front door for the excursion to the mail box. He made the customary salutation and played with my cane as I walked along. There was nothing in his behavior to indicate that he remembered the incident of the day before in the poultry yard or regarded either myself or my cane as a menace. But later the same day I went out of the west door of my laboratory again on my way to the poultry yard. Ponto met me at the door and, taking the tip of my cane in his mouth, played along happily till we passed the servants' quarters and came in view of the poultry yard. At that moment he stopped and seemed to survey the situation. His ears and tail drooped disconsolately, and, turning about, he went sorrowfully back to the laboratory. These reactions were repeated for several days following.

Now, the poultry yard had done nothing to chastise Ponto. It was myself and my cane that had functioned in that capacity. According to the theory of association the dog would be expected to associate (synthesize) the chastisement with me and my cane, the moving objects which overtly effected the reprimand. But, obviously, my cane and I held no menace for him so long as we were alone in his field of vision. As soon, however, as we made a common visual pattern with the poultry yard he recognized a menacing situation. It was the total pattern that acted as the stimulus. And this did not require an act of synthesis by Ponto. The totality (oneness) was primary, and in the primary total visual pattern none of the elements had acquired a sufficient degree of individuality of their own for the dog to recognize them as such in the composition of the field and to attach to them their true significance. In other words, Ponto could not individuate my cane, myself and the poultry yard.

But Ponto's behavior when he was six months old suggested that he had made progress in powers of visual individuation. He would then seat himself before me while I stood quietly, and would gaze into my eyes intently and inquiringly as if he expected something to come out of them. He had obviously noticed that my eyes were a part of me, and a very special part, for after we had looked each other straight in the eyes for a while, and without either of us making any other movement, he would playfully leap at my face. This leap was so sudden and close that I had to dodge to escape it.

Possibly I owe psychologists an apology for this trespass upon their field, particularly those who give little consideration to neurology or have no sympathy for Gestalt psychology. Kuo,[1] for instance, has criticized my "uncritical acceptance of the 'gestalttheorie.'" This does not seem to me quite justified, for I had not thought of accepting any theory of psychology. In fact I have not studied the theory of Gestalt in its broader implications. But I am in agreement with the theory in the interpretation of the relation of the part to the whole in organismic behavior. And in so far as I have advocated the theory I have been impelled by facts of structural and functional growth of the nervous system and the organism. In both structural and functional development I see the antagonistic processes of integration and individuation; the one tending to maintain the integrity of the organism, the other tending to dismember it. Normal development requires the whole to dominate the parts. If this is in accord with the *"gestalttheorie,"* as I think it is, all well and good, but beyond this I have no personal interest in the theory.

Within normal limits individuation makes for greater efficiency of living, both motor and sensory. In the visual functions I consider it as the biological process which makes possible a figure on a ground. Genetically, we see, first, totalities (wholes); later we "regard" parts of the totalities. It is possible that Ponto in his younger days saw my cane as a part of myself, for he was constantly trying to lick my hands, though I avoided this caress as much as possible and reproved him for it. Taking the tip of my cane in his mouth may have given him a similar satisfaction, and he could do this with impunity. Only later, I think, was he able to "regard" my cane as such; for this would be possible only through the process of individuation. In former writings I have spoken of this process as "reduction" of the field of stimulation,[2] or "progressive restriction of the stimulogenous zone,"[3] or "progressive reduction in the extent of the reflexogenous zone or range of the impinging stimuli."[4]

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[1] Zing Yang Kuo, *Psychological Review*, 39: 499–515, 1932.

STROBOSCOPIC ILLUSIONS CAUSED BY LIGHTNING

ON June 10, 1938, a thunder-storm lasting from 5:30 to 7:30 P.M., accompanied by brilliant lightning, occurred at Iowa City, Iowa. The sky, piled high with white cloud masses, was brightly illuminated at frequent intervals during this storm. An 8-inch electric fan running on a window sill facing the storm was sharply silhouetted against this light background throughout each flash. Lasting through many flashes

[2] G. E. Coghill, *Proc. Nat. Acad. Sciences*, 16: 637–643, 1930.

[3] *Ibid., Archives of Neurology and Psychiatry*, 21: 989–1001, 1929.

[4] *Ibid., Jour. Gen. Psychol.*, 3: 431–435, 1930.

a brief stroboscopic illusion was noted on the revolving fan blades. This was more clearly seen with the room lights turned off. Every stroke did not produce exactly the same illusion on the fan blades. A number of flashes caused the revolving blades to appear practically motionless; with others they seemed to revolve slowly in the direction of their original rotation. Some flashes produced no effects. During the present observations it was estimated that at least 80 per cent. of the flashes created a stroboscopic illusion upon the whirling fan blades. Noticeable flickering of the flash frequently characterized those strokes creating this illusion. No flashes were observed that caused the fan blades to appear to revolve backwards.

Recent researches upon lightning by McEachron and McMorris[1] have demonstrated that what appears to be a single stroke is often a series of flashes, spaced a fraction of a second apart. Such multiple strokes may consist of as many as 40 separate discharges, the interval between them varying from 0.0006 to 0.53 second. Their observations have indicated that about 90 per cent. of the strokes in some storms were multiple. This paper should be consulted for details impossible to cite in a short note.

These researches have clearly indicated that certain bolts of lightning are made up of a rapidly occurring series of separate flashes. A multiple stroke of lightning may, therefore, create the same type of illusion upon the revolving blades of an electric fan as do the intermittent light flashes produced by a stroboscope.

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ADVANTAGES OF $F_g = kma$

THE much-debated and troublesome gravitational measure of force can be handled in only two essentially different ways. These are $F_g = kma$ and $F_g = \frac{wa}{g}$. Each has its advantages and each has its ardent advocates, so that further discussion may be a waste of time. However, I should like to point out one or two possibly new reasons which seem to me to give the weight of argument in favor of *kma*.

In this method k is a numerical constant which, in the metric system, converts dynes to grams of force (F_g). In the form $F_g = kma$, it equals approximately 1/980 and is exactly analogous to the number 12, which converts a length measured in feet to the same length measured in inches. Such a number has no dimension as the word is usually understood. It is simply the quotient of one foot divided by one inch. The result is twelve, not 12 *in/ft*. If you ask how many quarters make a dollar, the answer is four, not 4 quarters/dollar. The latter would amount to saying: "four quarters per dollar quarters make a dollar"; which is certainly redundant. Thus we may write $L_{in} = 12L_{ft}$, or $F = 980\ F_g$, where 12 and 980 are numerical ratios of the same physical quantity, and are therefore numbers having no dimensions.

The other method is based on a force-length-time system of units instead of a mass-length-time system. The force (weight) w is converted to a mass by dividing by g, and this new mass, measured in units of 980 grams, gives force in grams when multiplied by the acceleration measured as usual. The numerical labor involved is identical in both methods, so the only question is as to which makes for the least confusion. It seems to me that *kma* is the least confusing, since it does not depart from the c.g.s. system in calculating the non-c.g.s. quantity, force measured in grams. The trouble with $F_g = \frac{wa}{g}$ is that it introduces practically two non-c.g.s. quantities, namely the weight w, and the mass w/g measured in 980-gm units. Possibly this system would be preferable if we always used gravitational units and nothing else. That is why it appeals to the engineer, who clings to the good old pound weight and ignores the possibility of a pound mass. But the use of the metric system either with c.g.s. or m.k.s. units is certainly increasing. So it seems to me that since we can not yet ignore force pounds and force grams, we should use that method of dealing with them which is the least confusing and which deviates as little as possible from the concept of force expressed by $F = ma$.

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QUOTATIONS

THE PHYSIOLOGICAL CONGRESS AT ZURICH

AMID auspicious surroundings the International Physiological Congress had its sixteenth, or jubilee, meeting at Zurich from August 14th to 19th. The president, Professor W. R. Hess, in a happy address of welcome, pointed out that the congress had been conceived in England in 1888, but was born at Basel in September of 1889 when a group of 129 physiologists met to hold their first congress. It was highly fitting, therefore, that the congress should return to Switzerland to celebrate its fiftieth anniversary; this time with a registration of more than 1,600 members.

[1] K. B. McEachron and W. A. McMorris, *General Electric Review*, 39: 487–496, 1938.