XIX. *Microscopical observations on the Materials of the Brain, and of the Ova of Animals, to show the analogy that exists between them. By Sir* EVERARD HOME, *Bart. V. P. R. S. Read at the Society for promoting Animal Chemistry, April* 12, 1825.

Read at the Royal Society June 3, 1825.

HALF a century ago, when I began my professional education under Mr. HUNTER, he was deeply engaged in investigating the properties of the blood, and ascertaining the changes it underwent in different circumstances. His object in this inquiry was to prove that the blood possessed within itself a principle of life, by which all these changes were regulated.

By his direction I made the following experiment, which proved that when frozen and thawed it had undergone no change.

Two inches in length of the jugular vein distended with blood and secured at each end by a ligature, when immersed in a cooling mixture and frozen, was found after it was thawed to remain fluid, and to coagulate on exposure like recently drawn blood. From this fact, which is published in his work on the blood, corroborated by many others, he concluded that as the principle of life resided in the blood, and no change was produced in that fluid by the act of freezing, none were to be expected to arise from its action

on the other parts of the body; and had we been able to produce the necessary degree of cold, he certainly would have tried the experiment.

From the time of Mr. HUNTER'S death to that of the expedition to the polar circle being fitted out, the subject had never recurred to my mind; it was then revived; and I had no doubt of being fully informed upon its return, whether animals after being frozen could be revived; but in this I was disappointed.

In the winter before last an experiment was made in the presence of several Members of this Society, of freezing a frog, inclosed in tin foil, in a mixture cooled to zero. The frog recovered; but there was reason to doubt of the brain having been frozen; and this experiment was repeated by Mr. FARADAY, in the laboratory of the Royal Institution, in the presence of Sir H. DAVY, Professor BRANDE, and myself, in the following manner.

Two healthy frogs, nearly of the same size, were separately wrapped up in tin foil, and immersed in a cooling mixture at zero. At the end of four hours one of them was examined; the brain and heart were found completely frozen; the other was allowed to thaw gradually, but had no remains of life. Upon opening the skull the brain was dissolved, and the cavity contained nothing but a watery fluid, with some gelatinous matter.

By this experiment it is decided that an animal whose brain has been frozen can never be restored to life.

Having, in the Croonian Lecture for 1823, illustrated the more minute structure of the human brain by three drawings, magnified in different degrees by Mr. BAUER, made from a

healthy brain very recently after death, I became desirous of decomposing a similar portion of brain by the act of freezing, and then having drawings similar to the others made, to show the contrast between the two.

For this purpose I got Mr. FARADAY to inclose in tin foil a thin slice of human brain soon after death, then weigh the tin foil in which it was enveloped in the balance belonging to the Royal Institution. After being thus accurately weighed, it was immersed in a cooling mixture as low as zero. When it had remained there for four hours it was taken out, and the tin foil unfolded that it might thaw gradually; a quantity of watery fluid had separated in the act of thawing from the portion of brain: this was allowed to drain off, and the tin foil with its contents was re-weighed, and had lost 20 per cent. from its decomposition. Mr. BAUER's drawings of it in this state, magnified in three different degrees, to correspond with the others, are annexed.

These two sets of drawings establish the real appearance of the more minute structure of the brain, and the changes that structure undergoes when exposed to the effects of having been frozen, and led me on to ascertain the effects of freezing upon the molecule of the pullet's egg after it has been impregnated, that I might ascertain whether the opinion I had formed, of its more minute parts corresponding with those of the brain, was correct; and as I have given drawings of the molecules highly magnified, similar drawings made after it had been frozen, would enable me to preserve the difference in appearance between the two.

To freeze the egg without disturbing the molecule, I enclosed it in a leaden case, with a cover exactly fitted to it;

Fig. 1.

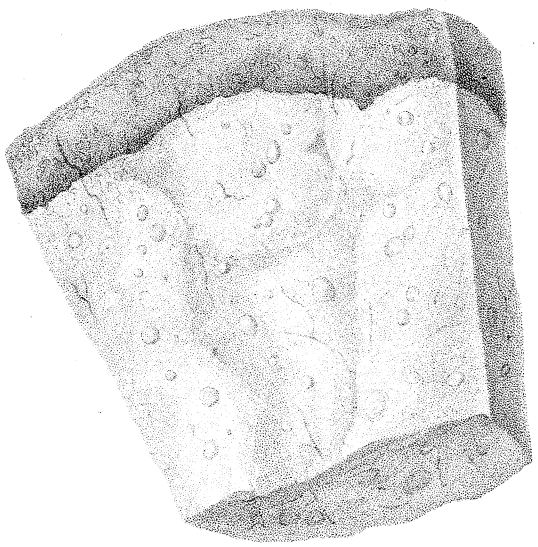


Fig. 2.

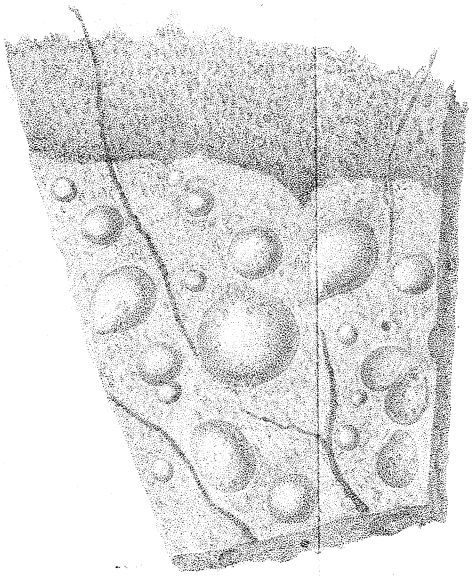


Fig. 3.

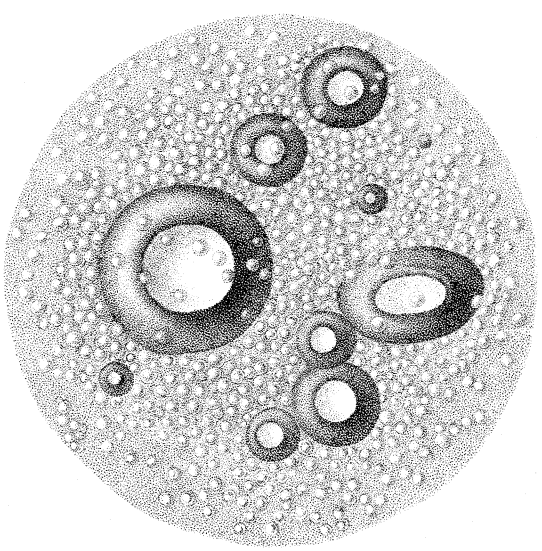
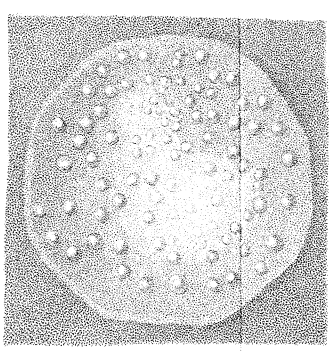


Fig. 4.



then exposed the molecule, put on the cover, and immersed the whole into a cold mixture, and carried it to Kew, that Mr. BAUER might represent the appearance.

EXPLANATION OF PLATE XXVII.

Fig. 1. A small portion of the cortical and medullary substance of the human brain that had been frozen and thawed, magnified 5 times.

Fig. 2. A part of the above, magnified 25 times.

Fig. 3. A still smaller part of the above, magnified 200 times.

These three drawings correspond with three that have a a place in the Philosophical Transactions: taken from the human brain recently after death, in a natural state.

Fig. 4. The molecule of the pullet's egg after impregnation, that had been frozen and thawed, magnified 10 times, to correspond with a similar drawing of the molecule in a natural state.