mental subjects (Group I). Both of these groups, when subjected to experimental stress, showed a decrease in driving below their original level. However, the average drop for the patient group was not as pronounced as for the experimental subjects (Fig. 4). The difference between these two curves was not significant, and yielded no measure for differentiating between patients with anxiety and individuals who were not anxiety-prone.

Group I showed a considerable rise in driving after the stress period was over, so that at C_2 they were at the same or a slightly higher level than the normals who reported their sensations while under no stress (Fig. 2). The increase in driving between B_6 and C_2 for Group I was significant beyond the 5% level ($\bar{d} = .393$, $\sigma = .161$, $t = 2.44$). Thus the normal subjects showed a recovery in driving after the tension was removed. No such increase was evident in the patient group (Fig. 4). Unfortunately, however, this difference in response was not discovered until all data had been collected; hence, we do not know whether the patients also would have shown an increase in driving if allowed a longer period of recovery.

The driving response at the second harmonic (28 c/sec) was also examined for all groups. There was found to be an average increase in harmonic response in those subjects who were exposed to experimental stress. However, the control subjects showed a similar tendency toward increased response during prolonged stimulation, and thus this phenomenon could not be attributed to the stress situation per se.

From our work it appears that the occipital rhythms induced by intermittent photic stimulation are disturbed by emotional tension in a fashion similar to that in which such stress produces α-blocking. In both instances the synchronized basic pattern is disturbed and the amount of recorded activity is decreased. The mechanisms by which such interruption is accomplished are not fully known, but one assumes from observations such as those of Gellhorn (*5*), Sapirstein (*6*), and Jasper (*7*) that, with the production of anxiety, discharge from diencephalic regions interferes with cortical mechanisms of synchronization by occupying neuronal circuits that are otherwise producing a resting or driven beat.

The finding that screened control subjects and anxious patients do not show a differential decrease of response in the photically activated EEG with the introduction of experimental stress is not entirely unexpected. Malmo (*8, 9*) reported negative results in attempting to differentiate patients from controls on the basis of amount of α-blocking accompanying painful stimulation. It is possible that the stress of our experimental situation could have induced a degree of heightened attention or "vigilance" in the experimental subjects which matched the effect of any anxiety that appeared in the chronically anxious patients. Vigilance may, as Liddell (*10*) stated, be a precursor of anxiety. If this be true its induction in the experimentally stressful situation would hinder the differentiation of our two groups.

The relationship of the neural mechanisms responsible for the photic driving response to those that produce α-activity is as yet undetermined. Observations in which a resting α can coexist relatively unchanged with the appearance of a driving response at another frequency suggest that independent cell groups may be at work. The present study does not answer this problem but does suggest that, whether or not such mechanisms use morphologically different or identical units, at least they react similarly when the subject is placed under emotional stress.

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Melting Phenomena of a Surface of Monomolecular Thickness[1]

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A number of observations points to the fact that the surface deviates in its melting behavior from matter in bulk. Lord Kelvin (1871) was the first to recognize that the melting point of the first ordered molecular aggregations is lower than that of bigger crystals. This lowering of the melting point with decrease in the size of the particles, corresponding to an increase of the total surface, was often observed thereafter (Ostwald, Freundlich, and Haber). Another group of experimenters noticed that substances absorbed on porous solids like silica may melt, in extreme cases, 40° below their regular melting points (*1*). Recently Hüttig and Lichtenecker (*2*) observed that the surface melting of metal layers 10^{-4} cm thick takes place at a temperature considerably lower than the true melting temperature, the difference sometimes being several hundred degrees. Stranski (*3*) found a "rounding off" which removes rough spots on a solid surface before melting, forming a new "crystal face."

Previous work of this author (*4*), using radioactive monolayers, suggested that these layers would be ideally suited to investigate the phase transition of the topmost layer of a solid material. The radioautographic technique was found to be extremely helpful in such investigations.

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[1] Opinions or conclusions contained in this report are those of the author. They are not to be construed as necessarily reflecting the views or the endorsement of the Navy Department.

The radioactive monolayers were prepared and transferred to a solid substratum by using the Langmuir-Blodgett method (*5*). Mica plates, slightly scratched on the surface by a fine needle, were used as a convenient supporting material for the layers. They were dipped under a surface of distilled water which was later covered by a monolayer of C^{14}-labeled stearic acid. In preparing this monolayer tricresyl phosphate was used as piston oil. On its way out of the water the mica surface takes up the monolayer from the water surface and is covered by a homogeneous layer of radioactive stearic acid. Specimens thus prepared were heated in a copper block oven without touching the walls.

The two-dimensional order of the unheated monolayer manifests itself on radioautographs in the form of an area of homogeneous optical density. The scratched signs are not noticeable, as the monolayer stretches like a blanket over all uneven parts of the surface. In heated specimens these signs appear and become gradually more and more visible as the temperature and the heating time increase (Fig. 1). The temperature at which the first inhomogeneity of the radioautograph is noticeable depends greatly on the duration of the heating process. In a series of samples heated 30 min, the temperature was found to be 35° C, and in another series heated 3 min it was 40° C. After a four-month storage of the engraved plates at room temperature (27° C), faint outlines of the marks could be observed. The time of exposure of the photographic plate, usually 110 hr, is not included in the above data since the photographic exposure was performed at the low temperature of 3° C.

This very simple method of observation indicates that the two-dimensional lattice of a stearic acid monolayer becomes unstable well below the normal melting point of the stearic acid (70° C). As the temperature increases, more and more molecules move from their position in the lattice by diffusion or evaporation. They leave holes in the original structure and thus further the phase transition solid-liquid. The diffusing molecules come to a rest at points on the surface where they are bound chemically. In an earlier study (*4*) the rims of scratches, on which the aluminum atoms of the mica structure are accessible, were found to be the places where diffusing stearic acid molecules are immobilized by formation of aluminum stearate. This method is very sensitive, since small accumulations of a radioactive substance are easily noticeable on the otherwise homogeneous background of the radioautographs.

Two additional observations confirm the above-mentioned results. In a quantitative study of surface diffusion of stearic acid on mica, this author (*4*) found that the surface diffusion coefficient D_s at 50° and at 60° C was 1.1 and 2.8 cm^2 sec^{-1}, respectively. These values are greater than the values normally found for volume diffusion coefficients of substances in solids. They are of the magnitude of diffusion coefficients in liquid diffusion media. Furthermore, the log D vs. $1/T$ relationship does not show a change in direction at the melting point of the stearic acid. This indicates that the monolayer has no phase transition at the temperature characteristic for the melting point of the bulk material.

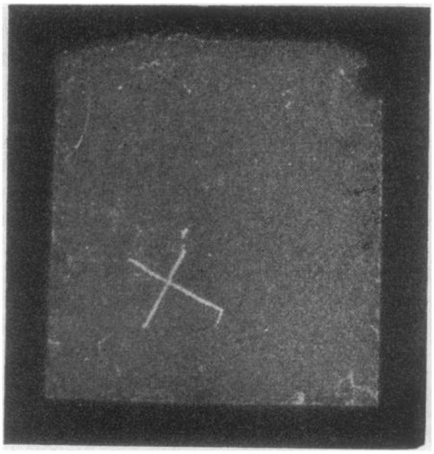

FIG. 1. The melting process of a monolayer is indicated by surface diffusion of the tagged molecules to scratches (cross) where they are immobilized by chemical binding to the supporting material.

An explanation of this special behavior of the surface can be attempted, based on the widely accepted theory of the melting process given by Lennard-Jones and Devonshire (*6*). This theory considers the melting process as an order-disorder transition based upon effects in the immediate neighborhood of the atoms. The neighborhood of molecules in the surface deviates so much from the neighborhood of molecules inside the phase that a special behavior of the phase transition is understandable. The molecules in a complete monolayer are bound to each other in two directions only. In addition, there is a certain influence on the film by the supporting material. All in all, the amount of translational energy which must be made available to render the two-dimensional lattice unstable will be smaller than in the three-dimensional case. The order-disorder transition will take place in the surface at a lower temperature than inside the phase. Lennard-Jones (*6*) has already suggested that the migration of surface atoms may be the first step of melting of a solid.

The experiments described above reveal still another phenomenon of surface melting. The sharp melting point of matter in bulk, which is so characteristic for a pure substance, could not be found in the phase transition of a monolayer of stearic acid. Similar observations had already been made by Adam (*7*). He reported that the melting of a solid film on a liquid surface is rarely observed to be sharp. The transition in the monolayer on solid and liquid substrata occurs gradually in a "melting interval," with the time as an additional factor. The single molecules break from their position in the two-dimensional lattice at a rate depending on the statistical nature of the energy available locally. The sharp melting point of material in bulk requires for its explanation the additional assumption that less energy is necessary to move several molecules out of their places in the three-dimensional lattice than to move the same molecules singly. The melting behavior of the material in bulk is determined by cooperative phenomena connected with the long-range order of the molecules in the solid state, whereas the behavior of the surface seems to depend more on the interaction of the neighboring molecules only.

The great importance of the surface of a solid body in all its communications with its surroundings makes surface research a vital part of our endeavor to understand the physical behavior of solid matter. The new possibility of observing the behavior of the topmost molecular layer of solids by radioautographs will be beneficial to a wide variety of experimental research and theoretical discussion. The application of this method on the observation of the phase transition is an example. It confirmed earlier observations of the melting phenomena of a surface in a more direct way.

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Comments and Communications

Zoological Nomenclature

Notice is hereby given that, as from October 15, 1952, the International Commission on Zoological Nomenclature will start to vote on the following cases involving the possible use of its plenary powers for the purposes specified in brackets against each entry. Full particulars of these cases were published on April 15, 1952, in the *Bulletin of Zoological Nomenclature,* those relating to cases (1) to (4) in Part 5 of Vol. 6, those relating to cases (5) to (18) in Parts 7/8 of Vol. 7.

1) Meigen, 1800, *Neuvelle* classification [suppression].
2) *Lysippe* Kinahan, 1858 (Class Crustacea) [validation].
3) *Cummingella* Reed, 1942 (Class Trilobita) [designation of type species].
4) *Dionide* Barrande, 1847 (Class Trilobita) [validation].
5) Vol. 1 of Cramer's *Uitl. Kapellen*: Schiffermüller's "Wiener Verzeichniss;" Fabricius' *Syst. Ent.*; Vols. 6 and 7 of the *Naturforscher.* [relative to priority for names of butterflies in].
6) *Naucoris* Geoffroy, 1762 (Class Insecta, Order Hemiptera) [validation].
7) *geoffroyi* Leach, 1817 *Corixa* (Class Insecta, Order Hemiptera) [validation].
8) Sand crab [trivial name for].
9) *Acmaea* Eschscholtz, 1833, and *Acmea* Hartmann, 1821 (Class Gastropoda) [settlement of problem relating to].
10) *Petalifera* Gray, 1847 (Class Gastropoda) [validation, if name found invalid].
11) *punctata* Cuvier, 1803, *Aplysia* (Class Gastropoda) [validation].
12) *Ammonia* Brünnich, 1771 (Class Cephalopoda or Rhizopoda) [suppression].
13) *Encrinus* Schulze, 1760 (Class Crinoidea) [validation].
14) and 15) *Archaeocidaris* McCoy, 1844, and *Pholidocidaris* Meek & Worthen, 1869 (Class Echinoidea) [validation].
16) *Eriechinus* Pomel, 1883 (Class Echinoidea) [suppression].
17) *Odobenus* Brisson, 1762 (Class Mammalia) [validation].
18) *Chinchilla* Bennett, 1829 (Class Mammalia) [determination of type species].

Comments on the above cases should be sent as soon as possible to Francis Hemming, Secretary to the Commission, 28 Park Village East, Regent's Park, London, N. W. 1, England.

Francis Hemming

Secretary to the International Commission
on Zoological Nomenclature

Salivary Amylase Inhibition

Several papers have appeared recently describing an inhibition of salivary amylase by indole derivatives (*1, 2*) and several plant hormones (*3, 4*). This was rather surprising to us, for during our study of the crystalline amylases (*5–7*) incidental work was done in the presence of similar substances without any observable effect. We therefore thought it necessary to clarify this point.

Both crude human saliva and crystalline human salivary α-amylase (*6*) have been used. The amylolytic power has been determined at 20° C by a reductometric method (*8*), using Sumner's 3–5 dinitrosalicylic acid (*9*), as well as by a method based on the change of color of the starch-iodine complex (*10*). The latter method, however, is not suitable in the presence of indole derivatives, as these compounds use up the iodine, a large excess of which must therefore be added. The substrate, a 1% solution of Zulkowski starch,[1] was buffered at pH 6.90, and the determination made in presence of $0.0067\ M$ NaCl. The following substances have been tested for their influence

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[1] Prepared in our department by R. Menzi.