# PHILOSOPHICAL

# TRANSACTIONS.

I. *On the black rete mucosum of the Negro, being a defence against the scorching effect of the sun's rays.* *By Sir* EVERARD HOME, *Bart. F. R. S.*

Read November 9, 1820.

To ascertain the use of the black colour of the rete mucosum in the Negro, has occupied the attention of many physiologists; and I confess that this subject formed the first investigation in which I ever engaged. Fruitless, indeed, were my attempts; and when I learnt that black surfaces absorbed heat, and raised the temperature several degrees beyond any others, I gave the matter up in despair. Two years ago my attention was again called to this enquiry, upon being told by our late excellent President, that a silver fish, in a pond at Spring Grove, during a very hot summer, immediately after some trees by which the pond was shaded were cut down, was so much exposed to the sun's rays as to have its back scorched, the surface putting on the same appearance as after a burn, and rising above the scales of the

surrounding skin. I saw the fish several times, and directions were given to send it to me when it died; but I was not so fortunate as to receive it.

This extraordinary circumstance brought to my recollection one not less so. In crossing the Tropic in April, 1781, at twelve o'clock at noon, in a voyage to the West Indies, I had fallen asleep upon deck, lying upon my back, having a thin linen pair of trowsers on, and I had not slept half an hour, when I was awakened by the bustle attending the demand of forfeits on crossing the Line, and found the inside of the upper part of both thighs scorched, the effects of which have never gone off, but till now I could not imagine how it happened, always suspecting it to be the effect of the bites of insects; but I never satisfied myself upon that subject.

The effect of the sun's rays upon the fish under water, led me to suspect the mixture of light and heat to be the cause of this scorching effect.

To ascertain the truth of this opinion, I made the following experiments.

*Experiment* 1.

In August, 1820, I exposed the back of my hand to the sun at twelve o'clock, with a thermometer attached to it, another thermometer being placed upon a table, with the same exposure. That on my hand stood at 90°, the other at 102°. In 45 minutes blisters rose, and coagulable lymph was exuded, which became vascular under my eye: the pain was very severe.

*Experiment* 2.

I exposed my face, my eyelids, and the back of my hand to water heated to 120°: in a few minutes they became pain-

ful; and when the heat was further increased, I could not bear it.

*Experiment 3.*

I exposed the backs of my two hands to the sun's rays, with a thermometer upon each; the one hand was uncovered, the other had a covering of black cloth, under which the ball of the thermometer was placed. After ten minutes, the degree of heat of each thermometer was marked, and the appearance on the skin examined. This was repeated at three different times. The

| | | |
|---|---|---|
| 1st time the thermometer under the cloth | 91° | the other 85° |
| 2nd time - - - - - - | 94 | - - 91 |
| 3rd time - - - - - - | 106 | - - 98 |

In every one of these trials the skin was scorched that was uncovered; the other had not suffered in the slightest degree; there was no appearance of perspiration on either hand.

*Experiment 4.*

The back of a Negro's hand was exposed to the sun with a thermometer upon it, which stood at 100°; at the end of ten minutes the skin had not suffered in the least.

*Experiment 5.*

During the eclipse of the sun on September 7, 1820, I exposed the back of my hand to the rays concentrated by a double lens of half an inch focus, at three different periods of the eclipse. When the heat to a thermometer was 75°, that is from 47 to 57 minutes past one'clock, (including three of the figures in the annexed drawing, made by Mr. BAUER, Pl. I.)

the concentrated rays felt warm, but gave no pain, although applied for ten minutes.

When the heat to a thermometer was 79°, that is at 15 minutes past two o'clock (including the twelfth figure in the annexed drawing), the concentrated rays in four minutes gave pain; in five minutes blistered the skin, and produced dots of coagulable lymph, which became vascular under the eye.

When the heat to a thermometer was 82°, that is at half past two o'clock, (including the 13th figure of the drawing), the concentrated rays in three minutes gave pain; in four, the part was blistered, and the pain could not longer be endured.

*Experiment* 6.

September 8th, 1820, at eleven o'clock, the heat in the sun 90°; the concentrated rays applied to my naked arm produced a vesicle. This experiment was repeated when the heat was 84°, and in seven minutes a blister formed on the arm.

*Experiment* 7.

September 9th, eleven o'clock, the thermometer in the sun at 90°. The concentrated rays applied to a piece of black kerseymere cloth, made tight round my arm for 15 minutes, gave no real pain, and left no impression whatever on the skin, although the nap of the cloth had been destroyed.

This experiment was repeated with white kerseymere, the heat at 86°; in 15 minutes a blister was formed.

Repeated with Irish linen, the thermomenter 86°. In 15 minutes a blister was formed, and coagulable lymph thrown out, which had become vascular.

The same experiment was made with a white handkerchief loose upon the hand, the heat 83°. In 15 minutes an inflammatory blush was produced over a surface of several inches extent, which almost immediately disappeared on withdrawing the hand from the sun's rays.

*Experiment* 8.

September 12th. The sun's heat at noon 85°. The concentrated rays applied to the back of the hand of a Negro from Grenada for 15 minutes, produced no visible effect; at the first moment he felt a stab going inwards, but that went off, and afterwards he had no pain.

From these experiments, it is evident that the power of the sun's rays to scorch the skin of animals is destroyed when applied to a black surface, although the absolute heat, in consequence of the absorption of the rays, is greater.

The same wise providence which has given so extraordinary a provision to the Negro for the defence of his skin, while living within the tropics, has extended it to the bottom of the eye, which otherwise would suffer in a greater or less degree when exposed to strong light; the retina, from its transparency, allowing it to pass through without injury.

That the nigrum pigmentum is not necessary for vision, but only provided as a defence against strong light, is proved by its being darker in the Negro than the European, and being of a lighter colour in fair people than in dark, and therefore lightest in those countries farthest removed from the effects of the sun.

In the monkey it is dark, and in all animals that look upwards.

In all birds exposed to the sun's rays the nigrum

pigmentum is black. In fishes, the basking shark, which lies upon the surface of the ocean, has a nigrum pigmentum. The turbot and skate, which lie upon banks of sand in shallow water, have nigrum pigmentum.

In all ruminating animals and birds of prey, there is a lucid tapetum at the bottom of the eye.

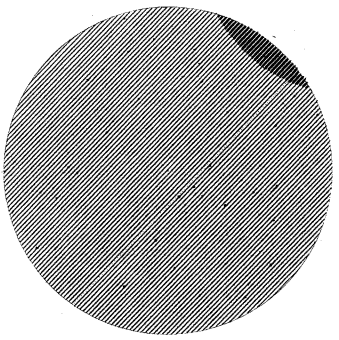
The owl, that never sees the sun, has no nigrum pigmentum.

The mackarel has the bottom of the eye lucid as quicksilver.

The *Coup de Soleil*, met with in the West Indies, the effects of which I have seen, I attribute to the scorching effect of the sun's rays upon the scalp.

The Egyptian ophthalmia I consider to be the effect of the sun's rays, and the glare of reflected light.

I have stated the fact of the scorching power of the sun's rays being destroyed when they are applied to black surfaces, but have not gone farther. Sir HUMPHRY DAVY, to whom I showed these observations, immediately explained it. He said the radiant heat in the sun's rays was absorbed by the black surface, and converted into sensible heat.



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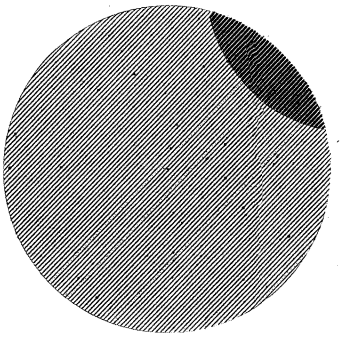

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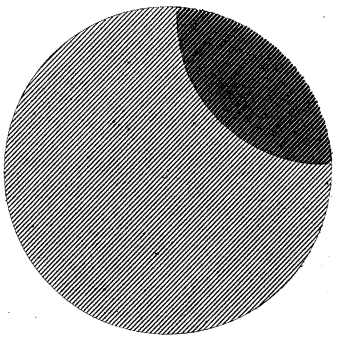

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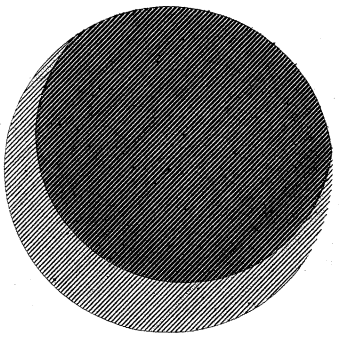

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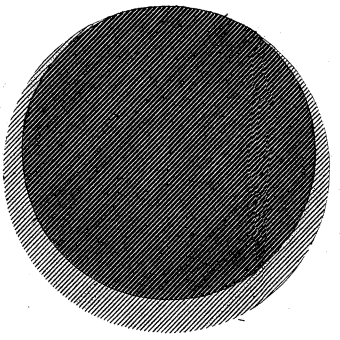

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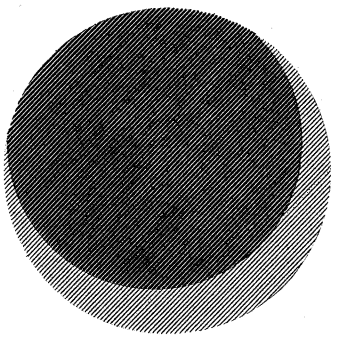

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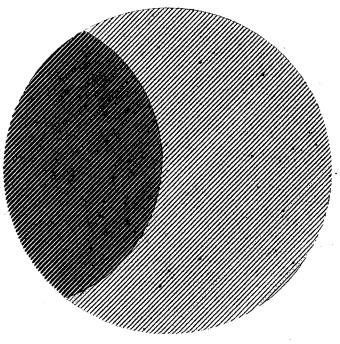

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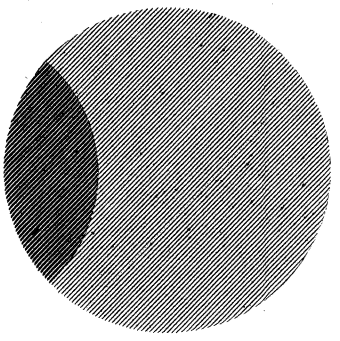

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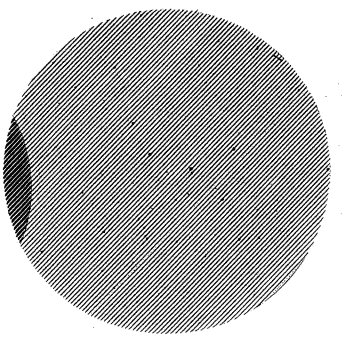

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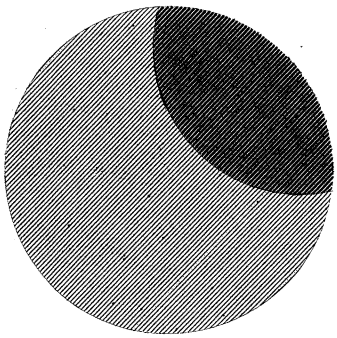
Kew Green. Francis Bauer.



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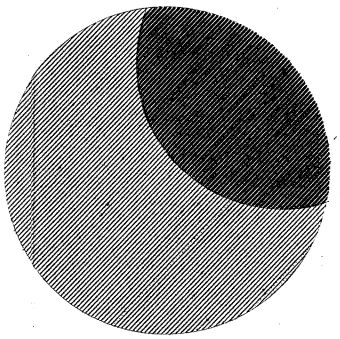

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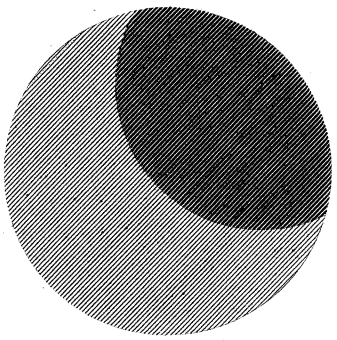

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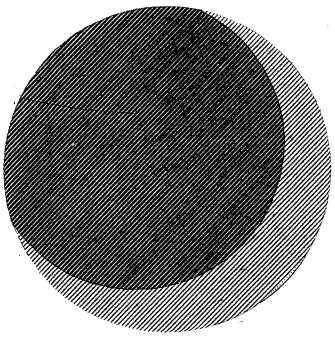

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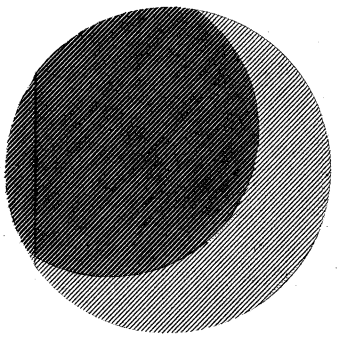

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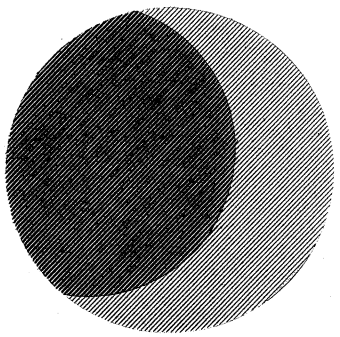

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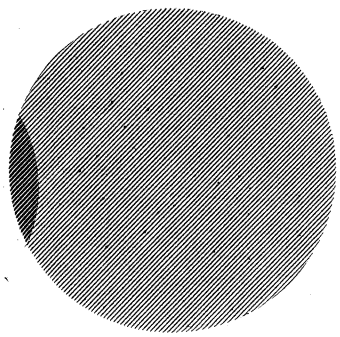

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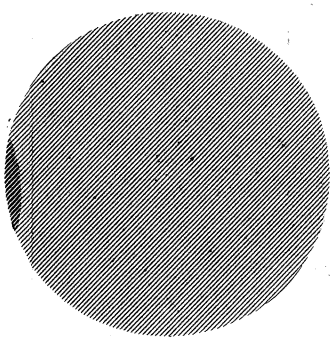

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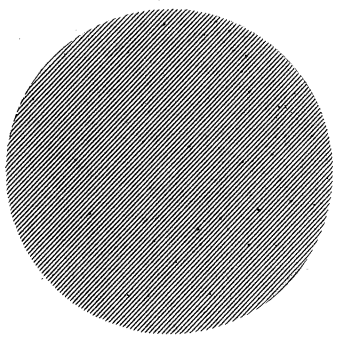

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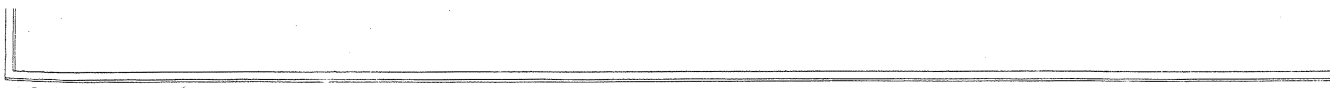

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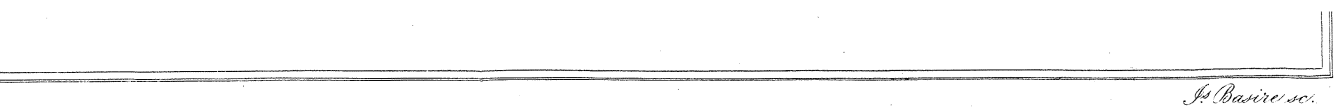
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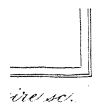

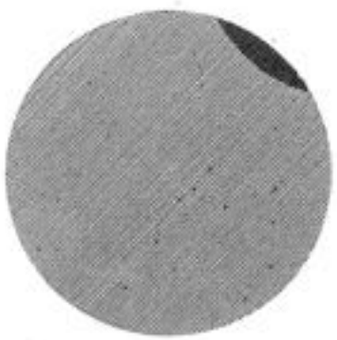

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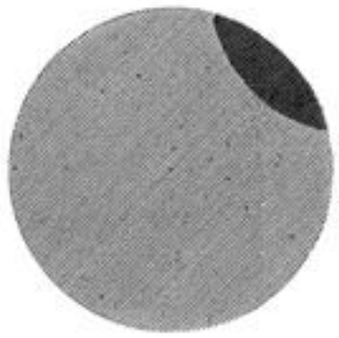

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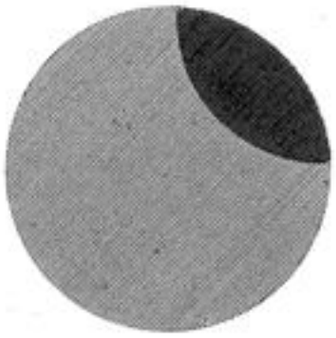

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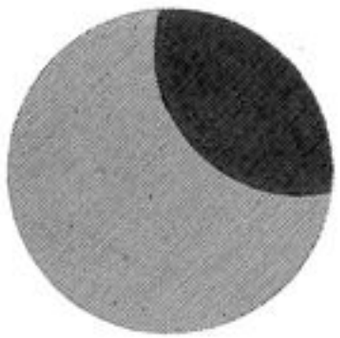

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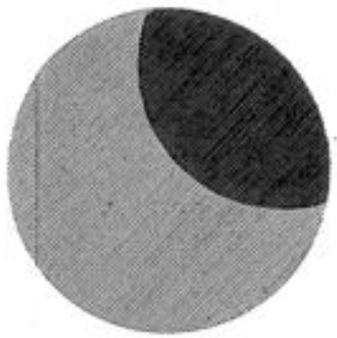

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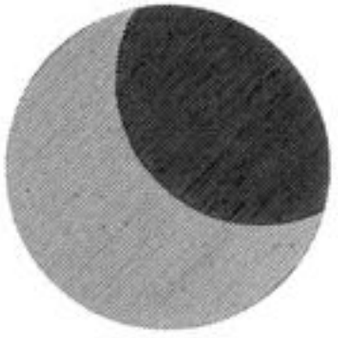

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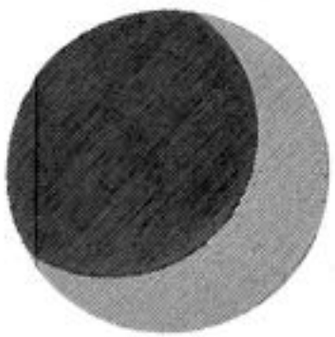

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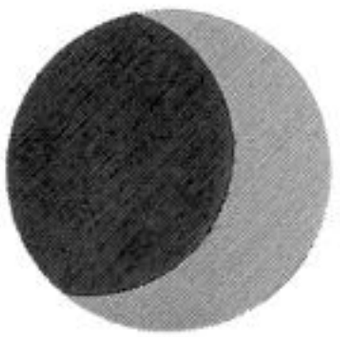

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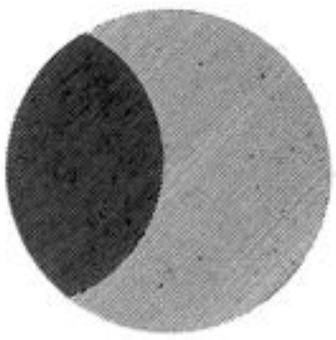

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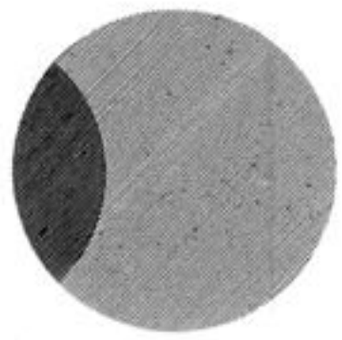

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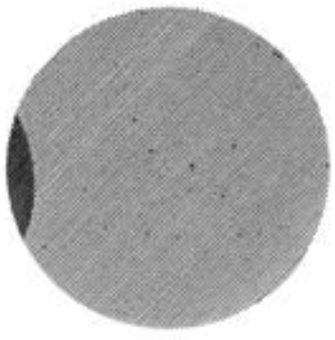

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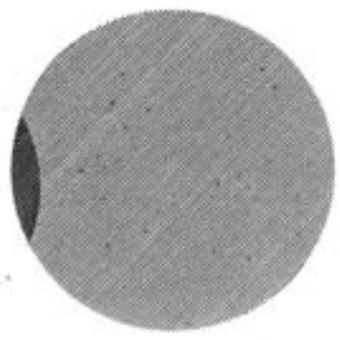

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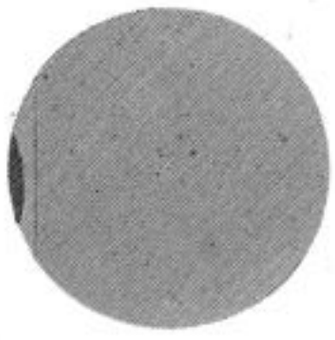

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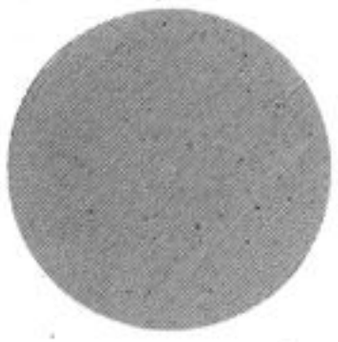

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