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*Original Articles.*

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THE HEAT CENTRES OF THE CORTEX CEREBRI  
AND PONS VAROLII.

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**I**N my experiments upon rabbits I found when a puncture was made just in front of the ear into the cortex there ensued a fugitive rise of temperature. This observation lead me to try in cats the effects of removal of areas of the cortex in this and other regions. The method was as follows : the animal was etherized in a bag, the skin in front of the ear divided, the muscles separated, the bone bared, and the trephine of Pasteur applied, which rapidly makes an opening through the skull. With a small hook-shaped knife the dura mater was divided, and the cortex cerebri beneath broken up to the depth of a sixteenth of an inch. The wound was then washed with a carbolized solution and the integuments brought together by sutures. The weight and rectal temperature were taken previous to the operation and in some cases the animal was placed in d, Arsonval's calorimeter, and heat production and heat dissipation noted for an hour. After the operation the animal was placed in a box of straw and allowed to sleep off the ether, after which he was set in the calorimeter at similar dates for several days. All observations with the calorimeter were made about the same time each day for a student of mine, Mr. W. S. Carter, has found that heat production and dissipation have periods of rise and fall, being lowest from 6 to 9 A. M., and highest

from 12 to 2 P. M. They were fed, but partook sparingly of food. A point at the juncture of the supra Sylvian and post-Sylvian fissures was found to have the highest thermic value. S in Fig. 1 shows the position of this centre and from this area it extends downward to the fissura postica. In my descriptions I shall follow the nomenclature of the fissures as given by Prof. Wilder. Other parts of the brain, with the

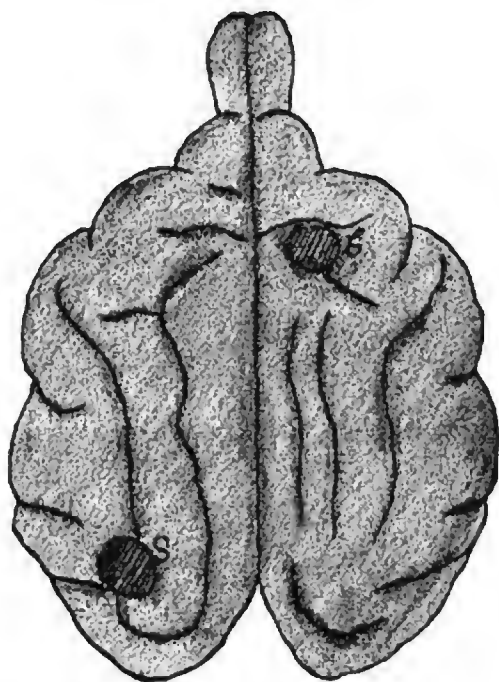
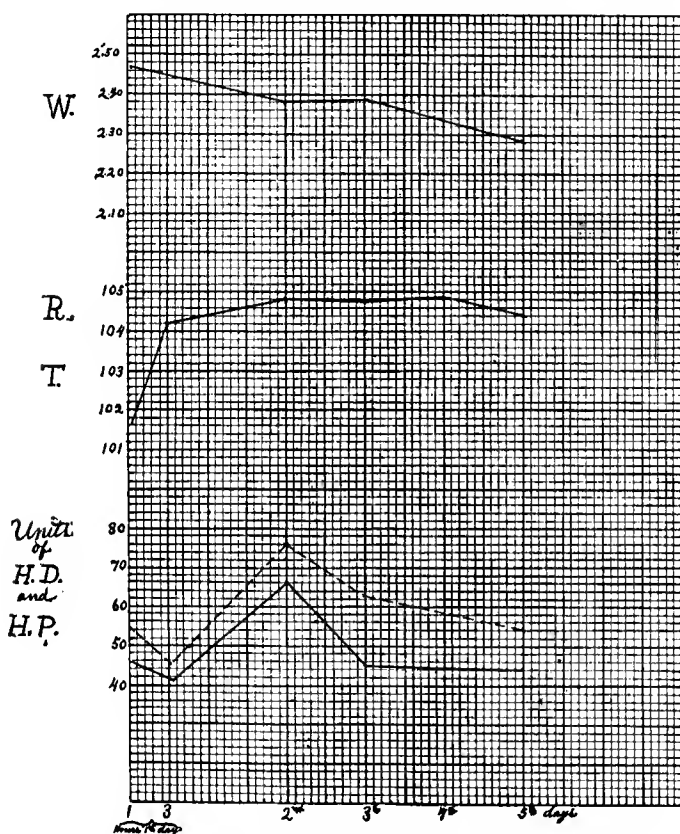


Fig. 1. Twice the natural size. After Wilder.

exception of the cruciate centres, had but small effect upon the temperature. In the experiments will be found the details of observations upon other regions of the brain. The rise of temperature after injury to the Sylvian centres is from three to four degrees, and continues till the death of the animal, which is usually about the sixth day. The calorimetric investigations show that either immediately or at the end of twenty-four hours, the heat production and heat dis-

sipation are increased, after that they usually fall below normal, although the temperature remains elevated, with a weight decreasing daily. In Fig. 2 are given the curves of an experiment, the highest line is that of weight ; the second



line, the temperature curve ; the dotted line that of heat-dissipation ; the continuous line that of heat production. The numbers at the bottom of the figure are the days during which the observations were made. That this increase of heat-production is not due to circulatory changes is seen in the experiment where the pulse and pressure were noted after an operation on the Sylvian centre. They both rise for a short period and then fall to a certain extent below normal, although the temperature is afterwards rising. No data

that I know of would justify any one in assuming at the end of twenty-four hours, an increased production of heat is due to a depressed circulation. It is true that after section of a nerve there is an increased temperature in the parts, but it by no means follows that there is an increased production of heat in the part due to increase of blood, for the section itself may remove the inhibition of thermogenesis in the parts supplied by the divided nerve,

Prof. R. Meade Smith,\* in a series of observations on the thermic phenomena of muscles, arrived at the conclusion that with a large supply of blood the cool skin, even though exposed to excessive and rapid loss of heat, will become warmer, while on the other hand, the warmer muscle will become cooler. Consequently he states the conception must be erroneous which is generally held as to the temperature changes in muscle from alterations in the blood-supply after section of the nerves.

That the increased heat production does not continue beyond the first twenty-four or forty-eight hours is in part due to diminished ingestion of food. I have observed a similar increase for the first twenty-four hours when experimenting upon the four cerebral heat-centres. In examining the curve of temperature in Fig. 2, it will be found to be similar to that seen after injuries about the corpus striatum, and dissimilar to those seen after the lesions of the thalamic or extra-thalamic centres. It was found that usually the temperature of the trunk and the extremities was elevated, the extremities opposite the side of lesion being slightly warmer than those on the side of injury. Whilst exploring the cortex I found that the cruciate centres (C. Fig. 1.) of Eulenberg and Landoist† exhibited upon injury the phenomena described by them.

I shall denominate their centre the cruciate to distinguish it from the Sylvian. I should like to state here that after injuries to the Sylvian I saw no evidences that the cruciate was involved by an meningo-encephalitis, in the production of the phenomena attributed to the Sylvian.

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\*Archives of Medicine, 1884.

†Therapeutic Gazette, Sept., 1887. Virchow Archiv. B.d. 68, 1876.

The cruciate is bounded anteriorly by the cruciate sulcus, and embraces entirely a part of the fourth primitive convolution and particularly the posterior and lateral convolutions of the "Häckenformigen" gyrus, which corresponds in man and apes to the antero-central convolution, and appears to be the post-frontal gyrus of Owen. Destruction of the parts was accomplished in dogs by means of the cautery, which caused a considerable rise of temperature in the opposite extremities. The increase of temperature often takes place before the animal recovers from the chloroform. The difference between the temperature of the extremities is from  $1.5^{\circ}$  C. and  $13^{\circ}$  C. They also used chloride of sodium, which after a stage of excitation acted like the cautery on the centres, destroying them. The temperature of the ear on the side of lesion was higher; destruction of the gyrus praefrontalis, the super sylvian and others is without effect on the temperature. They seem to think that when a part of the brain near the cruciate is destroyed, that the lesion in a few hours or a day, may cause a meningitis or encephalitis, invading the cruciate centres and thus elevating the temperatures. If this is true, areas in the neighborhood may have thermic value falsely attributed to them. The temperature after injury to the cruciate centres, gradually increases and remains elevated from three days to three months. Irritation of these centres causes a cooling of the opposite extremities. Prof. Wood has also noted phenomena similarly to those stated above, and he found that the increase of temperature was attended with an augmented production of heat. He did not ascertain how long this increase of heat-production continues. I have made experiments upon this point and determined the weight, temperature, heat-production and heat dissipation for several days. The animals used were cats, and the same method was followed as in experiments upon the Sylvian centres. It will be noted that at the end of twenty-four hours the heat production is elevated above normal, and then returns to its original level, to again rise on subsequent days. Heat dissipation closely follows heat-production. I have also sought to determine the effect of these centres, as well as the Sylvian on the rectal temper-

ature, and found that when irritated they depressed it. When by puncture of the corpus striatum the temperature is elevated, then irritation of the cortical centre by the far-adic current still depresses the hyperthermic condition generated by lesion of the heat-centres about the corpus striatum. Experiments upon the circulation when the cruciate centres are mechanically destroyed, produce the same results as after Sylvian destruction.

**Pons Varolii :** The discovery of the four cerebral heat centres by the method of puncture at the base of the brain, lead me to use it in the pons varolii. When the lateral columns of the spinal cord are divided, and the temperature of the ambient air is about that of the animal, the temperature of the animal rises because there is increased production of heat. If the pons is transversly separated from the medulla a similar increment of heat-production ensues, causing an elevation of temperature. In the experiments upon the pons I have used rabbits, and the puncture was made through the occipital bone, and cerebellum into the pons varolii. Notwithstanding a large number of punctures, the increase of temperature was only a few degrees and not permanent. These results convinced me that it was not necessary to make any calorimetric investigations, for it is usually, when the temperature is excessive and transient or when it is moderate and continuous for some days, that any notable increment of heat-production ensues. The rise that takes place after an injury to the pons varolii from a transverse section, is due to removal of an inhibiting influence upon it and the spinal cord. In section of the lateral columns of the spinal cord, a similar cause is at work. The idea that a dominant heat centre exists in the pons varolii is not supported by these experiments or by any others when they are held up to the light of recent discoveries.

The query now arises what is the nature of these six centres in the brain? I have already referred to the three divisions of the phenomena of fever by Dr. Donald Mac-Alister into thermotaxic, thermogenetic, and the thermolytic. The fact of the cruciate and Sylvian centres, upon their destruction, causing an elevation of temperature for

days, their irritation a slight refrigeration of the body, and, when striate hyperthermia is produced, irritation of the cruciate centre still reduces it, causes me to believe the Sylvian and cruciate to be thermotaxic. The striate, extra-striate and thalamic centres, with the one about Schriff's crying centre, constituting the four heat centres at the base of the brain, may be regarded, according to the different kind of impulses sent into them by different irritants, as either thermotaxic or thermogenetic.

In another paper\* I have spoken of the reasons which lead me to so regard them. The effect of section of the lateral columns of the spinal cord and of the great spinal stimulant, atropine,† in causing increased temperature, induces me to hold that the spinal cord is the main seat of the thermogenetic centres. The increase of heat production after injury to the Sylvian and cruciate centres, the fall to normal, and the subsequent rise in some cases (Exp. 12), indicates that there is a play between these centres and those beneath for mastery, a state of things seen in the temperature of fever patients. If these experiments are examined, they afford excellent ground for the belief that in certain feverish states the normal of heat production and heat dissipation is reset at a higher rate, but at the end of twenty-four hours slides down below normal, partly from want of food. Experiments upon the four basal heat centres also show a similar state of affairs during the first twenty-four hours, heat production and heat dissipation are increased, but afterwards fall, although the fever continues. It is probable that after injury to the cortical heat centre, the basal and spinal thermogenetic centres are temporarily permitted to obtain the upper hand, but that shortly the other cortical heat centres bring the thermogenetic centres into subjection, and thus reduce heat production. In the case of lesion of the basal and spinal thermogenetic centres, they primarily overcome the cortical centres for a short period, but finally succumb to the domination of the thermotaxic centres of the cortex. In other words, the Sylvian and cruciate centres constantly antagonize the basal and

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\* Therapeutic Gazette, 1887.

† Therapeutic Gazette, 1887.

spinal thermogenetic centres. It is also probable that under certain impulses the cortex and basal centres combine together to antagonize the spinal thermogenetic centres. It would seem that any injury to the thermotaxic or thermogenetic apparatus sets up a fever which is primarily accompanied by increased production and dissipation; but but they soon fall below normal, whilst the fever continues till the lesion is repaired. This would lead to the belief that in continued fever the generation of a ptomaine is continuously carried on for some time, and thus keeps up the fever. These experiments show how delicate and complex is that most important mechanism of the body temperature-regulation; each of these six cerebral heat centres has its own laws. Some are slow, others are rapid in their elevation of temperature; some continue their activity for days, others for a short time; some affect one part of the body more than another; others do not.

The crossed action of the cruciate and Sylvian centres, the former being stronger in crossed activity than the latter, is another fact in support of a view already advanced\* as to the decussation of thermotaxic fibres.

The mechanism of temperature production is as follows:

*Thermotaxic Centres :* { Cruciate (Eulenberg and Landois)  
and  
Sylvian.

*Thermotaxic and Thermogenetic :* { The centre about Schiff's crying centre and the  
extra-striate, striate (Sachs and Aronsohn), and the  
thalamie centres.

*Thermogenetic Centres :* { Spinal centres.

Appended are the experiments upon which the preceding statements are mainly based:

- R. T. means rectal temperature.
- C. T. " calorimeter "
- A. T. " air "
- W. is weight in pounds.
- H. D. is heat dissipation.
- H. P. is heat production.

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\* JOURNAL OF NERVOUS AND MENTAL DISEASES, July, 1887.



EXP. I.—Cat; weight, 3.36 lbs.

	A. T.	C. T.	R. T.
12.50 P. M.	80.	79.95	102.5
1.50 “	83.55	80.7	100.5
		<hr/>	<hr/>
		+ .75	—2.0

H. D.=31.29      H. P.=25.42  
2.10 P. M., Sylvian centre destroyed.

*Second Day.*

	A. T.	C. T.	R. T.
12.06 P. M.	73.4	71.45	105.2
1.06 “	75.3	72.7	100.4
		<hr/>	<hr/>
		1.25	—4.8

H. D.=52.15      H. P.=49.57

*Third Day.*

1 P. M. . . . . 106.5

*Fourth Day.*

1 P. M. . . . . 105.4

EXP. II.—Cat; weight, 7.6 lbs.

	A. T.	C. T.	R. T.
5.06 P. M.	76.4	70.98	102.4
6.06 “	73.0	72.5	100.3
		<hr/>	<hr/>
		+1.55	—2.1

6.30 P. M.—Sylvian centre destroyed on right side.

H. D.=63.41      H. P.=51.00  
8.15 P. M. . . . . 102.2

*Second Day.*

8 A. M. . . . . 105.9  
Left posterior extremity . . . 105.2  
Right “ “ . . . 104.8  
Trunk . . . . . 104.8  
Left anterior extremity . . . 104.7  
Right “ “ . . . 104.3

	A. T.	C. T.	R. T.	Weight, 7 lbs.
6.57 P. M.	76.4	76.3	104.3	
7.57 “	76.7	75.2	101.1	
		<hr/>	<hr/>	
		1.6	—3.2	

H. D.=66.75      H. P.=48.16

*Third Day.*

	A. T.	C. T.	R. T.	W., 7.38 lbs
10.50 A. M.	72.	71.75	106.1	
11.50 "	74.	73.6	101.9	
		+1.85	-4.2	
H. D.=77.18		H. P.=52.18		

*Fourth Day.*

11.30 A. M. .... 104.3

*Fifth Day.*

2 P. M. .... 105.4

*EXP. III.—Cat.*

	R. T.
7.45 A. M. ....	101.4
8.00 " Left cortex, injury between the median line of brain and f. lateralis at the posterior part.	

*Second Day.*

10.30 A. M. ....	101.3
12.50 P. M. ....	102.4
1.00 " Right cortex injured at the posterior edge of f. ansata towards the median line.	

*Third Day.*

2.05 " ....	104.2
This injury involved the area of the cruciate centre.	

*EXP. IV.—Cat; weight, 2.64 lbs.*

	A. T.	C. T.	R. T.
11.51 A. M.	62.	61.9	102.1
12.51 P. M.	64.5	62.95	99.3
		+1.05	-2.8
H. D.=43.80		H. P.=38.50	

2.00 P. M.—Sylvian centre destroyed on left side.

2.30 " ....	97.3
3.25 " ....	101.1
5.00 " ....	102.5

*Second Day.*

8.00 A. M. ....	101.9
12.00 M. ....	103.1
2.15 P. M.—Sylvian centre destroyed on right side.	

	A. T.	C. T.	R. T.	Weight, 2.60 lbs.
4.38 P. M.	63.	62.75	103.8	
5.38 " "	66.	63.95	100.1	
		+1.20	-3.7	
H. D.=50.06		H. P.=40.97		

*Third Day.*

	A. T.	C. T.	R. T.	Weight, 2.50 lbs.
1.12 P. M.	65.5	61.05	103.4	
2.12 "	63.8	62.0	100.6	
		+1.05	-2.8	
H. D.=43.80		H. P.=37.99		

*Fourth Day.*

12.00 M.	.....	104.5.
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*Fifth Day.*

	A. T.	C. T.	R. T.	Weight, 2.34 lbs.
1.46 P. M.	65.5	63.2	102.4	
2.46 "	65.0	64.0	100.3	
		.8	-2.1	
H. D.=33.37		H. P.=25.59		

*EXP. V.—Cat.*

	A. M.	R. T.
7.55	.....	100.9
8.00	" Right side, injury of cortex at anterior end of super-Sylvian fissure	
2.30 P. M.	.....	98.3

*Second Day.*

12.50	" Left side, injury of cortex just back of anterior end of supra-Sylvian fissure near f. ansata.	
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*Third Day.*

2.05	.....	96.3
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*EXP. VI.—Cat; weight, 2.98 lbs.*

	A. T.	C. T.	R. T.
11.26 A. M.	61.	60.75	101.7
12.26 "	61.8	61.95	100.6
		+1.20	-1.1
H. D.=50.64		H. P.=47.34	
12.30 P. M.	—Sylvian centre on right side destroyed.		
2.15 "	.....	103.1	
	A. T.	C. T.	R. T.
3.32 P. M.	65.4	62.8	104.2
4.32 "	64.8	63.9	102.4
		+1.1	-1.8
H. D.=45.89		H. P.=41.44	

*Second Day.*

8 A. M.				104.5
	A. T.	C. T.	R. T.	Weight, 2.76 lbs.
12.12 P. M.	64.2	61.8	103.9	
1.12 "	64.6	63.38	100.3	
		+1.58	-3.6	
H. D.=75.91			H. P.=67.67	

*Third Day.*

	A. T.	C. T.	R. T.	Weight, 2.78 lbs.
11.54 A. M.	60.	59.75	104.8	
12.54 P. M.	66.4	61.05	101.6	
		+1.30	-3.2	
H. D.=54.33			H. P.=46.93	

*Fourth Day.*

12.00 M.	Left post. extremity	104.9
	Right " "	109.0
	Trunk	104.5
	Left anterior extremity	104.5
	Right " "	104.5

*Fifth Day.*

	A. T.	C. T.	R. T.	Weight, 2.36 lbs.
12.46 P. M.	67.5	61.95	104.3	
1.46 "	67.6	63.20	100.1	
		+1.25	-4.2	
H. D.=52.15			H. P.=43.86	

*EXP. VII.—Cat.*

2.30 P. M.	101.5
2.35 " Sylvian centre broken up on left side.	
4.49 " "	102.3

*Second Day.*

8.00 A. M.	103.6
5.00 P. M.	104.1

*EXP. VIII.—Cat.*

2.30 P. M.	100.8
2.35 " Sylvian centre on left side broken up.	
4.50 " "	100.9

*Second Day.*

8.00 A. M.	103.2
5.00 P. M.	104.4
Left posterior extremity	103.4
Right " "	103.6

*Third Day.*

8.00 A. M.	103.1
4.00 P. M.	104.3

*Fourth Day.*

8.30 A. M.	102.1
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*EXP. IX.—Cat.*

	R. T.
2.15 P. M.	102.1
2.22 " Sylvian centre exposed and faradised for two minutes, Du Bois coil at 8.	
2.25 " . . . . .	101.5
2.32 " . . . . .	101.1
2.42 " . . . . .	101.1

*EXP. X.—Cat.*

	PULSE.	PRESSURE.
11.29 A. M.	76	124
11.30 " Sylvian centre destroyed.		
11.30.15 A. M.	83	140
11.30.45 " . . . . .	70	144
11.40.00 " . . . . .	72	118
12.18.00 P. M.	70	118

*EXP. XI.—Cat.*

	R. S.
3.50 P. M.	99.7
Excision of cortex on both sides of brain just back of the sulci cruciati—considerable hæmorrhage.	
4.25 " . . . . .	93.9
6.00 " . . . . .	96.9
8.35 " . . . . .	100.7
9.22 " . . . . .	101.2

*Second Day.*

8.00 A. M.	102.2
12.15 P. M.	103.8
3.00 " . . . . .	104.3
6.30 " . . . . .	102.9

*Third Day.*

8.00 A. M.	102.9
3.45 P. M.	103.

*EXP. XII.—Cat; weight, 4.78 lbs.*

	A. T.	C. T.	R. T.
11.55 A. M.	62.6	62.55	101.9
12.55 P. M.	63.4	63.7	99.7
		1.15	2.2

1.20 P. M.—Left post-cruciate centre ablated under ether.

		H. D.=47.97		H. P.=39.25	
		A. T.	C. T.	R. T.	Weight, 4.78 lbs.
4.43	P. M.	71.9	65.6	101.0	
5.43	"	71.6	66.85	99.0	
			1.25	2.0	
		H. D.=52.15		H. P.=44.22	
9.30	P. M.				102.5

*Second Day.*

9.00	A. M.				102.5
6.00	P. M.				102.3

*Third Day.*

11.30	A. M.				103.8
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*Fourth Day.*

11.30	A. M.				104.4
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*Fifth Day.*

11.30	A. M.				103.2
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*Sixth Day.*

Right side,	posterior extremity.				103.0
Left	"	"	"	"	102.6

*Seventh Day.*

2.35	A. M.				104.1
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*Eighth Day.*

		A. T.	C. T.	R. T.	Weight, 4.36 lbs.
12.36	A. M.	62.	61.45	102.0	
1.36	"	65.4	62.7	99.5	
			1.25	2.5	
		H. D.=52.15		H. P.=42.07	

*Ninth Day.*

11.55	A. M.				100.9
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*Tenth Day.*

1.20	P. M.				98.7
1.35	"	Puncture into corpus striatum.			
3.15	"				103.2
3.55	"				103.2
4.00	"	Irritation for fifteen seconds; Du Bois' coil at 10 of post-cruciate centre of right side.			
4.02	"				102.1

EXP. XIII.—Cat; weight, 4.98 lbs.

	A. T.	C. T.	R. T.
11.30 A. M.	67.8	67.7	101.9
12.30 "	68.6	68.45	101.6

.75 .3

H. D.=31.29

H. P.=30.06

1.40 P. M.—Etherized, left post-cruciate centre broken up with galvano-cautery.

1.41 "	98.7
2.00 "	101.2
3.42 "	102.1
5.00 "	102.0
8.20 "	102.7

*Second Day.*

	A. T.	C. T.	R. T.	Weight, 5 lbs.
12.00 M.	68.	67.5	103.2	
1.00 P. M.	69.5	68.65	100.6	

1.15

2.6

H. D.=47.97

H. P.=37.18

EXP. XIV.—Cat; weight, 4.80 lbs.

	A. T.	C. T.	R. T.
11.30 A. M.	65.3	62.45	102.9
12.30 "	65.4	63.55	101.2

1.10 —1.7

H. D.=47.97

H. P.=41.20

12.50 P. M. Under ether has left post cruciate centre destroyed.

1.00 "	98.7
1.20 "	101.6
3.50 "	102.7
5.50 "	103.0
9.00 "	102.9

*Second Day.*

Weight, 4.62 lbs.

9.00 A. M. 101.9

	A. T.	C. T.	R. T.
12.05 P. M.	64	63.6	103.9
1.05 "	64	64.5	103.1

+ .9 — .8

H. D.=39.63

H. P.=37.00

*Third Day.*

	A. T.	C. T.	R. T.	Weight, 2.22 lbs.
I 1.00 A. M.	66.	65.6	103.9	
I 2.00 M.	66.8	66.5	101.2	
		<hr/>	<hr/>	
		.95	2.7	
	H. D.=39.63		H. P.=34.66	

*Fourth Day.*

	A. T.	C. T.	R. T.	Weight, 2.22 lbs.
2. 10 P. M.	66.0	65.2	105.2	
3. 10 "	67.2	66.35	101.7	
		<hr/>	<hr/>	
		1.15	3.5	
H. D.=	47.97		H. P.=	41.53

*Fifth Day.*

9.00 A. M. . . . . 104.9

*Fifth Day.*

11.00 A. M.	105.1
Right posterior extremity.	104.6
Left " "	102.6

*EXP. XI.*—Cat; weight, 2.78 lbs.

	A. T.	C. T.	R. T.
3.43 P. M.	64.2	61.45	102.5
4.43 “	64.	62.18	102.0
		<hr/>	<hr/>
		73.	.5
5.00 P. M.—Left Sylvian centre destroyed.			
H. D.=30.45		H. P.=25.47	
6.45 P. M.			102.6
	A. T.	C. T.	R. T.
8.37 P. M.	63.7	62.3	102.9
9.37 “	63.6	63.28	102.0
		<hr/>	<hr/>
		.98	.9
H. D.=40.88		H. P.=38.81	

*Second Day.*

		A. T.	C. T.	R. T.	Weight, 2.26 lbs.
4.35	A. M.	66.5	65.3	103.8	
5.35	"	67.0	65.95	102.8	
			<hr/>	<hr/>	
			.65	1.0	
		H. D.=27.11		H. P.=25.24	



EXP. XVI.—Cat; weight, 3 lbs.

	A. T.	C. T.	R. T.
11.00 A. M.	62.55	62.55	102.0
12.00 M.	66.0	63.9	100.0
		<hr/>	<hr/>
		1.25	2.0

12.15 P. M.—Left post-cruciate centre destroyed.

H. D.=56.32		H. P.=51.34	
	A. T.	C. T.	R. T.
26	P. M.	64.5	63.8
26	"	66.0	65.3
		1.5	3.6
H. D.=62.58		H. P.=53.62	

*Second Day.*

	A. T.	C. T.	R. T.
1.28 P. M.	66.5	66.35	106.1
2.28 "	68.5	67.45	103.6
		<hr/>	<hr/>
		1.10	2.5
H. D.=45.89	H. P.=40.29		

EXP. XVII.—Cat.

1.00 P. M.—A puncture was made into the left corpus striatum.

*Second Day.*

	R. T.
11.50 A. M.	103.5
11.51 " Right post-cruciate centre was irritated with Du Bois' coil at 10 for two minutes.	
11.55 "	102.1
12.00 "	101.5
12.05 P. M.	101.8

EXP. XVIII.—Cat.

	PULSE.	PRESSURE.
2. 1. 0 P. M.	70	74
Destruction of the right cruciate centre.		
2. 1. 15 "	68	74
1. 1. 45 "	92	100
2. 2. 0 "	—	74
2. 52. 0 "	64	—

*EXP. XIX.*—Rabbit.

R. T.

2.35	P. M.	.....	102.6
2.36	"	Puncture in median line at the junction of the pons and medulla oblongata.	
2.45	"	.....	101.7
3.35	"	.....	99.5
4.00	"	.....	98.9
6.25	"	.....	98.5

*Second Day.*

9.12	A. M.	.....	89.7
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*EXP. XX.*—Rabbit.

R. T.

12.20	P. M.	.....	102.0
12.21	"	First puncture into right side of pons varolii.	
12.21	"	.....	102.3
1.15	"	.....	100.9
7.31	"	.....	101.3

*Second Day.*

2.10	P. M.	Puncture into right side of pons.	
3.40	"	.....	101.4
6.30	"	.....	103.0
8.05	"	.....	103.9
9.40	"	.....	103.6

*Third Day.*

## Puncture into right testes.

7.40	A. M.	.....	101.9
8.00	"	.....	101.8
11.15	"	.....	102.3
12.37	P. M.	.....	103.5

*EXP. XXI.*—Rabbit.

R. T.

12.00	M.	.....	102.7
12.01	"	Puncture into median part of pons varolii.	
12.30	"	.....	102.0
5.30	"	.....	100.5

*EXP. XXII.*—Rabbit.

R. T.

12.04	P. M.	.....	103.2
12.05	"	Puncture in median line at junction of me- dulla and pons varolii, runs forward in violent manner at times.	
12.30	"	.....	103.3
1.40	"	.....	104.8
2.05	"	.....	103.6

## EXP. XXIII.—Rabbit.

R. T.

12.09	P. M.	.....	102.9
12.10	"	Puncture into right side of pons varolii.	
12.30	"	.....	102.7
2.15	"	.....	102.2
3.25	"	.....	103.3
5.30	"	.....	101.3

*Second Day.*

12.52	"	Puncture into right testes.	
2.22	"	.....	104.0
3.05	"	.....	104.3
6.30	"	.....	103.5

*Third Day.*

1.30	P. M.	.....	99.8
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## EXP. XXIV.—Rabbit.

R. T.

2.24	P. M.	.....	103.0
2.25	"	Puncture about the middle of the pons varolii.	
3.15	"	.....	102.9
4.05	"	.....	103.3
5.25	"	.....	102.9

## EXP. XXV.—Rabbit.

R. T.

12.06	P. M.	.....	102.6
12.07	"	Puncture at end of pons varolii, where it joins the crura cerebri.	
12.25	"	.....	101.6
2.10	"	.....	101.1
6.35	"	.....	101.7

## EXP. XXVI.—Rabbit.

R. T.

2.54	P. M.	.....	101.7
2.55	"	Puncture into pons varolii.	
3.30	"	.....	101.0
6.15	"	.....	102.3
9.30	"	.....	102.5

*Second Day.*

8.15	A. M.	.....	101.3
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*EXP. XXVII.—Rabbit.*

	PULSE.	PRESSURE.
3.28 P. M. . . . .	60	64
3.28.30 " Puncture into upper part of pons varolii.		
3.29 " . . . . .	64	76
3.29.45 " . . . . .	52	76
3.38 " . . . . .	58	78
3.41 " . . . . .	—	78
4.07 " . . . . .	—	66

*EXP. XXVIII.—Rabbit.*

	R. T.
2.14 P. M. . . . .	103.2
2.15 " Puncture into median part of pons varolii.	
2.30 " . . . . .	103.6
3.10 " . . . . .	102.9
6.00 " . . . . .	103.7

*EXP. XXIX.—Rabbit.*

	R. T.
2.14 P. M. . . . .	102.9
2.15 " Puncture into the right upper end of pons varolii.	
2.30 " . . . . .	102.9
3.20 " . . . . .	100.2
6.00 P. M. . . . .	99.2