We hope soon to be able to give a more exact location of the center.

We wish to call attention to a very similar phenomenon connected with the *nervi erigens* described by Martin and Tainter.[3] After decerebration, stimulation of the *nervi erigens* failed to produce its usual effect. Section of the nerves did not abolish the inhibition. If one sectioned the nerve before decerebration there was no effect on the action of the nerve as a result of decerebration. We know of no studies dealing with the permeability of the capillaries during stimulation of the *nervi erigens,* but the probabilities are that erection would be accompanied by outpouring of fluid to the tissue spaces. Our results and those of Martin and Tainter seem to indicate that injury in the neighborhood of the colliculi throws the capillary cells into some kind of a fixed condition of lessened permeability. We believe this mechanism is involved in those conditions of anuria seen when calculi are passing down the ureters. We have not been able to remove this condition by stimulation of nerves, but our experiments along this line have been very few.

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Further observations on relation of glomerular function to phenolsulphonephthalein excretion in frog's kidney.

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Since Rowntree's Phenolsulphonephthalein Test[1] of renal function is used widely in clinical practice, it is important to determine whether Phenolsulphonephthalein and similar dyes are excreted through the glomeruli, through the tubules, or through both.

In previous communications, we,[2] and also Richards and

[3] Martin, E. G., and Tainter, M. L., *Am. J. Physiol.*, 1923, lxv, 139.

[1] Rowntree, L. G., and Geraghty, J. T., *J. Pharmacol. and Exp. Therap.*, 1910, i, 579; *Arch. Int. Med.*, 1912, ix, 284.

Wearn,[3] observing the frog's kidney by Richard's method, have demonstrated this dye in the fluid within the glomerular capsules of the frog, indicating clearly that in this animal the glomeruli excrete Phenolsulphonephthalein. We have also shown that the dye appeared in the lumen of the distal convoluted tubules and in the straight tubules about 5 to 10 minutes after it appeared in the glomerular fluid; and that the color within the tubules showed the dye present in a much more concentrated solution than in the glomerular capsule. We found further that if branches of the renal artery were ligated, no dye appeared in the lumina of the tubules in the areas in which there was no active circulation through the glomeruli. We regarded this as proof that Phenolsulphonephthalein is excreted by the glomeruli and is concentrated in the tubules by the reabsorption of water. Marshall and his collaborators[4] have objected to this interpretation because they have found that the cells of the convoluted tubules of the frog, seen on the dorsal surface of the kidney, are deeply stained with the dye; and they regard that as evidence that it is excreted by these cells. We have confirmed their objective findings but not their interpretations, since the presence of a dye within a tubule cell does not necessarily indicate that that cell is excreting it into the tubule.

In a previous communication we[2] have also shown that, contrary to the claims of Nussbaum[5] and of Woodland[6] and other observers, there is a definite anatomical anastomosis between the branches of the renal artery and those of the renal portal vein within the kidney, especially in the lower half, and that the pulsating stream from the artery and the continuous flow from the vein can be seen as separate currents within the same blood vessel. One would, therefore, expect that when the dye is injected

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[2] Bieter, R. N., and Hirschfelder, A. D., PROC. SOC. EXP. BIOL. AND MED., 1922, xix, 415; *Am. J. Physiol.*, 1924, lxviii, 326; *J. Pharmacol. and Exp. Therap.*, 1925, xxv, 165.

[3] Richards, A. N., *Am. J. Med. Sci.*, 1922, clxiii, 1. Wearn, J. T., and Richards, A. N., *J. Am. Med. Assn.*, 1923, lxxx, 1644; *Am. J. Physiol.*, 1924, lxxi, 209.

[4] Marshall, E. K., Jr., and Edwards, J. G., *Am. J. Physiol.*, 1924, lxx, 489; Marshall, E. K., Jr., and Crane, M., *Am. J. Physiol.*, 1924, lxx, 465; Marshall, E. K., Jr., and Vickers, J. L., *Bull. Johns Hopkins Hosp.*, 1923, xxxiv 1.

[5] Nussbaum, *Arch. f. d. ges. Physiol.*, 1878, xvi, 139; *ibid.*, 1878, xvii, 580.

[6] Woodland, J., *J. and Proc. Asiatic Soc.*, 1922, N. S. xviii, 85.

into the renal portal vein some of it would enter the glomeruli and be excreted by them.

Further observations as to glomerular activity obtained by excretion of phenolsulphonephthalein and the resulting injection of these glomeruli by American India Ink gives the results described below.

The technique for these procedures is as follows: Large frogs, weighing from 200 to 650 grams, of the species *Rana Catasbiana,* are anesthetized with urethane. The frogs are then tied down with the ventral surface upwards and the abdominal cavity opened by the method described elsewhere.[2] By means of a series of cannulae the urine from the upper and lower halves of the kidney can be collected separately. With another set of cannulae arterial blood can be transported from an aortic branch to a common iliac so that this blood when collected by the veins can be run into the kidney through the renal portal system. Oxygenated Ringer's solution is now run into the renal arteries so that, as we have found, it will strike most of the glomeruli of the upper half of the kidney, and there be filtered to produce a fluid in the urinary tubules. Phenolsulphonephthalein solution and American India Ink can now be injected into the system of cannulae carrying blood around the kidney so that it can return through the kidney by means of the renal portal system, or it can be injected into a branch of the renal portal vein.

With this technique the following results have been obtained: In a series of 10 frogs when Phenolsulphonephthalein has been injected into the blood being carried around the kidney to return as renal portal blood, the urine in the lower cannula shows Phenolsulphonephthalein within five or ten minutes, and the urine in the upper cannula shows Phenolsulphonephthalein in from ten to thirty minutes or in some cases not at all. The lower cannulae always show the Phenolsulphonephthalein in a deep concentration and in a fairly large amount, whereas the upper shows only in traces.

In another series of five frogs treated as above except that the Phenolsulphonephthalein and India Ink solution was injected continuously through the experiment into the anterior abdominal or pelvic vein on the left side, the lower cannula showed Phenolsulphonephthalein in an amount from two to four or five times as concentrated as the original solution injected, whereas the upper cannula showed the dye only in traces and never as concen-

trated as the original solution. The amounts of urine from the upper and lower halves ran fairly uniformly—*e. g.*, from one frog being 0.23 cc. for the upper portion and 0.26 cc. for the lower portion.

These kidneys removed after the experimental procedure, fixed, sectioned, and stained with eosin, showed (1) grossly, a kidney fairly uniformly injected with ink, and (2) microscopically, a fair degree of uniformity of tubular capillary injection and glomerular injections of upper and lower halves as follows: in the upper portion of the kidney from 4 to 32 per cent of the glomeruli were injected with an average of 14.3 per cent, whereas in the lower portion, from 17.5 to 97.5 per cent were injected, with an average of 43.1 per cent.

In the light of these findings, the burden of proof in the question as to whether the dye is excreted by way of the glomeruli or by way of the tubules, lies with those who claim that it is excreted by way of the tubules.

SUMMARY.

When a dye solution is run into the frog's kidney in such a way that, in the lower portion of the kidney, it runs into tubular capillaries and into a large number of glomerular capillaries, while in the upper portion of the kidney it runs into tubular capillaries, and into only a few glomerular capillaries, the amount of dye excreted follows the number of active glomeruli receiving dye solution, although both halves of the kidney are producing urine.

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On correlation between age of parents and length and weight of the newborn infant.

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It seems reasonable to assume that a number of factors influence the size of the human individual at various stages of

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