environment. This is particularly true in the case of the animal fats.

It is possible that for a long time too much attention has been given to the fats from the point of view of their being sources of mixtures of fatty acids rather than as mixtures of glycerides. Nearly all the usual analytical methods refer not to the glycerides *qua* glycerides but to the fatty acids contained therein. Thus Valenta was apparently working along the right lines with his acetic acid test, a method which although now somewhat despised, yet in a modified form may be adopted at some future time. The possible value of work on glycerides is shown by the fact that fats containing identical fatty acids may have entirely different physical properties due to the presence of characteristic mixed glycerides, and progress along these lines may be anticipated. The difficulties are great—how great only those who have attempted to fractionate mixtures of glycerides can realize.

The delights of pure research into problems of basic importance are not for the busy technologist—he must continue to confine his attention to the problems of immediate if ephemeral importance. He can, however, support in many ways those whose efforts are likely to be applied to such problems of pure chemistry.

The benefits of pure research, especially on a particular subject attacked with vision and pursued on the broadest of lines, have been proved on many occasions. It is for the Industry not only to support, but to encourage and initiate such research in its own field, which will undoubtedly be for its lasting benefit.

The Yellowing of Drying Oils

AT a meeting of the Oil and Color Chemists' Association, a paper by Dr. R. S. Morrell (past president of the Association) and Mr. S. Marks, on "The Yellowing of Drying Oil Films," was read. During the last year, said Dr. Morrell, Mr. Marks and himself had been investigating the yellowing of white paints with drying oils when kept in the dark, and it had been found advisable to review the changes occurring during the oxidation of drying oil films, in order to decide, if possible, which component of the oxidation products was producing the changes in color.

Materials Investigated

A number of paint films were prepared with white lead (stack), zinc white, titanium white, timonox, arsenious oxide, and tin dioxide. The changes in color of the films, which were kept in the dark in a moist atmosphere at the ordinary temperature, were observed, using yellow and red Lovibond's tintometer glasses. The paint films were compared against a film of zinc white and Reeve's poppy seed oil as standard. The amount of oil mixed with the pigment was as small as possible, and any increase in the amount was accompanied by greater changes in color. From the results obtained in the white lead experiments, there seemed to be an indication of a maximum yellowing and reddening in six months, and afterwards a diminution, but longer trials were necessary in order to decide this. The influence of the nature of the oil used agreed with the results of earlier investigators, and the oils could be placed in the following order of increasing yellowness: poppy, walnut, specially bleached special linseed oil (supplied by Professor Laure), and five varieties of raw bleached linseed oil prepared by one of the authors.

The rate of change of a white lead raw linseed oil film was much slower than with treated linseed oils; the original film was yellower at first, and a very thin film was formed. The same effect was observed with China wood oil, but the film was originally of a darker color. The addition of linseed oil acids, as well as oleic acid and benzoic acids, accelerated the yellowing. Oleic acid with raw linseed oil paint was more discolored than linseed oil alone when white lead was used as pigment.

Zinc white paints gave results, as regards color changes, much less striking than in the case of those with white lead; while in the case of titanium white the color changes in the oils were generally even less. With arsenious oxide, after six months' exposure, all the oils, with the exception of poppy oil, showed decided yellowing.

The Author's Conclusions

On the whole, the author's paint trials confirmed the results of previous investigators, but the forecast of Eibner, that there was little prospect of overcoming the difficulty, was too pessimistic. The behavior of stand oil was of interest in comparison with other drying oils, and the proposal to use it as a medium in the presence of petroleum thinners was worthy of consideration. The addition of dammar in turpentine as a preventive had been recognized in the craft for a long time, especially in oil varnishes on white work, and an increase in the resin content of a varnish invariably reduced the tendency of the film to become discolored by diminishing the permeability to moisture, but was often conducive to loss in lustre. The effect of manganese must now be withdrawn as a cause of the yellowing. With regard to the influence of the pigment on the discoloration, it appeared that anhydrous titanium oxide produced least yellowing with most of the drying oils tested.

From the results obtained up to the present, the property of yellowing in the dark was shown to be connected with the presence of a grouping derived from a peroxide, which grouping was contiguous to the carboxyl end of the molecule. The presence of the grouping would depend on circumstances. The basic or acidic nature of the pigment was not the deciding factor, but traces of water, or the elements of water, in a pigment, were especially active in favoring the arrangement indicated. The use of inactive anhydrous pigments to prevent the yellowing of the oxidized film was to be specially recommended. These conclusions had been suggested by earlier workers.

From the results obtained with the β-elaostearic glyceride, there were strong indications that the changes in the molecule might be controlled, because of the comparative simplicity of composition of the oxidized substance and freedom from other glycerides. Any subsequent polymerization effects of the oxidized substance could not be neglected, because there was evidence of their presence in the oxidized acids obtained from the α-eleaostearic acid.—*Chemical Age.*