In order to compare the two methods more closely a second series of experiments were performed in which the individual remained clothed and the hand, or arm, in the plethysmograph was covered with water of the same temperature as the water that had been in the calorimeter. The results of these experiments, shown in Table II., agree with the first set.

TABLE II.

	Average Room Temp.	Average Calorimeter.	Rate by Calorimeter.	Plethysmograph Rate.	
				Hand.	Arm.
V.Z.	24.5°	29.8°	7.4	9.6	
V.Z.	24°	28.0°	7.4	8.3	
V.Z.	25.5°	29.6°	4.7	8.6	3.1

These observations indicate that the blood flow in the hand, relative to its volume, is faster than is the flow in the combined forearm and hand. We found considerable differences in the results obtained by the two methods used on the hand. We do not know the exact causes of these differences but are inclined to believe that both hand methods are subject to greater error than is the plethysmograph method when applied to the arm.

69 (594)

On the phagocytic inclusion of carmine particles by sarcoma cells growing in vitro with consequent staining of the cell granules.

By **F. M. HANES** and **R. A. LAMBERT.**

[*From the Department of Pathology of the College of Physicians and Surgeons, Columbia University, New York.*]

The cells of rat and mouse sarcomata when cultivated in vitro show active amœboid movements and wander for considerable distances into the surrounding plasma. Upon adding finely powdered carmine particles to the plasma medium the wandering tumor cells take up the particles in an active phagocytic manner. The carmine particles within the cells are easily distinguishable by their opacity and angularity. The carmine is partially dissolved within the cell and brings into evidence the granules of the

cytoplasm. These granules are round, of very constant size and are stained pink by the carmine. They occupy the entire cytoplasm. By means of Altmann's fixative and stain exactly similar granular pictures are obtained.

70 (595)

The formation of metastases after an intravascular injection of tumor emulsions.

By **I. LEVIN** and **M. J. SITTENFIELD.**

[*From the Department of Pathology of Columbia University, George Crocker Special Research Fund, New York.*]

It is generally accepted that metastasis in malignant tumors is formed by the proliferation of tumor cells which have been transported to distant parts of the organism through the blood or lymph channels. The cells of the primary tumor penetrate in some manner into the lumen of the vessels, are swept away by currents as emboli, and finding lodgment in some distant part of the organism, they proliferate and form secondary tumors.

This conception of the formation of metastasis was established through observation of autopsy material and no direct experimental proof of the matter was adduced up to the present. All experiments with intravascular injection of human tumor material into animals either gave negative results or were entirely untrustworthy.

In all the extensive literature of the last decade on the subject of the transplantable cancer of the white mouse and rat there appears no statement in regard to intravascular injection of tumor material with the aim of forming metastasis. The only exception is a short note by Graf, who obtained negative results.

Metastasis in malignant tumors of the white mouse and rat occurs rarely as compared with human cancer, and the channels for the transportation of the tumor cells are in a majority of cases the blood vessels. The reason for the rare occurrence of metastasis in the rat and mouse Ehrlich, in accordance with his athreptic theory of immunity, sees in the fact that tumors in these animals are usually of extreme malignancy and grow to very large