Physiology of learning
R.S. hashley - 1942 - Harvard
Hilgard & Marquis - Caudal nerve: study of clue.
Psych. of Learning - Caudal theory 4/14.
"Human," McGeoch.

Association - what elements are associated
Contiguity - behavior
Similarity - gesture

Invertebrate organisms.
Kuo & Watson in Amer. painted.
Kuo backtracking a bit now admits may be.

Its nature - man as well as animals.

Invertebrate patterns unequivocal in lower forms.
Species of spiders & their webs - all insects -
Birds - pets.

Mammals - mating, nursing, etc.

rab: mating - bir, Steinach, etc., & Breed.
(birds retrieve, sound object, any color, have to)
be right texture as well as sound.

Isolation & lack of prey doesn't affect Rab.

Elimination of sense organs cannot go on
indef. as long as one or so is left.

Hedgehogs & guinea pig w. half extirpated.
Extra shots of hormone reduces particularly of 5 which is adequate. up to 15 days.

Retrieving - cotton made no strengthening drive & decrease. stuffed skin - yes put extract or replace very young babies for old babies. 3rd, 4th, & off & others sense modalities can be eliminated but not all.

Motivation - endocrine effects secretions do activate these performances.

made of action ??

cause growth of special PM connections. (speed rules out growth processes)

modifications of protoplasm endings, or widespread.

1) Wall's evacuation theory. - distention of mass or other glands - no cause.

occurs when most of glands removed.

Kempf - internal secretions effects sense organs of autonomic system effects a general increase in activity.

2) Hormones act directly on C.N.S. to bring out sex libido 1938 46:46 Psych Rev.
Rats reared 100 days in dark are able to judge distance for jumping -- innate organization. Some for pattern vision.

Inmate organization thus won't moving & building up avoid error.

Elements arranged in geometric patterns are more readily recognized & remembered.

Geometrical figures but not cause of mysterious intrinsic mathematical properties but case of R. to these objects.

Inmate organization of patterns?

Fill in homologous fields & simple figures in hemianopia & centrales.

Fortification figures in reinstituting centrales.

(Spontaneous discharge of cortex organized so)

Living in Einstein world seeing it as Euclidean? Is logic logical or experiential?
Neurology of this innate organization.

Terminally precise in growth of connections needed on connection basis. Kappers' biotaxis growth at rt is guided by electrical potentials.

No exp'tl evidence to support it. Arranged in retinal & tactile systems of the ref.

Arranged by mechanics of growth in cord.

Some of innate organs in early anomalous variations of C.N.S. connections.

Number of cases in retina found different - enlarged tracts, etc. Evidence rather opposed definite precise connections.

Other view = interaction of masses of cells algebraic summation. Laws of irradiation of excitations thru homogenous cortical tissue.
Growth process itself, establishes organized patterns in NS. Anatomical variations, however, preclude any precise cell-to-cell connection.

Variability of adequate $S$ shows simple cell connections won't work.

Neurological pathways involved in association
Peripheral n.s. precise & isolated.
Vision - cell-to-cell projection
Double hemisection of cord in rat - leaves equal to pinch, turning of head to correct side, later after shock disappears, get same motor patterns - the all long tracts are severed. above forelimb level. Rats are pretty clumsy, no indication same descent of cord's patterns thru cord?

In left arm get same denote, w. just a thread of long tracts left, but not when all cut.

Decorticated conditioning - "use attenuated galv.
Pretty clear get conc. in decorticate dogs
Birden, Culler, Weil, & Wellers.

Bird lacks cortex except hippocampal lobes & basal ganglia - w. these cut can be conditioned
Chickens can learn after forebrain removal to choose different colored grains.

No evidence of any specific "learning center" in the cortex.

Localized functions — except when

Lesions made in infancy. Brightness habits are abolished but can be rehearsed at a normal rate. Additional lesions to sup. collicus, nuclei, and subcortical habits. (really sub-thalamic)

Capacity for visual brightness habits — equivalent in sup. collicus and striate area. Large lesions elsewhere don't affect the retinal discrimination.

Striate lesions in monkeys make in look blind until they are taken into a dark room with one or two bright lights. Man may also be totally blind as claimed but

? = still controversial.
get myelograms made in animals w. strict area removed.

Hearing
Clips head & localized by rat w. lesions in auditory area.

Somatic - little known

Obstruction - appears to be sub-cortical or equivalent.
Motor areas - no C.R. after motor areas removed.

Slightly got retention in monkeys, however.

Get remeory of paralysis if only area 4 is destroyed but that if area 6 + 4 destroyed.

Maze habits - general effect of lesions needing mass of cortex destroyed.
Hatch box,measuring (maier) x brightness (vis.
visual area)

Possible explanations
1. Shock, ruled out by time factor
2. Invasion of a critical area - the hippocata
field in the visual area. This doesn't hold in
maze learning. However

3. Multi-sense primates -- e.g., tent rule
this out as sole factor. Destruction of visual
area effects a habit learned by blind animal.
Visual cortex has same other function besides
visual discrim in maze learning.

4. Larger lesion interferes w. transcortical
associative areas. Knife cuts vs. mass lesion
(knife cuts hit projection tracts)
Perfect retention after cuts that separate
any projection area from any other.

5. Non-sensory function of sensory areas.
Notion of mass lesion based on above
reasoning.

Function correlated w. most of time
what it means = ?

Diff'rt parts of cortex exert mutual facilitation
on near by parts, but large lesion outside
visual area does not affect visual habit
also non-effect of cutting transcortical
tracts = M. ndf. facilitation effect.
"Vicarious functioning" - a habit destroyed by lesion - another part can take over. Seems now that that sort of thing does not actually occur. If whole/all mechanisms concerned are destroyed, no other part can take over. (striate + sup. cal.) (area 6 + area 4) but if remove only part get recovery. So have so-called vicarious function only win specific systems. (true, ruber + motor area) in efct. What takes over is another part that always was concerned w/ this type of function.

"Equipotentiality" - 1st that whole cortex, but that obvious not so. Perhaps win function centers, but? here. Status now says yes win a given area of cortex. The new sensory function of sensory areas = equipot. in diff areas.

37,000 cells from lb. genic to cortex in rat. can still differentiate when only 500 cells of binocular field. Temporal constr. yea
Any small part of the visual cortex can work on or for pattern vision. = equivalent. [in same sense that different parts of retina = so.]

**Memory Disturbances - Clinical**

Difficult between loss of memory & understanding pretty well broken down now - get both.

Never a loss of a specific group of memories due to lesions (i.e., hystherical losses). + no primary motor or sensory center lesion) lesions cause loss of mass of organization.

Aphasia - don't get loss of associated group of words (not localized memory traces) but of general types of abilities - associate names, objects, getting words out. Loss in ability to think certain types of relationships. Not destruction of traces but of organizing mechanisms.

1) No loss specific memory
2) Disturbance of categories of thought process
3) Deterioration in new learning
4) Accompanying (3) once a habit is formed it is less stable - forgotten more easily
(ij trace bands, expect them to last as long in remaining tissue)

5) Dynamic loss thresholds - doesn't function until reinforced thru some intermediate memory devices. Under excitement, normal total aphasia talk fluently under fever, otherwise dumb. Do silence, sing hymns. Patterns there, threshold raised.

6) Definite localization, localization of functions the site too precise. Exception ar

(rhinal, angular gyrus - Broca's area motor speech)

Angular gyrus - Rhin's Inferior region in temporal lobe.)

Possibility of restitution of function

Vicarious function held only in last war but much less hopeful now.

Hospitalization discourages depression.

Reduction of this 'cared for' state.
Lesions in primary motor & sensory area = pretty permanent, chance of recovery = about nil.

In Francis's case an amputee - a considerable amount of motor cortex was left intact (much w. arms tied up, used other arm firmly).

Severe & in internal capsule = much disturbance showed very gradual recovery from person.

Outlook = much better for children than adults for restitution. Pretty complete recovery in infant monkeys.

Complementary growth & regeneration = improbable.

Can usually retrain any specific performance but get no recovery of generalized performance abilities.
Memory Breverse: (Wattie in German)

1. Growth of cells - connections, etc.
   Neurofibrillar substance (conductive substance).
   Cells that die during growth tend to deteriorate.
   Removal of eye = example. Lat genes & cortex with loss of cells, but in appearance.

2. Growth of connections
   Cell processes
   Glia growth (Cajal) expansion, retraction.
   Kappers (on neuroblastosis) J.C.N. '87
   Electric field causes connections to form.

Growth theories demand repetition, but learning w.r. single experience (tho. single event may last subsequencially).

3. Chemical activities in cell. Peterhaut '05
   Robertson - reversible chemical process.

Learning curve.
Matthews - Org. Chem., etc. Chile

Herrington: Not to be in his writings to learning - just impressed attributed to him. He talks of the of synapses determining the site, but,

McDermott: neritic pressure = drainage of water in pipe system.

Max Meyer: intercurrent pathways not functional are supplied by suction; etc. drainage.

Johnson's drainage theory.

It's been by electrical potential.

Fail to account for one-way assay, which is character of much leaning.

5. Specific sensitization

In learning & allergies

Hering: Cells simultaneously excited. Tend to develop chemicals which form interrelating chemicals.

Weiss: Specificities doesn't fit data on electrical currents.
Jager Koch’s *Physiology of Brain*

All theories based on assumption that 1 is one of particular synapses or between particular cells. Writethink across quickly.

Thing which learned is generalized — sensory motor.

1. Sensory equivalence — one eye to other, figure falls on right part of retina.
2. Motor equivalence — monkey right left halves on birthday boys. I bucked out cortex of left so monkey used trained right.

Don’t learn specific muscle coordination but pattern in relation to axis — practice of body.

3. C.N. equipotentiality.

4. Retroactive inhibition. Learning habit of a type tend to stack out other habits by same type the canoe is not identical.
Alterations of memory traces in course of time. Patterns distorted toward more familiar objects and toward greater symmetry. Trace = everywhere, nowhere, anywhere.
Attempts to be more definite.

1) Neural reverberation.

Miss Smith's ok on memory 10-15 per cent.
Continuous activity in consciousness which affects by every epoche. Total past experience of individual in every act.

Eberle's idea

2) Analogy vs. chemical gradients. 
   90% diffusion and mass.
   Nothing 'dyne' Dynamic Punkt. Isomorphism applies in C.N. yet spatial characters of formulation.

3) Radiation idea - wave analogy. 
   Trace must be reproduced throughout large areas of cortex. Must be replicated in the system.
   Cortex is essentially a network, any display into it results in radiation potential waves.
Get standing waves from a pattern w. interference points of inhibition & reinforcement.

Implausible

CNS doesn't transmit waves like a liquid so patterns of reverberatory circuits instead of wave reinforcements of migraine headaches.

Hence to consider equivalence on either side also. (Must in relation to axes of body)

Conditioning not a prototype of all learning.

Difficulties in extending dk. to include all.

Dekalb: an alternative theory of learning vs. associationism. 

Wheeler identify learning w. structuring

Memories are plastic, dynamic, undergo s, some laws apply to organization of memories

Very importance of repetition in fixing memory.
Definite time limits in some instances illusion of seeing complicated patterns.

Lateral list denial of association of individual items. Really just presenting a problem and not the solution of it. roster is about only one who sees need for physiological interpretation.

Inanimate organization coherence closure, etc. perhaps logical relation to ideas.

In animate organization for language, any child cannot learn any language as easily as any other. But once they learn language, get grammar, organization, which serves as background. What learned is not so much single word, as the flow of the language. (The posture)

Laws of learning is there one law for prediction of learning.

Continuity
Repetition, practice (w. a purpose)
Law of effect
Structure, logicality, etc.
Primary, Recency, Intensity.

Continuity recognized by all. Similarly

repetition may make other than strengthening and

Factors contributing to fixation of habits and memory

Cells of C.N.S. are firing all the time - conscious
in behavior only when excess impulses delivered.
Pattern of relations to each other in firing, the
continuation, keeps changing. Effects of various
are superimposed upon the basic activity

All this determined in terms of space
coordinates - factors

A 'set' enforces further direction of activity and throws
a whole field of associated C's into readiness for
functioning.
When a self taken, the activities which come out are contaminated by what I came (pretension).
Whole sentences formulated at sub-threshold level before starting.

Freudians start at wrong end by assuming that it is only in dreams these mid-line codes.
"Warming up" in extemp. lectures or a conversation.
Words + associations + organization gradually begin to come back.

At same time might out extraneous associations. A given item may call up entirely different associations depending on set.

Refrain chain associations - a three scheme by which whole system of organization is activated at once.

Set consists of a sub-threshold excitation of a whole series of activities.
Implicit temporal organization of a sequence before it comes out.
Organization of language - of music

Having rhythm tied things together when a state started seems to spread thru system and take care of phasic reaction going on. A basic pattern modifying what is superimposed upon it.

Verb - merit, direction in space coordinates

Noun - setting gives it relatives to space & time generalization into a category which relates it into a sound system

Schema of reinforcement which set as a mold, determine order (as set)

Problem of attention & hydrogen twitch region. Certain active center represents activity around bar of limit type of activity in that region.
Pain of Consciousness in Learning

Learning once considered a feature of consciousness

instances of learning want awareness

voluntary acts, purely as parts of unconscious cues that cannot be separated

"tics," typing errors,

Philosophers emphasize consciousness in spanning time in a way which physical events do not.

Continuity not only simultaneous - but together in attention, something more than mere continuity. More coherent - the better, more structure, the better. Repetition apparently doesn't help in itself, does not strengthen habits.

Law of Effect: Meaner, stronger present proposant.

Based in w. animal studies

Phrenology supports it.

Distinction between the association and the fixing of the association. Many associations are made, few fixed.
Rats recall where food located for 45 hrs after finding it once - by familiar ol. + acoust. 
- delayed reaction. The approach, transition, and many other things learned in habit formation 
besides the "habit" concentrated on.

Properties R's of Hylaena & Discophila: 
Reverse from positive to negative under various 
conditions. Same in higher forms & in man, 
according to physiological state predominant.

Motivation

for evacuation of distended viscera
- filling up by empty stomach
- general activity till release of
  tension - been over-generalized.

Rats cut off contractile part of stomach & got hunger, feel the same, but fullness causes
inhibition as before.

Morgan denervated stomach and got
effects on hunger by changing sugar level,
believing central effect. Like repair. 
Hunger centers have to be started by pumpin
First - central dehydration as in hunger

Drive - endocrine effects on all reproductive activities. Excitement reinforces the build-up, catalyzing

Manner of use of conception of energy. Activation

Nervous system. Diseases of organs, hormones

Common idea of drives from them. Daily mutual facilitation of various systems reinforcing or canceling

Knowing nothing really what "drive" is.

Law of Effect - too relaxation or want to learn in incidentally learning. Animal case.

Continuity in field of attention

Motivation. Relaxation of the fixing agents

Them phylum, but increase association habits of continuity in field of attention.

Doesn't see how D of tension can act as a fixing agent.
Gestalt System & Learning  R. E. Koffka

Assume every sin leaves a trace of some sort - chemical.

No suggestion of problem of serial order.

They didn't translate its de spatial order into motor sequences.

Traces all organized in gestalten - deny the linkage of elements.

Trace persists by virtue of its organization.

Traces interact w. each other & w. simultaneous excitations.

Trace or process differ located.

A description of the behavior of memory traces - but not a theory of what the tracks are.


Amnesia & other conditions get visual. pp 170 - OK, but it is not remembered any time.
Dr. Mauer - an error of insight.

The T. that remains annoying situation, the S that produced it, has important influence.

A purely verbal system.

Is there simultaneous occurrence of excitation in field of attention?

[Never learn any new basic reactions. They can all be performed first - they have to be performed first before they are learned. Learning consists of adjusting the background set & organizing it as S appears & get new output. So traces cannot be specific.]

Visual after images may reappear spontaneously up to 48 hrs after experience.