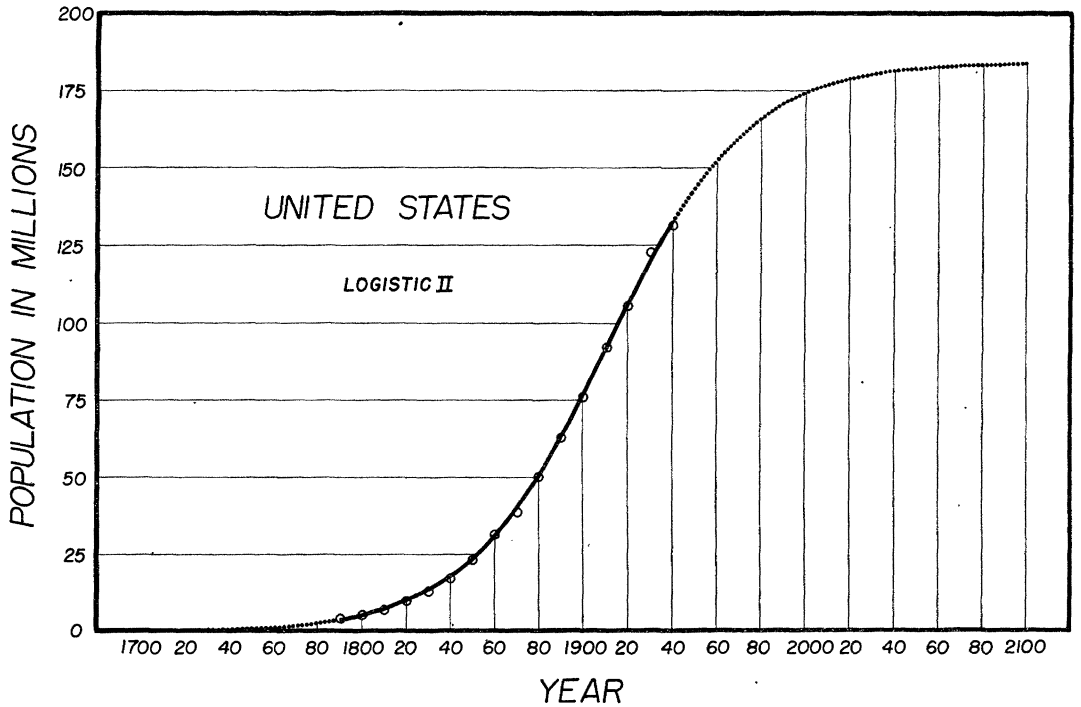

FIG. 2. Logistic curve II (smooth curve) fitted to the census counts (circles) of the population of the United States from 1790 to 1940 inclusive.

not know, and shall not know until the count of 1950 gives some indication as to whether the discrepancy between theory and observation in 1940 is merely a minor fluctuation that will be compensated for in the next ten years, or marks instead the beginning of a different trend of the curve.

But in the meantime, in part as a token of good faith relative to our past promises, we have computed a new logistic curve (Logistic II), using the method of successive least square approximations,[4] to the history of the growth of the population of the United States, including all the recorded data from 1790 to 1940 inclusive. The results are set forth in Table II, and Fig. 2. The equation of this new logistic (Logistic II) is:

$$y = \frac{184.00}{1 + 66.69e^{-0.0322x}} \qquad (2)$$

The constants K and C in (2) are *smaller* than in (1) by amounts that are respectively 6.7 and 0.9 per cent. of their values in (1). The constant r is *larger* in (2) than in (1) by 2.9 per cent. of its value in (1). From Table II the following root mean square deviations are computed

$$\sqrt{\frac{\Sigma(B-A)^2}{16}} = \sqrt{\frac{12.408}{16}} = .8805$$

$$\sqrt{\frac{\Sigma(C-A)^2}{16}} = \sqrt{\frac{29.853}{16}} = 1.3659$$

[4] R. Pearl, "Introduction to Medical Biometry and Statistics." Third Edit. Chapter XVIII *passim*. Philadelphia: W. B. Saunders Company, 1940.

It is plain that either of the two logistics fits the 16 observed populations very well, considering that each is only a three constant curve. But as to which makes the better forecast of the population to be counted in 1950 we are not prepared to say at this time. We hope to make a statement on the point in 1950.

RAYMOND PEARL[5]
LOWELL J. REED
JOSEPH F. KISH

SCHOOL OF HYGIENE AND PUBLIC HEALTH,
THE JOHNS HOPKINS UNIVERSITY

THE HEPARINS OF VARIOUS MAMMALIAN SPECIES AND THEIR RELATIVE ANTICOAGULANT POTENCY

ON the basis of studies of impure beef heparin Jorpes[1] postulated that heparin is a mixture of mucoitin polysulfuric acids, the anticoagulant action of which is dependent on the sulfate groups, the potency increasing with increasing sulfur content. The isolation of the crystalline barium salt of heparin by Charles and Scott[2] has made it possible to prepare large amounts of the pure anticoagulant. Working with samples of this crystalline material isolated from different tissues of the ox, Charles and Todd[3] could

[5] Professor Pearl died on November 17.

[1] Jorpes, *Biochem. Jour.*, 29: 1817, 1935; *ibid.*, 33: 47, 1938.

[2] Charles and Scott, *Biochem. Jour.*, 30: 1927, 1936.

[3] Charles and Todd, *Biochem. Jour.*, 34: 112, 1940.

find no evidence of the heterogeneity claimed by Jorpes. Similar findings have been reported by Jaques and Waters[4] for the crystalline barium salt of heparin isolated from the blood of dogs in anaphylactic shock.

The latter authors reported that crystalline heparin isolated from dog tissue has a much greater anticoagulant potency than that from beef, suggesting a species difference. More recently, heparin has been isolated as the crystalline barium salt from pig and from sheep lung, and these also have been found to differ in potency. The potencies of samples of crystalline heparin isolated from the four species are listed in Table I. The anticoagulant in each case was purified

TABLE I

THE ANTICOAGULANT POTENCY AND SULFUR CONTENT OF HEPARINS FROM DIFFERENT SPECIES*

Source	Potency u/mg	S. content %
Dog	240	10.8
Ox	100	10.8(2)
Pig	44	10.4
Sheep	23	11.6

* In each case the potency reported is for the air-dried crystalline barium salt, while the sulfur content is for the same sample after removal of the water of crystallization (about 10 per cent).

and crystallized as described by Charles and Scott. The potency was determined by comparison with a standard preparation of pure beef heparin, using a modification of the Howell method. It is evident that heparin isolated from different species varies greatly in potency; *i.e.*, different heparins occur in different species. The barium salts of the various heparins all crystallize in the typical rosettes and sheaves described for beef heparin by Charles and Scott and apparently require almost identical conditions for crystallization. It is rare for a biological substance to show such widely differing activity in different species without a corresponding variation in crystalline structure.

The sulfur contents of the various heparins are also shown in Table I. While there are minor variations in these values, there is no correlation between the potency and sulfur content of these heparins. For example, as previously reported by Jaques and Waters, the sulfur content of dog heparin is no greater than that of the heparins from other species, although its potency is 2½ times that of the beef and 10 times that of the sheep heparin. Furthermore, in the 4 mammalian species studied, sheep heparin has the highest sulfur content and lowest potency. Hence, although removal of the sulfur inactivates heparin (Charles and Todd), the very high anticoagulant activities of the crystalline material from dog, beef and pork tissue must be due in part to factors other than the high sulfur content.

Investigations in these laboratories support the conclusions of Charles and Todd that the heparin in any one species is a chemical individual. It is evident, however, that different heparins are found in different species.

L. B. JAQUES

DEPARTMENT OF PHYSIOLOGY,
CONNAUGHT LABORATORIES,
UNIVERSITY OF TORONTO

SCIENTIFIC APPARATUS AND LABORATORY METHODS

ELECTRO-FOLIAR DIAGNOSIS

WHILE investigating the alkalinity of greenhouse soils, caused by the use of hard water, and its relationship to chlorosis in plants, especially the role of iron and manganese as a cause of the chlorosis, the idea occurred that perhaps qualitative or semi-quantitative spot tests for these elements could be obtained by electrolyzing the leaf tissue and catching the removable ions in chemically treated filter papers. Accordingly, a suitable form of the well-known electrolysis apparatus was improvised which includes a common table clamp to hold the plant leaves, filter papers and electrodes, a 45-volt B-battery, a nickel crucible cover for the cathode, and a 1½-inch platinum disk for the anode. The general features of the apparatus are shown in Fig. 1.

The following technique was found suitable for the determinations: A plant leaf was perforated over an area of about four square centimeters by placing it on the convex side of a watch glass and tapping it with the teeth points of a fine comb. The perforated leaf was then laid between two small filter papers, which were saturated previously with a dilute acetic acid solution, and the whole then placed between the electrodes. After clamping the electrodes firmly together between insulators, and with suitable electrical connections, the current was passed through the leaf. Perforating the leaf in the manner described, and saturating the filter papers with an acid or salt solution, lowers the electrical resistance of the whole considerably and thus increases the efficiency of the electrolysis. Two minutes' time for current passage gave good tests for nitrates, phosphorus, iron and manganese in certain cases. Obviously, the proper kind of electrodes, current strength, chemical treatment of the filter papers and other experimental conditions to use will depend on the special tests to be made with the apparatus. In all cases, however, the filter papers must be free from the ions under test.

[4] Jaques and Waters, *Amer. Jour. Physiol.*, 129: 389, 1940.