

Bryan:¹

We are thus led to the conclusion that under any given conditions only a limited portion of the energy of a system can be converted into mechanical work. This portion is called the *available energy* of the system subject to the given conditions. In order, however, to completely define the available energy of a system, it is necessary to specify not only the external conditions to which the system is subject, but also the means at our disposal for converting energy into useful work.

Nernst:²

If any system whatever is subjected to any desired changes, these are, in general, identified with the following changes in energy: firstly, a certain amount of heat is either absorbed or given out; secondly, a certain amount of external work is either performed by the system or is performed against it; thirdly, the internal energy of the system will either diminish or increase. In general in any event the diminution of the internal energy U must be equal to the external work A accomplished by the system, minus the amount of heat Q absorbed; i. e., the following relation exists:

$$U = A - Q.$$

Rushmore:³

From a practical standpoint energy may be classified as *available energy*, or that which can be turned into mechanical energy, and *unavailable energy*, or that which is practically useless for the purpose. To the latter belong the enormous sources of energy stored in the earth's rotation, as well as the interior heat of the earth.

There are several reasons why we shall never return to any former conception of the term "energy" as Dr. Kent in his last paragraph hints might yet be done.

Every new study of the relationships only strengthens the division as made above in the three quotations. This view has been expounded so long and widely and is so firmly established in all collegiate education that there is slight excuse for combating it. It is true that investigation and deduction increase our knowledge of energy without disclosing any ultimate interpretation, exactly as in the

case of gravitation, yet the laws of transfer and transformation are always found to hold most rigidly. These laws of the conservation of energy and the degradation of energy are ever becoming more valuable and firmly established.

Recent discoveries and conceptions only render a definition or unqualified statement of what *energy* is more and more difficult.

The development of radioactivity has enormously broadened our field of knowledge on energy and set us irrevocably beyond our past. We find "energy" and "matter" meeting on common ground and know not which from 't'other.

The development of quantum theory and the study of radiations again shatter any previous notion of energy and portend that energy ideas of the future must involve some aspect of granularity and distribution function.

All the studies on the constitution of matter and the structure of atoms presage radical change and new methods; in dealing with whole classes of energy we are finding the limits of the application of the gross laws of energetics. It is highly significant to follow the mathematical physicist who with much pains in logic comes inevitably to the conclusion that the ether has infinite energy—a conclusion he will likely abruptly discard as absurd!

With matter, ether and energy as possibly only different aspects of, or approaches to, the same ultimatum, who can imagine that our ideas will ever again fit into the long-discarded and outgrown definition.

Useful work may comprise the chief end of the engineer's effort, but it can do him only good to have ever present the concept that relatively only a negligible part of our energy universe concerns itself with such work. It would certainly be a great misfortune to have a statement about energy so terse as to deny the greatest and most useful of our generalizations.

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"TYPUS" AND "TYPE" IN TAXONOMY

THERE is a general attempt among systematic zoologists and botanists to limit the words "type" and "typical" and their equiv-

¹ "Thermodynamics," p. 35, 1907.

² "Theoretical Chemistry," trans. of sixth German text, p. 8, 1911.

³ *General Electric Review*, p. 422, May, 1916.

alents in other modern languages to their strictly taxonomic meanings, *e. g.*, "type species," "typical genus," "type specimen," rejecting their use in their long recognized more general sense. The attempt to restrict a word in general use to a new technical meaning is always difficult and rarely is wholly successful.

May I suggest a way around the difficulty in the case of these words? If in its strictly taxonomic use the word be given its Latin form, *typus*, there will be no ambiguity. It would accomplish the purpose if all zoologists and botanists would abandon the use of the English words type and typical or their equivalents in other modern tongues, thus avoiding all chance of confusion, but this can hardly be secured. On the other hand, taxonomists, who have in mind the taxonomic conventions, might be expected to conform to a better usage, if recommended, and use only the Latin form for the technical meaning. It is easier to bring taxonomists to this better usage than it is to persuade all biologists to abandon the ordinary non-technical use of the vernacular equivalents of the word *typus*.

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QUOTATIONS

SCIENTIFIC DEVELOPMENT IN RUSSIA

A REVIEW, however cursory, of scientific work in Russia during the past two years must take account of two features of outstanding interest and importance. One is the appointment, on the initiative of the Imperial Academy of Sciences of Petrograd, of a commission to investigate and report on the natural resources of the Russian Empire with a view to their scientific and practical development and utilization.

Stated in one bald sentence this may not appear particularly impressive, but looked at through the lens of imagination it is revealed as a stupendous project with far-reaching aims and destined to lead to incalculable results. The prime incentive is the fact that in Russia, as elsewhere, the eyes of the nation have been

opened and attention has been focused on what was in times of peace known to many, deplored by some, and passively acquiesced in by all: the extent to which its economic life has been honeycombed by the greater energy, enterprise and initiative of the Germans. It is now realized that this economic dependence, extending to many things which might just as well have been supplied by native industry, went far beyond the limits of a natural and legitimate exchange of products between neighboring countries, and the empire is firmly resolved to make a determined effort to put an end to an intolerable anomaly. Russia stands at the parting of the ways, and we in this year of grace are, it may be, witnessing the economic birth of a nation.

As may be supposed, the development of such a comprehensive scheme to the point of effective utility has not been accomplished without much discussion and some hostile criticism. One critic "doubts if the time is well chosen for embarking on such an ambitious enterprise when the strength of the empire is being taxed to the utmost by this terrible war. The end proposed is highly desirable, but . . . the program is so enormous that the preliminary steps alone will take years, to say nothing of the long interval that must elapse between scientific investigation and practical fruition . . ."; and he goes on to point out many problems to the immediate solution of which the academy might in this crisis more profitably apply its energies. However, the commission has in a surprisingly short time got to work—the first sitting took place only in October of last year—and is issuing a series of monographs, several of which have already been published, each written by a specialist, dealing, by way of a commencement, with the vast field, in many directions undeveloped, in others lying fallow, of Russian mining and metallurgy.

The other item of interest is the convening of a conference by the Imperial Academy of Sciences to consider the proposal to found a Russian Botanical Society with its own official journal. There is a great deal of botanical investigation carried on in Russia by various