to keep pharmacy in the status of a profession, therefore be it

Resolved: By the Faculty of the Philadelphia College of Pharmacy and Science, that we deprecate any movement to shorten the time devoted to the course of pharmaceutical education in the college, and be it further

Resolved: That we request the Board of Trustees of the college to return, as soon as practicable, to the previous requirement of four calendar years of study as a requisite for the degree of bachelor of science in pharmacy, and be it further

Resolved: That a copy of these resolutions be properly publicized to the end that it may be realized that the Philadelphia College stands to-day, as it has in the past, for sound educational principles.

THE board of trustees and the dean of the Texas Dental College at Houston announced recently that the program of dental education conducted by the college would be discontinued on August 31 and that the properties of the college would be given to the University of Texas. The school of dentistry was opened on September 1 in the properties acquired by gift from the Texas Dental College, which was founded in Houston in February, 1905. It was organized as a public trust in 1929. Dr. F. C. Elliott has been dean of the college since 1932 and has been named dean of the School of Dentistry of the University of Texas. The Chamber of Commerce of Houston gave a testimonial dinner for Dr. Elliott on June 3 at which he was highly praised for his part in the transfer of the college to the university and for his many public services to the city of Houston and to the State of Texas in the promotion of public health.

AFTER establishing life trust funds of $200,000, the will of the late former Governor Horace White provides that three fourths of the residuary estate shall go to Cornell University at Ithaca and one fourth to Syracuse University. Income from the fund at Cornell University will be applied in whole or in part "to pay or increase salaries of officers and members of the faculty who have rendered distinguished services or who may be of great value to the university." Syracuse University's share in the estate will be known as "the Horace White Fund" and the income will be used to pay the salary of "the Edward C. Reifenstein professorship of medicine." The $200,000 set up for life trusts ultimately will revert to the two universities in their proportionate shares.

IT is announced by the Mining Association of Great Britain that the colliery owners of Great Britain will provide further sums, of the order of half a million pounds, for coal research, in order to extend their existing program, which itself involves the expenditure of £1,000,000 over the current five years. The new program relates to the development of processes for producing hydro-carbons and hydro-carbon derivatives from coal and to the treatment of coal generally as a chemical raw material. The program will begin immediately, and the colliery owners will themselves contribute between £400,000 and £500,000 towards its cost during the period ending with 1945.

ACCORDING to *Nature,* a million dollars has been set aside by the British Council for the Promotion of Science and Technology in China as cash awards for solutions of national defense scientific problems. The Council for the Promotion of Science and Technology has selected ten special industrial and scientific problems for consideration. Chinese men of science, industrial technicians and research workers are invited to engage in studies and research on these problems and submit reports of their results to the council before the end of the current year.

THE South African Standards Institution, which is the national standardizing body in the Union and incorporates the South African branch of the British Standards Institution, recently reelected Professor John Orr as chairman. He has led the standardization movement in South Africa since its inception more than thirty years ago.

IT is reported in the daily press that the University of Lublin, Poland, has been formally adopted for the duration of the war by Fordham University. The Reverend Robert I. Gannon, S.J., president of the university, pointed out that the adoption was "a slight return for the cultural help and influence which our universities have received from the Old World."

DISCUSSION

TRYPTOPHAN AND PHYTOHORMONE PRECURSORS

IT has been shown by different workers[1,2,3] that certain plant tissues, upon alkaline hydrolysis, give much larger yields of auxin than unhydrolyzed tissues. This and related work has established the existence of one or more naturally occurring compounds which have been called auxin "precursors"; they become auxin only after suitable treatment. The chemical identity of such precursors has not been established, but a suggestive paper has been published recently.[4] It reports that the amino acid tryptophan, upon alkaline hydrolysis, yields an auxin which is presumably

[1] G. S. Avery, Jr., J. Berger and B. Shalucha, *Amer. Jour. Bot.,* 28: 596–607, 1941.

[2] A. J. Haagen Smit, W. D. Leech and W. R. Bergren, *Amer. Jour. Bot.,* 29: 500–506, 1942.

[3] E. S. J. Hatcher, *Nature,* 151: 278–279, 1943.

[4] S. A. Gordon and S. G. Wildman, *Jour. Biol. Chem.,* 147: 389–398, 1943.

indoleacetic acid; and that tryptophan-containing proteins (casein and several purified protein preparations from spinach leaves) similarly yield auxin upon treatment with alkali. From these results the authors[4] conclude that "it is not improbable that tryptophane does occur as such in plants, and until it can be definitely shown that there is no conversion of this substance to auxin under the influence of alkali treatment, reported increases in auxin liberation must be viewed with misgiving." This implies that yields obtained by alkaline hydrolysis are in the nature of artifacts. But, rather than causing "misgiving" over the alkaline hydrolysis method, it seems to us that the paper in question supports its value as an extraction method, *i.e.,* it may be such substances as tryptophan in plant tissues which are the precursors. Indeed, it has been reported that tryptophan is convertible to auxin by plant tissues[5,6] and by ultra-violet light.[7]

It has been shown[1,2,3] that approximately 90 per cent. or more of the total auxin obtainable from kernels of corn, wheat and rye is present in the kernels not as auxin, but as a precursor. Thus there is an enormous conversion of a physiologically inactive compound into auxin. Before attaching too much importance to the possibility of tryptophan being the precursor in corn and wheat, it is to the point to compare the magnitude of the conversion obtained from pure tryptophan and that from plant tissue. The maximum yield of auxin (calculated as indoleacetic acid) from alkali treatment of tryptophan is 0.008 per cent., and from a tryptophan-rich protein, casein, is 0.001 per cent. (Gordon and Wildman, tables 3 and 4).[4] In contrast, the maximum yield of auxin from alkali treatment of fresh whole grains of sugar corn is 0.084 per cent. (84 million TDC per gram), calculated on dry weight of the corn.[8] This is at least ten times as high as the conversion from pure tryptophan. If our figures are correct, they indicate that the precursor in corn is not tryptophan.

Evidence in favor of the non-artifact nature of the auxin produced by alkaline hydrolysis of corn is provided by the experiments of van Overbeek.[9] Using a technique which involved exhaustive diffusion, van Overbeek reports that about 90 per cent. of the total auxin obtainable from the coleoptile tips of corn seedlings occurs not as auxin, but as a precursor.

Wheat, upon alkaline hydrolysis, has been reported[1,2] to give increases in auxin yield up to 3 to 6 mg indoleacetic acid per kg of kernels (over that of unhydrolyzed tissue). Contrary to the calculation of Gordon and Wildman, which seems to be in error by a factor of one million,[10] such increases are very much in excess of any activity obtainable from the tryptophan in wheat.

It has been pointed out in the work of this laboratory that the alkaline hydrolysis method is unsatisfactory for a number of green tissues.[8] These tissues presumably contain tryptophan, but it is obvious that the conversion of tryptophan to auxin was too little to be detected.

From diffusion curves, Gordon and Wildman (see their Fig. 1) conclude that the auxin produced is probably indoleacetic acid.[11] It should be noted that indoleacetic acid is stable to strong alkali: whereas no auxin is obtained from tryptophan with 0.25 N sodium hydroxide at 100° C. for 15 minutes, identical treatment of corn gives maximum auxin yields. Thus, it is unlikely that indoleacetic acid is the auxin produced from tryptophan by alkaline hydrolysis.

In Table IV[4] the data show that mild acid treatment of tryptophan (phosphate buffer at pH 4.6) gives higher yields of auxin than any other treatment described in the paper. Opposed to this is another datum in the same table, that a tryptophan solution adjusted to pH 4.6 gives no auxin. These results are difficult to understand. If the former is correct, it is still further evidence that the auxin precursors in corn and wheat are not tryptophan, since they do not give auxin under such conditions.

The tentative conclusion that tryptophan is not identical with the corn and wheat auxin precursors rests chiefly on the fact that the per cent. conversion of natural precursors to auxin is very much higher than that of pure tryptophan to auxin. Since it might be argued that tryptophan would show a higher percentage conversion into auxin in the presence of plant materials, we have hydrolyzed mixtures of tryptophan and ground corn kernels, and tryptophan and purified corn auxin precursor in varying amounts by weight, at pH 9.7 for 30 minutes. Avena assays indicate no appreciable increase in auxin yield from the tryptophan in either case. For example, 250 mg ground dry sugar corn alkali-hydrolyzed in the presence of 100 mg of *l*-tryptophan (Merck) gave 17.6° curvature at 1:16,000, compared with 13.8° curvature for corn hydrolyzed alone. The curvature attribut-

[5] F. Skoog, *Jour. Gen. Physiol.,* 20: 311–334, 1937.

[6] W. S. Stewart, *Bot. Gaz.,* 102: 801–805, 1941.

[7] A. Berthelot and G. Amoureux, *Compt. Rend.,* 206: 699, 1938.

[8] G. S. Avery, Jr., J. Berger and B. Shalucha, *Amer. Jour. Bot.,* 29: 765–772, 1942.

[9] J. van Overbeek, *Amer. Jour. Bot.,* 28: 1–10, 1941.

[10] Correspondence from Dr. Gordon recognizes that his 0.6 mg should be 500 grams (G. and W., p. 397). The agar block size referred to on page 389 of their work, Dr. Gordon informs us, should be 9 cmm, and the subsequently calculated figure should be 1.8×10^{-4} µg.

[11] A number of other possible intermediates of tryptophan breakdown were eliminated because of their physiological inactivity, although indolepyruvic acid, a very likely intermediate with 1.0 per cent. of the activity of indoleacetic acid, seems not to have been considered (suggested by Skoog[5]). 2-Indoleacetic acid is also a possible product.

able to tryptophan conversion is equivalent to a 0.015 per cent. yield of indoleacetic acid from pure tryptophan, versus a 0.022 per cent. yield of indoleacetic yield from crude corn. If tryptophan were the corn auxin precursor, then corn would have to be pure tryptophan, which is obviously absurd. It may be safely concluded, therefore, that tryptophan is not the corn auxin precursor to which most of the auxin activity is attributable.

On the other hand, it may be concluded from the work of other investigators[5,6] as well as from that of Gordon and Wildman, that tryptophan is a plant auxin precursor of a low degree of activity. Their results[4] suggest that auxin yields obtained from green tissues by methods involving extraction periods of many weeks[12] may possibly be attributable to tryptophan conversion into auxin.

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THE ROOTS OF SPINAL NERVES

Every one acquainted with the structure and function of the spinal nerves is aware of their threefold origin. Although this fact was recognized and generally accepted during the closing years of the nineteenth century, present-day descriptions of the spinal nerves continue to be based on the knowledge of a still earlier day. Consequently, they are initially misleading and always cause the beginner unnecessary difficulty in gaining an appreciation of the sources and functions of the fibers in peripheral nerves.

Each spinal nerve contains axons arising from cell bodies located in dorsal root ganglia, in the spinal gray matter and in the ganglia of the sympathetic chain. Fiber bundles from the first two mentioned sources are known as roots of the nerve, but the bundle from the third source is reduced to the status of a branch or ramus in all current descriptions. There seems to be no reason for continuing this erroneous designation except long-established custom. While it is true that the gray root is much smaller and joins the rest of the nerve at a point some distance removed from the union of the dorsal and ventral roots, such differences are mere details of pattern in comparison to the complete reversal of meaning occasioned by referring to a root as a branch; or, in the sense that these terms are employed, in speaking of a contribution as a derivative.

To obviate the above-mentioned misnomer in present terminology the following changes in the description of spinal nerves are proposed: (1) With an occasional exception, all spinal nerves are formed from three roots, a dorsal, a ventral and a gray (sympathetic). (2) Every spinal nerve gives rise to three primary rami and some of them give rise to four; the constant rami are the dorsal, the ventral and the recurrent, while the one arising from only certain of the nerves is the white (visceral) ramus. A white ramus springs from each of the thoracic nerves, the cranial three lumbar and the third and fourth sacral nerves; in addition, a white ramus may issue from the eighth cervical, the fourth lumbar or the second sacral. (3) The trunk of the spinal nerve is the portion between the roots; *i.e.*, it extends from the junction of dorsal and ventral roots to the point where the gray root joins the bundle formed by the union of the other two. By this definition the dorsal, the recurrent and the anterior rami arise directly from the trunk; but the white ramus is peculiar in that it may arise from the trunk, from the anterior ramus, or pass to the sympathetic chain enclosed in a sheath common to it and the gray root.[1] As to the composition of the rami with respect to the triple origin of the parent trunk, the dorsal and ventral rami contain fibers from all three roots, the recurrent carries fibers from the dorsal and the gray roots, and the white ramus receives fibers from the dorsal root and from the ventral root. It is to be noted that the white ramus alone carries dorsal and ventral root fibers only as implied for all rami in the usual introductory description.

That all spinal nerves have not two roots, but three, is factually correct. The question raised is: Shall all three roots be known as such or shall one of them remain disguised as a ramus and so continue to confuse and confound those who must eventually learn that the nerves to skin contain not only afferent fibers but efferent fibers as well; that in nerves to muscle, fibers from all three sources are generously represented; and that the white rami instead of being strictly efferent contain abundant afferent fibers? The author is aware that some afferent fibers may course with the gray ramus, that dorsal roots apparently carry efferent impulses as well as afferent, and that the possibility of afferent fibers in the ventral roots may not be excluded entirely. However, the errors imposed in neglecting to mention these facts in an introduction to the subject seem trivial compared to the continued persistence of the term "gray ramus" when the structure so named has long been established as a root—and an important one—of each and every spinal nerve.

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TAXONOMY AND GENONOMY

Systematic biology has been occupied in the past primarily with the end results of speciation. The object of practising systematists has been to define

[12] K. V. Thimann, F. Skoog and A. C. Byer, *Amer. Jour. Bot.*, 29: 598–606, 1942.

[1] D. Sheehan and J. Pick, *Jour. Anat.*, 77: 125, 1943.