XXXI. *Experiments on ignited Bodies.*

By John Roebuck, *M. D. F. R. S.*

Extract of a Letter from Dr. ROEBUCK *to Dr.* BROCKLESBY.

R. Feb. 15, 1776. MR. BUFFON aſſerts, that he found a ball of iron, which weighed 49 lbs. 9 oz. when cold, to weigh, when heated to a white heat, 49 lbs. 11 oz. which is an augmentation of weight of $19\frac{1}{5}$ grains to the pound.

This extraordinary fact, circumſtantially narrated by the very eminent and ingenious M. BUFFON, being contrary to the opinions of thoſe philoſophers who have moſt enlarged our natural Knowledge by their candid and cautious inquiry into the qualities of bodies, made me very ſolicitous to make ſimilar experiments.

Some time ago, when I was at Birmingham, I had very luckily an opportunity, by the aid of two accurate balances of my friend Mr. BOLTON's; one of which would, without ſtraining the beam, weigh a pound and turn with one-tenth of a grain; and the other weigh half an ounce, and turn with the hundredth part of a grain.

I heated a piece of iron, of nearly one pound weight, to a white heat, or what the ſmiths call a welding heat, and found, by the moſt accurate experiments which I could make, and which I again and again repeated, that the iron, when left ſeveral hours in the balance to cool, weighed nearly one grain leſs when cold than when hot; and that a piece of iron, of about five pennyweights, which was tried by the ſmaller and more accurate balance, weighed, as appeared by an index which moved oppoſite to a quadrant, ſomewhat more when cold than when hot. I tried the ſame experiment on copper; but, to my great ſurprize, I found a piece of copper, of nearly one pound weight, four grains lighter after it had been left ſome hours to cool in the balance than when it was put in. I repeated the experiment, and found the event the ſame; but ſuſpecting this might poſſibly ariſe from the copper caſting ſcales, I placed a ſheet of white paper under the balance, and collected as many ſcales as made up nearly the deficiency of the weight.

TO SIR JOHN PRINGLE, BART. P. R. S.

SIR, London, May 9, 1776.

R. May 9, 1776. I BEG leave to inform you of the following experiments, which were made to aſcertain the variation of the weight of bodies when hot and cold.

April 29, 1776, I heated a cylinder of wrought iron, which weighed fifty-five pounds, to a white heat, and exactly balanced the ſame, when hot, in the preſence of the hon. HENRY CAVENDISH, NATH. PIGGOT, MATTHEW RAPER, ANDREW CROSBY, EDW. DELAVAL, HAMILTON, DAVID HARTLEY, WILLIAM RUSSEL, Eſquires; Doctors HUNTER, BROCKLESBY, MORTON, WILLIAM FORDYCE, GEORGE FORDYCE, RUSSEL, WATSON junior, MUSGRAVE; Meſſ. JOHN HUNTER, BEN. WILSON, JAMES RUSSEL, RAMSDEN, WHITEHOUSE, MAGELLAN. After the cylinder had been two hours cooling in the ſcale, I weighed it again, and found that it had increaſed in weight three pennyweights and a few grains. Five hours after cooling, Mr. MAGELLAN weighed it, and found it had increaſed in weight three pennyweights ſeventeen grains. Six hours after cooling, when the cylinder was blood-warm, I weighed it again, in the preſence of Dr. HUNTER, Dr. BROCKLESBY, Mr. GRAY, and Mr. NEISBIT, and found it to have increaſed in weight four pennyweights. The day following, about twenty-two hours after cooling in the preſence of MATTHEW RAPER and ANDREW CROSBY, eſquires, I again weighed it, and found that it had increaſed in weight ſix pennyweights ſeventeen grains. Mr. ABRAM WHITEHOUSE, who was very ſolicitous to have the above experiment made accurately, procured from Mr. SAMUEL READ a very exact beam, which readily turned, to the conviction of all the above gentlemen, with leſs than a pennyweight, though loaded with the above iron cylinder; but MATTHEW RAPER, ANDREW CROSBY, Eſquires, and myſelf

ſelf examined the beam leiſurely and accurately, and found it turned very diſtinctly with four grains, though loaded as above. In order to diſcover the cauſe of this increaſe of weight of the cylinder when cold, I heated two ounces eight pennyweights of the ſcales or *calx* of wrought iron, and found the ſame to increaſe in weight five grains when cold.

I heated two pieces of pure ſilver which weighed two pounds, ten ounces, five pennyweights; and when the ſilver was cold it increaſed in weight five grains, though it produces no *calx* from being heated red-hot.

The above experiments are conformable to thoſe which I formerly made with ſome very exact ſcales at Birmingham; an account of which I tranſmitted to Dr. BROCKLESBY.

I have the honour to be, &c.

XXXII. *Expe-*