

**Theory & Experiment in the Science of Robert Grosseteste**

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Early in the thirteenth century a revolution took place in scientific methodology and we may associate this with the name of Robert Grosseteste for two reasons. (1) He united in his own work two tendencies which had previously been somewhat independent of each other, the experimental habit found in the practical techniques and the habit of rational explanation which had developed in twelfth century philosophy, and out of these he produced an experimental science using rational explanations. (2) He founded a school of science at Oxford which carried on his work and in particular his ideas on induction and experiment and the use of mathematics in physics and put them into practice in the science to which he had paid particular attention, namely, optics.

Before Grosseteste, educated people had taken an interest in and in many cases practised the practical arts, and from them they had acquired the habit of observation and experiment, even though sometimes their knowledge of these arts was that of literary men and their experiments performed only in the imagination. What these natural scientists lacked was not so much the empirical attitude as the ability to transcend rule of thumb methods and construct a theoretical science offering rational explanations of the facts of experience.

The construction of such a science was made possible first by the rationalistic tendency in twelfth century philosophy and more concretely by the use of Aristotle's *Posterior Analytics* and Euclid's *Elements* in connection with specific problems introduced by the newly translated works of Greco-Arabic science. The conception of explanation developed in the twelfth century was the deduction of facts from prior principles. This raised the problems of how to reach the prior principles and how to distinguish true from false principles.

Grosseteste, basing himself on Aristotle and certain medical writers, developed the idea of collecting instances of phenomena, noting common elements, and arriving at a "common formula" stating the empirical connection observed. This might then be shown to be the causal principle from which the observed facts could be demonstrated. False principles or theories could be eliminated by making deductions from them and reaching some proposition that could be tested either by experience or by reference to an established theory.

Principles or theories could often be supplied by mathematics because though mathematics was an abstraction from physical things it could describe how they behaved. The reason for this Grosseteste held was that light was the first corporeal form and first principle of movement; God had created out of nothing unformed matter and light, and these two principles had produced the physical universe; and light behaved according to mathematical laws. For this reason Grosseteste regarded optics as the basic science and it was in optics that he did his most important concrete research.