The second step in construction produced an entirely different effect. The first diagram became the basis of the new one. Along the edge of the isometric base a graduated vertical scale was drawn with the divisions —one for each isotherm—about one millimeter apart. On a new piece of tracing cloth a single marker was drawn in such a way as to coincide with the lowest division on the vertical scale. The tracing cloth was attached to a T-square in order to ensure that it could be moved the appropriate interval and maintain the same direction. With the index of the tracing on the lowest division of the vertical scale the highest, or warmest, isotherm was redrawn on the tracing. By moving the tracing upward one division on the vertical scale the next lowest isotherm was drawn, and in the same manner each lower isotherm was added to the diagram. Also the intersections of the coordinates with the isotherms were indicated, so that they could be drawn in later. After all the isotherms were drawn the ends were connected by a heavy line which had the effect of making the device appear as a block-diagram. The drawing-in of the coordinates helped to create the desired optical illusion, and the adding of a base completed the diagram except for the lettering.

A very similar three-dimensional diagram may be made on an isometric base by erecting at each intersection a vertical line representing the mean hourly temperature. The top ends can then be connected by a smooth curve more or less parallel with the corresponding coordinate. Only the coordinate curves should be shown in the completed diagram. The resulting isopleth will resemble the diagram Davis made to show the distribution of insolation.

To facilitate the construction of a block diagram from a contour map a special pantograph has been designed by Castelnau.[4] Even with the assistance of such equipment the isopleth-block diagram may require more time than its value will justify. However, the writer has found it very useful for the display of the mean hourly temperatures throughout the year.

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A METHOD FOR PURIFICATION OF EXTRACTS CONTAINING THE GROWTH-PROMOTING PRINCIPLE OF THE ANTERIOR HYPOPHYSIS[1]

IN 1921 Long and Evans[2] produced gigantism in rats by daily intraperitoneal injections of saline extracts of the anterior lobe of the bovine hypophysis. In the Harvey Lectures of 1923–1924, Evans[3] described more refined methods for the extraction of the growth-promoting principle. The most potent extracts were prepared by means of extracting the ground anterior lobe tissue with sodium hydroxide and subsequently bringing the extract to approximate neutrality with acetic acid. Evans and Simpson[4] have recently reported success in obtaining growth in adult female rats with the daily administrations of as little as one eighth to one fourth cubic centimeter of such a preparation.

A modification of the method first described by Evans which made it possible for us to prepare sufficient quantity of a sterile potent extract for use in dogs has been described in a previous communication.[5]

Some months ago a study of the blood chemistry of dogs receiving this growth-promoting substance was begun, and it became desirable to free the extract from the bulk of non-protein nitrogen and certain inorganic substances. Since success had not been attained in freeing the principle from proteins an attempt to fractionate the protein was made. After a preliminary trial of salts for fractionation, sodium sulphate was selected.

Method: The usual neutralized alkaline extract is prepared as described in a previous communication. The solution is cautiously warmed to 35° C., and twenty grams granular anhydrous sodium sulphate for each 100 cc of extract is added slowly and with stirring. After about fifteen minutes the precipitate becomes flocculent and may be easily filtered. The washed precipitate is pressed as dry as possible and is taken up in one half the original volume of water.[6] The redissolved precipitate is filtered through a sterilized Seitz filter and is then ready to inject. The protein precipitate consnsts of globin euglobulin and pseudo-globulin. Further separation of the euglobulin and pseudo-globulin fractions has resulted in a division of the growth-promoting substance between the fractions. The fraction from 20 per cent. to 35 per cent. sodium sulphate which brings down nearly all of the remaining protein has not resulted in growth. The redissolved globulin extract is slightly lower in protein than the original preparation, and the sugar, phosphates, non-protein nitrogen and uric acid are reduced to traces.

[4] Paul Castelnau, "La théorie du bloc-diagrams," *Bull. de la Société de Topographie de France*, July–August, 1912, pp. 121–136.

[1] From the Surgical Laboratory of the Harvard Medical School.

[2] Evans and Long, *Anat. Rec.*, 21: 62, 1921.

[3] H. M. Evans, Harvey Lectures, 1923–24.

[4] H. M. Evans and M. E. Simpson, *Jour. A. M. A.*, 91: 18, 1928.

[5] T. J. Putnam, E. B. Benedict and H. M. Teel, *Am. Jour. Physiol.*, 84: 157, 1928.

[6] There is sufficient sodium sulphate in the precipitate to redissolve this water-insoluble protein fraction. There is also a small amount of lipoid material which does not go back into solution.

The presence of the growth-promoting principle in the globulin group is in accord with the observation of Evans that alkaline extractives are most efficient. Further after the addition of twenty volumes of water to a paste of ground glands, the growth effect appears to be in the water-insoluble fraction which further suggests the adsorption with or identity of this substance with the globulin and water-insoluble group of proteins. It is interesting that the growth-promoting principle is destroyed by about the same temperature as that at which this group of proteins is denatured.

SUMMARY

(1) The growth-promoting principle of the anterior hypophysis may be salted out of the more crude extracts by means of sodium sulphate.

(2) Attempts to further fractionate the globulin group of proteins in which the growth-promoting principle comes down resulted in a division of the substances between the fractions.

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SPECIAL ARTICLES

THE FIRST SPECTRUM OF XENON[1]

A NEW list of estimated intensities and measured wave-lengths has been obtained for about 300 lines characterizing the first spectrum of xenon. The observed wave-lengths range from 3442.7A in the ultra-violet to 9923.10A in the infra-red. Spectral terms which account for practically all of these lines have been identified. The largest term is $^1S_0$ (p_0) representing the normal state of the neutral atom. The value of this term in xenon is 97835; from it the ionization potential of 12.078 volts is derived. In the notation introduced by Paschen in his analysis of neon the main atomic energy levels may be grouped as four *s*-terms, ten *p*-terms and twelve *d*-terms. These in turn are each separable into two subgroups coordinated to the two $^2P_{2,1}$ levels of the rare gas ion. The absolute values of the four *s*-terms and of the set of *p*-terms related to the lower level of the Xe^+ ion are as given.

Inner quantum numbers are shown in the first column while the last contains the separations of the levels; the large value between $1s_4$ and $1s_3$ is connected with the coordination of these levels to the $^2P_{2,1}$ levels of the Xe^+ ion which appear to be separated by 9621 cm^{-1}. The general features of the Xe I spectrum closely resemble those of the analogous spectra Ne I, A I, Kr I, and are in excellent accord with the theoretical expectations. Complete details of the wave-length measurements and analysis will appear in an early number of the Bureau of Standards *Journal of Research*.

2	$1s_5$	30766.90	
			977.64
1	$1s_4$	29789.26	
			8151.60
0	$1s_3$	21637.66	
			988.30
1	$1s_2$	20649.36	
1	$2p_{10}$	20565.23	
			850.58
2	$2p_9$	19714.65	
			283.24
3	$2p_8$	19431.41	
			552.98
1	$2p_7$	18878.43	
			256.48
2	$2p_6$	18621.95	
			906.47
0	$2p_5$	17715.48	

[1] Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

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DEVELOPMENT OF THE MOUSE ADRENAL

BETWEEN the cortex and the medulla of the adrenal gland, a band of tissue which is free of adrenalin has been observed by Cramer[1] in mice which had received adrenalin injections. He describes this tissue as medullary tissue which is drained of its adrenalin and inhibited from producing more by a mechanism of secretory control which reacts to the presence of excess adrenalin in the circulation. He observes "essentially the same changes" after such various experimental treatments as injection of thyroid extract and exposure to heat.

The writer failed to find this reaction following adrenalin injections, but has observed similar appearances in experimentally untreated mice, in the course of the development of the adrenal.[2] It is suggested that this normal stage in development could account for Cramer's observations.

Adrenalin injections were made into adult male mice, following Cramer's procedure of the injection of 0.015 mg of adrenalin per mouse, and fixation of the adrenals after twenty minutes. The tissue was

[1] W. Cramer. *Brit. Jour. Exp. Path.*, 7: 88, 1926, quoted by G. N. Stewart, in Cowdry's "Special Cytology," 1: 636.

[2] E. Howard Miller. *Amer. Jour. Anat.*, 40: 251–298, 1927; and R. Deanesly, *Proc. Roy. Soc.*, B, 103: 523, 1928.