treppe represents increased irritability and increased working power, due to the action of small quantities of carbon dioxide, lactic acid and, possibly, other fatigue substances.

If Fröhlich's theory be correct, there should be a progressive increase in the length of the successive muscle curves throughout the treppe. This is found not to be so. When a muscle lever is made to close an electric circuit automatically at the precise end of each relaxation and thus to stimulate the muscle anew, it is found that the length of the muscle curves at first increases and then decreases, while the treppe is still proceeding. This fact does not seem explicable by Fröhlich's theory, but is what might be expected if the treppe were due to the augmenting action of fatigue substances.

Fröhlich's theory demands that the irritability of the muscle should progressively decrease from the time of the first contraction. This also is found not to be so. When the irritability of the excised and non-curarized muscle, as indicated by the threshold of stimulation, is determined at intervals throughout the course of the treppe, it is found that the irritability progressively increases. This again is in harmony with the theory of the treppe, proposed by the senior author.

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An attempt to discover the cause of the specific dynamic action of protein.

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The writer has shown that if glutamic acid be given to a phlorhizined dog three of its carbon atoms are converted into glucose. One can write the reaction thus:

$$2HOOC \cdot CH_2 \cdot CH_2 \cdot CHNH_2 \cdot COOH + 2HOH = 2CH_3\,COOH + C_6H_{12}O_6 + 2NH_3.$$

Rubner sought to explain the increase in heat production which followed meat ingestion—its *specific dynamic* action—by the supposition that protein could be used for the vital activities of the cells only in so far as it was converted into dextrose; all the oxidations of other portions of the protein yielded free heat within the

organism which could not be used as power for the living mechanism. If this were true then a considerable increase in the output of carbon dioxide would follow the administration of glutamic acid superimposed upon a regular standard diet. Alanin, which Ringer and the writer have shown to be completely convertible into dextrose, should show no specific dynamic action, whereas tyrosin with its many cleavages before it reaches a stage for use in metabolism might show a pronounced increase in carbon dioxide output.

From the experiments at hand no specific dynamic action can be shown even after giving large quantities of amino-acids, and there is not even a rise in carbon output which can be interpreted as due to "Darmarbeit" or intestinal work in the sense of Zuntz. The "standard diet" was given in two portions daily and consisted in

	Grams.	Grams C.
Cane sugar	100	42.1
Fat (+ fat in meat)	21.0	16.0
Meat (1 g. N)	33.4	3.3
Total C		61.4

The results are given in the following table. The dog was kept at a temperature of 30° C. in the chamber of a Pettenkofer-Voit respiration apparatus for a period of about 22 hours daily.

Date.	Ingesta.	N in urine.	C in respiration.
1908			
1, XII	Dextrose, 40 g.	3.55	46.56
2	" 20 g. +alanin 15.9 g. (2.5 g. N)	6.39	47.13
1910			
21, IV	Standard diet	2.02	64.25
22	" " +24 g. glutamic (2.28 g. N)	3.58	59.00
	" " in interim		
28	" "	1.68	57.72
29	" " +24 g. tyrosin (2.03 g. N)	2.78	58.02
	Interim, fasting, ordinary diet, standard diet		
13, V	Standard diet	1.19	59.24
14	[1] " " +40 g. glutamic (3.82 g. N)	3.90	57.78
15	" "	2.24	54.31
16	" " +35 g. glutamic (3.41 g. N)	3.32	52.25
17	" " +30 g. glutamic (2.85 g. N)	4.25	58.88

[1]Small amount vomited (containing 0.2 g. N).