powerful turning lathe, worked by a steam-engine in the Royal Arsenal at Woolwich. This being made to revolve at the rate of 640 turns per minute, the needle was deflected out several degrees, and there remained stationary during the motion of the ball, but returned immediately to its original position on ceasing the rotation. On inverting the motion of the shell, an equal and contrary deflection took place.

As the law of the phenomena was not evident with this disposition of the apparatus, and the shell was found too heavy for perfect safety, a Shrapnel shell of eight inches diameter was mounted in a proper apparatus (described in the paper), and a number of experiments made; the law of which, however, still seemed anomalous, till the idea occurred of neutralizing the earth's action on the needle, when the anomalies disappeared, and the general law of the effect was placed in evidence. The needle being made a tangent to the ball, if the motion of the ball was made towards the needle (whatever was the direction of the axis of rotation), the north end of the latter was attracted, and if the contrary way, repelled. In the two extremities of the axis there was found no effect, while in two opposite points, at right angles to the axis, the effect was a maximum, and the direction of the needle was to the centre of the ball.

The author then proceeds to show how all the results, which before appeared anomalous, agree with this general view, and closes his communication with some theoretical views of their general bearing on the subject of the earth's magnetism, which he thinks there are strong reasons for believing to be of the *induced* kind; and although it appears to him doubtful whether the anomalies observed in the variation of the needle on the earth's surface, can ultimately be referred to this cause, yet, he observes, that one condition essential to the production of these phenomena holds good in the case of the earth, viz. the non-coincidence of its polarized axis with that of its diurnal rotation.

Further Researches on the Preservation of Metals by Electro-chemical Means. By Sir Humphry Davy, *Bart. P.R.S.* Read June 9, 1825. [*Phil. Trans.* 1825, *p.* 328.]

After adverting to the general details respecting the protection of the copper sheathing of ships, contained in his former papers, the President proceeds, in the present communication, to consider the circumstances under which various substances are deposited upon the protecting copper, and their general influence upon its wear, more especially in regard to ships in motion. For this purpose, he availed himself of the use of a steam boat, employed on an expedition to ascertain some points of longitude in the North Seas, and his inquiries lead to the inference that motion does not affect the nature of the limits and quantity of the protecting metal; and that, independently of the chemical, there is likewise a mechanical wear of the copper in sailing.

In examining the results of some of the experiments upon the effects of single masses of protecting metal on the sheeting, the author observed, that in some cases the corrosion seemed to increase with the distance from the protector. It became, therefore, necessary to investigate this circumstance, and to ascertain the extent of the diminution of electrical action in instances of imperfect or irregular conducting surfaces. Sir Humphry details several experiments in illustration of this inquiry, which prove that any diminution of protecting effect at a distance does not depend upon the nature of the metallic, but of the imperfect or fluid conductor. His experiments upon perfect and imperfect conductors led him to another inquiry, important in its practical relations, respecting the nature of the contact between the copper and the preserving metal. He found the protecting action prevented by the thinnest stratum of air, or the finest leaf of talc or dry paper; but the ordinary coating of rust, or a thin piece of moistened paper, did not impair it.

After some experimental details respecting the electro-chemical powers of metals in solutions excluded from air, Sir Humphry concludes his paper with practical inferences and theoretical elucidations arising out of its general details. Finding that in certain cases of imperfect connexion, the influence of the protector was weakened by distance, the author proposed that when ships with old sheathing were to be protected, a greater proportion of iron should be used, and if possible more distributed. The advantage of this plan was strikingly shown in the Semerang, which had been coppered in India in the year 1821, and came into dock, in the spring of 1824, covered with rust, weeds, and zoophytes; she was protected by four masses of iron, equal in surface to about one 80th of the copper, two of which were near the stern, and two on the bows. She made a voyage to Nova Scotia, and returned in January 1825; not, as was falsely reported, covered with weeds and barnacles, but remarkably clean and in good condition. After citing other instances of the perfect efficiency of the protectors, and adverting to the relative proportion which, in different circumstances, they ought to bear to the sheathing of the vessel, and to the most advantageous methods of applying them, the author concludes by observing upon the importance of selecting perfectly pure copper for the sheathing; of applying it smoothly and equably; and of using for its attachment nails of pure copper, and not of mixed metal.

On the Magnetism of Iron arising from its Rotation. *By* Samuel Hunter Christie, *Esq. M.A. of Trinity College, Cambridge; Fellow of the Cambridge Philosophical Society; of the Royal Military Academy. Communicated April* 20, 1825, *by* J. F. W. Herschel, *Esq. Sec. R.S.* Read May 12, 1825. [*Phil. Trans.* 1825, *p.* 347.]

The effects observed and described in this paper, although minute in themselves, appear, in the author's opinion, to point out a species of magnetic action not hitherto described. It had long been well