three years later he presented privately to a few friends a brief paper of seven pages with the title *Approximatio ad Summam Terminarum Binomii* $a - b^n$ *in Seriem Expansi.* The discovery of this exceedingly rare document is due to Pearson. . . .

In this obscure treatise on abstract mathematics, written in Latin nearly two centuries ago, and supposed by its author to have no practical implications outside the realm of games of chance, in this brief supplement now so rare that only two copies have been reported extant, we have the first formulation of the momentous concept of a law of errors.

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QUESTIONS

IF tomatoes grown in greenhouses have vitamins, does it mean that ordinary window-glass transmits ultra-violet radiations: or does it mean that plants can build up vitamins without the help of ultra-violet?

If sunlight is essential for chlorophyll formation by plants, how did it happen that sprouted seeds with primary and secondary roots, a stem and fully chlorophyllated cotyledons and primary leaves were found *inside* an opened Spanish succulent yellow gourd which had been in the shade in the house for eight months?

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REPORTS

PUBLIC SERVICE AS AN ELEMENT IN THE LIFE OF THE AMERICAN SCIENTIST[1]

IT has been said truly, that our universities magnify the advantage of the individual at the expense of humanity. Few that leave academic halls with degrees in their pockets carry with them any considerable sense of public duty or think of anything beyond their own personal advancement. Recognition of the duty of parentage, for instance, is an essential element in any lasting civilization; but any sense of such a duty is almost entirely lacking among our collegiate young men and women. What professor in his lectures, what college president in his baccalaureate ever mentions that subject? Yet to teach and to practise public service, and service to humanity are especially the duties of scientific men.

Ours is the most humane and altruistic of professions. Yet we commonly fail, I believe, rather grievously in respect to public service. I shall deal with this subject quite concretely, as it is illustrated in a great social, political, moral and toxicological question now before the American people. I refer to the public duty resting upon American physiologists, biochemists, pharmacologists and pathologists in relation to the alcohol question.

Through an odd chain of events I became during the past year virtually, although of course unofficially, consulting toxicologist to the Congress of the United States. It is mainly on my advice that legal beer is to be 4 per cent. by volume and 3.2 by weight. The volume of such a beverage that must be taken to induce even the lowest slightly intoxicating concentration of alcohol in the blood (one milligram of alcohol per cubic centimeter of blood) is at the limit of the capacity of the human stomach.

The studies which this service involved led me to read practically all the testimony on this subject that has ever been given before Congressional Committees by scientific witnesses. And the more I read the more I was exasperated by the attitude that we scientists generally take when called on by legislators for advice; and the more tolerant and even sympathetic I become toward those much maligned bodies of men, the members of Congress and of the legislatures.

Legislators are necessarily called upon to decide a vast number of questions in all fields of human activity. On many of these questions even the most broadly educated man, unless he has specialized on that one subject, can have only superficial information. Legislators are not specialists. But they can and do call upon scientific men who have specialized on each particular question.

In this case the question is the toxicological properties of alcoholic beverages. What do they get in reply? One scientist says, "Alcohol is a food." Another says, "Alcohol is a powerful narcotic drug." Others add other facts. All these statements are true scientifically. But what is the poor legislator, anxious to do his duty and to legislate wisely, to make out of such raw facts? Scarcely any scientific witness seems to realize that what is actually needed is that he himself shall emphasize the practical significance of the scientific facts, and shall show the legislators to what conclusion and to what policy these facts point in relation to the public welfare.

I know that many scientific men will disagree with me on this. One of our most eminent colleagues, when I presented this view to him, offered the objection that what I proposed "involves more than the scientist's function; it requires him to speak as a citizen." To this I would reply that one does not escape the responsibilities of a citizen merely because he is a scientific expert.

As to the alcohol problem it is surely clear that the American people have made a woeful failure to control its evils both before and under prohibition;

[1] Part of an address at the dinner of the Federation of American Societies for Experimental Biology, at Cincinnati, April 11, 1933.

and that without scientific guidance a third experiment may not turn out any better. Is it not clear that this failure in the past, and possibly in the future, is due to the popular ignorance as to the underlying scientific facts? Is it not also true that it is only such scientific men as we who are gathered at this meeting that can supply and interpret the facts?

You may not believe it, but it is true, that a large, conscientious, determined and utterly ignorant element among our fellow citizens honestly believes that "beer is more intoxicating than distilled spirits." Not one legislator in a hundred realizes, until it is explained to him, that to allow spirits to be dispensed under the same conditions as the merely fermented beverages is equivalent to allowing tobacco shops to sell morphine and cocaine under the same conditions as tobacco.

Our British colleagues have served their nation much better. They have the great tradition and institution of royal commissions and similar advisory bodies that in England are so effective in the fundamental direction of national policy. On the alcohol question the facts and their meaning have certainly never been put more clearly than they were by a committee that reported a few years ago to the British Liquor Control Board. On that committee were such men as Cushny, Dale, Newman, Mott, McDougal and Sherrington. What they reported was virtually nothing more nor less than that the mass law of chemistry applies to alcoholic beverages. Those beverages that are concentrated are powerful and harmful in their effects. Those that are dilute are relatively innocuous. So clear was their report both in its presentation of facts and in the inference derived from those facts, that the Judiciary Committee of the Senate embodied the whole British statement in its own report.[2]

I have not the time in a mere after-dinner speech to develop this topic in detail. I have done so, however, in an article soon to appear in a general journal.[3] But is it not clear, when we face the facts known perfectly well to all of us here at this meeting, that the line of public policy and legislation that should be followed, that must be followed, if the evils of alcohol are to be minimized, is that of substituting the more dilute for the stronger alcoholic beverages?

I ask your cooperation in teaching the American people, and particularly the legislators, the mass law in its application to alcoholic beverages.

YANDELL HENDERSON

YALE UNIVERSITY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A LOW-COST LABORATORY UNIT FOR LIGHTING AND APPLIANCES

A LABORATORY table lighting unit has been designed for individual or class use to provide a satisfactory artificial light source for both high power microscopy and table or stage dissection, providing also outlets for electrical appliances. It is believed that the improvements incorporated will be of extended use where economy (*i.e.*, construction, installation charges and operation) must also be taken into consideration. The major points concerning the fixture are the utilization of the recently developed inside frosted blue daylight lamps in the larger sizes, suitable for use in naked fixtures without color filters or globes, and the convenience-outlets so often beyond reach but here made a part of the lighting fixture.

(1) Provision is made for interchangeable use of lamps from 150 to 300 watts, maintaining the center of illumination within the fixture by socket extensions for the 150 watt and 200 watt sizes, and employing the medium-screw "skirted" base for the largest size. Inside frosted Mazda blue daylight lamps are recommended for the reasons indicated in paragraph 3.

(2) Beam intensity values at the table top and 30 inches from the base of the unit, with the lower edge of the reflector hood 17 inches above the table top, for three sizes of inside frosted blue daylight lamps with same position of light-center, are as follows:[1]

Lamp size in watts	Socket extension	Intensity in ft. candles at 30° from plane of table[2]	Intensity in f-c in plane of table
150	3	23	9
200	2	30	13
300	0	41	16

(3) The quality of the light from the inside frosted blue daylight lamp matches average daylight suitably well for general use, and for those who are accustomed to studying by the latter medium this quality is an appreciable gain over the inside frosted white or the clear daylight incandescent lamps.

Normal lamp life is anticipated in the ordinary operation of the inside frosted blue daylight lamp in the fixture. It is pointed out, however, that the color

[2] Senate Report No. 1105, 72nd Congress.

[3] *Harper's Magazine* for June, 1933.

[1] Measured with Weston Model No. 603 Photronic Illumination meter, equipped with a green-yellow filter so that the color sensitivity of the instrument matched that of the human eye.

[2] Ca. angle of microscope mirror.