ing learned behavior gave an exciting view of what may be accomplished in the performing animal with the unit recording method.

In addition to the papers described above, the following presentations were made: H. Adrian and W. Lifschitz (Santiago), "Functional organization of the auditory system"; O. Gutiérrez (Santiago), "Chromatic information and retina"; M. Palestini (Santiago), "Neurophysiology of sleep"; Teresa Pinto (Santiago), "Cortical functions in instrumental learning"; and A. Rojas (Santiago), "Functional organization of the visual cortex of the rat."

An important aspect of the seminar was a course on the use of the LINC computer in biological research offered by J. E. Rose (Madison, Wisconsin) and demonstrations with a LINC which was taken to Chile for the seminar from Washington University, St. Louis (C. Molnar).

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Cancer Dissemination

The slow progress in clinical chemotherapy of malignancies, based largely on the lack of specificity of present drugs and the overlapping characteristics of tumor and normal tissues, prompted the convening of a meeting on cancer dissemination. It was felt that the invasiveness of tumor cells, leading to metastatic growth, might offer an opportunity for selective chemotherapy since this process does not occur with normal tissue. The meeting, held at the Istituto di Ricerche Farmacologiche "Mario Negri," Milan, Italy, 23 June 1967, was sponsored by the International Union against Cancer (UICC); Silvio Garattini, director of the "Istituto "Mario Negri" and chairman of the Committee on Experimental Chemotherapy of the UICC, was the organizer. A working party was attended by about 50 cancer scientists from 12 countries.

Under the topic of in vitro tests available for studying tumor cells, J. A. For-

rester (Max Planck Institute, Munich) discussed the physical chemistry of cell adhesion and described his work employing the technique of electrophoresis of whole cells. The adhesiveness of the tumor cells is related to the charge density of the cell surface and the stiffness of the membrane. The enhanced surface charge of certain tumor cells, compared to the normal homologs of these cells, is believed to lead to increased stiffness of the cell membrane, to impair the ability of the cells to form adhesions, and thus to play a role in the leakage of tumor cells into other tissues. L. Morasca (Istituto "Mario Negri") described his method for counting visible tumor cells adhering to glass, based on the destruction of nonviable cells by trypsinization. A. F. Hermens (Radiobiological Institute, Rijswijk) discussed a plating technique developed to estimate viability of tumor cells. This procedure has allowed him to conclude that lymph nodes were relatively inefficient in filtering out tumor cells, but that most of the escaped tumor cells do not give rise to metastases. Similarly, J. Kvetina (Istituto "Mario Negri") used perfused livers to measure clearance of tumor cells from blood. Although cells were rapidly transferred to the liver, the number of malignant cells recovered in that organ was relatively low. J. Leighton (University of Pittsburgh) described the use of collagen-coated cellulose sponges as a matrix for organ culture. This technique allows the study of the invasiveness of tumor cells and the stepwise delineation of the growth-inhibitory effects of various agents. Leighton suggested that tumor cells destroyed normal cells by interposing themselves between the normal cells and the source of nutrient.

Concerning the subject of leakage of cancer cells, P. Strauli (Institut de Pathologie, Zurich) classified the processes of penetration of organs by the tumor cell as either by invasion or infiltration, depending in part on the cohesion of tumors. A. de Lemos Bastos (Instituto Portugues de Oncologia, Lisbon) described his studies on the leakage of secretory granules from tumor cells after supravital and vital staining by quinacrine. Evidence for the lysosomal nature of the intravital stained bodies was presented.

Various organs differ in their susceptibility to metastatic growth. R. Rosso (Istituto "Mario Negri") discussed the dissemination of tumor cells to lung and liver after their intracerebral injection. Efforts were made in the quanti-

tation of circulating cancer cells by different methods of measurement. J. Leighton (University of Pittsburgh) reported on inoculation of chick embryos with tumors of varying malignancy. Whereas highly malignant rodent ascites cells produced extensive metastases in liver, lungs, kidney, chorioallantois, and brain, tumors of lower malignancy (for example, HeLa) produced no metastases except in the brain. In addition to the potential usefulness of this system for assaying relative malignancy of differing populations of neoplastic or transformed cells, this technique also provides the opportunity of studying the effects of drugs on metastasis formation with highly malignant cells in portions of the chorioallantoic membrane, the remaining membrane with its metastasis serving as a control. G. C. Easty (Chester Beatty Institute, London) reported that non-strain specific tumors injected into chick embryos grew in a number of organs, whereas most strain-specific tumors grew only in the brain, in spite of the relatively small share of tumor cells received by that tissue at the initial stage of intravascular dissemination. In general, the distribution of thymidine-labeled tumor cells in various organs was not related quantitatively to the sites of subsequent tumor growth. The inoculation of a single cell of rat ascites hepatoma into the rat resulted in metastases at characteristic sites and to predictable extents, according to Y. Sakurai (Cancer Institute, Tokyo). Other authors (K. Karrer, University of Vienna; S. R. Humphreys, NIH) reported preliminary studies on tumor metastasis to the lung and the effect of drugs on the formation of metastasis in vivo.

Unfortunately too little time was available for consideration of the topics of immunological responses of tumor cells, or the use of carcinostatic drugs. It was the consensus of the participants that an important beginning had been made in the examination of the problem of cancer dissemination, and that this complex subject is now ready for examination in greater depth. The Committee on Chemotherapy of the UICC is planning to stimulate further interest and exchange of information at a conference in about 2 years in the hope that more attention will be paid to the topic of prevention of tumor dissemination and the chemotherapy of primary versus metastatic tumor growth.

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