sult may also be obtained from the last of the
ced (1). For since the arbitrary equation

$$\Delta^n = \{(1 + \Delta) - 1\}^n$$

d, and that the latter member when developed

$$. + \Delta)^{n-1} + \frac{n(n-1)}{1 . 2}(1 + \Delta)^{n-2} \ldots\ldots \pm 1;$$

by uniting the function u to the several symbols
ere will arise

$$^n u - n(1 + \Delta)^{n-1} u + \frac{n(n-1)}{1 . 2}(1 + \Delta)^{n-2}$$

$$. \pm u.$$

the equations (1)

$$(1 + \Delta)^n \quad u = u_n$$
$$(1 + \Delta)^{n-1} u = u_{n-1}$$
$$(1 + \Delta)^{n-2} u = u_{n-2}$$
$$\ldots\ldots\ldots\ldots\ldots\ldots$$
$$u = u$$

y substitution,

$$_{n-1} + \frac{n(n-1)}{1 . 2} u_{n-2} \ldots\ldots \pm u,$$

al with the result obtained by Arbogast.
ss of the above investigations demonstrates that
advantages may be derived from the theory of
although, in the first point of view, it may seem
rsue with certainty and precision any extended
al inquiry, by employing symbols of operation
rom the functions with which they were origi-
yet it will be perceived, that it is of no conse-
light we regard the symbol; whether as an
nerate successive changes in a function, or to
e momentary idea of quantity, when in its
om the function. In the latter point of view, it
nes subject to all the forms and laws of which
ceptible. But it may be proper to caution the
is attaching a permanent idea of quantity to
eration, even in its separated state. It is only
tter condition that it is supposed to be subject
perations of quantity, and never decidedly loses
as originally destined to maintain in any stage
n. In my next communication I shall endea-
some further applications of the principle.

I am, Sir, your humble servant,

George Harvey.

Article V.

On Mesotype, Needlestone, and Thomsonite.
By H. J. Brooke, Esq. F.R.S.

(To Dr. Thomson.)

Sir, *Keppel-street, Aug.* 14, 1820.

In the several published works on mineralogy, the substance denominated *mesotype* is said to be found in Auvergne, in Iceland, Ferro, near Dumbarton, &c. and a square prism is given by the Abbé Haüy as its primary form. This form, however, does not belong to any specimens I have seen from those localities, nor do the substances themselves belong to the same species.

In the following notice I shall call the Auvergne variety, *Mesotype;* that from Iceland and Ferro, *Needlestone;* and that from Dumbarton, *Thomsonite,* after the editor of this journal, who has contributed so largely to the improvement of chemical analysis.

The specific gravity of the mesotype is.	2·24
needlestone.	2·27
thomsonite.	2·37

Mesotype, from Auvergne.

Among the first specimens I examined of this substance, I observed the summits of some of the crystals to consist of eight planes, as in (Pl. CVII) fig. 8, four of which, $d\,d'$, $f\,f'$, were incompatible with the supposition of a square prism being the primary form. And on submitting to the reflective goniometer the planes obtained by cleaving the crystals parallel to the natural planes, M, M′, of the prism, I found the inclination of those planes which afforded the best reflections to be 91° 10′. The inclinations of the terminal planes c, c', e, e', on the sides of the prism were also all equal, the primary form is, therefore, a right rhombic prism; and if the planes c, c', e, e', result from a decrement by one row on the terminal edges of the primary crystal, the height of the prism will be to its terminal edge very nearly as one to two. The planes d, d', are the result of an intermediary decrement on the acute angles of the prism.

The measurement of M on	*c* is	116°	37′
c	*e′*	126	47
c	*d*	178	45
c	*c′*	143	14
d	*d′*	145	44

Needlestone from Ferro.

Besides the difference in specific gravity, the needlestone differs from the mesotype in some other of its characters.

The prisms are much longer in proportion than those of the mesotype, and the natural planes smoother and more brilliant, those of the mesotype being striated longitudinally, and affording comparatively imperfect reflections.

The primary form of the needlestone, fig. 9, is also a right rhombic prism, but measuring 91° 10′ and 88° 40′, M on M′ being the acute angle.

It differs also in its chemical composition from mesotype, which, according to Berzelius, contains no lime, while the needlestone does contain it.

If the planes c, c', e, e', be the result of a decrement by one row on the terminal edges of the prism, the height of the prism will be to one of those edges as 1 to 2.

Measurement of M on M′.	88°	40′
M on C	116	30

I believe it was ascertained some time since by Dr. Wollaston that this substance differed from the mesotype both chemically and crystallographically.

Thomsonite, from Dumbarton.

This substance is found in the neighbourhood of Kilpatrick, near Dumbarton, and has for its primary form a right rectangular prism.

The crystals I have examined are of the form fig. 10, but they are not sufficiently perfect to afford the necessary measurements for determining the dimensions of the prism with accuracy. It is, however, nearly square, and the height equal to nearly four times the lesser terminal edge if the plane c, be produced by a decrement by one row on the greater edge of the terminal plane.

The measurement of	M on	P	is	90°	00′
	M	T		90	00
	M	a	about	135	20
	a	a'	about	90	40

The cleavages parallel to M and T are effected with great facility, and the planes afford very distinct reflections.

H. J. Brooke.

Article VI.

Exposition of the Atomic Theory of Chemistry of Definite Proportions. By William Jame
Professor of Chemistry and Materia Medic
Physicians and Surgeons of the Universi
New-York.

1. It has been known, ever since chemis
of analyzing bodies, that substances always e
combination in determinate proportions.
under all circumstances and in all situations,
of 54 parts nitric acid and 46 potash, per cent
46 muriatic acid and 54 soda; no matter wh
taken from the sea, or from a spring, or artifi
proportions of the constituent parts are unifor
lime is always found to consist of 43·2 carbo
lime. Sulphate of barytes of 34·5 sulphur
barytes. The more rigorously this law has
accurate analysis, the more conspicuous a
become the proofs of its reality. It is, the
admitted; indeed, it is obvious, that if ther
nature to determine and preserve these fixed
could be no uniformity in compound bodies:
and fixedness of the law necessarily depend
cause which renders all other combinations i
this cause, whatever it be, must constitute the
chemical philosophy, and well understood and
would introduce mathematical precision into ou
ings and conclusions. In ascending to the ca
it no other residence than those elementary p
which are so constituted as to be exempt from
though they are capable of being variously c
ther and separated again, so as to give origi
transitions of elementary into organized matte
of the elements themselves is immutable; th
vary. The indefatigable alchymist frequently
device and process, endeavouring, with keen
digal talent, to alter the nature of matter, a
species of metal into another, but he was eter
chimerical attempt.

The productions of nature have not only su
ther in the same general order, but have bee
ning invariably the same. An oak of the pre
same general nature and the same properties a
oaks that ever existed; we find the same te
and bark; a similar disposition in general
branches; the leaves have the same form; th