Art. I.—Catalysis and Some of its Applications to the Arts and Medicine.* By Walter G. Smith, M.D., F.R.C.P.I.; King's Professor of Materia Medica, School of Physic; Physician to Sir Patrick Dun's Hospital.

CATALYSIS.

Chemical Affinity.—Of all the great old-standing problems of chemistry that of chemical affinity has been least developed. Chemical affinity is the name given to that property of bodies in virtue of which when brought into contact they react with each other, forming new bodies. It is the driving power of a chemical reaction. There is always a change of energy, and, in fact, transformation of energy is at the root of every chemical or physical process. The term affinity (affinitas—i.e., relationship) reaches back to Greek philosophy. The Grecian philosophers considered it as somewhat similar to human qualities—e.g., sympathy and antipathy. The meaning now attaching to it in chemistry is exactly the converse

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of the ancient notion: not "likes" but "unlikes" attract each other. The conception, however, of affinity as an attractive force is of little or no use in explaining chemical phenomena. What the intimate nature of chemical affinity really is we know no more to-day than did the chemists of old.

No satisfactory hypothesis has yet found acceptance among scientific men, and I will not spend time in discussing the different hypotheses which have been advanced.

Light is, however, beginning to dawn upon the darkness, and it comes from four quarters:

(a) The introduction of mechanical ideas into chemistry. For this we have to thank Galileo. Chemical statics and dynamics are now securely established, and have yielded fruitful and stimulating results in the hands of van 't Hoff, Arrhenius, and many others.

(b) The introduction of quantitative determinations of the rate and amount of chemical change, as distinguished from vague data, such as the older tables of affinity and the like. One of the main objects of scientific chemistry is to measure the intensity of chemical affinity in different cases.

(c) The bringing of chemical problems under the controlling sway of mathematical calculation. The higher walks of theoretical chemistry and of physiology are becoming difficult or impossible to follow without some mathematical training.

The modern chemist may almost say with Descartes:—

"I will accept nothing as true but what is declared (from the first principle that matter can be divided, figured, and moved in all sorts of ways) by direct evidence which can take rank of a mathematical demonstration."

(d) The growth and extraordinarily rapid development of physical chemistry.

The three forms of energy which normally undergo alteration in value when a chemical reaction occurs in solution are the chemical energy, the heat energy, and