

On nutritive channels within the liver cells which communicate with the lobular capillaries / by E.A. Schäfer.

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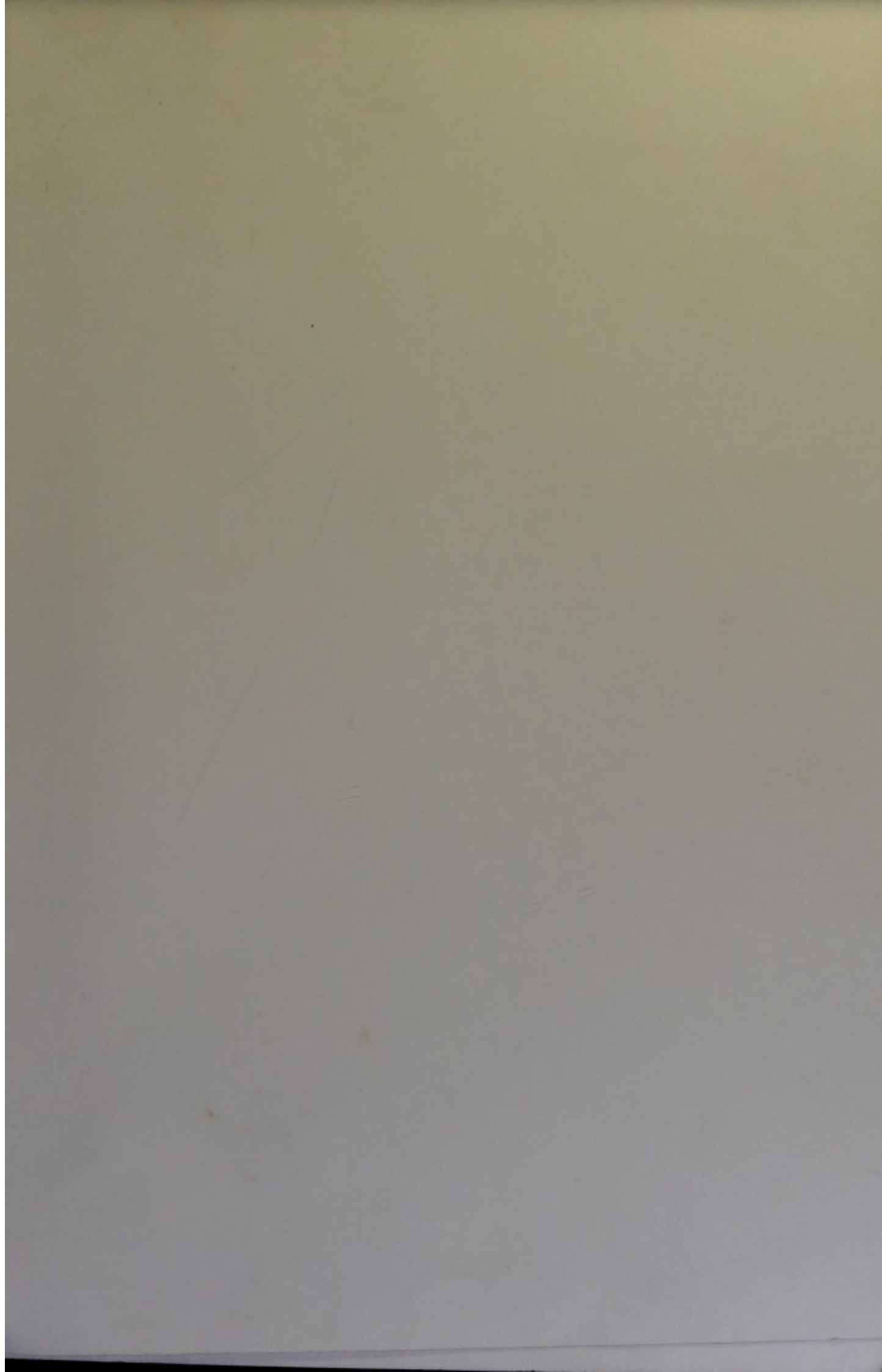
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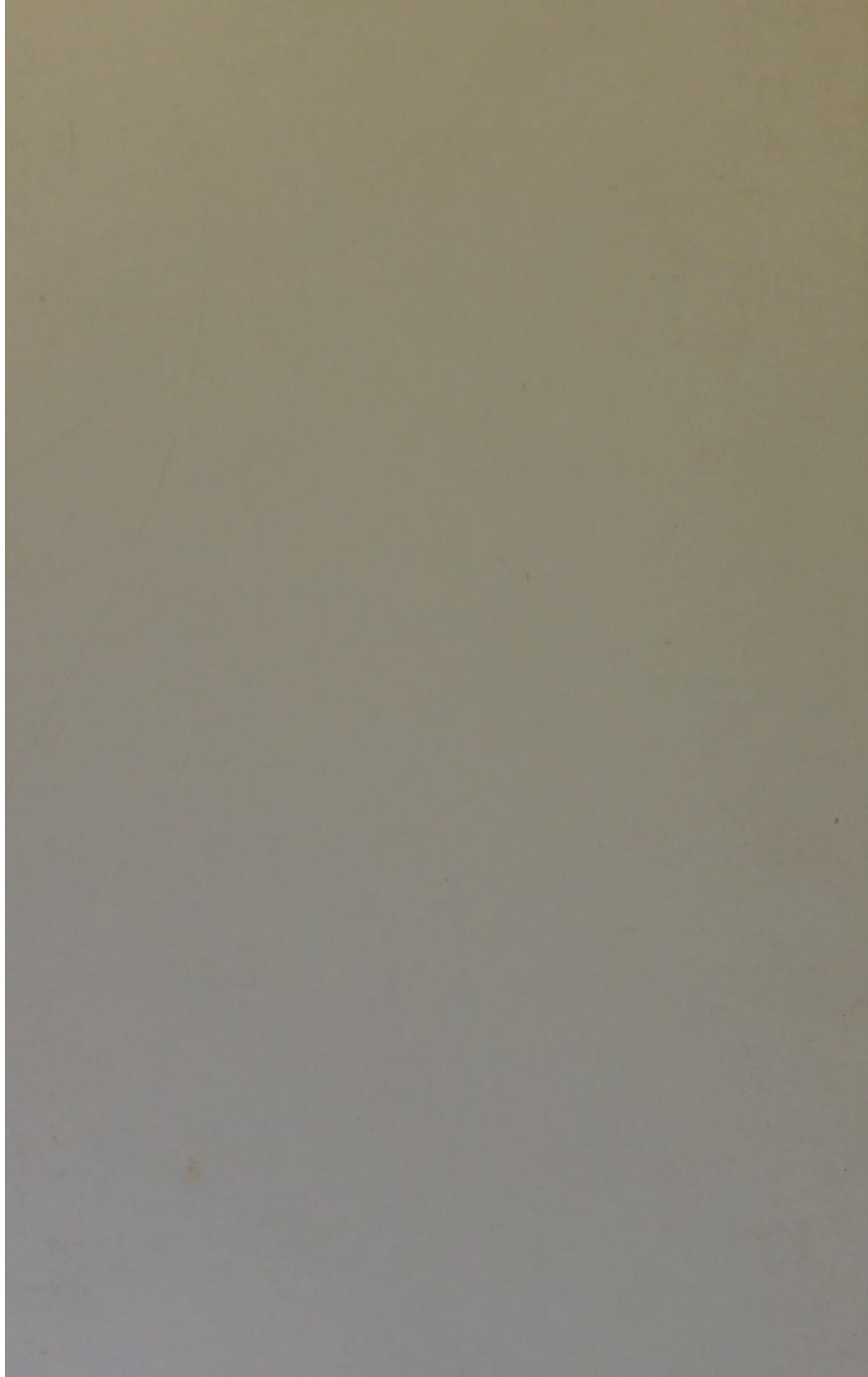
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T +44 (0)20 7611 8722
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**On nutritive Channels within the Liver Cells
which communicate with the lobular Capillaries.**

By E. A. SCHÄFER, Edinburgh.

With one Figure.

The existence of nutritive channels within the liver cells which are in direct communication with the bloodvessels has been inferred by BROWICZ as the result of a series of observations communicated by him since 1897 to the Academy of Sciences at Cracow and published in the *Bulletin international de l'Académie*¹⁾. These observations have shown that under both normal and abnormal conditions the liver cells may contain, both within the nucleus and in vacuoles within the cyto-

1) Intracellular biliary passages in the liver cells, March 1897. On pathological conditions of the nucleus of the hepatic cell indicating that the nucleus is a secreting organ, April 1897. On the structure of the liver cell, May 1897. How and in what form is hæmoglobin brought to the liver cells? June 1897. On crystallisation phenomena in the liver cells, April 1898. On the intravascular cells in the hepatic capillaries, April 1898. On microscopic appearances in the liver cells after intravenous injection of hæmoglobin, November 1898. Intussusception of erythrocytes by the liver cell and the appearances of the cells thereby produced, July 1899. Channels of nutrition in the liver cell — with a resumé of the author's results since 1897, July 1899. Structure of intraacinous blood capillaries and their relation to the liver cells, May 1900.

plasm, erythrocytes singly and in groups, as well as masses of free hæmoglobin and hæmoglobin crystals, and pigment in granules and in crystalline clumps. The inference which BROWICZ is led to form from the facts which he has recorded is expressed in the following words¹⁾:

“Alle diese angeführten Umstände veranlassen den Verfasser, außer den intracellulären Gallengängen als Ausfuhrwege noch die Existenz besonderer Einfuhrwege, Ernährungswege oder Kanälchen, in den Leberzellen anzunehmen.

Daß dieselben nicht als ein System von evidenten Kanälchen sichtbar gemacht werden konnten, thut dieser Annahme keinen Abbruch. Die intracellulären Kanälchen überhaupt müssen ja selbstverständlich äußerst fein sein, welche selbst unter günstigeren Verhältnissen nur teilweise, gleichsam stückweise sichtbar werden, besonders wenn man die sehr geringe Quantität von Ernährungs- und Functions-material, welches in einer Zeiteinheit in die Leberzelle hineingelangt, berücksichtigt; das mikroskopische Bild der Zelle ist ja nur ein Augenblicksbild”.

The objective proof of the existence of the intracellular canaliculi and their connection with the lobular capillaries which BROWICZ has inferred from the presence of erythrocytes within the liver cells (an inference which is confirmed by the intimate anatomical connection which he has further shown to exist between the cells bounding the capillaries and those of the parenchyma of the lobules) is furnished in a striking manner in a preparation of rabbit's liver, injected with carmine-gelatine from the portal vein, which I have come across in the histological collection belonging to the Physiological Laboratory of the University of Edinburgh. In all sections from this liver there is seen within the protoplasm of the cells — but not within the nucleus — a network of fine varicose canaliculi filled with the red injection and communicating here and there directly with the lobular capillaries, which are also completely injected. There is nowhere any sign of diffusion of the carmine — the nuclei are completely colourless — and only here and there of extravasation of the injecting material between the cells, which at such places do not show the canaliculi in question. The gelatine mass has not passed into the cells by way of the bile ducts or perivascular lymphatics for these show no signs of being injected. The injection is in fact limited to the bloodvessels and the intracellular channels, but the efferent lymphatics of the portal canals contain diluted injection-material. The intracellular canaliculi are not

1) Bull. intern. de l'Acad. d. Sc. de Cracovie, Juillet 1899, p. 369, 370.

confined to the part of the cell which lies next to the bloodvessel but penetrate to all parts and are especially numerous in the immediate neighbourhood of the nucleus (or nuclei when there are two), but the injection nowhere penetrates into the nuclei. There is also in the laboratory a piece of injected cat's liver showing precisely similar appearances.

The livers in question have been used for cutting sections for class purposes for a number of years and it was in such a preparation that I noticed the appearances here described and delineated (see Figure). As I have but recently come to Edinburgh I know nothing of

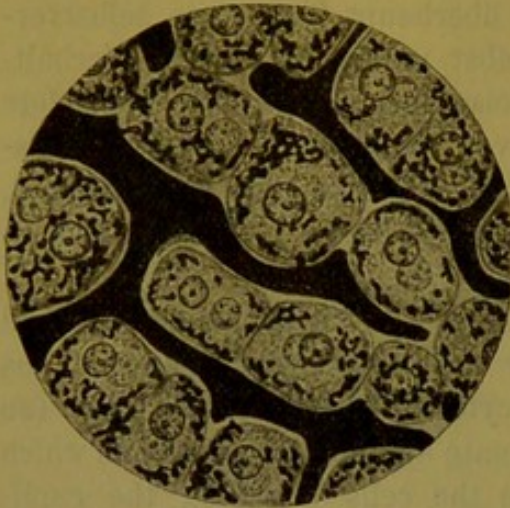


Fig. 1. Section of liver of rabbit injected with carmine gelatine from the portal vein. 350 diameters.

the history of the preparations, and my present assistants (all of whom had worked under my predecessor the late Professor RUTHERFORD) were unable to throw any light upon it. But in looking through the private collection of the late Professor I came across some specimens labelled in his handwriting "Liver, injected from portal vein. Shows injection within cells" one bearing the date 1886. I accordingly wrote to Professor CARLIER of Birmingham who was then and for many years subsequently assistant to RUTHERFORD, for information about the spe-

cimen and received from him the following reply: "The specimens of liver injected in red were done by SIMPSON under my direction and used for class purposes. These canals were first noticed by me and shown to RUTHERFORD who would not let me publish a note of them." Whatever may have been Professor RUTHERFORD's reason for refusing to permit the publication of Professor CARLIER's observation one cannot but regret that it should have been delayed for so long considering the important influence the knowledge of this intimate connection between liver cells and bloodvessels must have on our views regarding the mechanism of nutrition of the liver cells and its bearing upon pathological conditions which have been hitherto obscure.

I have sent sections of the injected liver of the rabbit to Professor BROWICZ, and I learn from him that he entirely agrees in the conclusion I have drawn from these preparations viz: that they unmistakeably demonstrate the existence within the liver cells of canaliculi communicating directly with the bloodvessels.



