Comments and Communications

Mustard—Its Preparation and Use

Numerous articles are appearing in which results of laboratory tests with mustard are reported. A large part of this work was done with samples obtained from the Chemical Corps, but since the substance is easily made, it may be assumed that some experimenters have prepared samples for their own use. It should be emphasized that the laboratory preparation of mustard by the novice is a much more dangerous procedure than the laboratory use of small quantities in clinical research. The writer has observed many workers over a period of 20 years and can report that a very small fraction have avoided being burned when using the material in bulk. Because of this experience it is believed that the instructions for the laboratory preparation of mustard by Bent (*Science*, October 17, 1947, p. 374) are not quite adequate.

During the past year the Chemical Corps has refused to supply samples of mustard to a number of applicants, but has furnished instructions for its preparation and handling. Since it appears to be desirable to give this information wider distribution, it is presented elsewhere in this issue (p. 204) as a contribution by personnel of the Chemical Corps Technical Command.

In connection with the simplicity of the preparation of mustard from thiodiglycol, it is of interest to point out that the latter compound is now sold under the trade name of Kromfax solvent and that, although the advertising literature of the Carbide and Carbon Corporation advises the user not to add hydrochloric acid to it, no mention is made of the fact that mustard is the reaction product. More amusing still, the compound $(HOCH_2\text{-}CH_2)_2S_2$ is now sold by Thiokol Corporation under the name Thiokol SC–10, with the warning that hydrochloric acid should not be added to it, but, if it is, then the reaction product is only one-third as toxic as that obtained with the monosulfide, namely, Kromfax solvent. It is not clear why the advertising literature should so studiously avoid use of the name *mustard* when addressed to chemists.

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Method for Changing Units

I was attracted by an article by F. L. Robeson, entitled "A Simple Method for Changing Units" (*Science*, October 10, 1947, p. 352).

While the author is justified in presenting his method as a simple one, a slight modification, which I have always used, appears to me to eliminate additional possible sources of confusion, such as memorized constants, fractions in numerator and denominator, etc.

Axiom: No value is changed upon multiplication by unity.

Rule: Units may be treated mathematically like numbers, *i.e.* they may be multiplied, divided, etc.

I trust that the author will not object when I cite his example to illustrate:

Given, the coefficient of thermal conductivity of glass:

$$k = 0.00250 \frac{\text{cal cm}}{\text{cm}^2\ ^\circ\text{C sec}}$$

Required, k in terms of Btu per inch thickness per ft^2 per hr per °F.

Carrying out cross-multiplication by fractions having the value 1, we obtain:

$$k = 0.00250 \frac{\text{cal cm}}{\text{cm}^2\ ^\circ\text{C sec}}$$

$$= 0.00250 \frac{\text{cal cm}}{\text{cm}^2\ ^\circ\text{C sec}} \times \frac{1\ \text{Btu}}{252\ \text{cal}} \times \frac{1\ \text{in}}{2.54\ \text{cm}} \times \frac{(30.48\ \text{cm})^2}{1\ \text{ft}^2} \times \frac{5\ ^\circ\text{C}}{9\ ^\circ\text{F}} \times \frac{3600\ \text{sec}}{1\ \text{hr}}$$

$$= 7.26 \frac{\text{Btu in}}{\text{ft}^2\ ^\circ\text{F hr}}.$$

In addition to carrying out a direct slide-rule calculation, the worker can fix the position of the decimal immediately by inspection.

The above method is not applicable to calculus problems, in which the carrying of units is undesirable.

I feel happy to give credit for this method to one of my former instructors, the late E. Frenkel, who lost his life in a concentration camp in Holland during the German occupation of that country.

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The "Polished Rocks" of Cornudas Mountain, New Mexico

Walter B. Lang, of the U. S. Geological Survey, has recently published two articles (*Science*, October 24, 1941, p. 390; January 17, 1947, p. 65) which may be paraphrased as follows: Some igneous boulders are found in the Hueco and Cornudas Mountains along the Texas-New Mexico boundary which exhibit highly polished patches near the edges or corners. These polished surfaces may be accounted for by their having been used by animals long extinct—possibly the cave bear or ground sloth—as places for rubbing and scratching their bodies. Minute particles of grease from their hides have become trapped within the outer fiftieth of an inch of the rock and may still be recovered by chemical reagents.

I believe that biological factors have had more effect in modifying the surface of the earth than is generally admitted. As a consequence, these two articles interested

me, since they purported to prove a biological cause of phenomena that would ordinarily have been attributed to sand-blast or water polish. I therefore made a trip in October 1947 to investigate.

Believing that the grease that Dr. Lang claims to have recovered from samples of rock chipped from the boulders might have come from something greasy such as a chisel, hammer, human hands, or the container in which the samples were transported, I took elaborate precautions to prevent contamination by grease of the specimens which I secured. I was skeptical of finding grease that was supposed to have been imprisoned in the rock for hundreds or thousands of years, but was hopeful of corroborating the biological explanation of the polished rocks.

Both of these groups of mountains receive their names from the relatively small intrusive masses of igneous rock which lie among much larger mountains of sedimentary rock strata which are, for the greater part, still horizontal. The USGS maps cannot differentiate between igneous and sedimentary mountains by contour alone. It is therefore surprising to come suddenly upon these jagged outcroppings among the terraced giants. "Hueco" is Spanish for "hollow" and refers to the window-like holes weathered in these rocks as well as to the caves formed by falling boulders. The name is now applied to the surrounding mountains as well. The Cornudas Mountains receive their name from "cornudo" or "bearing horns," which refers to the jagged summit of this small mountain. The Cornudas have weathered by the more conventional process of exfoliation.

Dr. Lang states that these intrusions are a porphyritic syenite injected into Permian strata. Weathering has freed iron which forms a coating over the surface of the rock, imparting a reddish-brown color.

The hydrous iron coating is only relatively smooth and cannot properly be termed "polished," but this type of surface is the smoothest to be found in the Huecos, either upon exposed surfaces or on the "hanging wall" of the caves where Dr. Lang reports having found it. He omits any mention of the Huecos in his second paper, although in a letter dated July 29, 1947, he stated: (At the Huecos) "you can see about everything that the Cornudas have to offer. . . ." Quoting from his second paper again, we find that the polished surfaces exist ". . . only on the southeast side of the Cornudas Mountain and only within a relatively narrow zone . . . at the base of the cliffs."

The Cornudas Mountain also has this black stain in places. The exfoliation gives the boulders a spotty appearance due to the scabby flaking. Search of the caves gave the same negative results as those of the Huecos. I did, however, find patches of polished rock around the southeast edge of the Cornudas. The first examples noted tallied pretty well with Dr. Lang's statements. These polished corners and edges appeared as if they might have been caused by some agency other than geophysical, but each example was definitely correlated with an ancient watercourse. Especially noted were a couple of cases where the polishing was *underneath* a ledge extending over solid rock. Here the polishing could have been done only by the back-scratching of an animal the size of a pig. Finally, a solid boulder was found resting upon bedrock. The under slope of this boulder was polished clear to its contact with the bedrock.

Neither the igneous Huecos nor Cornudas are surrounded by a detrital apron, but rise from a fairly smooth surface. Dr. Lang states: "I was surprised to see the same type of polished surface on the sides of large outlying boulders . . . which had broken loose from the high cliffs and had tumbled out upon the surrounding apron. . . ." No such igneous boulders were seen, but instances of large fragments were noted which had rolled from the thicker strata of sedimentary rock of the surrounding mountains and had come to rest upon their detrital aprons. These chunks did not bear any polished surfaces.

It is my belief that the polished surfaces are nothing more than stream scour such as is found in many watercourses. In this instance the scouring was accomplished so long ago that only fragments of polished surface remain, and these for the most part on sheltered aspects or on the harder rocks. The rainfall at the time of polishing must have been much greater than at present.

Under the circumstances I do not think it necessary to carry out tests upon the specimens which I secured to search for grease which could not have accumulated in the manner stated by Dr. Lang.

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Books for Korea

The generous response to my article on "Science Education in Korea" (*Science*, January 9, p. 31) is most gratifying to me and is of inestimable value to the scientists of Korea. Since many donors of books, magazines, and equipment wish to send their gifts direct, the following address is given: Bureau of Textbooks, Department of Education, USAMGIK, A. P. O. 235, Unit 2, c/o Postmaster, San Francisco, California.

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