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Molecular Forces

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What determines its size? What sizes are used on the different maps?

13. Can contours cross each other? Can contours touch?

14. How do contours show a gentle slope? Steep slope? Uniform slope?

15. Do contour lines terminate within a map?

16. Which way do contour lines bend when coming to a valley? A ridge?

17. How are contour lines numbered? What are index contours?

18. What are depression contours? What use is made of them?

19. What are the possible errors in reading differences in elevation from contour maps when but one station is on the contour line and when both stations are off the contour line?

20. What is the method of locating stations on the topographic map?

Some Points to Emphasize from the Study of Contour Maps

1. All points on a contour line have the same elevation.

2. Contour lines can never cross each other.

3. An almost perpendicular slope is shown by coincident contour lines.

4. Contour lines crossing river-made depressions bend up slope.

5. Contour lines crossing ridges between valleys bend down the slope.

6. Every contour line closes on itself either within the map or beyond the limits of the map. When they do not close on the map, the end of the contour line will run to the edge of the map. When they close within the map, a hill or ridge is shown.

7. Contours equally spaced indicate a uniform slope. Unequally spaced contours show unequal slopes. Contours close together or coincident show almost perpendicular slopes.

8. Contour lines never split or divide.

9. Contour lines always cross streams at right angles to the stream.

10. The land on one side of a contour line is higher than the contour line itself. On the other side the land is lower that the contour line.

11. Contour lines are shaded a light brown and a heavy brown. The heavy shaded lines are index contours and have the elevation marked on them.

The study of physiography is concerned with the origin of our present day surface features, the agents producing them and the effect these forms have upon man's activities.

Since it is impossible for the teacher in any community to find outdoor illustrations of all phases of the work covered in the ordinary text, it is quite necessary that a well selected list of topographic maps should be secured. The United States Geological Survey, Washington, D.C., has completed the mapping of over 3000 quadrangles and this material may be secured at a very nominal price. Write to the Survey and ask them to send you their printed list of available topographic maps, and then select those which will represent the physiographic phases covered in the text.

To aid the teacher in the selection, the following phases are treated carefully in most text books. (1) The materials of the land, including a study of the common rock-making minerals, the rocks of the lithosphere such as the igneous, sedimentary and metamorphic. (2) The work of the wind. (3) The work of ground water. (4) The work of running water. (5) The work of glaciers. (6) The work of the ocean. (7) The work of forces in the earth, called vulcanism. (8) Earthquakes.

A carefully selected list of topographic maps which can be used for laboratory work with the above mentioned phases of textbook work can be obtained from the writer upon request. E. J. CABLE

MOLECULAR FORCES

Physics

One of the characteristic properties of molecules assembled in masses is their attraction for one another. While it is customary to classify these attractions under two heads, cohesion and adhesion, it is well understood that there is in reality only one form of attraction. Defining cohesion as "an attraction between like molecules" and adhesion as "an attraction between unlike molecules", is merely a relic of the traditional classification that has come down to us from the early history of the subject, when we had no idea of the nature of this attraction. Knowing, as we now do, that molecules are usually aggregates of atoms and that atoms are always aggregates of positive and negative charges of electricity, it is perfectly natural to assume that these molecular attractions are electrical and consist of the interactions of oppositely directed, unbalanced molecular charges. In other words, adhesion and cohesion take place in accordance with the fundamental principle of static electricity, a principle which states that two unlike charges attract each other with an intensity directly proportional to the product of the charges and inversely proportional to the square of the distance between them.

That the attractions of molecules are significant only through incredibly small distances is evident in all cases of mass breakage. The molecular attractions in a steel rod are tremendous in their total effect, as evidenced by the tons of force necessary to pull them apart. When, however, a steel rod is once broken, the two pieces cannot be firmly reunited even by putting them together in the most exact manner and under an enormous pressure. The molecules cannot be brought close enough by pressure to make the two pieces hold. This can only be accomplished by heating the broken ends to a plastic state and hammering the molecules into close proximity as in the case of mechanical welding.

Such properties of matter as malleability, ductility, brittleness, hardness, elasticity and rigidity are merely different exhibitions of the electrical molecular attractions we commonly call adhesion and cohesion.

(To be continued)

L. BEGEMAN

PROFESSIONAL GROWTH
(Concluded)

Chemistry

The first class provides bits of scientific information which can be interspersed in class discussions. Such items will add interest to the class work and may indicate new and modern uses for chemical substances and appliances. They are found in such publications as Popular Science Monthly.

The second class of articles are indispensable to good teaching. Courses in methods may have been studied in college, but with practical experience the teacher finds that "how to teach" becomes an ever growing problem. It is also true that new methods are constantly appearing, with which he should become conversant. The old idea that anyone who knew a subject could teach it, is obsolete. Modern teaching requires a skill that demands a knowledge of methods. If the present reader, as a teacher of high school science, is employing the same methods that he used a decade ago, he should hasten to disinter the professional ideals which were laid to rest somewhere along the road. The books which offer you a challenge in methods are of the type of Downing's Teaching Science in the Schools; the magazines include the Journal of Chemical Education and School Science and Mathematics.

High school chemistry is, of necessity, so elementary that the teacher's fund of knowledge is seldom challenged by those better informed than he. This offers a temptation for mental loafing. Such a lure must be resisted. Read the new college texts; study the articles that appear in professional chemical journals, even though they are a little beyond the bounds of your comprehension.

Various pamphlets offer supplementary material. Among these are Science Classroom, Chemist-Analyst, Science News-Letter, Current Science and Chemistry Leaflet.

The professionally minded teacher welcomes the opportunity to attend conventions and other scientific meetings. Here he receives the stimulus of associations and discussions with those of like interests and obtains the help offered in the addresses and papers. Occasional return to college, even though it be for only six weeks in the summer and without academic credit, is to be commended. If properly directed, this "brushing up" is worth every cent it costs. As another incentive to study, prepare papers or lectures for conventions, for local clubs, or just for the satisfaction of delving intensively into some technical topic. The writer makes no claims to diagnostic abilities, but he believes that when the thrill and enthusiasm and ambition for superior work has gone from the teacher's daily tasks, professional disintegration has started.

R. W. GETCHELL