preparations of chlorophyll and its separate modifications, a and b, into protopheophytin, pheophytin being formed as an intermediate step. Subsequent removal of the ester groups gave the same free acid that had been obtained from the phylloerythrin of galls. This acid gave the same spectrum as blood porphyrin. Anhydro-compounds were also obtainable from the free acid and these were identical in spectra and other properties with those formed from natural protopheophytin and phylloerythrin.

The chemical relation of chlorophyll to protochlorophyll thus has been cleared up by establishing that chlorophyll is an oxidation product of protochlorophyll. In addition the gap between the leaf and blood pigments has been bridged.

In the green plant this means that the photo-oxidation of protochlorophyll is the final step in the formation of chlorophyll.

An explanation can also be made of the rôle which iron plays in the formation of the green pigments, since it is well known that absence of iron is a cause of the chlorosis of leaves and since Noack had previously shown that the fluorescent organic pigments, including chlorophyll, possess a strong photo-oxidative action which is decidedly hastened by the presence of small amounts of iron.

Furthermore, this shows a noteworthy relationship between the chemical activity involved in the formation of chlorophyll and the function of chlorophyll, since Noack had in an earlier paper shown that the photo-oxidative action of chlorophyll is linked up somehow with the assimilation of carbon dioxide. This indicates that in the physiology of animals the formation of phylloerythrin from chlorophyll involves a reduction process. In addition, the spectroscopic agreement of cleaved phylloerythrin with the blood porphyrins lends definite support to the often disputed formation of blood pigment from chlorophyll. Hans Fischer has already pointed out the importance of phylloerythrin as a product formed biologically from chlorophyll.

This paper by Noack shows very clearly a relation between the green pigment found in leaves and the red pigment found in blood. It does not show just how the blood pigment is formed from chlorophyll. The paper is concerned with two problems very important in biochemistry. The first problem concerns the origin of chlorophyll. Showing that chlorophyll comes from protochlorophyll does not solve the problem. It will be solved only when we know how protochlorophyll is produced.

The other problem concerns the manner in which blood pigment is produced from chlorophyll. Is the relation a direct one or is chlorophyll broken down and then resynthesized as blood? These two important problems must sooner or later be solved by biochemists, as they are most fundamental in all plant and animal life.

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SIGNIFICANCE OF POST-ILLINOIAN, PRE-IOWAN LOESS

IN the May 24, 1929, issue of SCIENCE, Mr. Frank Leverett questioned the writer's correlation of the Loveland loess of western Iowa with post-Illinoian, pre-Iowan loess on Illinoian till in western Illinois and southeastern Iowa. Leverett stated that the probable correlation of the Loveland loess of western Iowa is with pre-Illinoian loess rather than with post-Illinoian loess; he considers the Loveland loess to be pre-Illinoian, pre-Iowan in age and not post-Illinoian, pre-Iowan in age as the Loveland has been interpreted to be by the writer. Leverett and the writer agree that the Loveland loess of western Iowa is post-Kansan gumbotil erosion, pre-Iowan in age; we differ as to whether it is the loess which underlies the Illinoian till or the loess which overlies the Illinoian till that is of the same age as the Loveland of western Iowa. Since the Loveland loess of western Iowa was deposited within the interval of time during which both the pre-Illinoian and post-Illinoian loesses were laid down in the Illinoian drift area, it may well be that although the Loveland loess appears to be a single formation, in reality its lower part may be pre-Illinoian in age and only its upper part post-Illinoian in age; and it may be that a part of the Loveland of western Iowa was deposited during the Illinoian glacial stage.

The purpose of this brief paper is to make clear that the post-Illinoian loess which the writer correlated with the Loveland loess of western Iowa would lose none of its significance as evidence in establishing the relative ages of the Iowan and Illinoian tills even if further investigations were to demonstrate that all or a part of the Loveland loess of western Iowa is pre-Illinoian rather than post-Illinoian in age.

There are two loesses on the Illinoian till, only the younger of which, the Peorian loess, is also on the Iowan till. The older loess is by no means a "nondescript deposit" found only in "a few places" as stated by Leverett. It has been mapped widely by members of the Illinois and Iowa Geological Surveys.

On the Iowan till the Peorian loess only is present. This loess has been shown by Calvin, Alden and Leighton, the writer and others to be genetically related to the Iowan till and to have been deposited very soon after the retreat of the Iowan ice-sheet. There is beneath the Iowan till in places a loess which resembles the older loess on the Illinoian till

and which the writer believes is in whole or in part of the same age as the older loess on the Illinoian.

The older loess on the Illinoian is post-Illinoian, pre-Peorian loess in age. It was deposited after the development over wide areas, chiefly by chemical weathering, of gumbotil more than three feet thick on the Illinoian till. Furthermore, there was sufficient time after this loess was laid down for it to have been leached in places to a depth of several feet before the deposition of the Peorian loess which as stated is but little younger than the Iowan till. The interval between the time of deposition of the Illinoian till and the deposition of the Peorian loess was of sufficient duration to account for (*a*) the weathering of the unoxidized and unleached Illinoian till to gumbotil more than three feet thick; (*b*) the deposition of a loess on the gumbotil and eroded surfaces of Illinoian till, and (*c*) the leaching of this loess in places to a depth of several feet. In contrast, the Peorian loess was deposited very soon after the deposition of the Iowan till. These facts indicate clearly that the Iowan till is much younger than the Illinoian till.

Regardless of whether or not the post-Illinoian, pre-Peorian loess is Loveland in age it "adds new evidence to that which has been presented for many years by several geologists in support of the view that the Iowan glacial stage is much younger than the Illinoian glacial stage."

The writer discussed fully the relative ages of the Iowan and Illinoian drift sheets in a paper in *American Journal of Science,* December, 1928.

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PECULIARLY SHAPED HAILSTONES

ON Saturday afternoon, June 15, at about 3 o'clock, what may have been considered a typical semi-cloudless sky became suddenly overcast from the southwest followed by a slight shower of unusually large drops which soon were accompanied by occasional hailstones. The Weather Bureau's forecast was "increasing cloudiness." Within a few minutes the rain turned to hail. It was not a heavy hail-storm; no damage was done to the flowering shrubs in our garden—a few lily-pads were pierced—yet in a space about seventy-five feet square the lawn was strewn with the most grotesque-shaped hailstones that I ever had chanced to see. I picked up hurriedly four specimens, the largest of which I sketched from memory (Fig. 1). It was about 6.5 cm long, 2 cm thick and about 3.5 cm wide. The "stone" seemed to be made up of an agglomerate of a dozen or more smaller stones frozen together. The nucleus of the separate stones could readily be distinguished. The mass was flinty hard, as freshly frozen ice, and except for the nuclei was clear.

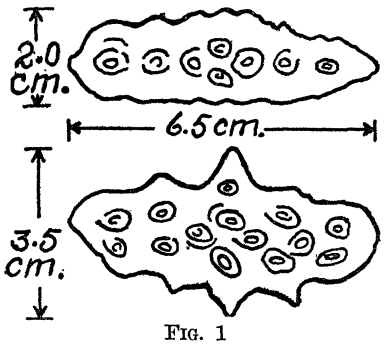

FIG. 1

The hail-storm was not characterized by large hailstones, the largest single-nuclear stone that came to my notice in the garden was but 1½ to 2 cm in diameter. I have witnessed many hail-storms of much greater severity and of longer duration, but never saw the stones frozen in agglomerates, especially of such size.

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MORTALITY STATISTICS AND THE LENGTH OF LIFE

PROFESSOR FORSYTH'S paper in SCIENCE, July 26, directly contradicts the prevalent opinion on the subject discussed. Mortality statistics are not a satisfactory basis for generalization, and the probability that the author's conclusions may have been influenced by the surface aspects of the figures referred to is suggested by several of his statements.

The great reduction in infant mortality and in deaths from communicable diseases in recent years has postponed death, in such cases, to later dates, and the lives thus prolonged are usually sustained by diminished vitality. It is reasonable to expect that the *average* general health of the community has been reduced, and the *average* death-rate during subsequent years increased, by these extended lives. Consistently, if a substantial number of these previously short lives has been extended to the forties and fifties, the *average* age, at death, of all persons passing the age of forty will be reduced. The ratio of the number of persons reaching the age of fifty to the total population will also be reduced.

The increasing mortality due to certain organic diseases is frequently referred to in current discussions as indicating a greater susceptibility to such diseases, induced by changes in our manner of living or by the devitalizing influence of organic stresses incident to more strenuous activities. There is absolutely no foundation in fact or experience for such beliefs. More people escape death by croup, diphtheria and smallpox than formerly, but, as all must ultimately die,