

ever, that these precipitin tests can give us quantitative measures of the present relationships of existing forms and thus supply exact ideas as to that part of their phylogeny which concerns their present position on the phylogenetic tree. If so the tests will have succeeded in giving us what a century or more of intensive morphological investigation has failed to provide, namely, a basis for a quantitative phylogeny.

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## Note on the Correlation between Chronaxie and Reaction Time.

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The researches of Lapique and Bourguignon have shown that the excitability of muscles as measured by their chronaxie is closely associated with the form and duration of their contraction, the general rule being that the slower the contraction the longer the chronaxie and vice versa. This has been attested, on the one hand, by the comparatively long chronaxies of smooth as compared with striated musculature (animals) and on the other hand, by the chronaxie changes following nerve degeneration and those met with in the various muscular dystrophies.

In view of this association it seemed to us that there might be some correlation between motor speed and neuromuscular excitability, which might account for differences in speed of movement, on the basis of a constitutional (organic) factor. The present note is a report on the results obtained by simultaneous measurement of the chronaxie and reaction time in 20 normal human subjects.

In obtaining the chronaxie we followed Bourguignon's technique, employing a method described by us in a previous paper,<sup>1</sup> with the apparatus assembled into a simple portable form devised by one of us. The chronaxie was taken over the motor point of the biceps muscle. The average of five readings was taken as the chronaxie.

The speed of bicepital contraction against which we correlated the muscle chronaxie was obtained as follows: Each subject after placing his forearm, fist clenched, upon a table in front of him was

<sup>1</sup> Wechsler, D., and Freeman, R. G., Jr., *Arch. Neur. and Psych.*, 1929, **22**, 558.

instructed, upon a given signal, to move his fist horizontally to the right (a distance of six inches), strike a key and then flex his arm as quickly as possible in a vertical direction. The height and distance through which the subject could flex his arm was limited by an extended board fastened 12 inches above the surface of the table and parallel to it, on the under surface of which was attached a legless telegraph key against which the subject's fist inevitably struck. The interval between the striking of the first and second keys was measured by a 1/100 split second chronometer started by the first blow and stopped by the second, and the interval taken as the reaction time. By breaking up the response into two steps the perceptual component was eliminated.

The table shows the individual data obtained in respect to the 2 variables measured.

TABLE I.

Case	Chronaxie (Σ)	Reaction Time (0.01 sec.)	Case	Chronaxie (Σ)	Reaction Time (0.01 sec.)
1	0.10	1.23	11	0.10	1.15
2	0.10	1.23	12	0.06	1.00
3	0.10	1.47	13	0.10	1.00
4	0.12	1.37	14	0.06	1.10
5	0.06	1.28	15	0.12	1.30
6	0.06	1.01	16	0.06	1.05
7	0.10	1.05	17	0.08	1.10
8	0.10	1.32	18	0.06	1.10
9	0.10	1.20	19	0.06	1.14
10	0.10	1.29	20	0.04	1.00

A correlation, by Sheppard's coefficient method of unlike signs, of 0.84 was found between the two measures. We interpret the results as showing that the speed of muscular contraction, and probably of movement in general is in some way dependent upon the chronaxie of the nerves and muscles involved.