petent geologists, but the physicists were presently able to give convincing reasons for increasing these estimates about tenfold, and these results have been meekly accepted by the geologists and biologists. Superimposed, or perhaps I should say underlying, all these observations, direct and indirect—the material of science—is the body of overbeliefs, resulting from tradition, and fed by the emotions. We cannot escape from these, or abandon our sense of human values. A great dilemma of modern life results from the fact that some or many of the ancient beliefs do not accord with the findings of science, and people live, as it were, in two worlds, one of practical realities, and one of the emotions. The reconciliation of these discrepancies is one of the great tasks for the future. What have the psychologists to say about this? What has science to say about it? What is the verdict of religion?

The great tasks of education are twofold: to educate the mind, or the senses, so that the findings of science may be available to all, not as rigid dogma but as reasonable approximation to truth, certain to be largely extended and modified in the future; to educate the feelings, the social senses, so that the welfare of all mankind becomes in a measure that of every individual, the happiness of all the happiness of each.

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Water Loss From the Respiratory Tract in the Subtropics

The interpretation of Dr. Burch's valuable data (*Science*, 1945, 102, 619–620) on water loss from lungs, in so far as this is a function of the temperature and humidity of the inspired air, would be facilitated, I believe, had he used values of humidity in terms of physiological saturation deficit rather than of relative humidity. Physiological saturation deficit, a term I am now inventing or reinventing, is the difference between the absolute humidity of the air and what the absolute humidity would be at saturation at body temperature. Since it would be impossible for the lungs to evaporate any moisture into air already saturated at body temperature, the PSD represents the opportunity for evaporation from the lungs.

I have derived the PSD's for the temperature and humidity conditions presented by Dr. Burch, with the following results. It is convenient to work in terms of the deficit of the vapor pressure of the air relative to that at saturation at body temperature, 6.2 mb. The PSD's for the conditions under which most of the measurements were made (20.0 to 21.1° C. and rel. hum. 55 to 60 per cent) were 4.7 to 4.9 mb. The PSD for the cool, foggy air (15° C., 97 per cent rel. hum.) was 4.6 mb, and of cool, dry room air (15° C., 60 per cent rel. hum.) 5.2 mb. Since these humidity conditions differ by only 4 to 8 per cent from the standard test conditions it is natural that they influenced the rate of water loss relatively little.

The hot dry air (50° C., 18 per cent rel. hum.), though its PSD was, at 4.0, less than under the standard conditions, increased the rate of water loss. Perhaps this was owing to increased heart action and respiration to be expected in such a high temperature, for the expired air had a PSD of 1.0 mb, or 3.0 mb lower than the inhaled air, which was the same as the reduction in PSD from the 4.7 to 4.9 of inspired air to the 1.7 mean of exhaled air in the general test. The hot moist air (50° C., 49 per cent rel. hum.), with a PSD of only 0.2, naturally, reduced the rate of water loss considerably. Indeed, it appears, from the fact that the expired air (at 39.4° C. and 74 per cent rel. hum.) had a PSD of 1.0 mb, that there was condensation of vapor in the body!

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Rediscovery in the Vitamin A Field

It is becoming increasingly troublesome to verify whether or not one has made a discovery, or merely a rediscovery. However, if the matter seems worth publishing, courtesy surely demands the admission that no thorough literature search has been made when this is so.

According to recent communications to this journal (*Science*, 1945, **101**, 585; **102**, 158) the blue colour developed on treating vitamin A with various acid earths has been independently discovered three times, by Lowman, by Meunier, and by Emmerie and Engels. [For references, see *Science*, 1946, **103**, 175.] It is possible to add a fourth and probably the original discoverer to the list, namely Takahashi (K. Takahashi and K. Kawakami. *J. chem. Soc. Japan*, 1923, **44**, 590), who published the observation no less than 16 years before the earliest reference previously quoted.

Similarly, the fact that the greater part of the vitamin A of fish-liver oils is present as fatty acid esters has been independently discovered at least three times. K. Hickman (*Ind. eng. Chem.*, 1937, **29**, 1107) confirmed the observation by analytical molecular distillation but referred to no earlier work. In a recent paper from the same laboratories (H. Koscher and J. Barter. *Ind. eng. Chem.* (Anal. ed.), 1945, **17**, 499), priority is accorded to L. Reti (*C.R. soc. Biol.*, 1935, **120**, 577), who used partition methods. The original observation, also using partition, was published by A. L. Bacharach and myself seven years earlier (*Quart. J. Pharm.*, 1928, **1**, 539).

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Freedom of Science in Soviet Union

We followed with great interest the exchange of views between Dr. Karl Sax, of Harvard University (*Science*, 1944, **99**, 298–299; 1945, **102**, 649) and Dr. Anton R. Zhebrak of Timiriazev Agricultural Academy, USSR (*Science*, 1945, **102**, 357–358).

K. Sax wisely leaves unchallenged some purely political questions raised by A. Zhebrak. If a one-party state with a system of election when the population has

no choice of candidates and must vote a straight communistic ticket is called "a highest form of democracy," it is clear that American and Soviet concepts of democracy are so far apart that there cannot be a constructive debate on that point.

Let us turn to another statement by A. Zhebrak, "that science can be free in a centralized socialistic state" and that the opinion of K. Sax that "science must conform to political philosophy" in USSR is wrong.

We must state most emphatically, on the basis of our personal experience in USSR, that K. Sax is absolutely right. All groups of population in Soviet Union are living under terrific political pressure and the state is regulating everything and interfering in everything, and this cannot be different because the state is supreme and absolute and the individual is just nothing. Freedom, as Americans understand it, is simply nonexistent in USSR. The scientists are not exceptions to a general rule, although they enjoy some privileges and their standard of living is much higher than that of other less fortunate subjects of Soviet Union.

Let us take a glaring example, about which A. Zhebrak keeps a modest silence. We mean the case of academician N. I. Vavilov, who "was arrested by NKVD in the summer of 1940 and has been kept in custody since then" (*Chronica Botanica*, 1941, 6, 429). We have now reliable information that Vavilov died in a concentration camp in Siberia in 1942.

We can understand the reasons for Zhebrak's avoiding the issue. What ironical commentary on the freedom of science in USSR is the fact that one of the most famous Russian scientists, who rendered outstanding service to his country and who was so respected in USA, could be put to a certain death in a concentration camp for no other reason than his scientific views were found not to be in conformity with Marxian ideology (Vavilov–Lysenko controversy)! But the most disturbing fact is that the case of Vavilov is by no means an exception. We know that hundreds of less-known Russian scientists are dying slowly in Soviet concentration camps which can compete quite favorably in atrocities with Belsen, Dachau, and other Nazi horror camps. Although we can cite the names of some of these unfortunates we have some very sound reasons not to do this. The first rule of all totalitarian states—silence is golden—is known not only to A. Zhebrak but also to us. We talk about Vavilov only because we are sure that he is dead.

K. Sax asks "why and how Vavilov died." He can find the answer to his second question in a book written by a well-known Russian scientist, Prof. Chernavin, *I speak for the silent*, which gives a true and very vivid picture of the life of scientists in the Soviet Union and explains why their careers end sometimes in jail. Prof. Chernavin spent considerable time in various concentration camps and eventually escaped from one of them to Finland, so he can be considered a specialist on this subject.

Although probably 12–15 years elapsed since Chernavin's book was written, our information gathered from the persons who returned only recently from Soviet Union convinced us that nothing was done there to promote the cause of freedom in general and freedom of science in particular. A few privileges granted to scientists are not enough to change the general picture. And although A. Zhebrak describes very eloquently the progress of science, especially in his field (plant genetics), we earnestly believe that the achievements of scientists in USSR would be much more impressive if the fundamental conditions for that—freedom of scientific research and freedom of discussion and criticism—existed in that state.

We are afraid that A. Zhebrak hardly will understand us. We are probably talking again different languages although we both were born in the same country. And this fact is significant in itself. The difference in concepts of such fundamental things as democracy and freedom, which appeared only after the revolution of 1917, is the result of 28 years of most persistent, shrewd, and vicious propaganda to which all citizens of the Soviet Union are subjected day after day. It is interesting to note that even scientists are not immune to this scourge of our time.

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Present Status of Foreign Herbaria and Museums

Although the war has brought about tremendous advances in most branches of science, it has resulted in irreparable losses to systematic biology. Losses of some of the reservoirs of basic data of these sciences, the herbaria and museums that have been destroyed or damaged, are like the results of the fall of the legendary Humpty-Dumpty—all the king's horses and all the king's men cannot restore them. Similar specimens may be accumulated to replace those destroyed, if the places from which they came have not been completely altered, but if a species has been based on a specimen, there is no conceivable way of filling its place if it is lost. Much destruction of this sort has occurred during the war just ended and is likely to continue to occur because of a lack of interest during the period of reconstruction, and because of loss and lack of replacement of competent curatorial personnel.

Systematic botany and zoology differ from most other branches of biology in that the sources of their data can be preserved in relatively permanent form in herbaria and museums. Collections of specimens, together with libraries in which are preserved the records of the circumstances under which the specimens were collected as well as the results of hundreds of years of study, form the essential equipment of the biological systematist. With these collections and libraries as the reservoirs of data, the student may identify plants and animals, construct classifications, work out comparative morphology, stabilize nomenclature, reconstruct phylogeny, plot and interpret geographical distribution, and with newer techniques study the structure and behavior of populations. Since the collections are carefully preserved and filed, the work in these fields does not rest merely on observations of ephemeral phenomena recorded by human hand