home to farmers and men in the fields generally the utility and simplicity of metric measures.

Scientific men the world over champion and use these units; also a large majority of the people of the world use them; but in two countries, Great Britain and the United States, arbitrary weights and measures continue in popular use. In the United States we use (and are duly grateful) a decimal coinage; but notwithstanding we find inch and ounce in use in kitchen, field and on the street. The low-brows remain deaf to the preachment of high-brows in laboratory and observatory. What then is to be done?

Radio is bringing into common use the meter, as the unit of wavelength; and electrical engineers measure current, energy and power in metric units; but mechanical engineers continue to think in foot-pounds, horse-power, etc. They are in the same class as the cooks. Now, both have their place in the divine economy and we would not underestimate their usefulness; but would we not rate their intelligence higher if "pinch," "spoonful," "sixteenth-of-an-inch," etc., gave way to grams in the kitchen and centimeters in the shop?

When such changes take place then without doubt school arithmetics will cease printing such paleozoic problems as "How many grains in 3 pwt.?" "What will ¾ lb. of candy cost at 3 cents an oz.?"[1]

Evidently those of us who advocate the metric system must devise a method of conciliating cooks and converting carpenters!

ALEXANDER MCADIE

PHYSICS TEXT-BOOKS

THE protest against the use of loose definitions in physics texts which appeared in a recent issue of SCIENCE prompts me to call attention to other defects of text-books, which, to my mind, are even more serious than lack of rigor.

The recent researches in physics have done a great deal towards the correlation of physical facts and the unification of the whole field. It is now possible by logical deductions from very few principles and hypotheses to embrace the whole science of physics. To divide physics into the traditional mechanics, sound, heat, light and electricity, without showing how closely these branches are related to each other is inexcusable. But this is exactly what our texts do. Their attitude seems to be to keep secret the modern advances or, at least, to say nothing about the light that these advances throw on the subject. Our texts present scores of formulae and hundreds of facts, each of which seems to be separate from the rest. The various so-called gas laws, latent heat, specific heat, thermal expansion, are all still treated as if they had nothing in common. The kinetic theory of gases is treated as a curiosity in as many lines as the prony brake, for example, and with as much emphasis. The electrons are mentioned at the end of the part on electricity, and no attempt whatever is made to explain electrical phenomena in terms of the electron theory, although such an explanation would provide a clearer conception of what is taking place in an electrical conductor. The principle of conservation of energy is dismissed with a few short paragraphs at the beginning of the book, never to be mentioned again. The study of physics becomes an art of committing to memory a host of disconnected laws and facts.

The arrangement of the subject appears to be a cross between logical presentation and historical development. Needless to say, neither is attained. It is impossible nor is it desirable to present the elements of a science historically for beginners. While historical references are very useful, inasmuch as they stimulate the interest of the reader, chronological sequence of the advances of the subject must be sacrificed if coherent and logical presentation is to be attained. As it is, the failure of our texts to emphasize the unity of the subject together with the tendency to adhere to chronological sequence in the exposition results in the failure of the average student to see the connection between chapters. I have repeatedly asked my students whether they could see, without lectures, the logic underlying the sequence of chapters, and in the large majority of cases the reply was negative, although we have been using widely accepted text-books.

Not making use of the properties of electrons, atoms and molecules to explain physical phenomena the texts fail to make appeal to the imagination. The student gains no vivid picture of what is taking place in a gas or in an electrical conductor. The only readable part in an elementary book on physics are the applications of physical principles; the most interesting part, the theory, is there as a rule the most boring.

Much has been said concerning the dislike the average undergraduate has for physics. I have often wondered if a part at least of this attitude is not due to the old cut-and-dried way of dealing with the subject that our text-books have. Bare statements of facts and principles can give no inkling of the vitality of the subject of its problems, doubts and triumphs, and without conveying something of its romance the teaching of a science as thoroughly alive as physics can hardly be successful.

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[1] These are actual problems found in a School Arithmetic opened at random. Also, "How many pills of 5 grains each can be made from 1 gram and 2 scruples of calomel?"