# Local Measurement of Lateral Motion in Human Erythrocyte Membranes and Multilamellar Bilayer Vesicles by Fluorescence Recover after Photobleaching Technique (FRAP)

H.G. Kapitza and E. Sackmann

Abteilung für Biophysik, Universität Ulm
Oberer Eselsberg, D-7900 Ulm, Germany (F.R.)

The lateral diffusion coefficients (D) of the molecular fluorescence probe 3,3'-dioctadecyloxacarbocyanine (diO-$C_{18}$ (3)) in the membrane of discoid erythrocyte ghosts has been measured with the FRAP-technique betweeen 7 °C and 40 °C.

The diffusion coefficient increases from $D=9\cdot10^{-10}$ $cm^2/sec$ to $D=7.5\cdot10^{-9}$ $cm^2/sec$ from 7 °C to 40 °C. In the range between 12 °C and 17 °C a deviation from the exponential behaviour of the D-versus-T plot is observed.

In myelin-like structures, evolving from cell membranes D is by about a factor of 2 larger and in transformed cells (echinocytes) the diffusion coefficient in areas between the spicules is by about a factor of 2 smaller (at 12 °C).

Some measurements were performed to determine D in dimyristoylphosphatidylcholine (DMPC) multibilayer vesicles (MBV) with the same membrane probe molecules. We could measure the phase transition temperature as 23 °C±1°C, the value of $D = (7.5\pm2.5) \cdot 10^{-8}$ $cm^2/sec$ at 25 °C and $D = (2.6\pm1.4) \cdot 10^{-11}$ $cm^2/sec$ at 15°C.

In recent investigations we have demonstrated that the value of D in erythrocyte ghosts of one patient with paramyotonic disease is clearly slower in some of the cells below 20 °C.