for immersion. A temperature difference is to be expected from the difference in solar energy absorption, since the subsolar latitude is 19°N, close to the emersion latitude of 28°N, but 46° from the immersion latitude of 27°S. The mean temperatures for both profiles (as well as this quantity can be defined) agree with the mean temperatures obtained from Mars 6 (*9*) and Viking 1 entry data (*5*).

A striking similarity between the occultation temperature profiles and the Viking entry profile is the wavelike vertical structure with wavelength between two and three pressure scale heights and a peak-to-peak amplitude about 35°K at a number density of 10^{14} cm^{-3}, roughly eight scale heights above the 5-mbar pressure level. The wavelength and amplitude are in agreement with the general character of tidal waves predicted by Zurek (*6*) for clear (not dusty) conditions. Detailed comparison of temperature profiles, including phase information, with his predictions is not meaningful for several reasons. The details of profiles depend upon the amount and distribution of traces of dust in the atmosphere, and these factors are unknown. There may be significant additional forcing due to boundary layer convergence, neglected in Zurek's treatment. The large amplitude of the tides probably leads to instabilities and, as a result, to turbulence. Zurek pointed out that such turbulence would influence the structure of the tide but in a manner difficult to predict.

There are other possible explanations for the thermal structure. McElroy's detailed radiative equilibrium calculations (*10*) suggested that oscillations of temperature with height might occur near these levels on Mars because the concentration of (and solar absorption by) photodissociation products varies. Dütsch (*11*) discussed temperature variations in Earth's atmosphere caused by the stratification of photochemical products due to flow "fingering." Finally, aerosols have been observed by the Viking orbiter at heights as great as 40 km on Mars (*12*), and stratification into layers could lead to varying radiative heating with height. Purely thermal layering due to slowly varying (not tidal) large-scale flows is probably not a possibility, because radiative relaxation times are less than 1 day (*6*).

There is one point of disagreement between our data and Zurek's predictions, namely, the isothermal (not wavy) thermal structure above 70 km on emersion. However, radiative damping increases rapidly with height at these levels, and Zurek remarked that its influence is difficult to predict accurately.

We believe that the wavelength and amplitude of temperature variations shown by the data are best explained in terms of the existence of tides. A definitive test of this interpretation may be possible if several more temperature profiles of sufficiently high signal-to-noise ratio are available from other observers of the ϵ Gem occultation. These profiles, in conjunction with the Viking entry profiles, would provide information on the atmospheric temperature structure above different locations on Mars, which could be compared with the predictions of the tidal model.

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Fluidity in the Membranes of Adult and Neonatal Human Erythrocytes

Abstract. *Several antigens and receptors are mobile in the plane of the membrane of the intact neonatal human erythrocyte but not in the membrane of the normal adult cell. In this report, measurements of the fluorescence polarization of perylene dissolved in isolated erythrocyte membranes are reported, which are indistinguishable for the two kinds of cells. This result indicates that the viscosities of the membrane interiors of the two cells are the same. The observed mobility differences, therefore, cannot be attributed to different lipid viscosities in the two membranes.*

It has been appreciated for some time (*1*) that the intact adult human erythrocyte possesses an atypical membrane, in that its surface components appear to be immobile in the plane of the membrane. Antibodies and lectins bind to receptors on the surface of the intact erythrocyte but do not normally induce any redistributions or endocytosis of these receptors, in contrast to the situation with

Table 1. Polarized fluorescence data and microviscosities of erythrocyte ghost membranes labeled with perylene. Results were obtained at 25°C.

Cell	Cell concentration (ghost/ml)	$\frac{I_{VH}}{I_{VV}}$	$\frac{I_{VH}^{S}}{I_{VV}^{S}}$	I_{VV}	I_{VV}^{S}	A	τ (nsec)	η (poise)
Adult	1.6×10^8	.813	.254	1.25	.044	.0625	6.6	2.56
Neonatal	1.4×10^8	.812	.272	1.55	.058	.0626	6.6	2.56

many other cell membranes (*2*). On the other hand, following up a report that ferritin-conjugated antibodies directed to blood group A antigen produce endocytosis in neonatal human erythrocytes, but not in adult cells (*3*), Schekman and Singer (*4*) have shown that the lateral mobilities of several receptors and antigens in the membrane of intact neonatal cells are greater than those for adult cells. For example, by the use of ferritin conjugates of concanavalin A, they showed that adding concanavalin A to neonatal mature erythrocytes causes a clustering in the plane of the membrane of the concanavalin A bound to its membrane receptors. The clustering was followed by endocytosis of the bound receptors. With adult mature erythrocytes, however, no such clustering or endocytosis was observed.

One possible explanation for this remarkable difference in mobility of receptors in the two membranes is that the lipid viscosity might be considerably less in the membrane of the neonatal cell than in the adult cell. Accordingly, we have measured the apparent lipid viscosity in the isolated membranes of the two cell types by a fluorescence polarization technique using the fluorescent probe, perylene (*5*, *6*). No significant difference between the two membranes was observed.

Adult erythrocytes were obtained from outdated blood from the San Diego Blood Bank and neonatal cells from cord blood immediately after a normal delivery. Erythrocyte ghosts were prepared from well-washed cells from which the buffy coat layer had been removed by lysis in 17 m*M* NaCl, $10^{-4}M$ EDTA, 0.5 m*M* tris-HCl, *p*H 7.4 (buffer A). The ghosts were centrifuged three times in this buffer in the cold and were used within 2 days. To erythrocyte ghosts at a concentration of about 1.5×10^8 ghost/ml in buffer A we added a $4 \times 10^{-4}M$ solution of perylene in ethanol to a final concentration of $4 \times 10^{-7}M$. Under these conditions the mole ratio of lipid to perylene in the suspension was greater than 500, which, according to other measurements we have made, eliminates the complicating effects of depolarization by excitation energy transfer between perylene molecules. After about 30 minutes, the fluorescence increase accompanying the absorption of perylene into the membranes reached equilibrium. Measurements of the intensity of polarized fluorescence were then immediately made with a sensitive spectrofluorimeter constructed in this laboratory (*7*). The cell suspension was excited at 404 nm with light polarized in a vertical direction. The emitted light was detected by two photomultiplier tubes, one of which measured the vertical component I_{VV} of polarized emission intensity while the other measured the horizontal component I_{VH}. The recording system gave digital readings of the values I_{VV}, I_{VH}, and $R = I_{VH}/I_{VV}$. The fluorescence anisotropy function A, a measure of the average angle through which the perylene molecules rotate during their fluorescent lifetime τ, was calculated from the expression

$$A = \frac{(1 - R) - (I_{VV}^S/I_{VV})(1 - R^S)}{(1 + 2R) + (I_{VV}^S/I_{VV})(1 + R^S)}$$

which includes correction factors for scattered light (*5*). The quantities with the superscript S were measured using an unlabeled cell suspension as a scattering blank. Membrane microviscosity was calculated from the anisotropy and lifetime (τ) of perylene by means of a calibration graph obtained with oils of known viscosity by the procedure of Cogan *et al.* (*6*). Lifetimes were measured with an instrument described elsewhere (*8*).

There was no difference in the microviscosities of neonatal and adult erythrocytes as measured by perylene (Table 1). The measured anisotropies are similar to those reported by Rudy and Gitler for the erythrocyte membrane at 37°C (*9*).

In studies such as this, perylene presumably serves as a probe for the fluidity in the interior hydrocarbon region of the membrane bilayer (*5*). It is conceivable that there are differences in the fluidity of surface regions of the membranes of neonatal and adult erythrocyte that are not measured with perylene. Nevertheless, any change in the dynamic properties of a lipid bilayer large enough to markedly alter the lateral mobilities of receptors in the membrane would probably be sensed by perylene.

In view of the evidence in this report, and of other data, Schekman and Singer (*4*) have proposed that the difference in lateral mobilities of receptors in the two different membranes is attributable to a different state of the spectrin complex attached to the cytoplasmic surfaces of the two membranes.

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13-*cis*-Retinoic Acid: Inhibition of Bladder Carcinogenesis in the Rat

Abstract. *Transitional cell and squamous cell cancer of the bladder was induced in Wistar/Lewis female rats by direct instillation of* N-*methyl*-N-*nitrosourea into the bladder. Feeding of the synthetic retinoid, 13-*cis*-retinoic acid, inhibited the incidence and extent of bladder cancer in these rats, even when 13-*cis*-retinoic acid administration was begun after completion of the carcinogen treatment.*

Bladder cancer in man continues to be a problem of major importance since death rates from this disease have not decreased appreciably within the past 20 years (*1*). The development of several animal models for the human disease, which is primarily transitional cell carcinoma, now allows intensive studies of agents which might be of use in prevention of bladder cancer (*2*, *3*). Recent studies have shown that synthetic analogs of vitamin A (retinoids) (*4*) may be used to prevent epithelial cancer of the skin, respiratory tract, and mammary gland in experimental animals (*5*). We therefore wished to see if these studies could be extended to prevention of cancer in bladder epithelium, which is known to depend on retinoids for maintenance of normal cellular differentiation (*6*). It has been previously reported that dietary deficiency of retinoids greatly increases susceptibility of bladder epithelium to chemical carcinogenesis (*7*). However, in these same experiments, feeding of high doses of natural vitamin A ester (retinyl palmitate) did not afford any protection from carcinogenesis (*7*). Therefore, for the present study we chose a different type of retinoid, which has pharmacokinetic proper-