

of purely mental, abstraction that our study begins and is prosecuted. One very powerful instrument of research, where through size and distance—be they very great or very small—objects of nature are beyond our actual reach, is given us in the diagram and the model. There we, for the sake of study, picture or imitate on a reduced or an enlarged scale the movements of the heavenly bodies which are too large or of the atoms which are too small for our actual grip. Now and again the natural philosopher who thus uses the abstract methods of experiment, registration, and calculation, is forcibly reminded that he is in danger of dealing not with natural, but with artificial, things. Instances are plentiful where, through the elaboration of fanciful theories, the connection with the real world has been lost and scientific reasoning has been led astray, to be recalled to a more fruitful path only by the effort of some original genius living in immediate communion with the actual world.

There is, moreover, in addition to the aspect of convenience, one very powerful inducement for scientific workers to persevere in their process of abstraction, in the study of such things and phenomena as can be handled in the laboratory and the workshop, and studied by diagram and by model. This is the practical usefulness of such researches in the arts and industries. In these we do actually abstract the possessions of nature from their proper hiding-places; we drag the minerals from the bowels of the earth; we cut up the timber of exotic growth into artificial fragments; we break up that natural equilibrium in which electrical and

2.
Convenience
and usefulness
of the
process of
abstraction.