man, Rochester, Minn.; Public health, Dr. Claude W. Munger, New York; Gynecology and obstetrics, Dr. Henry Dawson Furniss, New York; Orthopedic surgery, Dr. John Royal Moore, Philadelphia; general surgery, Dr. William D. Haggard, Nashville, Tenn.; Otorhinolaryngology, Dr. William E. Sauer, St. Louis; Cancer, Dr. James Ewing, New York; Radiology, Dr. Edwin C. Ernst, St. Louis; Urology, Dr. Elmer Hess, Erie, Pa.; Neurology, neurosurgery and psychiatry, Dr. Foster Kennedy, New York; Ophthalmology, Dr. Webb W. Weeks, New York; Dermatology and syphilology, Dr. Elmore B. Tauber, Cincinnati; Pediatrics, Dr. Orville E. Barbour, Peoria, Ill.; Physical medicine, Dr. William Bierman, New York; Industrial medicine and surgery, Dr. John B. Lauricella, New York; Dentistry, Alfred Walker, D.D.S., New York. Dr. Alberto Inclan, Havana, is president of the association, and Dr. Joseph J. Eller, New York, is director general.

THE United States Civil Service Commission announces open competitive examinations for which applications should be on file on November 29, for the position of associate meteorologist in the U. S. Weather Bureau, at a salary of $3,200 a year and of assistant meteorologist at $2,600 a year. To become eligible applicants must qualify in at least one of the following optional branches and must state in their applications the branch, or branches, desired: radiometeorography, air mass analysis, general and synoptic meteorology, physical and dynamical meteorology, statistical meteorology, any other well-defined specialized branch of modern meteorology. Further information can be obtained from the commission at Washington.

# DISCUSSION

## "GERM TRACK" AND "GERM TRACT"

UNFORTUNATE confusion exists in the use of the words "germ track" and "germ tract." If these expressions mean anything, they mean different things. A track is a path—a figurative one in this instance, down through time. A tract is a region, and could more or less properly refer to part of an embryo or of an individual in any stage. Neither one can by any legitimate stretch of language be used for the other.

"Germ track" was presumably first used in connection with the work of Weismann, as the English equivalent of his Keimbahn, of which it is a correct translation. It means the continuity of the germplasm through a line of descent, as contrasted with the intermittent or broken series formed by the somata produced in successive generations. How "germ tract" got its start would be difficult to ascertain. It may just possibly have originated as have the other biological expressions involving the questioned word, such as respiratory tract or optic tract. A plausible suggestion, however, is that it arose as a blunder resulting from a conversation or lecture in which the listener misunderstood the word and mistook the idea. Such an error might be confirmed by the other biological uses of the word tract, in the sense of a region. Having a familiar sound, and in these other places a legitimate use, the word tract could easily have been propagated so long as the original idea of a path was dissociated from it.

So far as the author is aware, the expression "germ track" is not being used in any other sense than genetic continuity. "Germ tract," on the contrary, is used in both senses. In one recent publication the words "germ tract" are followed by parentheses enclosing six other terms, which are presumably regarded as synonymous with or substantially equivalent to them. Two of these terms refer to continuity in descent, three of them to a region, while one is non-committal. Still another confusion has been discovered in conversation, though not in print, when the germ track was held to be the path followed by the germ cells in migrating from their point of "origin" to their ultimate location; in some animals such a track would be from the intestinal lining, through the mesentery, to the site of the gonads on the coelomic walls. This error is an isolated one, however, and not so likely to be repeated.

How best to eliminate the confusion into which the word "tract" has here fallen is suggested by the fact that it is not a very suitable name for the thing to which it is applied. "Tract" in its geometric sense means something drawn out, an area or an elongated form. Most of the biological uses of the word conform at least roughly to that idea, as feather tract, alimentary tract, etc. When it refers to something which has a considerable third dimension, there is often the excuse that anatomists have studied this object in sections where to the eye it is an area. The group of germ cells, or the region of an egg in which germ cells will be produced, is not aptly described by a word emphasizing extent. While one dimension of the germ mass may be less than the others, it is not often so much less as to suggest a surface. One would scarcely choose the word "tract" to describe such a mass, were it not for the fact that it had been used before. If, as is suggested above, the first use of "tract" in that sense was a simple error, prior usage is not a good reason for continuing it. Moreover, there are so many words which correctly describe the germinal region

that ineptitude in its name is scarcely to be condoned.

It would seem to be in the interest of clarity, therefore, to abandon the expression "germ tract" for both the abstract idea and the object to which it has been applied. It can not legitimately mean continuity, and it is not a good name for the germ mass. Surely, at least, no one with a feeling for language can go on using it for the continuity which the words "germ track" were used to describe.

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## UNITS IN MECHANICS

IN the recent text-book, "Mechanics," by W. F. Osgood, there appears in Section 11 of Chapter III a discussion of "Change of Units in Physics." The author is very definite and precise as to the method he proposes to use, but at the same time he vigorously denounces another method, viz., that of including units in the analysis. That Osgood has not seen the point to this method is very difficult to believe, but at any rate that is what is apparent from his criticism.

He states that to measure the length of right lines is to find how many times a right line chosen arbitrarily as the unit of length is contained in a given right line, and that the number, $s$, thus resulting is called the length of the line. Further, if $s'$ is the length of a line in this sense when the yard is the unit and if $s$ is its length when the foot is unit, then he shows by a proportionality that $s' = s/3$.

In a footnote he comments in part:

> It would seem paradoxical to say that the same *line* has a length of 6 when the foot is the unit and a length of 2 when the yard is the unit. But it must be remembered that the length is a function of two variables, the unit being one of them. The attempt is sometimes made to meet the apparent difficulty by saying "3 ft. = 1 yd." But this makes confusion worse confounded; for 3 = 1 is not true, while on the other hand to try to introduce "concrete numbers" like 3 ft., 10 lbs., 5 secs., into mathematics is not feasible. To try to change units in this way leads to blunders and wrong numerical results.

To illustrate this last claim he proceeds in a second footnote to find the relation between $s'$ and $s$ when the units are the yard and foot, respectively. He says "it would seem to follow from the statement (1 yd. = 3 ft.) that $s'$ yds. = $3s$ ft. But $s' = 1/3s$. What a cheerful prospect of getting the right answer by that method!"

This is erroneous. From the notation he has adopted it follows that $s'$ yds. = $s$ ft., not $3s$ ft., as he suggests. Also, *in transforming an equation one can replace any term or quantity by its equivalent and the equation will remain true.* In the above equation, therefore, one may replace *yds.* by *3 ft.*, and the equation then becomes $s'$ (3ft.) = $s$ ft., whence $3s' = s$, or $s' = s/3$ as before.

So why the claim that there is confusion worse confounded? From the equation 3 ft. = 1 yd. there is no more reason for writing 3 = 1 than there is from the equation $3x = 2y$ for writing 3 = 2.

Evidently with Osgood a symbol or letter always signifies an arithmetical number. But why should it not be used to designate a *physical quantity,* or "concrete number" as he calls it? If $s$ is the position of a point at time $t$ (units included implicitly in both $s$ and $t$) then $ds/dt$ is the velocity (units included) at time $t$.

Furthermore, the statement "the length is 6" has by itself no meaning. To this Osgood would doubtless agree, for he states the length is a function of two variables, the unit being one of them. He thus must say, "the length is 6 when the ft. is the unit," or something similar. But the statement, "the length is 6 ft.," is only a shorthand way of conveying the same idea.

For the treatment of general theory in physical problems it is convenient to regard all symbols as including units implicitly. Then no mention of units need be made in developing equations. In applying developed equations to numerical problems one will never go wrong if when substituting for a symbol he puts in units as well as numerical measures, and in solving or reducing adheres to the principle of replacing units by their equivalents in other units. On the other hand, it is not *necessary* to operate in this way, for one may simplify matters by the use of a *homogeneous system* of units.

By a homogeneous system of units is meant: If in a general physical equation a set of corresponding values is substituted, units as well as measures, and if, with the units deleted, the resulting equation (in measures alone) remains true, then the units used belong to a homogeneous system.

This makes it possible to work as follows: If a homogeneous system of units is used in which to express the physical quantities occurring, the general equations developed may be regarded as relations among the measures only. The equations may be solved for the desired measures, and the results may then be stated physically by means of the system of units adopted.

Osgood uses Newton's second law with a proportionality factor, and in any given problem determines the value of the factor by the units being used. This is one possible way of dealing with units. Whether or not it is the best way is a matter of taste. But certainly there is no justification for the claim that to include units in analysis is to promote blundering.

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