TABLE 1

Compound	Relative R_F
Androstanedione 3,17	0.25
Δ^4Androstenedione 3,17	0.385
Androsterone	0.420
Isoandrosterone	0.527
Dehydroisoandrosterone	0.60
Testosterone	0.64

have not attributed great significance to their absolute magnitudes. Instead we have calculated the R_F values of the steroids relative to the slowest moving steroid in our series, androstanedione 3, 17. Since this compound has an average R_F in the neighborhood of 0.25, we have fixed this value as a "standard." Every mixture analyzed contained androstanedione 3, 17. The R_F values of the other components of the mixture were calculated relative to the distance that the "standard" substance had moved. At least 5 different determinations of the relative R_F values were made with each steroid in the series. The average relative R_F values are recorded in Table 1. Variation of the relative R_F values from the average for any one particular compound did not exceed ±4%.

Efforts are now being made to investigate the quantitative aspects of this method.

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The Alarm Reaction and the Hibernating Gland

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The alarm reaction (*1*) appears, among other things, as an enlargement of the adrenal cortex, rapid increase of the adrenocorticotropic hormone secretion of the pituitary gland and corticosterone secretion of the adrenals, etc. Selye and Timiras (*2*) have found that in rats, coincident with the lipid discharge of the adrenal cortex, reduetion in the sudanophile element of the brown fat tissue takes place. The alarm reaction was brought about by keeping piebald female rats in hunger and cold for 16 hr. Reduction in the lipids of the adrenal cortex and peptic ulcer showed that the alarm reaction had really taken place in them.

In animals that hibernate a special adipose tissue, the brown fat tissue, is found, which is called the hibernating gland (*3*). It is a bilateral formation which extends over the neck, axillary region, and anterior part of the back. Its lobes extend to the mediastinum and diaphragm and surround the large blood vessels of the thoracic cavity.

Using the method of Selye and Timiras (from information in a personal communication from P. S. Timiras, Montreal), we have investigated the hibernating gland of the hedgehog (*Erinaceus europaeus*) in the summer (5 animals, July), during hibernation (5 animals, January, after 3 months' sleep), and in animals spontaneously awakened in captivity from hibernation in May (5 animals, killed immediately after awakening). Immediately after killing the animal, the brown fat tissue was fixed in Bouin's fluid for at least 48 hr. After this it was sectioned with a freezing microtome, and the sections stained with Sudan IV and put into glycerol, where they were examined with the microscope.

The hibernating gland was most intensely stained with Sudan in the summer hedgehog; staining was weakest in the just awakened hedgehog. In hibernating hedgehogs the stainability lay approximately halfway between the two extremes. The stronger the stainability, the more sudanophile substance occurs in the hibernating gland.

The size of the sudanophile particles in the hibernating gland was greatest in the summer hedgehog, smallest in the just awakened animal. In the hibernating hedgehog it was again intermediate between the two.

We find that in the hedgehog in hibernation, and especially in the animal awakened from it, one of the phenomena typical of the alarm reaction described by Selye and Timiras has taken place: reduction in number and size of the sudanophile particles in the brown fat tissue. Judging from this, the awakening of the hedgehog from hibernation (*4*) is such a great physiological strain that it induces an alarm reaction.

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A Method for Dissection and Electrical Study *in Vitro* of Mammalian Central Nervous Tissue[1]

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Dissection of the spinal cord in the living cat has been found to be a simple and reproducible procedure if the piarachnoid membrane is first carefully re-

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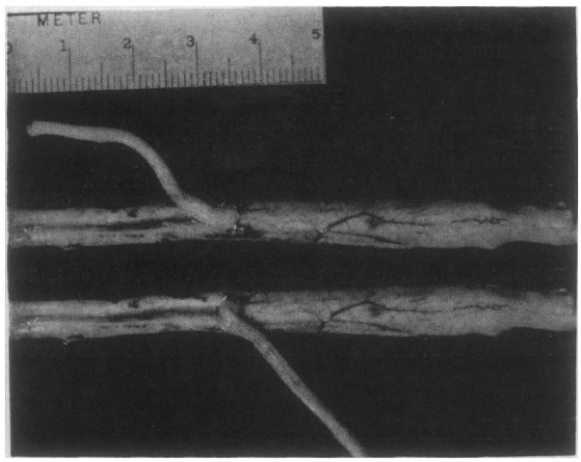

FIG. 1. Dorsal view of lumbosacral cord with cauda equina to the right. Dorsal columns were cleared of pia and dissected in the living cat.

moved. When the resistance offered by this structure is avoided the internal strength of the various white tracts is great enough for them to be peeled away from the remaining cord in lengths of 10–15 cm. Fig. 1 shows the dorsal aspect of a fresh lumbosacral preparation from which the dorsal columns have been partly dissected. The rostral edge of intact piarachnoid can be seen straddling the cord under the 3.5-cm mark. Histological study of a small series of dissected white columns has shown no signs of hemorrhage within them.

Preliminary calculations (based on the formula presented by Fenn [*1*] and Gerard [*2*] for relating external pO_2 to pO_2 at a depth within tissue of cylindrical form) indicate that oxygenation optimum for the maintenance of the resting metabolism of an individual spinal funiculus can occur by means of diffusion alone if the external pO_2 is in the vicinity of 1.0 atm.

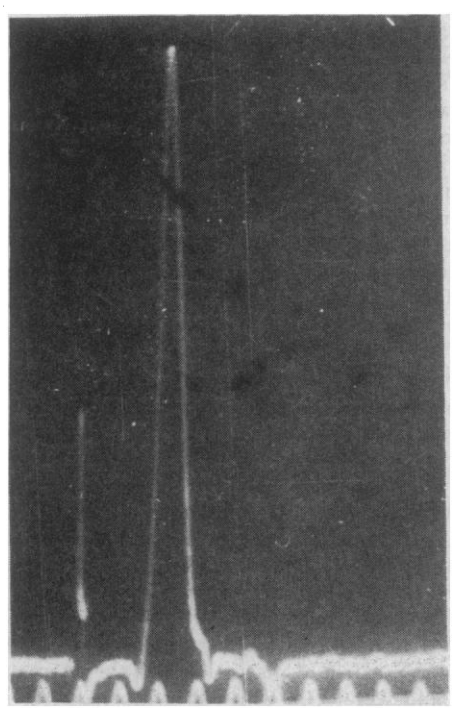

FIG. 2. Maximal response of ventral columns *in vitro*. Conduction distance, 6 cm; time signal, 2,000 cps.

Supporting this theoretical consideration is the fact that well-developed action potentials can be recorded from the tissue *in vitro* for as long as 18 hr. Spike potentials of the ventral columns *in vitro* show a peak amplitude of 15 mv when maintained in 0.88 atm pO_2 and 0.047 atm pCO_2. This can be compared favorably, at least as to order of magnitude, with maximum α-spikes of mammalian peripheral nerve (*3*). In addition, maximum spike velocities up to 114 m/sec and spike durations between 0.4–0.5 m sec have been recorded in the ventral columns. Fig. 2 shows a spike potential that has been rendered monophasic and recorded oscillographically from a ventral column following the application to it of a short rectangular stimulating pulse. This was obtained from tissue equilibrated in a nerve chamber with modified Krebs' solution 4 hr after its dissection. It resembles the directly conducted response of the intact ventral columns *in vivo*. As shown by Lloyd (*4*) and confirmed in this laboratory, the latter is characterized by a single highly synchronized spike showing diminishing amplitude and little tendency to disperse with increasing conduction distance. The form of the *in vitro* spike differs, however, from the *in vivo* response in a manner consistent with volume conductor theory; i.e., the triphasicity is lost. Slow post-spike potentials of low amplitude can also be observed under appropriate conditions of recording but have not yet been studied in detail.

Determination of the physiological state of this tissue and of its optimum artificial environment will require extensive investigation. It is clear, however, that its survival capacity *in vitro* is satisfactory for laboratory study, and some, at least, of its physiological properties remain intact under these conditions.

Not only may central white tissues be manipulated like peripheral nerve for electrophysiological and pharmacological study in a nerve chamber but, as illustrated in Fig. 1, the columns may be only partially separated and left to make normal connection with the rest of the cord at some point. This technique makes possible unusual differential leads for studying input-output relations across central nervous system integrating structures.[2] In certain experimental situations this may be of value in controlling the effects of electrical shunting, field spread, and other phenomena encountered in a volume conductor (*6*).

Fig. 3 demonstrates the type of fractionation of complex potentials that can be carried out by such anatomical means. A shock was applied to L_6 dorsal root entering intact cord. That part of the voltage

[2] It is of interest to note that in 1897 Sherrington (*5*) separated a short length of dorsal column, which he stimulated while observing the ensuing muscle responses.

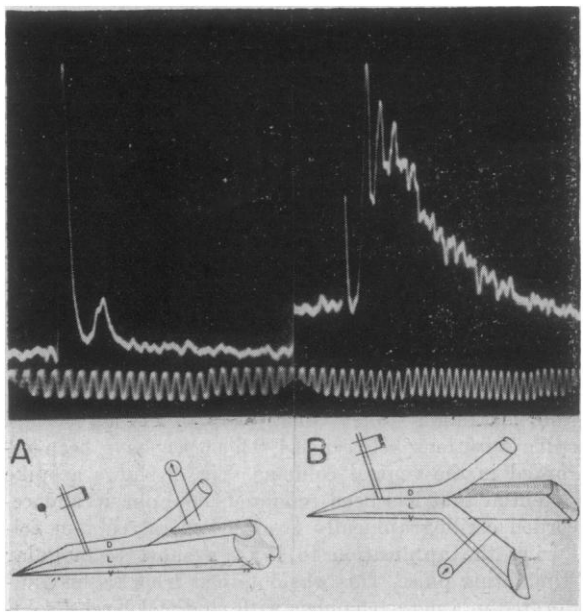

FIG. 3. *A*, dorsal column response to L_6 dorsal root stimulus. *B*, response of ventrolateral column to homolateral L_6 dorsal root stimulus. Stimulus pulse, first negative potential on left. Same preparation and conduction distance as *A*. Cord was split down the midline after the dorsal column had been freed. Time signal, 1,000 cps. Note the absence of triphasicity.

generated by the volley of nerve impulses traveling rostrally in the dorsal columns (dissected down to L_4) can be seen in Fig. 3A. The first spike is analagous to the directly conducted spike of the complex dorsal cord potential described by Gasser and Graham (*7*). The second component disappears more readily on tetanization and lags behind the spike by an amount (2.7 msecs) equal to that of the dorsal column relay potential described by Hursh (*8*). In the undissected cord this potential would be obscured at this level by other potentials arising concurrently in grey matter. Traveling out into the homolateral ventrolateral columns simultaneously with the dorsal column potential is a potential of different character (Fig. 3B). Its spike is delayed by a time interval corresponding to one synaptic delay behind that of the dorsal column spike, as would be expected on the basis of neuroanatomy and as already shown for the intact cord (*9, 10*). The slow negative potential following the spike is a consequence of synaptic activity and has been discussed extensively in the neurophysiological literature. All recordings were taken from stripped tissue with the proximal recording electrode 1.5 cm away from intact cord in order to avoid electrotonic derivatives of its activity. The recording leads have been carried to an RC-coupled preamplifier in such a manner that an upward deflection on the cathode-ray oscilloscope was produced when the electrode nearer intact cord was negative to the distal one.

The details of dissection have been worked out in 40 cats over the past year. The sample records presented here are intended mainly to demonstrate the nature of a method that promises to aid analysis of central nervous system mechanisms by disengaging them along functional and anatomical lines.

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Lewis Evans' Early American Notice of Isostacy

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The term "isostacy" was first proposed by Dutton in 1889 (*1, 2*). As early as about 1500 Leonardo da Vinci (*3, 4*) recognized that change of load causes movement of the earth's crust. The earliest recognition in America of what we now call isostatic adjustment appears to have been in 1743 by Lewis Evans, colonial surveyor, cartographer, and geological observer.

Evans was born in Wales about 1700 and died in New York in 1756 (*5*). He is best known for his *Map of the Middle British Colonies* (*6*). He was a keen observer of geologic phenomena and topography and inserted geologic notes on his earlier maps (*7*) and included much more extended geologic notes in *An Analysis of a General Map . . .*, a booklet of 36 pages which accompanied his 1755 map (*8*). Evans' surprisingly modern geological observations, almost completely unnoticed by historians of geology, are now the subject of study, which will be reported more extensively elsewhere.

Evans' remarks on isostacy were recorded in a journal he kept while on an expedition in 1743 from Philadelphia to Onondago and Lake Ontario with John Bartram (*9*), the pioneer botanist, and Conrad Weiser, interpreter and "ambassador" to the Indian tribes. The journal was not published by Evans and is now lost, but a copy was in possession of Thomas Pownall, colonial administrator and patron of Evans, who published parts of it. In 1776 Pownall brought out a revised edition of Evans' 1755 map and *Analysis* (*10*), which he supplemented with his own observations, especially of New England, a territory not well known to Evans. Pownall is careful to indicate exactly the material copied from Evans' *Analysis* and from Evans' 1743 journal. Pownall's original publication is now rare, but a new edition based on Pownall's notes for a revised edition was published in 1949 (*11*).

Pownall, after a discussion of the Appalachian ridges and valleys, in which he mainly quotes Evans' *Analysis*, introduces Evans' unpublished journal observation of 1743 on fossils, the drainage of once