In this stream each emphasis in attention seems to be influential in producing its successor.

But finally, (2, B) as we have seen that the neururgic emphases to which variations of activity are due may be the result of influences arising out of the great undifferentiable mass of unemphatic activities against which the emphases of activity are contrasted; so we should expect to find the emphases within consciousness, which accompany variations of activity, determined often by influences which are felt to arise out of the undifferentiable psychic mass of unemphatic psychic states; *i. e.*, we should expect to find the field of attention at such times determined by obscure influences from the field of inattention. And this we surely do find in what is called voluntary attention; *i. e.*, in attention which is maintained as such by the reaction of the whole system of consciousness. And in this, as all psychologists acknowledge now-a-days, we have the root of that modification of our reactions upon the outer world which we describe as due to volition.[3]

In the preceding paragraphs I have presented a version of the theory of neururgic and noetic correspondences which enables us to hold that it is thoroughgoing. The test of a theory lies in the explanation it enables us to give of facts of experience which otherwise baffle us. In the articles to follow this I shall first attempt to show that if we accept the theory thus outlined we are able to answer certain questions of interest and importance; and shall then trace some implications of the theory which have bearing upon current psychological problems.

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DIMENSIONAL EQUATIONS AND THE PRINCIPLE OF THE CONSERVATION OF ENERGY

PHYSICISTS generally consider that the assumption of three independent quantities as fundamental dimensions is necessary and sufficient. Time, space and mass are usually selected as elemental, and expressions for physical units, in terms of these three, are called the dimensional equations of these quantities. In Table I. (accompanying) the usual expressions for the more common physical quantities are given.

[3] The relation between intelligence and variation from typical forms of reaction I have discussed at length in my 'Instinct and Reason': the limits of this paper prevent any further consideration of it here. Cf. especially Chapter XVII.

The selection of time and space as fundamental is inevitable, as these are respectively the 'forms' of the inner and outer experience of our consciousness, but the use of mass as the third dimension is open to serious objections. It may be noted that much confusion is caused by the indiscriminate use of the terms mass and matter. The hypothesis of matter as being something behind the concept of mass—*i. e.,* the existence of a great variety of inert bodies divisible into molecules, atoms, electrons, ions or what not, causing the phenomena of mass—is purely metaphysical and entirely without any physical basis. Mass free from the matter hypothesis is real, but a complex quantity containing the time and space factors, and hence should not be used as a fundamental dimension.

The basis of modern physics is the principle of the conservation of energy, and upon this dogma rests the whole superstructure of quantitative measurements. Energy is considered an invariant in amount through all its transmutations, the sum total remaining the same to-day, yesterday and forever; *i. e.,* energy is independent of time and space. It can also exist where there is no mass, witnesseth: the transmission of energy through vacua in the forms of light, radiant heat, electromagnetic waves, Roentgen rays, etc. But in Table I. (giving the system now in general use) the dimensions of energy (work) are given as L^2MT^{-2}. Evidently this is a contradiction of the principle just stated and, therefore, if the conservation of energy dogma be accepted, mass can not be independent of time and space dimensions. Further, since all our knowledge of mass comes to us through our senses by means of energy-changes in time and space, it would seem more logical to consider energy the simple and mass the complex quantity.

Using E as the symbol of energy, and solving the dimensional equation for energy, as given in Table I. ($E = L^2MT^{-2}$), we have $M = L^{-2}ET^2$. Mass is thus a complex quantity, having the dimensions of space, energy and time, or, in other words, mass is energy divided by the square of a velocity.

If mass be a complex quantity, time and space are erroneously introduced or omitted wherever mass occurs in the dimensional equation. Substituting for mass its dimensions in Table I., a new system of dimensional equations is derived in which the fundamental quantities are space, energy and time. This system is founded upon the principle of the conservation of energy and is thus in accord with the fundamental law of modern physics. The resulting equations given in Table II. express directly the nature of each unit as we are accustomed to think of them. For example, in mechanical quantities, power $= ET^{-1}$ = energy per unit of time; and force $= EL^{-1}$, *i. e.,* force times space = energy.

TABLE I.

Physical Quantity.	Dimensions.	
Fundamental:		
Length	L	
Mass	M	
Time	T	
Geometric:		
Surface	L^2	
Volume	L^3	
Mechanical:		
Velocity	LT^{-1}	
Angular velocity	T^{-1}	
Acceleration	LT^{-2}	
Angular acceleration	T^{-2}	
Force	LMT^{-2}	
Work	L^2MT^{-2}	
Power	L^2MT^{-3}	
Pressure	$L^{-1}MT^{-2}$	
Momentum	LMT^{-1}	
Moment of a couple	L^2MT^{-2}	
Moment of inertia	L^2M	
	Electrostatic.	Electromagnetic.
Magnetic Quantities:		
Strength of pole	$L^{\frac{1}{2}}M^{\frac{1}{2}}$	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetic moment	$L^{\frac{5}{2}}M^{\frac{1}{2}}$	$L^{\frac{5}{2}}M^{\frac{1}{2}}T^{-1}$
Intensity of magnetization	$L^{-\frac{3}{2}}M^{\frac{1}{2}}$	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Field intensity	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetic potential	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetic induction	$L^{-\frac{3}{2}}M^{\frac{1}{2}}$	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetizing force	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Permeability	$L^{-2}T^2$	A number
Reluctance	LT^{-2}	L^{-1}
Magnetic flux	$L^{\frac{1}{2}}M^{\frac{1}{2}}$	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetomotive force	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Reluctivity	L^2T^{-2}	A number
Susceptibility	$L^{-2}T^2$	A number
Electrical Quantities:		
Resistance	$L^{-1}T$	LT^{-1}
Electromotive force	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}$
Current	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Quantity of electricity	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}$
Surface density	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$	$L^{-\frac{3}{2}}M^{\frac{1}{2}}$
Capacity	L	$L^{-1}T^2$
Specific inductive capacity	A number	$L^{-2}T^2$
Electric force or intensity of electric field	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-2}$
Electric energy	L^2MT^{-2}	L^2MT^{-2}
Electric power	L^2MT^{-3}	L^2MT^{-3}
Resistivity (specific resistance)	T	L^2T^{-1}
Conductance	LT^{-1}	$L^{-1}T$
Conductivity (specific conductance)	T^{-1}	$L^{-2}T$
Coefficient of induction	$L^{-1}T^2$	L

TABLE II.

Physical Quantity.	Dimensions.	
Fundamental:		
Length	L	
Energy	E	
Time	T	
Geometric:		
Surface	L^2	
Volume	T^3	
Mechanical:		
Velocity	LT^{-1}	
Angular velocity	T^{-1}	
Acceleration	LT^{-2}	
Angular acceleration	T^{-2}	
Mass	$L^{-2}ET^2$	
Force	$L^{-1}E$	
Work	E	
Power	ET^{-1}	
Pressure	$L^{-3}E$	
Momentum	$L^{-1}ET$	
Moment of a couple	E	
Moment of inertia	ET^2	
	Electrostatic.	Electromagnetic.
Magnetic Quantities:		
Strength of pole	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T$	$L^{\frac{1}{2}}E^{\frac{1}{2}}$
Magnetic movement	$L^{\frac{1}{2}}E^{\frac{1}{2}}T$	$L^{\frac{3}{2}}E^{\frac{1}{2}}$
Intensity of magnetization	$L^{-\frac{5}{2}}E^{\frac{1}{2}}T$	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$
Field intensity	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$
Magnetic potential	$L^{\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}$
Magnetic induction	$L^{-\frac{5}{2}}E^{\frac{1}{2}}T$	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$
Magnetizing force	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$
Permeability	$L^{-2}T^2$	A number
Reluctance	LT^{-2}	L^{-1}
Magnetic flux	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T$	$L^{\frac{1}{2}}E^{\frac{1}{2}}$
Magnetomotive force	$L^{\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}$
Reluctivity	L^2T^{-2}	A number
Susceptibility	$L^{-2}T^2$	A number
Electrical Quantities:		
Resistance	$L^{-1}T$	LT^{-1}
Electromotive force	$L^{-\frac{1}{2}}E^{\frac{1}{2}}$	$L^{\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$
Current	$L^{\frac{1}{2}}E^{\frac{1}{2}}T$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}$
Quantity of electricity	$L^{\frac{1}{2}}E^{\frac{1}{2}}$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T$
Surface density	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$	$L^{-\frac{5}{2}}E^{\frac{1}{2}}T$
Capacity	L	$L^{-1}T^2$
Specific inductive capacity	A number	$L^{-2}T^2$
Electric force or intensity of electric field	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$
Electric energy	E	E
Electric power	ET^{-1}	ET^{-1}
Resistivity (specific resistance)	T	L^2T^{-1}
Conductance	LT^{-1}	$L^{-1}T$
Conductivity (specific conductance)	T^{-1}	$L^{-2}T$
Coefficient of inductance	$L^{-1}T^2$	L

Especially in the magnetic and electrical quantities is there a great advantage in eliminating the mass dimension and using energy with time and space in its stead. Take, for example, the strength of pole in the electro-magnetic system. This quantity is derived from the experimentally observed fact that between two equal and opposite magnetic poles, of strength 'm,' and at a distance 'l' apart, there is a force which is proportional to m^2/l^2. Hence $m^2 = FL^2$. But $E = FL$, hence $m^2 = EL$, and therefore $m = E^{\frac{1}{2}}L^{\frac{1}{2}}$. The superiority of this expression to $L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}$ in practice, as well as in theory, will be admitted by all.

It is noteworthy that all the magnetic quantities in the electro-magnetic system are independent of time. From the usual conception of these quantities this evidently should be the case, and it appears that the time dimension given in Table I. is erroneously introduced by the use of mass as a fundamental quantity. It is, however, unnecessary to go further into detail. The expressions in Table II. are so plain that 'he who runs may read.'

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DISCUSSION

DR. MONTAGUE'S THEORY OF TIME-PERCEPTION

IN the January number of *The American Journal of Psychology* for 1904, Dr. W. P. Montague has given a theory of time-perception and in particular, of the specious present, which is so clear-cut and ingenious as to be well-nigh captivating. And yet, after reading this article, I cannot refrain from calling attention to one or two points which, as it seems to me, need at least some reconsideration.

If I have correctly read Dr. Montague, he sets out to explain how that finitely extended segment of time in the individual consciousness known as the 'specious present,' can exist in the metaphysical present which is infinitesimal, that is, which is a segment of time whose extent is zero. "How is it that at any one moment there can appear to be present several moments?" "Every psychosis," he continues, "has two distinguishable but inseparable aspects, the subjective and the objective. The subjective element or 'knowing thought' is the whole system of conscious contents taken collectively and *including the incoming content*" (my italics), "while the latter is the *object* of the (normally prospective) act of attention. . . . We may describe every psychosis as the assimilation of an entering sensation-mass by a receiving apperception-mass." The explanation is: "Let Δo symbolize the amount of change or alteration in the objective content o produced in any