Stimulus being stretch of the hip-flexors under gravity—is not followed by after-increase of the reflex.

Or the after-increase might result from the inhibition being followed by a rebound to superactivity. This latter seems to be the case. The after-increase occurs even when both hind limbs are passively lifted from below during the whole duration of the inhibitory stimulus applied to the tail. It is the depression of inhibition, and not the mere freedom from an exciting stimulus, that induces a later superactivity. And the reflex inhibition of the knee-extensor by stimulation of the central end of its own nerve is especially followed by marked rebound to superactivity of the extensor itself.

Again, the knee jerk, after being inhibited by stimulation of the hamstring nerve, returns, and is then more brisk than before the inhibition.

By virtue of this spinal contrast, therefore, the extension-reflex predisposes to and may actually induce a flexion-reflex, and conversely the flexion-reflex predisposes to and may actually induce an extension-reflex. This process is qualified to play a part in linking reflexes together in a co-ordinate sequence of successive combination. If a reflex arc A during its own activity temporarily checks that of an opposed reflex arc B, but as a subsequent result induces in arc B a phase of greater excitability and capacity for discharge, it predisposes the spinal organ for a second reflex opposite in character to its own in immediate succession to itself. The writer has elsewhere pointed out the peculiar prominence of a alternating reflexes ” in pro­longed spinal reactions. It is significant that they are usually cut short with ease by mere passive mechanical interruption of the alternating movement in progress. It seems that each step of the reflex movement tends to excite by spinal induction the step next succeeding itself.

Much of the reflex action of the limb that can be studied in the “ spinal ” dog bears the character of adaptation to locomotion. This has been shown recently with particular clearness by the observations of Phillipson. In describing the extensor thrust of the limb the writer drew attention at the time to its signifi­cance for locomotion. Spinal induction obviously tends to connect to this extensor-thrust flexion of the limb as an after-effect. In the stepping of the limb the flexion that raises the foot and carries it clear of the ground prepares the antagonistic arcs of extension, and, so to say, sensitizes them to respond later in their turn by the supporting and propulsive extension of the limb necessary for progression. In such reflex sequences an antecedent reflex would thus not only be the means of bring­ing about an ensuing stimulus for the next reflex, but would pre­dispose the arc of the next reflex to react to the stimulus when it arrives, or even induce the reflex without external stimulus. The reflex "stepping ” of the " spinal ” dog does go on even without an *external skin* stimulus: it will continue when the dog is held in the air. The cat walks well when anaesthetic in the soles of all four feet.

Each reflex movement must of itself generate stimuli to afferent apparatus in many parts and organs—muscles, joints, tendons &c. This probably reinforces the reflex in progress. The reflex obtainable by stimulation of the afferent nerve of the flexor muscles of the knee excites those muscles to contraction and inhibits their antagonistics: the reflex obtainable from the afferent nerve of the extensor muscles of the knee excites the flexors and inhibits their antagonistics.

Where a reflex by spinal induction tends to eventually bring about the opposed reflex, the process of spinal induction is therefore probably reinforced by the operation of any reflex generated in the movement. This would help to explain how it is that a reflex reaction, when once excited in a a spinal ” animal, ceases on cessation of the stimulus as quickly as it generally does. Such a reaction must generate in its progress a number of further stimuli and throw up a shower of centripetal impulses from the moving muscles and joints into the spinal cord. Squeezing of muscles and stimulation of their afferent nerves and those of joints, &c., elicit reflexes. The primary reflex movement might be expected, therefore, of itself to initiate further reflex movement, and that secondarily to initiate further still, and so on. Yet on cessation of the external stimulus to the foot in the flexion-reflex the whole reflex comes usually at once to an end. The scratch-reflex, even when violently pro­voked, ceases usually within two seconds of the discontinuance of the external stimulus that provoked it.

We have as yet no satisfactory explanation of this. But we remember that such reflexes are intercurrent reactions breaking in on a condition of neural equilibrium itself reflex. The suc­cessive induction will tend to induce a *compensatory* reflex, which brings the moving parts back again to the original position of equilibrium.

2. Another condition influencing the issue of competition between reflexes of different source for possession of one and the same final common path is *fatigue,* A spinal reflex under continuous excitation or frequent repetition becomes weaker, and may cease altogether. This decline is progressive, and takes place earlier in some kinds of reflexes than it does in others. In the “ spinal ” dog the scratch-reflex under ordinary circumstances tires much more rapidly than does the flexion-reflex.

A reflex as it tires shows other changes besides decline in amplitude of contraction. Thus in the flexion-reflex, the original steadiness of the contraction decreases; it becomes tremulous, and the tremor becomes progressively more marked and more irregular. The rhythm of the tremor in the writer’s observations has often been about 10 per second. Then phases of greater tremor tend to alternate with phases of improved con­traction as indicated by some regain of original extent of flexion of limb and diminished tremor. Apart from these partial evan­escent recoveries the decline is progressive. Later, the stimula­tion being maintained all the time, brief periods of something like complete intermission of the reflex appear, and even of a replacement of flexion by extension. These lapses are·recovered from, but tend to recur more and more. Finally, an irregular phasic tremor of the muscles is all that remains. It is not the flexor muscles themselves which tire out, for these, when under fatigue of the flexion-reflex they contract no longer for that reflex, contract in response to the scratch-reflex which also employs them.

Similar results are furnished by the scratch-reflex, with certain differences in accord with the peculiar character of its individual charge. One of these latter is the feature that the individual beats of the scratch-reflex usually become slower and follow each other at slower frequency. Also the beats, instead of remaining fairly regular in amplitude and frequency, tend to succeed in somewhat regular groups. The beats may disappear altogether for a short time, and then for a short time reappear, the stimulus continuing all the while. Here, again, the phenomena are not referable to the muscle, for when excited through other reflex channels, or through its motor nerve directly, the muscle shows its contraction well. Part of the decline of these reflexes under electrical stimulation in the “ spinal ” dog may be due to reduction of the intensity of the stimulus itself by physical polarization. That does not account in the main for the above described, effects. The graphic record of fatigue of the flexion of the scratch-reflex obtained by continued *mechanical* stimulation does not appreciably differ from that yielded under electrical stimulation. The different speed of the decline due to fatigue proceeds characteristically in different kinds of reflex, and in the same kind of reflex under different physiological conditions, *e.g.. "* spinal shock this indicates its determination by other factors than electrical polarization. Polarization has in a num­ber of cases been deferred as far as possible by using equalized alternate shocks applied in opposite directions through the same gilt needle; this precaution has not yielded; results differing appreciably from those given by ordinary double shocks or by series of make or break shocks of the same direction. The slow­ing of the beat in fatigue is also against the explanation by polarization, since merely weakening the stimulus does not lead to a slower beat.

When the scratch-reflex elicited from a spot of skin is fatigued,