unlock, if so inclined, the great vaults, in which ages have deposited the result of their learning and wisdom, and without any assistance but a thirst for knowledge we may attain to the position of a luminary in the galaxy of the learned.

But does the art of reading also instill unconditionally a thirst for knowledge? If so, why do the majority of our school children, who are taught it, from the very first day of their school life, entertain rather a dislike than a love for their books? And this is a fact which every teacher experiences, if she lets her pupils decide for themselves whether they will rather read a beautiful story or have the teacher relate it to them. In nine cases out of ten they will unanimously decide for the latter.

If this be admitted to be true, the very important question presents itself: Can the school be expected to conquer such dislike, and how may it be done?

I am free to answer the first part of the question in the affirmative and shall also endeavor to show how it may be done; but first let me call your attention to the phenomenon which has doubtless come under the observation of most of us.

Let us take a boy of eight coming to school for the first time, perfectly illiterate, but possessed of common