Sperry, R.W.

May 7, 19--


Haudeke de Narm. un. pathel. phyriel 1175
Bethe

4/15 1045
Detwiler's Neuromyology (see biblio. - 1936)

There are no nerve fibers which directly connect at some point w. a ganglion cell, i.e. grow out directly.

Chimeras = composite animal formed by grafts.

Inducing reunion of glass needle + hair loop used operations: meromeric pudenda may come into use. + vital dyes used.

Vital dyes: Nile, blue, sulphate, neutral red, Biulman's brown.

Sheath cells + Schwann arise from neural crest. Sympathetic cells come from neural crest also and not from card.

Myelin forms about area of sheath cells along the axons.

Early unmyelinated nerves serve as bit to direct advancing myelin-emergent nerve cells 4-10 microns in w. sheath cells (long myelinated segments may be observed by end-to-end anastomosis of shorter segments in obliteration of intervening mode of Ranvier).

Knowing this of single nerve fiber shows nerve activity.

- Myelin sheath is not a part of sheath cell, but of axon. Schwann is an organ of part of sheath cell.

- What about connections inward?
  - Specificity of a given motor neuron for any particular muscle fiber. Distribution of motor not an intrinsic factor. Segments nerves posterior. Brachial, plexus of normal limbs will innervate a grafted limb. Segments posterior t. normal positions. No limb bud exerts direct influence on growing nerves. (But not a specific one?)

Brachial nerves will be attracted to limb bud grafted anteriorly in gill region - against considerable opposition. Anterior spinal nerves also grafted in. - What attracts 'em?

Human limbs, limbs of head, become innervated by cranial nerves. Cranial nerves will innervate limb buds. V-VII + IX-X ganglia innervate + extrinsic eye muscle nerves.

No morphological specificity between nerves + their end organs. Kind limbs innervated anterior, normal position.

Hamburger, frogs, intacted lumbosacral region + plexus from opposite side, turned over, names innervated, denervated limbs.

Rogers - Hyperinnervation of an embryonic muscle = possible added greatly necessary units of spinal cord.

2. When limbs on both sides innervated by same brachial or lumbosacral plexus - do the limbs coarbohydrate alternately or together? - Dave any frog - could it be done an ambystome? of reciprocal innervation etc.

Spiral nerves will grow toward neural placodes + eye placodes. Sensory nerves will connect to muscles directly innervated them.

Eye does not seem to attract spiral nerves. Yes, need Retzius.

The outgrowth of nerve fibres is; a mode of protoplasmic movement and not a wave progressive differentiation in situ. Embryonic frog neuromasts were explanted into frog lymph outside body of embryo = tissue culture. Harrison.

3 theories - factors directing nerve outgrowth.
1. Chemotropism - Capel - Forsasen.
2. Electrical - Shaffer - Kappers - Child effects in bioelectric potential.
3. Mechanical - His, Harrison neuromasts - e.g. pull support.

Outgrowth cell processes become oriented in the direction of lines of force of the galvanic field. Those toward anode differ from those toward cathode.

Outgrowth is perpendicular to a weak current than a conductor in the culture.
Weiss - fibroblasts from chick embryos respond to intimate structure of fibrous cells in which cultivated. Stretched film of plasma in frame + lines of tension influence direction of growth. suggest chemical + electrical things influence groundwork that wh. fibres grow, but they themselves mechanically guided by groundwork. But this par fibroblasts, not nerve fibres. Nerve fibres grow in all directions. But nerve fibres directed in a tissue shifted longitudinally while cutting - mechanical environment.

Repeated electrical effects w. negative results and explains them in mechanical channels alone. Explains growth to limb buds or any rapid metabol tic center in mechanical terms.

But: what about growing thru apertures anteriorly and crossing over from comparable places.

Nerve fibres from centers of accelerated growth explain the tracts formed thru-out ceps.

If we couldn't make an artificial growth center by stimulation with electricity - fish etc. & get nerves to grow where they shouldn't in normal animal-use calf blooded animals - or current thru localized portion of embryos.

Behavior of autograftic transplantsations. Limbs excised and grafted in diff place on same embryo. Plasmograftic transplantsations = limbs from diff embryos are made during tail-bud stage of development. Yet coordinated function is apparent finds only when the transplant supplied by some of breech's nerves.
Rogers - when a supernumerary brachial region grows in transplanted between the normal cord and the limb, the limb may acquire nerves from the graft only. - normal adaptive muscles may continue for long periods of a time. But if the graft is composed of the 4th-8th trunk segments of the cord, muscles grow into the limb, its function is in no way adaptive - only slight twitching.

Peripheral mechanism - same in both cases, but central is different.

What part of connections were made in these 2 cases (between the graft and the CNS)?

Anterior limb rudiment 3rd-5th somites centering on 4th.

Limb innervated by 5, 6, 7, spinal nerves don't coordinate if 5th, wh. is only normal brachial, is cut. (to day 7, 8, 9,)

[But if you cut large nerve to any limb, its apt to destroy the coordination?]

Normal limbs
3rd cut - shoulder function affected
4th - forearm...
5th - hand...

When have 2 limbs - one transplant and another in normal position, regenerated and supplied by 3rd and 4th nerves only - it coordinates OK.

In normal cases a limb exhibits full function when supplied by only one segmental nerve.

Sometimes when only a few fibers of 5th nerve (6th, 7th, preferably) supply grafted limb, it exhibits full function.
When have a regenerated limb 39.4
and a grafted limb 56.4 nerves both sets of mis
contract synchronously with same degree of intensity.

The brachial nerves may be heavily overloaded - no extra
central cells, so to the branching of the axones

Superimmary limb is grafted next to an orthotopic normal
by nicking cutting one or more of the nerves to the normal
limb in shaving the wound for insertion of the superimmary
and then the nerves regenerate into both limbs and you
get homologous response. The nerves regenerate at random.

Resonance theory of homologous-marks - not measurable in
physical sense.
The cm's can emit different forms of excitations and the
specific m. responds to the one to which it is attuned.
The central coordination consists in combining the
excitation for m's that are a function of a given moment
All components of an excitation are conveyed to all
m's, but each responds only to its specific component.

Wains - toast - implanted to fixed skeletal points under tenuis
various individual leg muscles from one side of body to
the other and into the implanted muscle a branch of the
lumbo-sacral complexes. - became functional attached to
recording device. Homologous m's to remain synchronously.

Worked no matter what nerve branch is introduced
into grafted m. or what combination of m's is employed.

In earlier papers the end-plate emphasized as
the selective apparatus - later the whole motor neuron
is a gastroneumens and spread some substance or influence
that would make the nerve gastroneumens - selective.
Each m. modulates its necessities. Tendering a nerve fibre in old periphery & connecting it with a new results in its taking the old module and acquiring a new.

Our playground of integrated central activity. Central smudging system identified w. the neuropile.

If selectivity controls the admission of impulses from the neuropile to the unmodulated peripheral fibre, no trace of the unmodulated central activity can be expected to be found in the peripheral fibers nor in the modulated central fibers tract which in a sense represent extensions of the periphery into the centers

The unsorted mess of excitations present in the neuropile then is picked over by motor cells & intercenter cells and sent on.

Just how much of the sorting-out occurs in the motor neurons & how much of it is already done by sensory 5? How does it reduce the amount of diffused activity centers?

In order to coordinate the m. contractions have to be correlated w. the peripheral conditions.

Outter, limb rudiment grafted to head in place ear muscle shows extremitative correlated w. jaw muscles still observable six years later.

Works will tail that has been functioning in its normal position in larval life for several months.

Mind limbs grafted close to lumbar spinal plexus work homologously only when suprally. This show activity on occasion when jaw muscles are moving and all other mts of blady molicles.
When supplied by nerves other than brachial or lumbo-sacral, limb reactions are typically associated with the visera also supplied by these same nerves. Viscera of limbs grafted to head are usually much more extensive than those grafted to trunk region.

When end-organ or peripheral part of a nerve in adult organism is destroyed and remains regenerating, the ganglion cell atrophies. Life of ganglion cell depends on end organ. For limbs it fails to develop. Growth of nervous system in 2 phases:
1. 1st growth differentiation independent of function
2. Further dependent on function

Forelimbs, rudiments of amphibia, chicks, extirpated and marked deficiencies in peripheral nerves increasing motor nerve centers followed.

Naral placed excised forelimbs amphibians - forebrain appears up to time when functional activity begins - later hypoplastic development.

Details - section of amphibian forelimbs accompanied cellular reduction 50% in brachial ganglia.
A sensory hyperplasia in ganglia of 10% nerves where new limb is grafted.
When limbs + visera grafted to head, cranial ganglia likewise undergo hyperplastic development.

Grafts n tail hind stage make little difference up to time when function comes in 11-12 days after operation. Grafting fully differentiated limbs in animals with metamorphosis animals involving cutting of the nerves - also results in hyperplasia in ganglia - but three cases limbs connected w/ only one spinal nerve. Ganglia are already differentiated.
There seem to be indifferent cells in center of ganglia that grow & proliferate under special conditions (towards a chemical influence on growing neurons?)

Overfeeding favors hyperplastic growth & underfeeding decreases hyperplastic growth.

In chick excision of limbs leads results in reduction of corresponding neural roots (motor), & maybe in amelioration and amelioration.

Doritoler - in amelioration the no. of motor cells is unaffected by limb excision, and in both phenomena the gray areas of spinal cord unaffected by removal of one limb, birth volume decrease of 13% and motor roots volume decrease of 32%.

Conclude, the number of motor cells unaffected, but the size is affected. Average area of plane thor motor nerve is reduced 8% for one limb excision and 20% for both excised.

Growth function of one group of neurons may affect another related group.

Motor centers of cord fail to show hyperplastic as well as hyperplastic development.

Evidence against Doritoler saying frog spinal cord shows hyperplasia of motor cells.

Hamberger on chick shows hyperplasia of motor cells when limb excised in 68-72 hrs. of stage.

Motor centers in cord respond to peripheral changes in chick & amelan. but not in urodeles. The two former have a neurologic form of gray matter, but the latter don't.

In amelan. the motor neurons are located in the center of the spinal cord or not separated from correlation apparatus. They figure that groups of
neurons which have migrated away from center of spinal cord (spinal ganglia, aorta, yolk sac, notochord, if present) under control of peripheral fields. But 40% of cells of notochord in chick are developed independently of peripheral field.

Caspillo — this pattern develops in growth of nervous system + its parts + from medullary tube diverticule.

In Amblystoma, neural tube stage — when 4, 5 segments of nerve cord replaced by 7, 8, 9, the animal develops + eats normally. In both stages abnormally.

7, 8, 9 segments showed hyperplasia
3, 4, 5 replaced by 7, 8, 9 + limbs excised, but the hyperplasia was there just as before.

3, 4, 5 reversed and activity normal + OK. Thus no inherent predisposition or parts of a given brachial nerve for its normal musculature. 15-2 hypers + 3 hyps.

Do such exist in animals that have definite whorl reflexes, see how early they're built in.

The conditions determining development win cord determined not by peripheral, but central cord factors in Amblystoma. Highly up scale, peripheral can't do more.

While 1, 2, 3 part in position 4, 5, 6 they don't show hypoplasia.

Support Caspillo's notions that certain local regions of medulla undergo differentiation + proliferation from hereditary causes.

While medulla is substituted for brachial region, there's no effect on segments cephalad & caudad to graft. Thus there's a difference between medull + aorta, part of cord.
Certain regions like 1st and 2nd segments possess almost fixed inherent capacities for cell proliferation whereas other regions are more labile and respond by increases or decreases in accordance with the position they occupy in the central axis.

Anterior segments grafted caudal never reduced to and the caudal portion normally has sometimes proliferative more than if left in anterior.

Most of increase was in sensory areas which retain embryonic character larger than central.

The inherent proliferative capacities are higher at anterior end of cord than if more caudal.

More injury (7-25 days) doesn't produce cell increase.

It seems that fibers arising in medulla and invading cord have a stimulating effect upon cellular proliferation when medulla cut off and separated by limbs subjected to promoters, there is hyperplasia in caudal segments if these promotors are those which arise with interaction of bulbo-spinale fibers.

When lumbosacral region is isolated, same thing happens when units of cord transplanted outside normal cord & outside myotomes there is extreme hyperplasia.

Cellular proliferation + differentiation go on in cord and brain before projection fibers laid down, latter in growth affected by fibers.

When units of cord transplanted inside myotomes they are smaller than normal hyperplasia = safe sectioning.

The ingrowth of olfactory nerve stimulates growth of the olfactory lobe in telencephalon.
Burr-grafted optic nerves; placebo+thalamus caudal to anterior
limbs - in one cage left exposed to surface to function in other
case buried - both developed the same - self-fusion not
involved in development - [but question as to whether
graft actually functioned]

Transplant supernumerary plaque - in eyes with extra
fibers and ingrowth causes hyperplasia in suprathyroid lane.

Sometime grafted off, nerve invaded back to intr
thalamus, then hyperplasia there, in thalamic centers
or to ophthalmic division of fifth in ophthalmic ganglion.

When ethanol substituted for Perameitan plaque, yet
hyperplasia also.

Burr finds rhythms of proliferation in several systems
corresponding to ingrowth of sensory fibers, whereas
that of the eye fibers is where it does influence of center of
active proliferation at that point, & not vice-versa.

Not of evidence that local regions of accelerated
proliferation influence ingrowth of growing nerve roots
if also that entrance of nerve itself into the neural
wall stimulates cells in that region to increased activity
thus relation = reciproc.

Burr says attraction due to dielectric effects of increased
metabolism.

Optic cups grafted to position of other nerves develop
an optic nerve with otic medulla IX, X gang complex
& V, VII.

All of these centers undergo hyperplastic changes.
Normal & supernumerary eyes pure & prominent hyperplasia.

C. Hill points out that nerves grow while they function.
But cauterized tadpoles supposed to be evidence that coordinated
patterns can be grown in w/ sub evitiation of neurons.
Harrison: grafted pigmented anterior half of one larva to clear posterior of another larva. New pigmented cells move back to form lateral line sense organs.

Pigmented limb on punctatum gravis larger than normal Punctatum "tigruinum" smaller.

Similar for eye, ear, gills.

Feeding experiments seemed to indicate it was the "nutrient level" of the two organisms which made the difference.

Tendency for graft to maintain growth rate independently of host, but levels where host factors will modify this rate even under conditions of "maximal feeding".

When spinal cord grafted, it accommodated itself very early to dimensions of host.

When tigruinum branchial region grafted, it regulated branchial development and function were normal.

Maximum feeding alters at 1st, but in end comes out same.

The segmentation of the spinal cord and peripheral nerves in ascidians is entirely suberiment to merodermic segmentation and intrinsic segmentation is nonexistent.

Segmentation of ganglia suppressed by absence of somites in a different region of abdominal somites - abnormal ganglia.

It is presence of neural surface of somites that brings about differentiation and segmentation of the ganglia. Neural surface lacks formative quality a mediolateral gradient in the somites.
A formative role is exerted also to cartilage.

Afterward has evidence vs. above of Schwan, but he used older embryos.

In all classes of vertebrates, the limb musculature arises from unsegmented mesoderm.

Cranial nerves are able to grow and reach the developing limb rudiment without any mechanical guidance by the corresponding mystatites. The segmental character of ganglia of mesoderm from limb is influenced by the mystatites in brachial region.

When 1 somites substituted for 3 in brachial region, get 1 ganglia developed instead of 3 and limb functions ok.

[What about these primitive simple coordinations being inbuilt then? Doesn't look as tho it were so much a matter of inbuilt connections as of types of discharges.]

When 5 subst'd for 3 didn't get extra ganglia, but got 2 extra nerves to the limbs.

Shifting unsegmented mesoderm from caudal region of younger embryos 4 & 5 extra arches and ganglia developed, so 5 instead of 3 to the limbs.

When crypt cells cut, ganglia develop anyway.

In vertebrates, the maximum extent of the limb rudiment determines the no. of optic spinal nerves to form the limb. Please. The no. corresponds to the given no. of mystatomes segments when the initial nerve connection is made. But moving limb rudiment canad several segments does not occur in corresponding shift of poles.
In higher vertebrates where limb muscles no longer derived from segmental muscles, the enlargement of the corresponding segmented nerves appears to be associated by an attraction on the part of the developing hindlimbs at a time when it occupies its greatest relative extent in the embryo.

Write out the main points in conditioning, so you will have few always in mind while studying neurology & many fixed answers to problems.

Marthas' fibres = 2 giant neurones, of gigantic size and of high differentiation, lying in medulla, lateral position at level of entrance of VIII nerve. Found in fishes & amphibia, extensive dendritic connections.

Axones after descending course caudally then spiral caudally in a ventral position where connections are made with both motor & intercalary cells.

Each cell has 2 giant dendrites (lateral & ventral) and numerous small others.

Lateral branches among VIII root fibres & cells of Deiters' nucleus.

Syringes must be located along dendrites as well as around Perikaryon.

In amblystoma, dendrite spreads along distribution area all lateral line roots.

Makes a short path between aorticocerebral centers and the motor nuclei of the ms used in swimming. Makes a 3-neurone reflex arc.

Animals w. one ear nucleus remain show torsion in swimming. Fatigue more quickly than normal.

One Marthas cell remained equal ok but became exhausted quickly.
Both Mathner's cells removed - equal OK and exhausted about the same as removal of one nerve.

Both ears removed - partial tams tests no coordination of swimming strokes. Exhausted quickly.

Large round conduct more rapidly than small ones.

Cerebellum tests: Ms fibers amazes because both motor cells and intercalated cells. As he says unequal serving cerebellum would inhibit local sensory-motor responses in flippers of all action pattern & at same time inhibit response on one side in favor of agonists on other.

* In cases where a single nerve fiber is supplying non-homologous muscles, the homologous movements are like-wise synchronized. (Resonance)

[Explain resonance in terms rhythm?]

[Two nerve fibers w. sensory cells attached in retina & see if 8 makes difference in growth synaptic connections.]
End bulb = bouton.
Boutons not demonstrable in kittens until post-natal stage of about 1 month.
Reflexes are present before end-bulbs demonstrated.

Two types of end-bulbs: definitive (terminal) & collateral (boutons en passant).
Boutons en passant = less frequent than terminal.
Both less common in medulla & lumbar region than in cervical.

Some ganglion cells have many around them, & some right clade B. I don't have any.
Boutons end on dendrites frequently as well as close to cell body & some seemed to end next neither all endings.

A few of large end-bulbs in cat showed a somewhat flattened edge lying against ganglion cells.

J. Camp. Neurology - Dec 15 1937
Dane Badian, Dep't Anatomy, Univ. Chicago.
A few perikarya of motor nerve cell in goldfish these terminate
many large end-feet, immeasurable small end-feet, a few small
unmyelinated clubs, many unmyelinated clubs.

Axon cap = myelinating axons of M's cell & many of letter T types end on it. = unique type of synaptic apparatus.
100 or more large end-feet on entire perikaryon
100 to 150 on proximal half of internal dendrite
many small on further end on dendrite.

Axon cap = synaptic apparatus consists of collaterals of neighboring nerve fibers, small dendrites form the underlying cell bodies & glial elements. Its central core consists of a network of unmyelinated fibers = continuations of axons from pericellular & longitudinal fibers. They terminate...
in tiny enclaves about axon cap. dendrites & cell itself.

Tiny medullated in distal portion of lateral dendrite and large medullated on proximal.

Almost the entire surface of Ms. cell is covered w.
axon terminals of at least four distinct types varying
in size from about 1 µ to 7 µ (1/200th of a mm)

These terminals are circumscribed by a plasma membrane
and arise from myelinated and unmyelinated nerve fibers
in padish, & they end diversely.

Surround membrane of contractile synaptic surface.

Kurick Dept. of Anatomy Chicago

Amblystoma can state within brain above
cerar vesicles is transected off. Staining in special
cord and medulla oblongata including Ms. cell & cerar
vesicles.

Says in cerebral motor peduncle in connection
with swimming adjustments & swimming movements
influenced by thy cerebral motor apparatuses - the
influence, say, being autonomous of intrinsic origin
ie central excitation due to metabolic or other internal
events aside so called spontaneous activity.

The cerebral motor field attains a high grade of
histological differentiation before with extensive
fibrous connections w. lower motor centers before
it is entered by nerve fibers from some sensory
field - [what about proprioceptive fibers etc. from below]
[The means ofatory and other perf.]
Paul Weiss - Univ. Chic. 20 Jlypt. 1936

New outfit for making pictures. Grants from Packfield Foundation.

New using large-sized photogravure and both Anobi, mexicanum.

Expt on dogs, on ferret, and on half normals - several months old.

Sometimes use chloroform anesthesia, but usually clamp down
in wet straight jacket on operating table.

Autoplastical transplantation on same animal.

Heteroplastical

Use A. quartzatum as donor

A. mexicanum - host.

Tissue excised w. good-sized slice of cartilaginous shoulder
girdle.

To nerve plexus nearest at posterior edge of shoulder
blade dorsal to blade of normal arm.

A hole torn in skin and subjacent muscles separated
bluntly & form gap but smaller than base of transplant.

Nerve plexus located in depth of gap, and the particular
nerve wanted is lifted & severed. A short piece of peripheral
nerve stump removed to prevent reunion.

The tissues close in an graft & hold it firmly. Can then
twist limbs into any desired orientation.

Some times normal arm limbs can be looped back
from elbow region & inserted into transplant.

Some cases blood circulation is perfect and digital
parts may become gangrenous + drop off, but they
regenerate later. If the same ages, there is better recovery

Regeneration of whole limbs depends quantitatively on
the presence of intact nerves at level of amputation.

Transplant limb = T, original = O.

* O continues to function normally - the loss of nerves
depicted by T - seems not to impair its motility

How come?
T displays at any instant same type of move as O, regardless of its orientation. More accurately, the same homologous m. contracts at same time.

The after in wk. m. of T came into function seems variable according to time received information.

In toads there is a period when T muscles contract in general unspecific manner before they contract in specific homologous fashion. If only such period in T, it is very short.

Intensity measured in terms of angles between joints of 2 different limbs of T was equal. "syncinomic"

A R5 limb transplanted near left normal moves in mirror image of O. Thus homologous response. If both limbs removed, animal walks backwards.

The homologous response is permanent and non-adaptable. When smaller limbs transplanted beside those of larger fact, the two show same angular motion of. A2 = k A1.

Homologous response persists when limbs transplanted between newt and salamanders (different genera).

Homologous m. of different species move closely related in R & C. More than 2 differ homologous v. same species.

Mystatic reflex = due to passive stretching.
Not due to specific connections because when a m. in T is stretched, both T & the homologous m. in O beside it respond by contraction.

These mystatic reflexes found mainly in m. of lower arms.
They can be graded; the stronger the stretch, the stronger the reflex contraction.
Myotatic reflexes occur only in limbs that have a bit of tension in them at start (not fully relaxed).

With 2 or 3, give reflexed pain to stretch of one or two m. 

One I had only forearm + hand inserted in body wall + it gave myotatic reflex of wrist and fingers at joints.

No myotatic reflex when animal is pithed.

Sometimes use paraldehyde 5% to get m.0 in time for stretching.

When brain, including anterior part of medulla is removed, still get homologous reflex. If myotatic reflex fits in w. man, adaptability of the reflexes - higher centers for adaptability.

Cardia shed off gradually backward. When 3rd qtr spines not yet reached, tails in 0 dropped but T uninnervated by 5th still functional.

Maxim: character of reappearance of function in transplants.

Three possible relations between CNS and muscle:

1. Linkage may be due to selectivity in establishment of connections between regenerating nerve + m.

2. Linkage may be achieved under guidance of sensory discharge reaching the centers from m. of newly formed transplants. (From myotatic evidence)

3. Linkage may be physiological relationship between centers + m.s = "recurrence principle."

Sometimes transplants didn't function because weren't completely innervated - may cross nerve fibers missing in that trunk. 4-0 functioning or after some of its three nerves had been severed as maybe each nerve has fibers for all m.s.
Weiss is tracing peripheral nerve connections by electrical stimulation.

The severed 5th nerve did not have to be placed in T, it grew into it, if T placed close to cut end.

For electrical testing, animal decerebrated, unanesthetized pinned to board submerged in physiological saline solution. The nerves cut at emergence from spine persist from adherent connective tissue & blood vessels.

Then electrical is applied at various points in plexus.

Use induction coil & 2 melts in very circuit. Electrodes of fine platinum wire 1 cm apart.

Stimulation done in air about liquid nurse water bleated off nerves.

Fibers identified by staining myelin rings, then following in rings w. dots or tracers, branching groups of fibers.

Concludes again that T has failed to induce the centers to send out fibers at an increased rate.

And that they divide so that at periphery T has as many nerve fibers as O.

Number of fibers in T varies pretty directly w. size of T.

Nerves follow old degenerated paths pretty closely.

"H" are about same size as in O.

In order to produce normal number fibers in T, the 5th nerve trunk must branch 6 times as extensively as normally.

The branching all seems to be done right at stump of old 5th nerve. Thus the branching takes place even before nerve enters brain.
Nerve branch from cut surface & then don't divide any more till center the muscle.

3-4-5 nerves converge into plexus wh. is variable but fairly constant if breaks up into 2 nerves going into limb - superior & inferior brachial. Both nerves become subdivided into 2 parts.

In axolotl, 3 spinal gives more to inferior brachial superior

(Weiss's students are using histological techniques)

By degeneration decide 5-th nerve has share in mineralization of proximal mis as well as distal. (call it)

For limb of brachial has about 40 mis.

For selective regeneration need about 40 types of nerves, and since nerves follow old routes without any apparent crossing or recrossing to reach specific mis in the limb, it must be that the selection occurs at the root stump where the nerves divide before regenerating into distal.

There are about 270 possible motor fibers going out to the 40 mis leaving about 6 fibers averaged per each mis. By branching maybe get 15 fibers per mm.

* Sometimes thinks he has 3-4 where a nerve supplying a particular group of mis regenerates so haphazard, an entirely new from homologous set of mis. (But his evidence not very good here - should be done experimentally if this alone in mind.)
Electrical stimulation of a common nerve leads to flexion in T and extension in D. Some nerve fibers supplying main homologous m's.

The proximal portions of nerves in T are pushed out. Regeneration in 62 days as opposed to 30 days where the degenerating nerves left intact. Regenerating nerves permit greater subdivision of regeneration of nerves than muscle faster than in other tissues.

Homologous response again. OK.

Regenerated along regular suprabrachial + infrabrachial pathways despite absence of cell nerve. But instead of 2 main trunks many smaller ones.

Assumes inferior + superior brachial nerves supply localized groups of m's.

Nerve fibers formerly connected with only a restricted group of m's assume the task of innervating functionally the whole set of m's. Present in transplanted

arm inferior brachial splits up into inferior and superior and grows but unspecifically. P. 578

* Unmistakable arm reflexes were obtained in two cases all central connections were cut. S of peripheral nerve in one limb caused response of one of several muscles in other. The reaction due to spread central to point of innervation of the axone + then peripheral over the other branch of same axone into the other limb.

The two branches terminated in non-homologous m's in the two limbs.
The specificity of proprioceptive excitations has been demonstrated - (presumably a physical not granular)

Complete deafferentation of the left fore limb, without damage to the motor innervation and transplanting them into vicinity of the limbs, a supernumerary pseudo-limb to be supplied by one of the purely motor nerves of the pelvis.

Have to test for myotatic + other reflexes to be sure of complete deafferentation.

Using dissecting mice the ganglia severed from their digital nerves pulled out. 1st and 6th ganglia including were pulled out. Mortality about 50%.

Deafferentation (as in toad) failed to entail any essential impairment of the locomotor function of the limbs. Pinching, squeezing, touching of deafferentated limbs fails to yield any reaction in amphibian.

But in time 9-11 weeks - 4 weeks after function appears there regeneration of sensory nerves + sensibility.

Neurological response as good as ever.

Have to deafferent both sides of cord - the afferent impulses from one side may be enough to control motor impulses of other side. Dry double deafferentation and decerebration to see how much of central is central + how much of it is peripheral. Mystotatic reflexes also.
Use mystatic reflexes and action currents.

Take 0 & T side by side - make mystatic reflex in 0 and see if corresponding m. in T contracts when T is differentiated and put in a posture that given m. in T would not ordinarily contract in.

Bartholomew & Herr - Skull Lab. of Anasty Chicago
on Ventricular club endings in Ancestris - Morphology.
B+H = student by Herrick

Ancestris = bull's head - on club endings of root fibres of
VIII nerve on lateral dendrite of M's cell in pin.

May matter of living animal has consistency of thick paraffine & it's not surprising that minute cytopleamic processes like dendritic and just should adhere together for cohesive forces might be great.

Cytopleamic & nucleopleamic of nerve cells = rather firm jelly
under microdissection conditions - no probably already
coagulated since all other cell matter are fluid in
living state.

Glyc matter has exceedingly rich blood supply and
high metabolic rate.

Coeleterate m. show synapses in living preparations
stained w. methylene blue / leado-bace. Shows
neurofibrillae. First evidence for such in vent. living m.
Method

Perfusion: Fixing fluid injected into vascular system of

Ventricles and cerebral, brain quickly removed and

immersed in chilled fixative.

Mordanting: After 12-24 hours put brain in Mueller's fluid

or 3% KClo, or CaCl2, for 1-4 weeks.

Wash w/ distilled H2O, dehydrate thoroughly and
double embed in methyl benzoate-celloidin &
paraffin

or use densley mitochondrial technique.

No evidence of neuropilollar continuity.

Do thin histology first on m.s. Then find club about

histological technique for m.s.

Evidence that each of elements of synapse has a

limiting membrane, these at contact only one

membrane can be resolved.

[How do neurohumors flow, are sheet thru, the membranes?]

[Certainly not of learned P, due to shift in

pacture & not change of neural tissue — how

much of new P due of traces?]

[How explain contractions of limb m's transplanted

to read region on Resonance theory?]

[Contradict the theory perfectly.
Nicholas - Zoology lab - Yale

think m. supply normal when arterial supply normal
and aberrant when arterial pattern deficient. The
greater the no. of n. fibers the more independent they
are of the arterial pattern.

vs Weiss. The m. contractions occur according to
their location w. the musculature in association w. them. — the plank, the dorsal muscle, the eye
region.

Eye substitution T's are integrated w. eye of
opposite side or w. jaw muscles — tipping
dith causes eye orientation.

Ments sometime occur when rest of animal is
present.

Do limbs show coordination w. themselves
when placed in these odd positions? — no
peripheral party control?

When m.s. injured or when limbs used to block
the regeneration of severed parts of the n. syst.
fiber cables pass from severed parts to
ends of m. And into limb and create responses
which are similar to those normally secured over n. trunks, spinal or cranial. (not plexal).

Coordination of limbs w. the eye m.s. of the
opposite side can be secured in exceptionally
favorable cases and in such cases non-homolog
muscle groups function in well-defined correlation
w. the dominant nerve supply.
Blake & Gerard - Dept Physical, Chicago 1937
10/sec rhythm of restless waking state disappears in sleep.
An or Ag electrode placed on occiput & forehead +
electrode jelly.
Under hypnosis 10/sec remains - abolished by suggesting
a light was shining in his eyes.
A striking slow rhythm in deep sleep. 5 to 3/sec.

Kleitman, Mullin, Cooperman - Dept. Physics, Chicago

Weiss: in Collecting Nerb 1938 July v. XIII no. 2 pp 29-31

Old ideas - connections
- transplant ganglia of toad to back & provide if
  with a strange limb nerve (from autonomic nerve),
  it contracts according damre.

Specific constitutional property of a muscle
may lie in a specific bio-chemical differential,
- The muscles specify their motor nerves turning
  them gradually into reflexive receptors for central
  impulses which are of form adequate for this kind of
  muscle.

A reverse from muscle & reconnected to new
acquires new muscle specificitv. This takes
longer in older animals. (Why this growth in
centers?)

Resemblances between muscle specification
and antigen-antibody correspondence suggested.
Central states - electrical, chemical
There are many different specific forms or modes of activity as there are
individual muscles in the district.

Each half of spinal cord contains the center for
its corresponding periphery. Neither half can
deal w. other side except by using discharge
mechanism of other side as intermediary. (r)
acting as references localized.

Van der Bijl - The Thermionic Vacuum Tube
1920, 145  Chapter on Amplifiers.

Separate batteries for each tube to reduce adventitious
vibrations.

Input connected to grid circuit directly or through
transformer. in 1st instance grid circuit is
shunted w. a R of 5,000,000 ohms, in latter w. 100,000

Transformer has 4 taps permitting one to vary
w. a switch S, the input impedance of the circuit to an
optimum.

A tube operated w. separate plate battery of 150/60
of no. 734 Eberhard batteries of 6 volts each.
5 Rs of 500,000 ohms each were inserted between
2nd and 3rd grids and ground - wh maintain grids -
to the filaments because of the potential drop in
the filaments Rs of the filament circuit.
In plate circuit of each tube is inserted a R = 200,000 ohms separately shielded, 2nd and 3rd grids are protected from potentials of preceding plates by the insertion of condensers fed w. a capacity of 2 microfarads, their R = 4,000,000 ohms.

Tube and plate battery act as a generator of AC potential because of variations in the tube resistance.

This potential is applied across the circuit consisting of the coupling condenser and the 500,000 ohm R and thus varies the potential of the next grid.

The AC output of the last tube is shunted across 500,000 ohm R through 14-microfarad condenser and the galvanometer string. Condenser has R of 50,000,000.

Sometimes 34-microfarad condenser used. As alternative it's possible by switches 8, 9, 10 to connect output of last tube to the primary of the string to 2nd stage of a transformer.

Optimum output impedance of this transformer is 500 ohms & input impedance matches that of tube.

Vac. tubes = Westinghouse V. designed for use w. a filament current of 1.3 amp., a grid voltage of -15, a normal plate voltage of 100, and a max. input voltage of 21.

Value of amplific constant μ is 28. Plate current under conditions of our circuit is 45 milliams.
The a.c. plate-filament R is 155,000 ohms and the a.c. 
R = 77,500 ohms.

While in win shields = wood box w. top & bottom 
& in steel & lining around sides of 7/8 in lead.
Box padded w. 1/4 in wool felt.

3 tubes screwed to spine brassed and the latter wedged 
about w. rubber bath sponges.

Switch S_3 cuts off one tube to give 2-stage ampl.
using 2 outside tubes — they used only 2 tubes!

S_4 & S_5 make possible to use 1 tube only.

Whole box w. hinged lid & outside casing switch 
for batteries is supported on a rubber
It placed inside a galvanized iron box.

Been better to place tubes in separate steel comparts.
In same room to make wiring straighter simpler.

A lot more in article about amplifiers - curves. P;
Of nerve arrangement in room etc. etc.
[Used it for A9's from phrenic nerve of dog.]
Embry
Huxley & DeBeer - "Eggle Embryology"
- Elements of"
Needham - Chum Embryol - as reference
Germann's - Embryonic Induction + Development
McElwain - General stuff - good
Arey - Development Anatomy - Human + mammal

Cytin Anat.
Posner - Vertebrate Paleontology
Lawrence - Stuartson dev. of Vertebrates
Knigley - Cytin Anatomy
Gregory - After Face pr. Head + Man (pops, but)

Invert. Paleontology
Muenhoffel - Invert. Paleontology

Physiol.
Allen - Sex & Internal Secretion
Barnes - Gen. Physiol.
Kilbrum - Gen.
Hare - Human

Genetics
Simmott & Dunn - Genetics
Snyder - Hereditary and genotype
Dobzhansky - Genetics + Origin of Species
Goldschmidt - Physical Geology
More

Cytology
Darlington - Cytology. Recent advances in
Sharpe - General Cytology
Wilson - The cell. 1924 2nd ed.
Cammack - Special Cytology

General Zo-

Plunkett - Outlines of Modern Biology
De Beer - Embryol. & Evolution

Geology - 3rd. Transl.
Calkins - Biology of Protozoa - Chap. on env.

Historical Geology - Schuchert & Dunder

Rall - Organic evolution

Paper - D. M. S. Watson - Origin & Cuscuta of Amphibia
Mem. of Ray Soc.
J.K. Noble - Biol. of Amphib.
Davis - Amplifiers for cerebral action current
Am. Jour. Physiol. vol. 104 1934

Davis - Ampl. elect. galv. & photo. camera for nerve act. etc.
Rev. Sci. Instr. v. 2 1931

Davis - An ink-writing elektro-encephalograph.
Arch. Neurol. & Psych. vol. 34 1935

Davis - Mag. elect. recording
Am. J. Physiol. v. 75 1926

Davis - On Chronaxie
Physiol. Rev. vol. 16, 1936

Bishop G.H. Expt. Work w. AC
Am. Jour. Physiol. v. 78 1926

A.C. Folk:

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Naray, H. Eccles, J.
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Barker, S. Fry
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Amberman, Wm. Presser, C.
Banks, D. Cattell, Wsh.
Derbyshire, A. Riddle, Ry.
number end

Drawing limits influences course of outgrowing nerves. Its influence specific or general? Would an eye, a tail, etc., influence limb buds in same way?

Skeletal nerves will grow toward nasal placodes & eye placodes.
Must brain waves below 20 cycles/sec.

used Rohme type 2-A undulators from Mr. J. W. Milner of West Union Telegraph Co.

"undulator" moving magnetic element which operates a small silver diaphragm unit on moving paper around up to 40 cycles/sec. - 4 minimizes 60 cycle r.m. a.c., requires an unusually large unit of power for operation.

- a portable ampl. of 2 units

1st unit is operated by a battery & consists of 3 stages of resistance-capacity-coupled high-m. pentodes in the last stage in push-pull.

objection is that when condensers & grid leaks are made large enough to pass low frequencies, some annoyance is caused by the blocking of the amplifier when large contract potentials are applied to the input.

Continued using condensers large as 4 microfarads & 1 megohm leaks, allows use of common B.B. B. & A. batteries.

used ultramicroammeter electrodes &

Amplifier Circuit.
Output unit operated on the 110 volt, 60 cycle mains. Amplify = a tube modification of the Wald & Wynne-Williams vacuum tube bridges.

The grids of 2 tubes in push-pull are excited 180° degrees out of phase by the output of the push-pull 3rd amplifying step.

The other 2 arms of bridge are also vacuum tubes of the same type (2A3) they are connected in bridge-threshold out of balance by a signal appearing on input grids and in consequence a small current appears in the lead, (in this case the undulator magnet) this current passes through the cathode drop resistors of the second pair of tubes and unbalances these arms of the bridge.

This bridge connection is a highly efficient way of inserting a load into plate circuitry and amplifier and of balancing out the direct current component of the plate current.

An extremely linear characteristic can be obtained without excessive plate wattages. The small potential between the plates of the 3rd and 4th tubes may be used to balance out the direct current components accurately. Need separate filament transformers for the 3rd and 4th tubes. — readily portable.
string galvan. too slow to give true pict of time relation in wave. 
nerve a.c. lasts about 1 minute. (10) if galvan. take 3-40.
stiff galvan. takes 10travels as long to reach max. as a.c it is 
attending the record. i.e. acts /naturally.

Intro. of cathode ray oscillog. for a.c by Variser + 
Schrader 1922 revolutionized nerve physiology.
this depending an deflecting stream of electrons, has 
practically no lag.

But it's sensitivity is as far below that of 
the string galvan., that depends on powerful 
electrontube amplifier.

3 stages been used, capacity of these tubes introducts 
lag of about .02 s = negligible.

this apparatus is complex and it's difficult to get 
record of single response.

also pattern depends on discharge of a condenser so 
the logarithmic curve must be redrawn to get 
absolute picture. variser gets rectilinear coordinates 
by placing vacuum tube in series w/ timing condenser

their contribution = shortening of the string of string 
galvan. gilded quartz is used careful can get it thinner, but 
density than tungstent (who can be pulled tighter).

light string falls down better than glass, but need more 
amplification. very fine strings pulled by melting quartz 
rocks, then gilded = delicate technique.
Amplifier from Bell &amp; La Bonte, manufactured to record transient currents, reaching max. in 30 mins input 10,000 - 100,000 ohms, voltage amplification 100 to 10,000, 7 by 12.5/2.5 galvanometers 10,000 x 10,000 ohms.

Because amplifiers usually have either 6 or 4 stages, accordingly they were designed.

4th stages employ 239-A tubes; 1 final 6th stage, 205-D tube.

Amplifiers assembled and mounted by Mr. Hand Martin.

Built in 3 units: 1st 2 tubes, 2nd 3 tubes, 3rd power stage.
Each unit in independent box with independent grounds and batteries.

Tubes mounted on pieces of lead 5 mm. thick, set on pads of sponge rubber. Tube steady by rubber should pass through vertical supporting posts.

Wooden boxes containing the amplifier units stand on a thick piece of felt in a cabinet in the galvanometer pillar. Better shield from its foundation independent by the building. Inside of cabinet lined with elaborated sheet iron to shield against steel and mag. 4 doors have cellulose layer in addition to guard vs. sound wave art.
What is a gene?

A gene is a small slab of particular chemical in a cell, which alters the shape of the cytoplasm. When altered, it may change the structure of the gene. The change in the chemical environment may cause a reaction of the gene chemical so that it alters character of cell into flower cells or finger-nail cells.

Test by growing cells in tissue culture. Alter the chemical makeup of the tissue culture by extracts of different parts of the organism and thus see if cells produce different types of cells.

When lumbar sacral region of cord in pups is entirely cut off from afferent impulses by double transections and spinal ract transection, Mr. Carlin can be elicited by mechanical pressure, pain etc. of that part of the cord which is unprotected by tissue of norm.

Then there is an organization in the C's. The antagonists don't pull against each other of the dorsal portions of lumbar transmission threshold as in the case of spinal creflex. But cord is not autonomic.
Qui est-ce qui c'est un gene?

Maybe a gene is a small blob of a particular chemical in a cell, which affects a certain chemical matrix that can reach and alter the shape of the cytoplasm.

Cytoplasm wanderers in chem. balance. When gene's about an tip of a branch or a finger, maybe the chemical environment is such as to cause reaction of the gene chemical so that it alters character of cell into flower cells or finger-nail cells.

Peck by growing cells in these cultures. After the chemical makeup of the tissue culture by extracts of different parts of the organism and then see if cells produce different types of cells.

When limbs neural region of cord in pups is entirely cut off from other limb by double transaction and digital root transaction, dr. cantric can be elicited by mechanical pressure giving etc. of that part of the cord, which is unprotected by nerve as in normal.

Then, there is an organization in the R's. The antagonists don't pull against each other. The digital portions of limbs has lowest threshold as is the case for spinal reflex. But cord is not autotomes.
Nov. 18

Effects of mines on development, maintenance, regeneration of muscles & sense organs.

(Respiratory influences)

atrophied, degenerated. Power, diminished, Parker, Stone
The central n. syst. is sheltered under bone, is perfectly static. It innervates the m.s. There have to move just right at the right time. When you say "just right" it means with respect to other parts of the nervous periphery — not the central syst. So in order that the motor organs may be adjusted with respect to the dynamic periphery and environment, there must be a relation between the periphery + environment and the muscles, i.e., the afferent m.s. — the static system could be independent.

In other words there must always be an influence on the centers from the sense organs — else the sense org. centers would have no means of adjusting the motor impulses to the periphery + environment.

This is probably true of human organism — but possibly there are more autonomous mechanisms in the lower vertebrates. Perhaps a central process may be started from afferent impulses and then work itself out, discharging into the periphery meanwhile, and unaffected by periphery. Simple locomotion may be of that form.

Should be able to prove that any getting mechanism going where it wouldn't accomplish results, but would have to be sure that no afferent impulses came in to stop.

If limbs are disafferented? What can the animal do? If he can walk again, etc., then there must be some cues coming in to start it off.

It's at the start that you could tell whether peripheral factors are influencing or whether it gets going from visual or other cues.

If the process is central, then there must be a central mechanism that mirrors peripheral conditions.

If peripheral conditions count, they must be inherent affairs 'cause limbs go off w/o~ during transplants.
Embryo & Exp. omit, get neurology. Much more work.

Differ in anatomical & physical, set of views. Now figures embryology is going to tell how n. sys got that way.

It's going to find out how n. sys. works, and is going to shatter many conceptions now current.

Neurobiotaxis is out. Few engaged in neuroembryology.

Details of neuroembryology given in text.

Mammals or Amphibia:

Higher centers, cut off as go down. Caretaker of rats, train 'em.

Where does action current come in?

No train 'em and then cut off layers & find out where stimuli appear.

Proof of central pattern, central discharge.

A linkage of molecules that react and are modified.

Note: the impulse travels only over the specific molecule.

The splitting of axons shows that it can't be a matter of conjunctions.

This show where association has occurred. A matter of operating on rats, shifting their muscles by the tendons. Then retraining them to use the shifted muscles - after which you cut out the forebrain and on down and see how far have to go to bring out the old associations.

Or graph frog legs to back where they'd do no good & see if they still coordinate.

Want something that can work of steadily, put in extra time etc.
Any part of ectoderm can form nervous system. Rathke's pouch around hypophysis. Neural crests migrate out—ganglionic crest—presumptive cells.

Proliferation of cells occurs on most ectodermal of surface of neural tube lining of neural tube, brain, etc. After proliferation begins, after growth starts.

Inner and outer limiting membranes holding neural tube plate. Cells of neural plate secrete these supporting membranes.

On proliferation, the tube begins. Several layers thick, cells migrate radially rather than tangentially—don't know why.

Mes. cyst is pulled out this way probably passively to great extent.

Proliferating layer, later called ependyma.

Glia. neuronal

Some of original lining cells stretch greatly and reach to outer layer serving as support and equal at traces of glia.

Spongial blast later turn into glia—look like regular neuronal at 1st.

Astrocytes = partly support, partly nutritive.

Nerve fibers begin to develop.
axis cylinder or neurite
neurilemma

myelin

late evidence that all neur. have a myelin-like coat.

sheath cells, surround cell completely on all cells.

myelinated fibers show extent of sheath cells, because a break in myelin undoes each a cell at end.

no sheath cells in center, its place taken by the glia, Schwann cells called peripher. glia.

but there's myelin, so myelin found where it should.

cells do not contain irreplaceable constituents at beaing. Parts can be interchanged.

muscle + skin interchange. Indeterminacy of cells, surroundings make tissue what it'll be.

practically any cell early can form n. syst.
likewise n. cells form any other tissue early enough.

mesoderm beneath med. plate does something to make med. plate -> nerve chord. Has to be in contact.

ner. syst. acts now to make ectoderm produce eye, ear, nose etc. = organizers.
Injuries microderm can one side and it makes the main plate develop asymmetrical, because plate impact part in shaping the malformations. However, a certain limit of shape and morphology of plate. Plate related to triad of like cellulose in hand. One surface part to contract the center to expand. This gelatin plate of dehydrated capacity like agar.

Glasser 1912. Red content much higher than rest of embryonic cells. Before particularising they don't have higher. Water takes in that slow, neural ectoderm swells. Collards swell for many reasons - salts, enzymes, etc. Some conditions there probably that require differentiation swelling.

Found that nuclei crowd to bottom of plate - so perhaps greater red content in upper pole of cell.

If grow bent plate in tissue culture, the nuclei crowd to outside.

Bending of plate is autonomous, by itself. Any hard bending of plate may be caused by ectoderm, partly. Plate will hard if placed in sugar solution? Hysteresis ectoderm pushed slightly.
Symposium

1. Nerve vs. Neurite
2. Neural correlates of embryonic differences
3. Effects of n. syst. and development, regeneration

Dependence of n. syst. on milieu - not autonomous
substitutes of mead.

Rehmann - indicates lateral aspects of n. syst. correlates
w. mead.
Adelmann - 2 eyes fuse, etc. depending on mesoderm

[We don't know what sort of an effect the mead has.]

Hypertonic sugar + NaCl solution causes n. plate
to stiffen and doesn't change - spine, lipids
Occasional human breath, sometimes animal live
quite a while.

Surprisingly little disturbance of behavior pattern
How much morphology of n. syst. characterizes behavior

1) Defect in nervous system
2) Closure of tube

Synergic factors operate

a. Autonomic nailing? don't know why
b. Pressure of lateral ectoderm.

After nailing, in syst. assumes profile of a retak
would collapse if it weren't for extrapleural pressure
Hypertonic fluid inside - pressure of cerebro-spinal fluid.
In REMAKING outline W. course.

Studniarska - cells lining the canal show secretory activity which later is restricted to choroid plexus - meninges reach into ventricles, like sac for chem. analysis. Some sort of filtration goes on. "Aneurysmal-cerebral barrier" - true secretion also going on.

General char. of embryology - gen. spec. areas of tissue.

Experiment on chick - cut out a fragment from brain and put into 5 values of inner and outer. 4 transplant into blood - folding. The inner will be surrounded by area of exudation. Outside place just sticks in coagulum.

Liquid is propelled anteriorly by plexus.

When portion of choroid transplanted from anterior to posterior - orientation normal, switched. This was a collection of liquid at back end. Liquid pressure actually caused it to push out.

If liquid prop. forward, it helps to extend the brain ventricles.

3/4 factor in death of tube, you can hardly keep a mass of transplanted n. tissue from developing canals in it. Due to cells lining that secrete - cystostomes - fishes develop from a solid n. sys.

Recirculate - fields in walls, difference in thickness of walls, growth pattern of n. sys.
(We know not why certain parts of organisms grow at more rapid pace than other.)

Growth of neural tube:

Growth factors rate & direction

- Fused cells could mitose if human were round, slip gives more surface.
- Cells that migrate to outside don't divide any more.
- Cells add to thickness, not length of tube.
- No central control among these factors.

1. Shape of canal
   - semi-to notch, under n. spt.
   - Neural tube lies directly on notochord.
   - Muscle repels human.

2. Muscle
   - A. p. & A. t. exchange piece of n. v. c. at stage when they're alike.
   - Hold for early stages - later they come up to cancel proportion.

So, intensity of mitosis is an inherent factor of tissue.

There is a mitotic pattern - close to canal, some factor in liquid prob. S. cells living if & divide.
There are distinct foci of mitotic activity along the cord. 

Caudate has done considerable work on this subject.

At first uniform, then brain comes in with tremendous peaks at
points. At pit's there is shrinkage, which indicates
migration of cells that shape of n. pyramis is
not due entirely to rate of growth.

Burr has studied mitotic patterns also. Yet caudate
foci of growth.

1. Rate of growth, 2. Migration effect mass of cells at
any point.

In brain:

In eddies, there is rapid mitosis which causes
surface expansion, cannot direct migrate.

Cells bored away from canal to outer portions
of tube causes thickness of tube.

Ependyma cells that form along w. other cells
nerveblasts slide out.

Zacharias o'd des. my cut 8 and segment 4 triangle
them elsewhere in body we 'cut connect it to

tube.

N. court has no tendency to grow in length,

legs behind, body - growth = passively
lengthened. Transplant beside cord is much
thicker than normal in the cord. cell count is
the same, but that in the tube is passively
stretched.
How does stretching occur?

We know little of length, shock, and electrical factors suggested

Verma has shown that axons move towards an electrode in a current.

Galanostaxis

Probably a type in patient between outside tube + inside of electrical radiance

Arius Kappers suggested cells move out in the field of electrical radiance

Neuroblasts in tissue culture were disappointing.

Kaplan + Kessel usually used current wire lethal.

Williams in sub-lethal dose appeared to change bit. Neuroblasts in electric field moved possibly more in an electrical field.

Drugs, such as Weisfar \textsuperscript{t} and ependymal fibers form a mechanical structure over with cells glide out.
Assignments Nov. 18th or 22nd  Effect of music on other time
Print that we go after stuff ourselves. [Neurohumors - nos. that can grow
Came in and asked them questions. in - etc., all only in so far as
it effects behavior.

How do these mitotic foci arise? - cause? a general problem
of development.

Growth pattern intrinsic to certain extent, but serves only
as base-line on wh. other factors are imposed.

Lateral factors, partly peripheral & partly extracerebral.

Length / perceive, width - active.

Foldline centers + Rhind limb centers appear before growth
of buds appears.

Neural crest split into 2 lateral crests, dorsal beside cord.
Looks as if it were poured down and dripping around
else - just columns whose segmentation will come
later. They form dorsal ganglia & sympathetic plexus in
and contribute frame to epithelial cells around cord.

Segmentation of ganglia:

Dependence of segments of myotomes. Neural crest wedges
in between myotomes and neural crest also begins to
show segmentation. The crest column breaks up
more or less irregularly, lost are its fillet myotomes.

Cranial nerves 1st to study relation, when myotomes
are removed, the ganglia drift segment, no do neural
arches.

Detwiler 1937. As dripping down occurs, the neural
arches stop it in places 1st between drips - ganglia
away tendency to break up into clusters not myotome
myotomes merely arrange it in regular manner.

Ganglia ob tennin in places of eaves of neural
crests. But W. thinks can go further and say its
tte neural arches which create but the neural crest
in regents. N. arches arranged as much as ganglia
by arrangement of myotomes.
1. fiber develops per in center w/out camiss. periphery.
2. when sudden mechanism of camiss. rise w. the periphery begins. 1. nerve fibers begin to develop.

The development of nerve fibers acquired much attention and many theories of origin have been put forward.

The primary origin is advocated by the theory of pre-existing structures, lying in the center. These structures give rise to nerve fibers that extend peripherally.

1. **Primary origin:**
   - Theory of pre-existing structures, lying in the center.
   - Nerve fibers develop from these structures.

2. **Secondary origin:**
   - One probable cell chain theory: Lehmann 1839
     - Balfour, Babkin, Mersenne
     - Nerve fibers develop from cells, not from a single cell.
     - Neurons develop from primitive cells. New cells are formed from the nerve fibers.
     - Neurons are formed in the central nervous system.
     - Hypothetical fibers show segments, figures that each cell developed in place from fibrillae.

3. Future research:
   - Need further study of nerve fibers.
   - Hypothetical fibers show segments, figures that each cell developed in place from fibrillae.

**Ramon y Cajal**

Nerve impulses travel along nerve fibers. The impulse travels out that transforms material in its path into neuronal cells.

**Krivshis** assumed plasma derivative - plasma connections between all cells, so influence spread out from the centers. He also suggested some fibril grains out, but that influence plasma derivative spread out from the centers.
Can't decide this question by histological technique.

Harrison for sciatic, Brand for peripheral. Do nerves w/in limbs arise if limbs are in center?

Pattern of transplanters to foreign parts, eye, etc., limbs got typical limb pattern. 

1. Brauns said nerves must be also in limb.
2. Harrison doing same concluded they grew out and followed factors in limbs that guided 'em into their patterns.

Harrison went on cut out part of spinal cord & filled it w. coagulated blood. Found it penetrated w. N. fibers that had roots in nearby cord. Grew nerves off mitos. Created the method of tissue culture (Weiss first opposed to this form of technique.)

Clay of blood on slide w. neuroblasts; few cell sprouts came out & w/in a day or 2 grew out.


Phase fiber fibers were made. However, so have a drift toward for sheath cells, which come from neural crest in early stages. (These were early advocates of chain theory.)

Harrison showed this by removing crest & lateral neural tube & got bare fibers out into muscle.

Harrison 1905 1st described N. fiber growing out in tadpole tail.

Williams stained fibers and showed 'em up better. Special wished N. fibers in tadpole.

(T. Exp Lab v57 1930 Williams not too good)
Ameliorated growth at tip of N. fiber. Perhaps material is synthesized in cell body, perhaps in axone we don't know how much of each - half axone.

Tip is active part of cell is passive. Sheath cells then put on and it to be myelinated later. Come in quite irregularly, keep dividing in periphery after becoming crusty.

Whether myelin to be formed or not depends on character of nerve fiber. Of course needs presence of sheath cells. Probably myelin formed from the nerve fiber itself. Spermid body maybe lymph cells between myelin and sheath cells.

When does fiber remain single and when does it branch?

Pseudopodion feel their way forward as in amebae. After one established, flow quickly into it and is withdrawn from others. (Hollow on table - draws out one long branch path.)

Crawls up in front of obstacle for time, then pausing go around any maybe both currents persist and maybe one clears all.

High ramification of amebita and axone from obstacle?

Sometimes get an offshoot of an older nerve - collaterals produced by irritation or injury.

Special J.C. Hus. v. 61. Mol. 1936 & ref. co.

Am. J. Anat. v. 52 1933

Nerve fiber can be spun out - elasticity of a nerve cell is elastic? (2)

Something transmitted from cell body to periphery. We know that certain fibers of utilities behind ear.
be carried out along nerve - doesn't mean carried along nerve axons - interstitial lymphatic spaces between nerve fibers that may be the place of transportation.

Parker has written on transport of substance inside of axon.

Question open. We don't know. (Influence of certain cells.)


Rogers' study - work that in brownlow. Have the start.

defines' hypothesis. degeneration vs. no degeneration.

Cajal nerves grow out in regenerating \( \frac{1}{2} \) - \( \frac{2}{7} \) mm/day in mammals.

Warrick tissue culture 3/day. Weiss 1 mm/day.

Regeneration in human beings - \( \frac{1}{4} \) mm/day. dependent on temp.

Mercuri has measured accurately.

\[ 2 \frac{1}{2} \text{ in. the cords} \]

\[ 4 \frac{1}{4} \text{ mm/day = in ear} \]

\[ 1 \frac{1}{2} - 5 \text{ mm/day in cords} \]

Summary of nerve regeneration.

1st outgrowth of microglia is axone cause a effect.

except where have bipolar in spinal ganglia and cell.

W. doesn't like to consider the spinal gang.

as dendritic. W. says no fibrin.

an an. in neck of Y.

Sheath cells around axons and myeline or no myeline.

The centers may have myeline or no myeline.

Declares there are antidromic impulses that effectually over sensory processes to blend themselves.
Nerve pattern of adult organism. — Bundles of peripheral are of 2-ary origin, primary = axon.
Plexus formation, fusion etc. = secondary.
Distances from center to periphery = very short in embryo.
Neural tube gives rise membrane of nerve cord (somewhat). The muscle myotome is right there, and at that early period each a single nerve cell innervates the myotome & then the myotome can twitch.
Lateral plate thickens to limb level & is innervated at the mostly cartilage.

Motor side develops at limb level long before there's any sensory impulses — so W. says it autonomic. No reflex.

In lateral plate the neural connections made before (m. cells actually differentiated, m. mass present).
When this gets anchored, pulled out at each end; passing
m. of body wall from myotomes.
Further course of nerves = passive distortion. Thread left behind to trace migration of the m. grs.
Furis of fishies that migrate anteriorly carry nerves from mouth behind.
M. of diaphragm show migrs.
Nerves are taken in tow by the m. s.

Limbs lower form from median hyose. Nerve pattern in limbs retrograde migration of limb muscles.
Neurotrophic factor: connective tissue comes and wraps around the sheaths of axones. 2nd bracing by network. Nerves may grow or go on to new structures. Disruption of central cells, migration, that disturbs the primary fibers. Growth into periphery of large animals. Not single. Sensation - medullar sheath of flat sheath cells when an axone interrupted, operation.

1. degeneration - effect periph. & central stump differently
2. degeneration - effect periph. & central stump differently
3. regeneration

"central stump" = nearest cell body.

Degeneration is queer in nerve: ritual phenomenon, production of new substances.

Peripheral end apparatus first undergoes degeneration, due to lack of impulses in motor, who about sensory?

Myelin sheet breaks down. Lymphocytes digest it. Axis cylinder breaks down. Whole area falls w. vacuoles + tissue.

Progressive changes occur in the Schwann cells - nucleolidivide, cytoplasm contracts back around nucleus + synthesis of Schwann cytoplasm. Get a tube of vacuolated membrane the nucleoli of the Schwann cells fill it. The central part of m. fiber no longer functions.
Protoxoplasmic symmetrical branch left in old n. path called Brunnher.

Proximal part = O.K., traumatic shock usually some go more than skeletal cell or two. No chance in olfactory nerve in body.

Wallerian degeneration.

The cell body itself is affected, nuclear bodies, chromatine, very gradually degenerate.

Ascending degeneration = Gordon's deg., used in tracing central pathways.

A new outgrowth begins at cut end.

Nerves w. connective tissue are elastic.

A scar is left in gap where old cell was that forms a link between prox. of peripheral prox. of axones.

If a "growth cone" of branchings about the scar do single axone branch? or is it the nerve trunk?  

Nerves formed at ends of regenerating branches in scar. 

Gray grows shaft up and transverse scar in all directions.

Nerve spun by strands fibers that get lost in scar tissue develops sensory endings - part after m. operations.

Nerve shafts old regenerated path shaft ahead rapidly, form healthy nerves, others = weak.

In absence of old degenerated path, nerves may grow, but very slowly.

Growth rates in type of nerve.

Radial = 4-5 mm. / day

Ulnar = 1.5-2

Median = 0.5-1
some trace of wall great. diff. lift in the sheath. paths, he says, but - lately

1 week, then freezing etc. causes some type of degener
ger. Dietary degeneration in beri-berry causes
degenerat of nerve. No - regeneration occurs
more smoothly.

Handbuch der Neurologie - 1935, J. Boeke

Thinner fibers degenerate faster than thicker
speed of degenerative process in the animals.

frog 30-40 days degenerate

Winter 120+ (60 days better)

Birds 2 days

Mammal 4-5 days depending on age of animal.

Most authors studied physiologically. S. X watch m.
but end-plate breaks down very soon. Act. pot.
Tetra has got A.C. + structures the decrease after the
operation

Two weeks after the transaction still got A.C. in the
peripheral portion. 3 weeks still got some A.C. but 5
" " cut.

Protolasm of m. fibers thru intern. protopl. bands of
Bunge. Individualization occurs later out of the
common protoplasmic mass. Then have pulled over
starting from the periphery. So the
m.s may modify the nerves peripherally to
that can't play peripheral outgrowth is random.

Anastomoses are very frequent. Work this into seminar
paper. No " are of the individual axons.
Prob. of orientation of path of nerve fiber growing out.

- Electrical, chemical factors
- Nerve pattern & its activity
- Muscular fiber pathways growing in, are not pulled but passively do so by muscle.
- Nerve trunks seems to be "nucleated" in most size

Head poisoning causes "radial" nerves to drop. If paralysis goes to motor cells, tone affects dorsal tract.

Adrenaline affects sympathetic nerves, acetylcholine affects parasympathetic.

So there are chemical differentials in the nervous system.

Orientation of n. fiber as it grows out:
- Electric effect on polar axis of nerve fiber?
- Something may initiate cell to set out a pseudopodium.
- Cells in tissue culture as may be not extended fibers.
- Something causes weak place in cell wall. Possibly an electrical factor, change of surface potential at any point.

As nerve always grows out at the far end of the cell.

What about intraneuronal cells?

Why does neuroblast move?

Always Kappers suggests neuroblastic is that neuroblastic in a certain direction. After a S. hits it. Based on phylogenetic morphology, & translated into ontogenetic terms. It goes mark as a fantomere.

Functional S. plays very little part in devel. of the nerver syst. ?? in man??

S. of nerve growth like S. of eye growth.

Neuroblastoma means nothing lasts. Kappers has put electricity as the S. = electrotaxis.
migration of neurastatic direct to outgrowing pseudopod. direction of the fiber after getting a start? 

Older nerves use the older nerves as a guide to their goal.

Certain types of fibers connect up with certain types of end organs?

Nervous fibers grow out w/o any idea as to what end organs they're to connect up with.

Nor is there any definite relationship between the CNS and the PNS, the specificity of neuronal connections.

The direction of outgrowth of the peripheral fibers:

Either orientation point starts on a general nerve at first out of which the regular trunks later (first blood vessel system of chick) graded elaboration. Some evidence that there is a little, over production of nerve fibers. So nerves must grow out w/ definite orientation at the beginning.

Orientation of nerve fiber: Is fiber endoneural w/ guiding factors, or is it passively deflected?

Neural culture shows of fibers growing out in all any & every way. So is mechanically or otherwise deflected passively.

In frog, spinal segments of cords are shorter than corresponding segment of the body. Thus grade as saying, expression of lag of growth rate of cord & rest of body. Seat of spinal nerve, however.

Arm immersion in 2, 3, 4, 5 segments. Details using tail bud stage mended anterior limbs & 3 sets back to take 6, 7, 8 segments. Spinal nerves on other side. Tendency of the brachial nerves to be attracted to the new location. Immature: 5, 6, 7 or so. Same thing happened when moved forward so 4 3 2 1 immature pt.

Not the same brachial plane, but new one. However, a tendency - not said nearly attracted from a distance. If done in later stage, there's no differentiation. Like neural placode in same region and get a
Like fern spores which are attracted by malic acid = chemotaxis.

Carpel interpret all on same basis = microphorism = tropism

Some substance diffuses out + nerves P. very delicately to this concentration gradient.Diff. of chemotaxis.

But a diffusion gradient could guide them only if it is steady during ontogenesis. Diffusion in jelly is slow. However, what's more all the tissues are different so N. fibers must have a specific sense. What more highly purified nerve tracts current might be misleading. Pulse of arteries, flow of lymph, etc. all produce currents.

Possibility of current. Body potential maintained only by membranes that keep charges apart. These membranes control the electrical fields that might be set up. Dry capacities & resistances etc.

Nobody has shown any influence of elect. fields on outgrowth of N. fibers.

Nerves grow in opposite direction at same time in brain. Spiegel has seen two nerve fibers type growing opposite to each other.

Factors - the growth of nerve of the horn in environmental stimuli. Child & Child have supported elect. theory.

Nerves are directed - certain factors attract em.

Nerves directed toward jelly, agar, etc. soaked in organ extracts. Brain substance, heart muscle, spleen extract & liver extract (not good exp). However, a flaw.

The place toward wh. they're attracted is not specific.

Harrison noted menenchyme cells tend to creep along delicat surfaces in tissue cultures - along spider webs = thigmotaxis

Of analysis of thigmotaxis yet - to boundary interfaces - as partially surface tension. Must prof.

H. suggests nerve fiber might do it, tried it, had no success different technique.

Kelly & others - plasmaemic & outgrowth theories complicated said Ns grew out along between cells already established
fibers not of cells = artifact but there were cadaverous
mass around my cord. Held observed that
n. fibers always penetrated along fiber surface.
so Harrison idea gained out.

Meantime tissue culture method perfected. Burrows
introduced fibrin clot. Carroll fed blood clots. He
did not try this cult. method. Small out of embryonic
piece that changes fibrosa to fibrin.

Harrison, Razi's, cultivated in liquid meed. Cavillon
had to use carriership as attract base. Razi's
studied sympathetic fibers as grew out.

Scheib'tz 1934

N. fibers in vitro - proof of existence of neurofibrils
by tissue culture technique.

Been claimed as artifacts of fixation. But in vivo's
labior + crustacea + suggestion that due injury.

1) radlets from light. Many studied spreading cells
watched inf grow of chick in vitro at all the
neurofibrils. Heinz + Meyer corroborated so no
further doubt. There are neurofibrils. Do the eight
fibers go out separate branches.

At Yale, 1931. Weiss - favored contact relations of Harrison.
Earlier proved blood plasma + phasic colloid cannot
of root shaped radlets wih. under stress
aggregate to form a spongy tissue mass oriented in
the direction. Pull off neatly cloth. Do that
to blood plasma + they'll arrest it, and then the
cells of these radlet trails

Molecules arrange selves like stake on a fence at
the surface.
Oriented coagulum polarizes light & creates oriented reticular matrix, like meshwork drawn out. The amoeboid tips off the lines like mesenchyme mesenchyme bodies. Neurofibers can be thus drawn out by the elastic axone.

Tension is applied early to whole clot in forming, space while IS growing on. Same thing for mesenchyme cells & sheath cells. N. tips so arborized in growth; - Orienting agents must then lay down even substrate to grow on. Runt lines, centers in brain, etc. Must affect the substrate.

Can duplicate same of this in vitro. Rete growing cells orient the substrate.

Membrane culture to produce with cells & nerve fibers. In proliferating cells dehydrate the surrounding colloids leading to fascination. Such a local dehydration in a membrane causes contraction in that place. Two centers of contract in cause tension between 'em. Runt line orients the micelle.

Papers & Cagetti; laws of synchronously dehydrating culture of brain and inter-connected. Spinal cord? After pioneer threads laid down, you've got a whole system of patterns.
Pattern of m.c. like photoplate exposed numerous times- and strong at once. (optic chiasma, how does it become crossed)

Anastomosing, plexus formation
Arterial, fibrous type go. Others converge, plexus. arterial - striated interfaces in tissue, retina, etc.

Averited tension - dehydration

Properly growing tail of tadpole: cann. tissue to surface water changes - oriented currents

Pericardial organs small tissue is tangential but there are many cords running radial into vesicle guide m.s. chem. factors so far no effect. He tried it in tissue culture under the chem. action affected structure of medium.


1. Tissue grew toward conductor & there is no physical force this way.
2. He tried for two years to make 1 affect growth +

no go. Kray, Speidel & others have found no effect.

Wick electrodes used by Ingvar - sucks liquid, get dehydration tension.

Much negative evidence for electrical effect.
Coordinations of periph. actions = central affair.
All ideas based on connections, but this not necessary
so long as a m. attached to a nerve that goes into these centers.
M. respond according to their name — always.
C.m.s. has specific type of discharge for each muscle
what about somatotopic, i.e., pr.
Diff modalities
in the C.M.S.

Since there are thousands of muscles, it's an economical
means of dealing w. coordinations.
As soon as m. is visibly functioning, it contracts
dramatically.
M. is of no use to the animal itself.
Transplantation of supernumerary m.s into the back
of tad. Transplanted from same animal, from
other leg.
M. placed so it can't move the skeleton
if must be stretched, cause can't contract
Use the 8th m. or m. from tibial so
know it has no gastric fiber
M. twitches on excision in place —
then prepared physiologically.

Ht homologues R. — even hi. nerves
that weren't hi. nerves.
Slight touch of anesthesia to knee. Touch annual & get response. Muscles transplanted to back & to different muscle. Instinct & temporal coincidence.

S. on one side brings stronger R. on that side than on contralateral.

Stiffness. S occurs in both 8 & 9 segments.

transg.res. to pattern discharged in cns & more or less of m. fibers are recruited under its influence.

The cns hastes the centers with these different specific exciting agents & they appear according to receptivity. Where the receptivity takes place in these centers.

At first the m's contain merely unspecific fibers that contract to any cns excite. Gradually the R. becomes more specific. w. fibers of these unspecific fibers.
spread out area, motor Ns & mix.

selective reception may occur in periphery.

Resonance of Ns to the excitation

physical or chemical differentials

enzymes limited so they'll work on only one

type of chemical post material.

a) if so, there's no reason why there should be any

imprecise Rhs.

b) test with electron current.

Wiersma in Aldrich's lab. in England tried it out
at Weir's suggestion. I have found that

motor Ns generally go off when their Rhs go off motor

That is, the apparatus that has occurred in the nerve

already.

so muscle modulates the motor nerve.

A nerve can be varied several times & different Ns in

amphibian each time get homologous Rhs.

Course the specification takes.

Possibly the modulation goes further than the motor cell.

The motor fibers must have access to tangled neuropile

of gray matter.

requires only few days to modulate a nerve in

the amphibian, but requires some time in an adult

tadpole. new or newborn. sometimes - memo cannibizone

contractions. not learned

tadpole amphibian mus. old tadpole, young tadpole

will show the specification.

antibody - antibody reactions. antibody affects protein

so it gets own structure.
Sometimes takes several weeks for the cumulative reactions to gradually fade out if homologous R. come in.

**Sensory field:**
- No similar relation holds on the sensory side.
- Specific functional relation between central and sensory explantation.
- Substitute simple R's for observation of c.m.s. action.
- Nodal parasitic reflex in 3-legged natural tad, for w. amputated tail + with cornea reflex.

(The excitation may be of same type or not.)

Cornea reflex of amphibians - s. Cornea lid closure reflex. - may affect thru away etc.
- M. biceps eye - buhl wh. pulls it in + lid closer mechanically.

Cyanes. cornea transplanted to ear reg. so inferior, grant II sp. in n. rather than trigem.

The reflex appears only after metamorphosis.

The transplanted eye has no m. so it doesn't retract but some few of the B and c.m.s. is specific for eye retractor muscle.

Don't get the B in. when touch other side in same place - transplant eye w/ out cornea & don't get it.

2 cases where it holds on the sensory side.

Reflexes thus the c.m.s. that are quantitatively different.

Helps for automatic activities of perimeningeal fibers of a girl. When blindfolded she got the various fingers mixed to tactile cues - gradually learned to identify.
Then may be a little drift, space, distance, position count
A cure in correct, where it holds.
If it's the quality of discharge that counts, then habit
Formation must be a main thing.
Acute reflexes hard to get cause, they don't all go into same other
M. - hard to see the limited.
Acute is specified to the branching ph. & commonly run in to all
M. has the selectivity functionally
Pain fiber, touch etc. May become what they are because
Of type of peripheral organ
Holds only for limb muscles & come reflex
Mammals have superimposed cortical reflexes.

Inherited vs. Acquired
Ro common to a species
Pth. learned in utero - now learn w/ out knowledge
Of results, making, maybe general coordinations - don't
Seem to be spontaneous in & larvae (?), cause
They don't go to extrem. S. - only internal, spontaneous.
Begin on chick - 1st active musc 5th day.
Then 7th week of limbs.
How could even musc coörd. be learned in the
Embryo. How know that these musc don't just
Appear when they do?
Guinea pig's debit arises in the mother, but do immediately
On removal.
Angulo y Ganguly - studied pectoral skin of white rats
Any changes of operation.
Longworth on Opium

Sensory areas become smaller in the cerebral cortex. How explain in terms of modulation? How explain in terms of connections.

Chloroform in acetone = chloroform.

Harrington & Carmichael: incubating chick-picking studies, found sparrow wings increased growth of abdominal muscles.

Gerard's twin study supports maternal effect.

Nicholas reared wild rats side by side with tame ones in tame mother's uterus & got normal wildness in such wild rats. Comments.

Hounds reared by shepherd on being taken to field, mined, put named animals acted very humanly.

Cerebral lesions as evidence: cats kill rats instinctively? Birds songs are affected by bird society.

Homing instinct of birds & learned

Stimulated parabiotic rats & only one had young showed maternal instinct — as not hormonal. My free diet results in lack of.

Evidence that learning occurs before birth.

Stays isolation in OK. Method: isolation in utero.
Foolish to ask how much is due to environment. How much due to innate.

How much a volume of gas is due to temper. How much due to pressure. Are they interact?

As in growth... Y

? Of whether learning is possible in utero where no knowledge or memory. No drive or want to learn.

? Of whether learning can come in...

Can we apply causal sys. to patterns in nature?

Types of order. [Orbit y. Star selection]

Random—may happen as much.

Plague on Caphill Amphi stoma Janet was right.

Behavior problem in Ambystoma—has no learning of motor coordination anyway. So it's merely a reflex. How innate strokes of reflex are developed. E.g., reflex need nerve tracts before. Can't memory. Question possible of how associating tracts are laid down with may help same functional factors functioning.

Early stages in Amb. motor n.s. innervate muscles in reg. posterior to cell body—pass through card. and in particular segments. Overall—half in higher forms. Others as well. Some of inn go into misplace to skin.

Roden head cells sense cells whose cell bodies are inside dorsal root of card. rather than in ganglia. Don't knew inn in higher vertebrates.

Stage of behavior:
1. May move
2. Single flume
3. Curl
4. S-shape
5. Swimming

No basketball tonite!
S internation sans motor pattern
Fishes mimic OK w/ auton dorsal root
Caghills' reflex based on idea that m. segments in reflexes from active contraction
but there are no cases yet where any active contraction caused apparent
— only stretch of those f.m.s.

Have they looked for all pulses & paired & got them? — Denby
Caghills reflect on activities of reflexes. [Golgii prep. picks out only a few cells & leaves all others
unstained!]

Caghills' observation support the
field theory of development - within etc. as much as
the neural system & memory.

The individualization here is merely a matter of nerve
tracts being laid down - no peripheral factor.

Richter has shown that
apparent mechanism between
limb & limb must arise in muscle.

Rod et al found that
has m. fibers spread out singly m.
m.

S. single axon here in digit region
& find that chromatid reunits with
the diameter. - so
same nerve m. differ chromatid values.
Chromence is still good measurement of tissue excitability.

Krebs thinks there is too much variation in trying to compare the physiological and anatomical stages (Karni in)

I gray centers grow in limb segments w. growth of leg

white material increases & mobility increases

Gal. = a better man. Coghil vs. Delforte that incriminating fibers cause proliferation.

no control between intracranial arterial afferent fibers and gray centers & white substance on ventral side.

5/16

A. marus his galls about discreetly

mass = specific

could make exact 1 line of date up c m o w. d the whole embryo another point

child must have been some man to lead so many men

at 1st impulse spread all over everywhere there are communications then how does inhibition of extraneous pathways occur?

Padpole's legs are not moved w. trunk motor. even tho' they are innervated.

at 1st a limb m is innervated by collaterals of trunk motor fibers. later he own motor fibers in limb centers.

why does limb become dissociated degenerat?

Angulo - says inhibition maybe. but 1 of course homologous response answers. r. says collaterals are still there if not.

single neuron innervates whole myotome at 1st

Nodulose R. in mediocr

gin will work a name + organization and will attract attention, workers, critics etc.
Embryonic Bird
Kuo + Windle

Kuo put needle on egg membranes w/ makes in transparent chick.
3rd day - head moves lifting
& lifting disappeared & got head turning.
 Twisted trunk
 Jerking & wriggling meat.
 Front limbs w/ trunk at 1st
 Hind limbs.

Rotation on table increased movement.
Temp. S.
Kuo + Coghills at 1st in interpretation.


Pain reflexes came in all coordinated.


Can't find any neural correlates.

Windle + Cbr - can't explain spontaneous unilaterally.
Po - not sure they're neurogenic.

Found motor n.s. before sensory.
Muscle is capable of contraction before Po & neural impulses.
Neuro said inhibited chicken couldn't arrest as well later on—definitely for learning in egg, not such good winner.

Mutt of adrenalin niceties exists in chick after 8 days. Metabolism processes work up to liminal state and then discharges—nerve cells—e.g., rate of respiration.

Myogenic—(slower) have no latency, no fatigue period

They don't know whether exists early are myo or neuro-

Frey on toadfish

Endogenous—endogenous

Conclusively Motor—endogenous delayed, more prone to these, etc., than move about w. in shells.

Spontaneous motor precedes so—But there's no evidence of neural correlates to explain em.

Consider all Caghill's "massive activity" as being myogenic?

Seidel says endogenous m. does not follow all or none law. and there's no A.C. connected with it.

Then suddenly the whole m. goes off—two mechanisms in a m. (certain)

the conducting and contracting mechanisms

The action of curves is still not completely understood.

Caghill

Foetal moves in mammals

Neural correlates—walking purely spinal in foetal cats—
decerebrated. Monkeys in early foetal, purely spinal.

Frog spawn—e.g., Angulo rats showed myelination doesn't have to precede behavior.

Motor cells before move.

Progressive segregation of motor cells correlated w. behavior?

And the role of signaling in the cells?

Ventral & other sensory structures present before motor patterns correlated caused this behavior—
Coincidence of death of adrenals & movements carpus. Recently yost showed acetylcholine enters air when motility appears. Possible that adrenalins comes in at time when motility appears. Ca absorbed from thiek shell when calcification of plane occurs.

Cochrane's opponum work. Observes lack of parabiosis 4 days. Certain neural tracts days appear at 1st later specific. None hind legs after being pushed 7 days.

Sensory correlates appear with 1st reflexes.

What about spontaneous motorels.

Differ win a letter as to onset of motility.

No connection between sensory & motor cells. At 1st when reflexes appear, get connections. 

Note that association tracts are laid down last in all cases.

5 mm do. cord reflexes precede massive motor 1st. Unilateral motor 1st precede contralateral.

The simple one-segment reflex pathways are formed 1st. How get these spontaneous motorels?

No spontaneous R's before appearance of reflexes.

Anoesthetics

Very anoesthetics & asphyxiated his animals--so supports Coghlan patterns.

Calvini's work on spontaneous motor.

doesn't support cephalo-caudal appearance of motor

Intense & give reflexes, light give massive

24 days gestation in rats

Anoesthetics 3rd lateral flexion of head on S. = 1st motor.

Motor when un injected cord cut--nerve or what?

Mile reflexes before trunk motor.
can get prove

2nd.

And "Caghillean" this and that—trying to bring another

mis-namer into the literature.

Windle vs. Caghill & Angulo.

Maybe strong S. will elicit a simple reaction before any

light's give reaction at all.

Human portal mort

2nd brain anatomist

Winkler. Diet., 6 Police. Nooker at Uni. of Pittsburgh for

making pictures. Cerebrum operations under anaesthetics.

1st month. Mere cut head

2nd.

3rd month. Trunk mort.

3rd month. Neck rotation

8-10 weeks

End 3rd month. Generalized morto.

11th week. Patellar reflex.

Removal of brain intensified the reflexes.

5th mo. - Grappling reflex strong enough to hold object.

6th. Stepping reflexes.

Rabinski reflex.

5th & 6th. S of cortex gives no P.


So paretic = still spinal.

6th. Definite sucking reflex.

Can elicit sound.

7th. S of cortex no P.

Medulla. R. of limb morts.
Brain waves start a bit after child is 5-6 mos. old.

**Summary:**

Spontaneous activity is never localized - is general.

W. Localized reflexes & spontaneous patterns separate processes.

Two distinct processes developing separately - the reflexes & the generalized spontaneous.

W. For an order in the n. rep. vs. connective system.

V. Note on surr. nerve mats.

Vagus to limbs - stroke skin - vomiting
few m.s. get releasing, move leg to cough

4th type of fiber in frog which Ri is dark.

Ret a single axon of frog optic nerve & it usually Ri is to one wavelength.

Spontaneous rhythmic discharges from photic respiratory
Compounds get important ward in place sentence structure.

the liquid wh. dissolves the substance.

the charge flowing thru the conductor.
separable prefix like et, en


- behemen & bloom
- entblühlen to burst into bloom

left very at

axe
denken to think
entdenken to think out

bedenken - to consider

beis (beid) around

beisehmen, cut around, has intensive or broken back severely,

make an intransitive verb transitive.

entgegen - repay
entblühlen - to burst into bloom vicariously
entfallen - to fall asleep
enthaften - to shed
entblättern - to deprive of leaves.
entwürmen - to take away

enough push away

entwurden - went away look to begin or end.

entblühen - fade

entschwinden - to vanish

entwirren - to untangle

entblättern - to undress

entwürmen - to make

entwürfen - to dream

entwirren - to disentangle

entwirren - to knead

entblättern - to tear

entwürfen - to build

entwürmen - to break

sententen - to shatter
Entfesselung = undress, release
vermißt = miss, regret
entfalten = to unfold
berühren = to touch, be contiguous
Kapitel = chapter
Behandlung = handling, treatment
mittragen = to bear
Kartlästigkeit = abstinence
besonders = peculiar, particular
mitande = able
nachweisen = detect, prove

(Zit. aus Orthopenie. Chirurgie 1. Bd. Laber)
dauer = to hold out, stand, keep
vollständig = complete, whole, entire
evident = capable of an explanation
ungleichheit = opposition, contrast
werterhebung = worthy, arrangement
innerhalb = within
darstellen = to present, appear
mehrheitiger = various, diverse
beschränkungen = restriction, reservation
bedingungen = condition, stipulating
dreh = the, common
umständen = conditions, circumstances
sofern = complete
vorschlag = proposal
verwendung = application
kraftspenden = skilled administration
erweise = prove, demonstrate
stillschweigen = still, tacitly implying
ansetz = supposition
feststellung = confirmation
beliebigem = desired
fall = failure
anzstreben = strive against
schaffung = creation, founding, provision
wutkraft = raging force
gejdette = accomplish
künstlerisches = art of pasturing
bildnerische = part appearance, painting
Hinweis = hint, arrest
Aufstellung = disposition, assertion
Lötze = thesis, project
Lachlen = Van de Velde
Quar = indeed, certainly
Anspruchlich = scarce, permitting, original
Ver APPROX = except, some, sphere
Mass = measure, moderation
Gräd = grade
Abtropfung = break up, gradation
gefordert = promote, advance
ZK = the
Schiede = separation, division
Verschiebung = displacement
erneue = to weigh, ponder, consider
Erperform = accomplish, fill, perform
Abgabe = problem
Verbum = error
Ermöglichen = possibility, feasibility
Reparation = repair, mend, heal
Verantworten = set going, temper, move
antreffen = to light upon
(Hin)zurück = apparent, toward
Bemittelkeit = mobility, bequest, skill
entstehen = to begin, originate
ändern = to D
Mitteilungen = communication
aktrionsfähig = action-capable
auf Fassung - to collect comprehens
Verfahren - to act, behave, proceed.
einheitlich - uniform, unitary.
reichaften - to produce, create.
Gerechtigkeits - lawfulness.
gemeinsam - common, mutual.
Mitarbeitenden - to organize as a whole, submit.
gehoben - beyond, appertain to.
zuweihen - to unite for a common cause.
Gesunden - to recover one’s health.
besonders - particular, peculiar, separate.
Abschätzung - estimation.
geschädigt - hurt, injured.
usw. = und anders
erwähnen - to mention, call notice to.
weg - fallen - to suppress, be omitted.
zwecken - unite in common cause.
gedeihen - to increase, prosper, succeed.
begegnen - to favor, befriend.
empfindlich - in regard to, as to.
Kraft - force, power.
Rufkampf - return.
zu - indeed, of course, certainly.
ersetzen - to replace, compensate.
Ersatz - compensation.
bedürfen - to be in need of.
Einbruch - catching, seizure.
Verlust - loss, damage.
geltend machen - assert.
Neuropsychology UJCO 1938

Weiss

Dates, Ref. Comments, German Vocabulary & Translation