NEUROSCIENCES CONTRIBUTION TO PSYCHIATRY

LEVEL

OBJECTIVES

- DEFINE NEUROSCIENCES
- OUTLINE THE ROLE OF NEUROSCIENCES IN

1. AETIOLOGY(PATHOGENESIS)
2. DIAGNOSIS
3. TREATMENT OF MENTAL DISORDERS

DEFINE NEUROSCIENCES

- IT IS STUDY OF NEURONS(NERVE CELLS)
- THEIR EMBROLOGY
- STRUCTURE
- THE VARIOUS TYPES OF NERVE CELLS
- AND HOW THEY FUNCTION THROUGH
  - Nerve conduction
  - Chemical conduction
  - Role of receptors

- MANIFESTATIONS OF DEFICITS IN THE ABOVE FUNCTIONS WHICH MAY PRESENT AS NEUROPHSYCHIATRIC DISODERS,

NEUROSCIENCES-SUMMARY

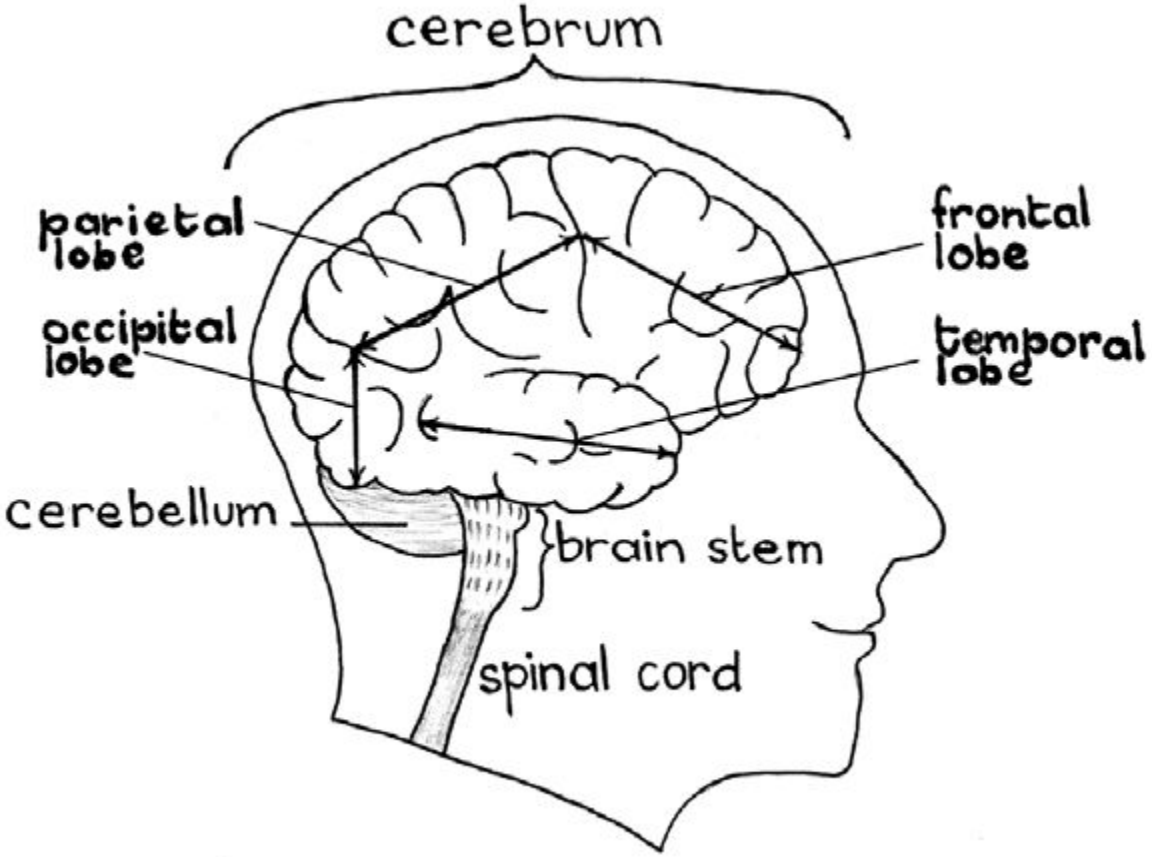
- IT IS THE FIELD OF STUDY ENCOMPASSING THE VARIOUS SCIENTIFIC DISCIPLINES DEALING WITH
- THE STRUCTURE,
- DEVELOPMENT,
- FUNCTION,
- CHEMISTRY/PHYSIOLOGY,
- PHARMACOLOGY,
- AND PATHOLOGY OF THE NERVOUS SYSTEM.
-

CNS STRUCTURES

- *CNS STRUCTURES AT THREE LEVELS*:

1. THE BRAIN (MACROSCOPIC)
2. NEURON AND SYNAPSE (MICROSCOPIC)
3. RELEASED CHEMICALS AND MEDICATIONS (SUB-MICROSCOPIC).

THE RIGHT SIDE OF THE HUMAN BRAIN (MACROSCOPIC)



KEY TO (MACROSCOPIC) BRAIN STRUCTURES.

- CC, THE CORPUS CALLOSUM, THE BRIDGE WHICH CONNECTS THE TWO HEMISPHERES.
- T, THALAMUS. THE THALAMUS IS SURROUNDED BY OTHER BRAIN TISSUE
- C,CEREBELLUM.
- BS, BRAIN STEM.
- H, HYPOTHALAMUS.
- P, PITUITARY

PROTECTIVE MECHANISMS OF BRAIN

1. BRAIN IS ENCLOSED IN THE HARD BONE CASE (THE SKULL)
2. IT IS WRAPPED IN THREE SPECIAL LAYERS OF SOFT TISSUE(MENIGES).
3. IT FLOATS IN A FLUID, CALLED THE CEREBROSPINAL FLUID (CSF),
4. IS NOT IN IMMEDIATE CONTACT WITH BLOOD. IT IS SHIELDED BY A SPECIAL ARRANGEMENT OF CELLS IN THE WALLS OF THE BRAIN BLOOD VESSELS. THIS ARRANGEMENT, CALLED THE BLOOD BRAIN BARRIER (BBB),
5. IT PROTECTS THE BRAIN FROM INFECTION BY ORGANISMS AND FROM SOME CHEMICALS AND DRUGS

FUNCTIONS OF THE BRAIN

- THE BRAIN IS COMPOSED OF 25 BILLION NERVE CELLS (NEURONS) AND EACH IS CONNECTED TO UP TO1000 OTHERS.
- HAS A VAST ARRAY OF BRAIN CIRCUITS
- THE BRAIN CO-ORDINATES THE RESPONSES OF THE NERVOUS, THE ENDOCRINE AND THE IMMUNE SYSTEMS.

EMBROLOGY OF CNS

1. BRAIN AND SPINAL CORD DEVELOP FROM A HOLLOW TUBE OF CELLS (CALLED THE NEURAL TUBE)
2. THE LARGEST BRAIN STRUCTURE IS THE (CEREBRUM)
3. CEREBRUM HAS LEFT AND RIGHT CEREBRAL HEMISPHERES
4. HEMISPHERES ARE JOINED BY A THICK BRIDGE OF WHITE MATTER (THE CORPUS CALLOSUM)
5. HEMISPHERES ARE DIVIDED INTO A SERIES OF LOBES:

EMBROLOGY OF CNS 2

(OUTSIDE STRUCTURES)

I. FRONTAL LOBE
II. PARIETAL LOBE
III. OCCIPITAL LOBE
IV. TEMPORAL LOBE

(INTERNAL STRUCTURES).

I. THE INSULA
II. LIMBIC LOBES

CEREBRAL CORTEX (“GREY MATTER)

- OUTER 2-5mm. OF THE CEREBRAL HEMISPHERES CONTAINS
- NEURONS
- CELL BODIES (GREY MATTER)
- THE AXON (WHITE FATTY INSULATION MYELIN SHEATH)
- THE NEURONS ARE HELD IN PLACE BY SPECIALIZED (GLIAL)CELLS
- CONNECTIONS BETWEEN CELLS ARE THROUGH GAPS CALLED SYNAPSES

STRUCTURES WITHIN HEMISPHERES

WITHIN EACH CEREBRAL ARE IMPORTANT STRUCTURES

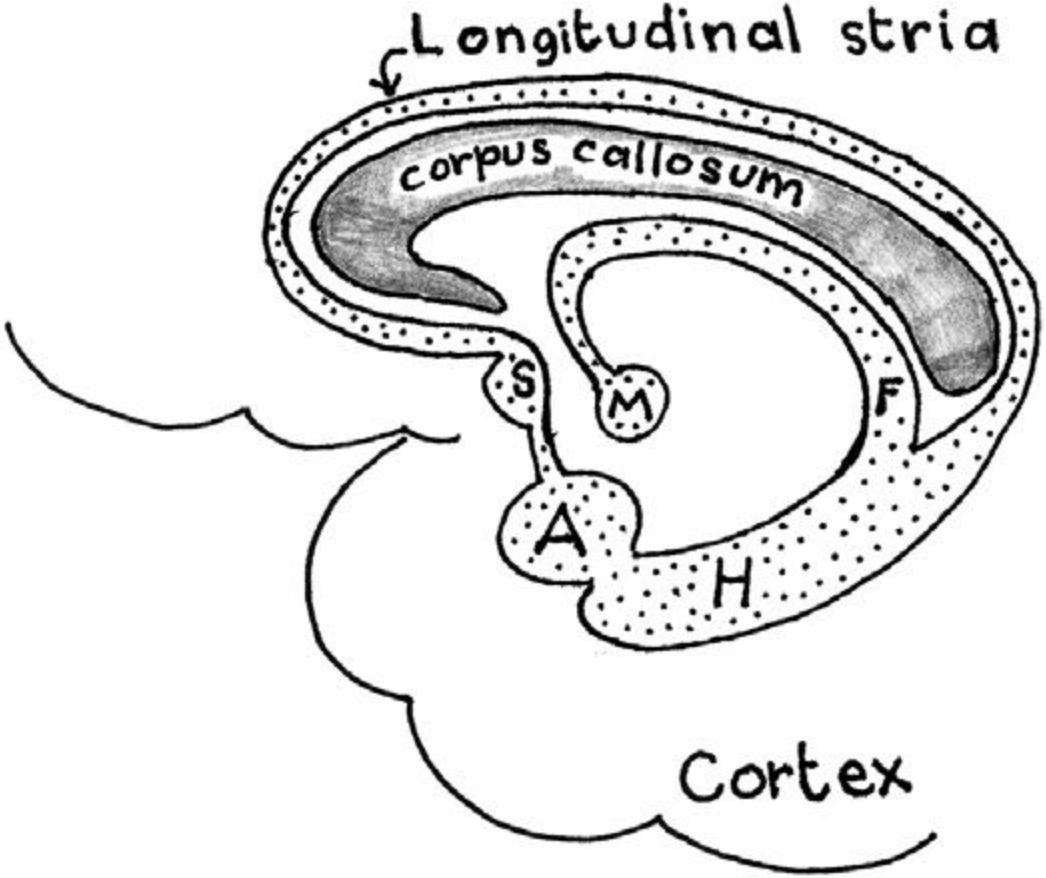
1. THE VENTRICLES,
2. THE LIMBIC SYSTEM,
3. THE BASAL GANGLIA
4. THE THALAMUS

THE LIMBIC SYSTEM

- IS A CIRCUIT OF NEURONS LOCATED CLOSE TO THE MIDLINE ON BOTH SIDES OF THE BRAIN.

KEY TO FIGURE IN THE NEXT SLIDE

- A, AMYGDALA.
- H, HIPPOCAMPUS.
- F, FORNIX.
- M, MAMILLARY BODY.
- S SEPTAL NUCLEUS.


Longitudinal stria
corpus callosum
S
M
F
A
H
Cortex

THE LIMBIC SYSTEM

CENTRAL ROLE IN

1. EMOTION
2. APPETITE
3. MEMORY

DEFICITS IN THESE STRUCTURES UNDERPIN A NUMBER OF MENTAL DISORDERS.eg.

(MOOD DISOREDES,DEMENTIA,MEMORY LOSS i.e. AMNESIA)

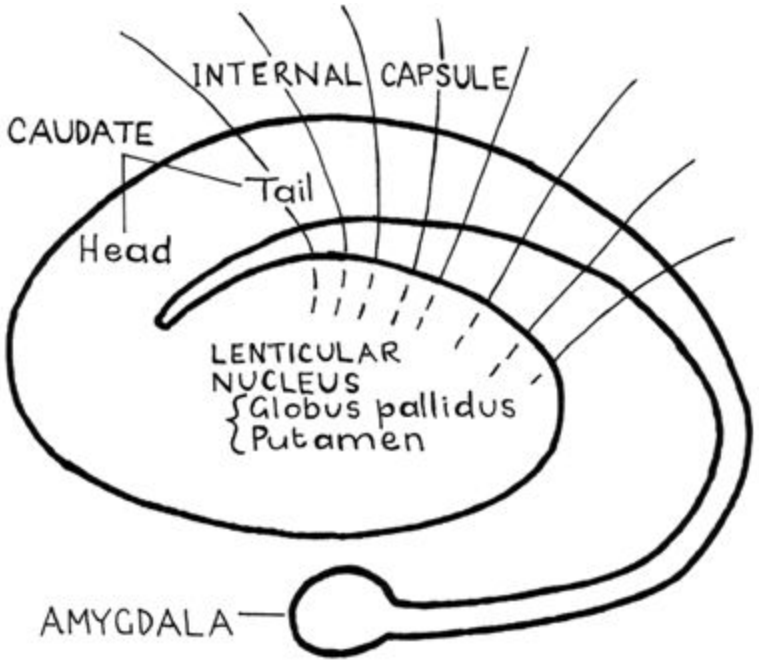
THE BASAL GANGLIA

- IS A PAIRED CONTINUOUS GREY MATTER STRUCTURE
- ONE IS LOCATED IN EACH HEMISPHERE.

ROLE IN

I. MOVEMENT
II. EMOTIONAL REGULATION.

DEFICITS ARE ASSOCIATED WITH NEUROPSYCHIATRIC DISORDERS


INTERNAL CAPSULE
CAUDATE
Tail
Head
LENTICULAR NUCLEUS
Globus pallidus
Putamen
AMYGDALA

THE THALAMUS

- IS TWO OVAL MASSES OF GREY MATTER (LIKE TWO HEN EGGS), ONE ON EITHER SIDE OF A NARROW ENVELOPE LIKE VENTRICLE WHICH IS SITUATED IN THE MIDLINE.
- THE THALAMUS SITS ON TOP OF A STEM STRUCTURE WHICH CONTINUES BELOW AS THE SPINAL CORD.
- THE THALAMUS IS THE MAJOR RELAY CENTRE FOR ALL SENSATIONS,EXCEPT SMELL

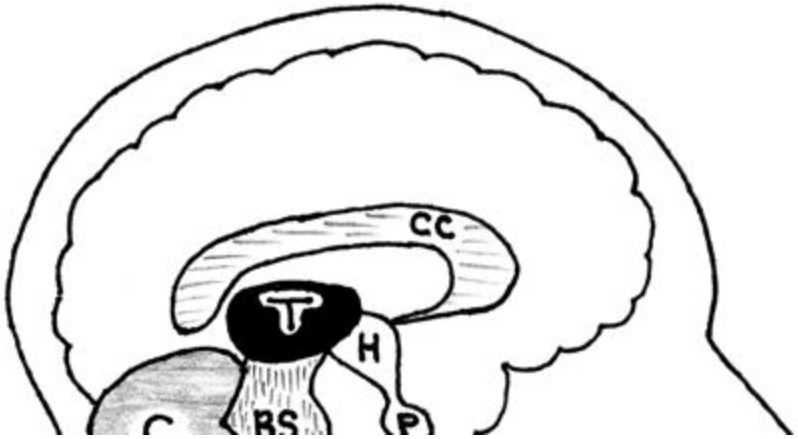
THE THALAMUS

- COMPOSED OF THREE PARTS:
- 1) THE CELL BODY,
- 2)NUMEROUS SHORT PROJECTIONS FROM THE CELL BODY CALLED DENDRITES,

AND

- 3) THE LONG THIN SPAGHETTI-LIKE PROJECTION FROM THE CELL BODY CALLED THE AXON.

DEEP STRUCTURES OF THE BRAIN



KEY TO DEEP STRUCTURES OF THE BRAIN

- CC, THE CORPUS CALLOSUM, THE BRIDGE WHICH CONNECTS THE TWO HEMISPHERES.
- T, THALAMUS. THE THALAMUS IS SURROUNDED BY OTHER BRAIN TISSUE
- C,CEREBELLUM.
- BS, BRAIN STEM.
- H, HYPOTHALAMUS.
- P, PITUITARY

THE BRAIN STEM

- SITS BELOW THE THALAMUS.
- IT EXTENDS WITH THE UPPER END OF THE SPINAL CORD.
- AXONS OF THE NEURONS PASS THROUGH THE BRAIN STEM CARRYING MESSAGES IN BOTH DIRECTIONS.

ACTIVATION TO KEEP THE BRAIN ALERT

- REGULATE THE HEART BEAT
- BREATHING AND BLOOD PRESSURE
- ENABLE REFLEXES SUCH AS SWALLOWING, SNEEZING, COUGHING AND BLINKING.

DEFECTS IN THE BRAIN STEM

- ARE INVOLVED IN A NUMBER OF MENTAL DISORDERS, INCLUDING PANIC DISORDER IN WHICH RAPID HEART RATE AND FEAR ARE IMPORTANT FEATURES.

THE HYPOTHALAMUS

- PROJECTS DOWN AND FORWARD FROM THE THALAMUS.
- IT IS COMPOSED OF CLUMPS OF GREY MATTER
- EXTENDS TO FORM THE PITUITARY GLAND.

MENTAL DISORDERS,

MOST HAVE FEATURES OF DISTURBANCE OF FOLLOWING FUNCTIONS

THE HYPOTHALAMUS 2

- *CONTROLS*

1. *ENDOCRINE SYSTEM*
2. THE AUTONOMIC NERVOUS SYSTEM,
3. RESPONSE TO STRESS,
4. FLUID BALANCE,
5. TEMPERATURE,
6. APPETITE,
7. SEXUAL BEHAVIOUR,
8. BLOOD PRESSURE
9. AND OTHER FUNCTIONS.

THE CEREBELLUM

- PROJECTS BACKWARDS FROM THE THALAMUS AND BRAIN STEM,
- IT IS IMPORTANT IN THE CO-ORDINATION OF MOVEMENTAND THINKING
- AND THAT DEFECTS IN CEREBELLAR FUNCTION ARE INVOLVED IN SCHIZOPHRENIA

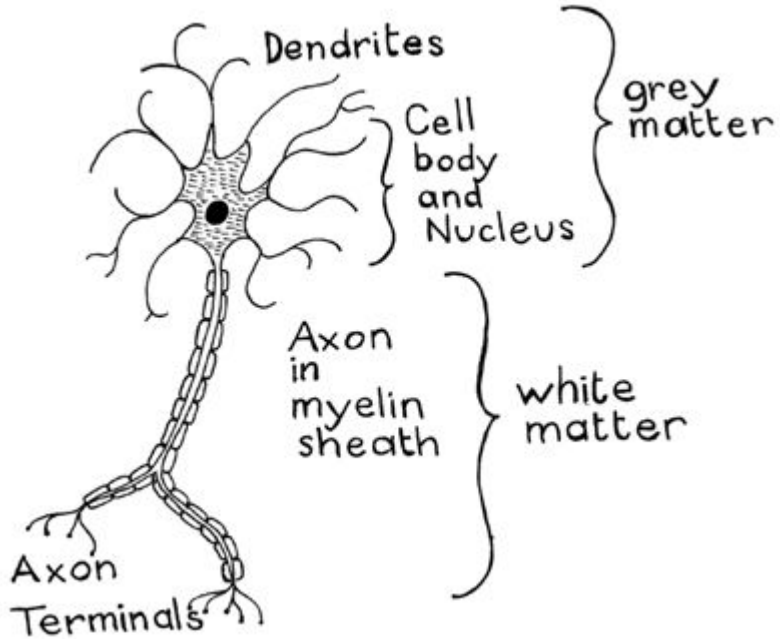
KEY

- CC, THE CORPUS CALLOSUM, THE BRIDGE WHICH CONNECTS THE TWO HEMISPHERES.
- T, THALAMUS. THE THALAMUS IS SURROUNDED BY OTHER BRAIN TISSUE
- C,CEREBELLUM.
- BS, BRAIN STEM.
- H, HYPOTHALAMUS.
- P, PITUITARY

NEURON

- COMPOSED OF:
- 1) THE CELL BODY, (which contains the genes)
- 2) NUMEROUS SHORT PROJECTIONS FROM THE CELL BODY CALLED DENDRITES(receive nerve impulses and conduct them toward the cell body)
- 3) THE LONG THIN SPAGHETTI-LIKE PROJECTION FROM THE CELL BODY CALLED THE AXON.(terminals, which form junctions, called synapses)

NEURON


Dendrites
Cell body and Nucleus
grey matter
Axon in myelin sheath
white matter
Axon Terminals

IMPULSE TRANSMISSION

- IN THE RESTING (NOT ACTIVELY TRANSMITTING) NEURON,
- THE MATERIAL INSIDE THE MEMBRANE (THE CYTOPLASM) IS NEGATIVELY CHARGED IN RELATION TO THE MATERIAL OUTSIDE THE MEMBRANE (EXTRACELLULAR FLUID).
- THIS IS THE RESULT OF THE SPECIAL POSITIONING OF CHARGED CHEMICALS (IONS).
- THERE IS A SLIGHT EXCESS OF NEGATIVE IONS INSIDE THE MEMBRANE AND A SLIGHT EXCESS OF POSITIVE IONS OUTSIDE THE MEMBRANE.

THE ENTIRE PROCESS OF DEPOLARIZATION

- WHEN THE STIMULUS APPLIED TO THE CELL MEMBRANE IS SUFFICIENTLY STRONG, THE POTENTIAL DIFFERENCE BETWEEN THE INSIDE AND OUTSIDE OF THE CELL IS REDUCED BELOW A THRESHOLD LEVEL.
- THIS CAUSES LOCAL ION CHANNELS TO OPEN, SODIUM IONS FLOW INTO THE CELL, AND THERE IS COMPLETE, TEMPORARY, LOSS OF CHARGE IMBALANCE ACROSS THE MEMBRANE.
- THESE CHANGES CAUSE SIMILAR CHANGES IN ADJACENT AREAS (CHAIN REACTION), AND BY THIS MECHANISM, AN ELECTRICAL IMPULSE PROGRESSES ALONG THE AXON.

REPOLARIZATION

- PROCESSES TO RESTORE THE CHARGE IMBALANCE ACROSS THE MEMBRANE
- TAKES LESS THAN ONE THOUSANDTH OF A SECOND.

THE SYNAPSE

- IS A CRITICAL COMPONENT OF THE NERVOUS SYSTEM
- IS THE FOCUS OF MOST CURRENT DRUG TREATMENTS OF MENTAL DISORDERS.
- THIS CONNECTION IS USUALLY BETWEEN A PROJECTION FROM THE END OF AN AXON TO THE BODY OR DENDRITES OF ANOTHER CELL
- MESSAGES PASS ALONG AXONS BY AN ELECTRICAL PROCESS,

ROLE OF SYNAPSE IN MENTAL DISORDERS

- CURRENT PHARMACOLOGICAL TREATMENT OF MENTAL DISORDERS RESTS ON OUR UNDERSTANDING OF THE
- EVENTS WHICH FOLLOW THE ARRIVAL OF AN ELECTRICAL IMPULSE AT THE AXON TERMINAL

PRE SYNAPSE

POST SYNAPSE

SYNAPSE IN ACTION(PRE)

1, A LOCAL NEUROTRANSMITTER FACTORY.
2, A NEUROTRANSMITTER STORAGE VESICLE.
3, AT THE ARRIVAL OF AN ELECTRICAL IMPULSE, A VESICLE FUSES WITH THE TERMINAL MEMBRANE AND NEUROTRANSMITTERS ARE RELEASED.
4, NEUROTRANSMITTERS IN THE SYNAPTIC GAP.
5, A NEUROTRANSMITTER APPROACHES A POSTSYNAPTIC RECEPTOR

SYNAPSE IN ACTION(POST)

6, NEUROTRANSMITTERS FITTING INTO RECEPTORS AND INITIATING AN ELECTRICAL IMPULSE IN THE POSTSYNAPTIC NEURON.
7, A NEUROTRANSMITTER MOVES TOWARD AN AUTO-RECEPTOR ON THE PRESYNAPTIC NEURON.
8, A NEUROTRANSMITTER FITS INTO AN AUTO-TRANSMITTER AND SLOWS THE FURTHER RELEASE OF NEUROTRANSMITTERS FROM THE PRESYNAPTIC NEURON.
9, OXIDASES (CHEMICALS LOCATED IN THE SYNAPTIC GAP) DESTROY NEUROTRANSMITTERS IN THE GAP.
10, A NEUROTRANSMITTER IS TAKEN BACK INTO THE PRESYNAPTIC NEURON THROUGH A REUPTAKE MECHANISM, TO BE STORED IN A VESICLE, READY FOR FUTURE REUSE.

NEUROTRANSMITTERS IMPORTANT IN MENTAL DISORDERS

- MONOAMINES
  - DOPAMINE
  - SEROTONIN
  - NOREPINEPHRINE
  - HISTAMINE
- AMINO ACIDS
  - GAMMA AMINO BUTYRIC ACID (GABA)
  - GLUTAMATE
- OTHERS
  - ACETYLCHOLINE
  - NITRIC OXIDE
  - ADENOSINE

NEUROTRANSMITTERS AND MENTAL DISORDERS

- INSUFFICIENT OR EXCESSIVE RELEASE OF ONE OR MORE SPECIFIC NEUROTRANSMITTERS.
- MEDICATIONS ARE DEVELOPED TO PERFORM PARTICULAR ACTIONS.
- THE ACTIONS OF MEDICATIONS INCLUDE INCREASING THE RELEASE OF NEUROTRANSMITTERS, ACTIVATING POSTSYNAPTIC OR AUTO-RECEPTORS (THAT IS, TO ACT LIKE NEUROTRANSMITTERS),
- BLOCKING POSTSYNAPTIC OR AUTO-RECEPTORS

The GABAergic system

1) GABA IS GENERATED IN THE PRESYNAPTIC NEURON – FROM GLUTAMATE – THROUGH THE ACTION OF GLUTAMIC ACID DECARBOXYLASE (GAD).

2) IT IS RELEASED INTO THE SYNAPTIC CLEFT, AND PASSES ACROSS TO ACTIVATE THE GABA A OR B RECEPTORS. ACTIVATION OF THE GABA A RECEPTOR (IONOTROPIC) RESULTS IN CHLORIDE ION (CL-) ENTERING THE CELL, WHICH CAUSESHYPERPOLARIZATION AND REDUCED EXCITABILITY.

3) A. GABA MAY BE TAKEN BACK INTO THE PRESYNAPTIC NEURON BY A GABA TRANSPORTER(GAT)

- B. GABA MAY TAKEN INTO GLIAL CELLS BY A GAT.

4) IN THE GLIAL CELL GABA IS CONVERTED, VIA KREB'S CYCLE, TO GLUTAMATE

5) THIS GLUTAMATE IS CONVERTED TO GLUTAMINE

6) THIS GLUTAMINE THEN PASSES INTO THE PRESYNAPTIC NEURON

7) WHERE IT IS CONVERTED BACK INTO GLUTAMATE

THE GLUTAMATERGIC SYSTEM

- GLUTAMATE IS THE MOST ABUNDANT EXCITATORY NEUROTRANSMITTER IN THE BRAIN.
- EVIDENCE SUGGESTS THE GLUTAMATERGIC SYSTEM MAY PLAY A ROLE IN MENTAL DISORDER,
- AND RECENTLY, DRUGS ACTING ON GLUTAMATE RECEPTORS HAVE PRODUCED RAPID AND DRAMATIC BENEFICIAL EFFECTS FOR INDIVIDUALS WITH TREATMENT RESISTANT MOOD DISORDER

THE GLUTAMATERGIC SYSTEM

- GLUTAMATE IS RELEASED INTO THE SYNAPTIC CLEFT AND MAY ACTIVATE VARIOUS RECEPTORS ON THE POSTSYNAPTIC MEMBRANE:
- 1. N-METHYL-D-ASPARTATE (NMDA; IONOTROPIC)
- 2. AMPA (THE CHEMICAL NAME IS TOO LONG TO REMEMBER; IONOTROPIC)
- 3. KAINATE (IONOTROPIC)
- 4. METABOTROPIC GLUTAMATE RECEPTOR (MGLUR)

- GLUTAMATE REACHING GLIA MAY:
- 1. ACTIVATE NMDA RECEPTORS
- 2. BE TAKEN INTO THE CELL BY EXCITATORY AMINO ACID TRANSPORTER (EAAT).
- GLUTAMATE TAKEN UP INTO GLIA IS CONVERTED TO GLUTAMINE AND PASSED BACK TO PRESYNAPTIC
- NEURONS, WHERE IT IS TRANSFORMED BACK INTO GLUTAMATE.

HIPPOCAMPUS

- A BETTER TITLE IS THE HIPPOCAMPAL FORMATION. THE HIPPOCAMPAL FORMATION IS COMPOSED OF THREE PARTS:

1) THE DENTATE GYRUS,

2) THE HIPPOCAMPUS (BETTER REFERRED TO AS THE HIPPOCAMPUS PROPER), AND

3) THE SUBICULUM.

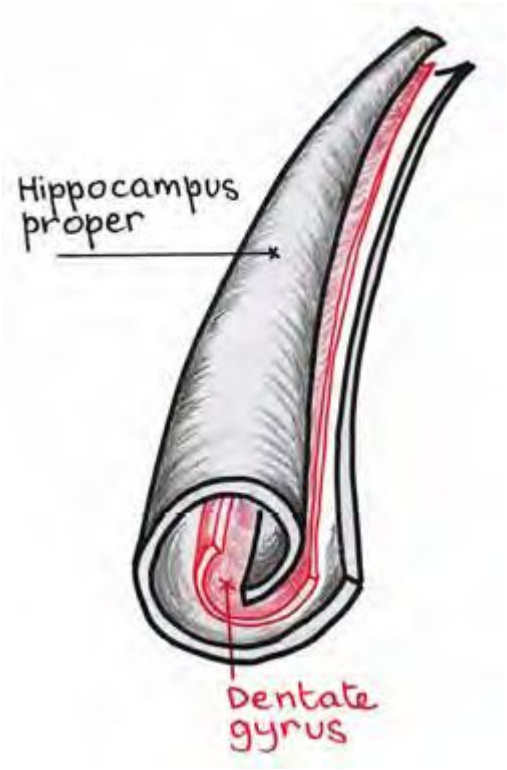
- THESE HAVE A CYLINDRICAL FORM.
- THINK OF A ROLLED UP NEWSPAPER WITH A LOOSE ADVERTISING PAMPHLET INSIDE.
- THE SUBICULUM AND THE HIPPOCAMPUS PROPER ARE CONTINUOUS AND ARE LIKE THE NEWSPAPER,
- THE DENTATE GYRUS IS LIKE THE PAMPHLET, THAT IS, A SEPARATE PIECE (ALTHOUGH,FURTHER BACK IN EVOLUTION, IT WAS CONTINUOUS WITH THE OTHER TWO PARTS).

THE HIPPOCAMPAL FORMATION

LIES

- IN THE TEMPORAL LOBE, IMMEDIATELY BELOW (INDENTING THE FLOOR OF) THE INFERIOR HORN OF THE LATERAL VENTRICLE.

THE HIPPOCAMPAL FORMATION.



PSYCHIATRIC DISORDERS AND THE HIPPOCAMPUS

- THE HIPPOCAMPUS IS IMPORTANT IN THE LAYING DOWN OF NEW MEMORIES (THAT IS, FACTS, DECLARATIVE MEMORY).
- DAMAGE TO BOTH HIPPOCAMPI RESULTS IN FAILURE TO LAY DOWN NEW MEMORIES (ANTEROGRADE AMNESIA),
- BUT OLD MEMORIES ARE RETAINED. THIS INDICATES, THE HIPPOCAMPI ARE USED IN LAYING DOWN MEMORIES, BUT THESE ARE THEN STORED ELSEWHERE (PRESUMABLY IN CORTICAL ASSOCIATION AREAS).

DIFFICULTY WITH LAYING DOWN NEW MEMORIES

1. CHRONIC BILATERAL TEMPORAL LOBE EPILEPSY,
2. SURGICAL RESECTION AND
3. TRAUMA.
4. TEMPORARY PHENOMENON WITH BILATERAL ELECTROCONVULSIVE THERAPY
5. KORSAKOFF'S PSYCHOSIS
6. POSTTRAUMATIC STRESS DISORDER (PTSD
7. DEPRESSION AND
8. EARLY LIFE ABUSE .

DIFFICULTY WITH LAYING DOWN NEW MEMORIES

- KORSAKOFF'S PSYCHOSIS (AMNESTIC SYNDROME, MOST COMMONLY RESULTING FROM THIAMINE DEFICIENCY)
- IS ASSOCIATED WITH BILATERAL DAMAGE TO THE MAMILLARY BODIES AND OTHER PERIAQUEDUCTAL GREY MATTER.
- (THE MAMILLARY BODIES BEING A MAJOR FOCUS OF OUTPUT FROM THE HIPPOCAMPUS, VIA THE FORNIX.)

FORNIX

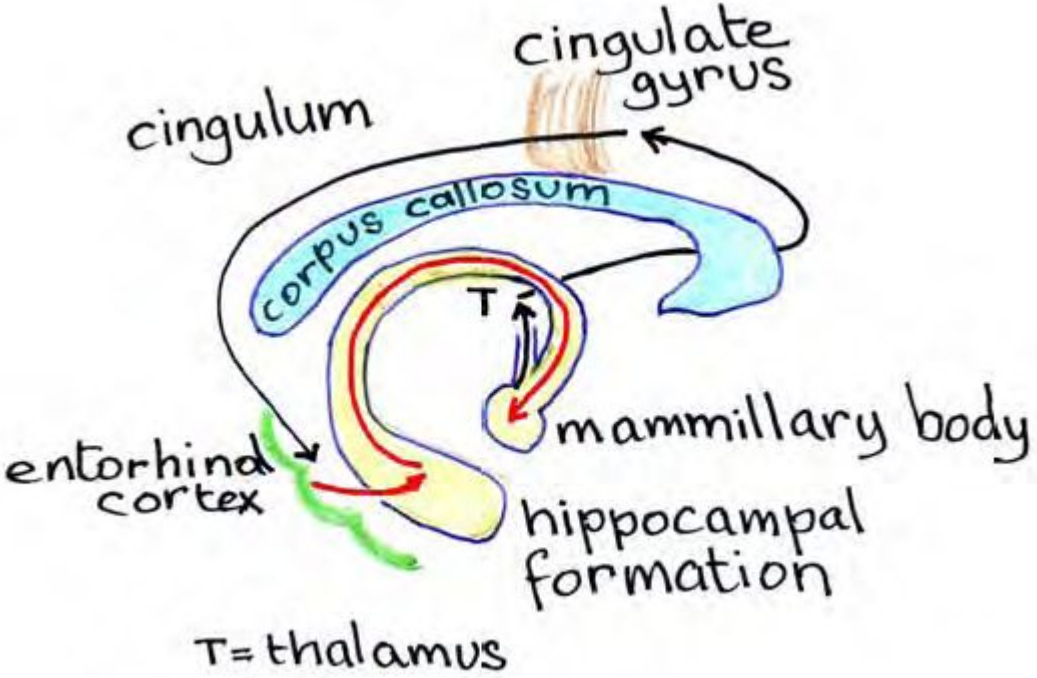
- THE FORNIX IS A WHITE MATTER STRUCTURE WITH CARRIES INFORMATION FROM AND TO (PREDOMINANTLY FROM) THE HIPPOCAMPAL FORMATION
- NO PSYCHIATRIC DISORDER IS KNOWN TO BE SPECIFICALLY RELATED TO PATHOLOGY OF THE FORNIX.

PAPEZ CIRCUIT

IN 1937, JAMES PAPEZ DESCRIBED A NEURAL LOOP WHICH COULD ALLOW THE COORDINATION OF THE

- NEOCORTEX,
- LIMBIC STRUCTURES AND
- THE HYPOTHALAMUS, AND
- FORM THE ANATOMICAL SUBSTRATE OF EMOTION.

PAPEZ CIRCUIT



AMYGDALA

- THE AMYGDALA IS THREE NUCLEI, AT THE TIP OF THE HIPPOCAMPAL FORMATION
- IT HAS A ROLE IN DRIVE-RELATED BEHAVIOURS AND THE SUBJECTIVE FEELINGS WHICH ACCOMPANY THEM.
- THE HIPPOCAMPUS IS INVOLVED IN LEARNING THAT AN EVENT HAS HAPPENED (THE FACT),
- THE AMYGDALA IS INVOLVED WITH LEARNING WHETHER TO CONSIDER SOMETHING IS “GOOD” OR “BAD”.

DISORDERS AND THE AMYGDALA

- KLUVER-BUCY (1939) SYNDROME
- PTSD (IMAGING STUDIES EXAGGERATED AMYGDALA ACTIVITY)
- ANXIETY DISORDERS (EXAGGERATED AMYGDALA ACTIVITY)
- DEPRESSIVE DISORDERS

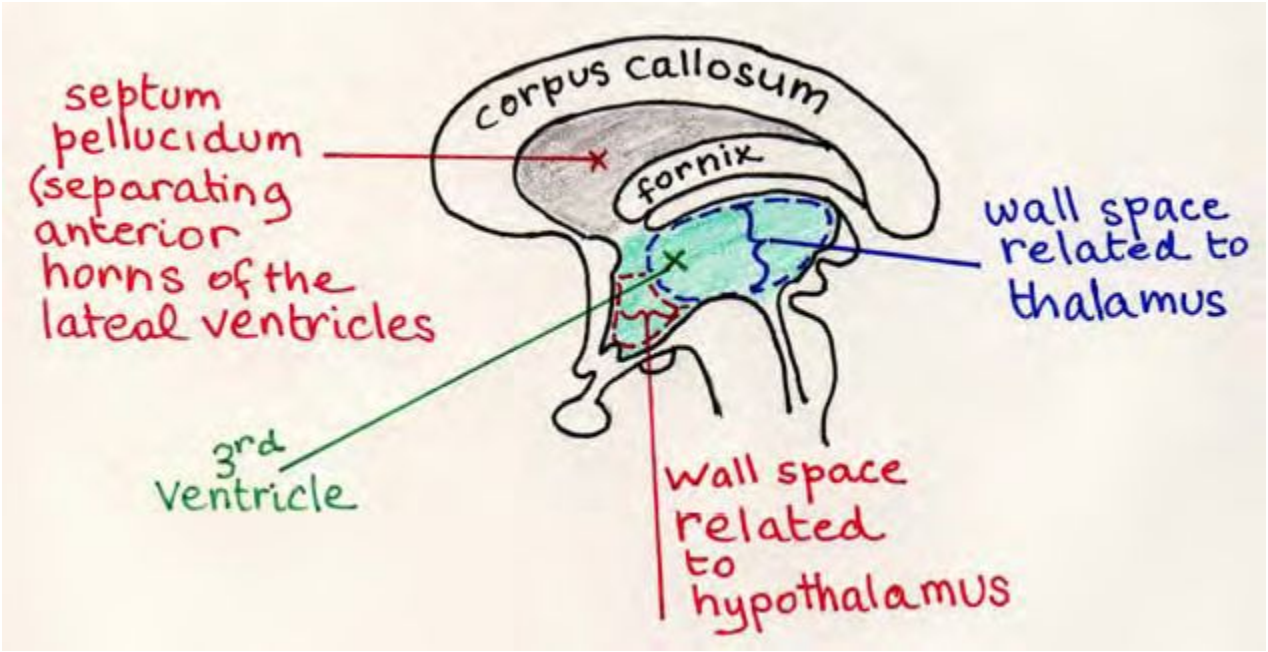
KLUVER-BUCY (1939) SYNDROME

- 1)PLACIDITY AND FAILURE TO RESPOND TO THREATS (PREDATORS),
- 2) MALES BECOME HYPERSEXUAL AND INDISCRIMINATE REGARDING GENDER AND SPECIES,
- 3) INORDINATE ATTENTION TO ALL SENSORY STIMULI,EXAMINING OBJECTS ORALLY, AND EATING THEM (IF AT ALL POSSIBLE) RESULTING IN WEIGHT GAIN, AND
- 4) INCESSANTLY EXAMINE THE SAME OBJECTS. THE ANIMAL HAS THE BEHAVIOUR PATTERNS FOR SATISFYING THE BASIC DRIVES, BUT CANNOT DETERMINE THE APPROPRIATE CONTEXT IN WHICH TO EMPLOY THEM.

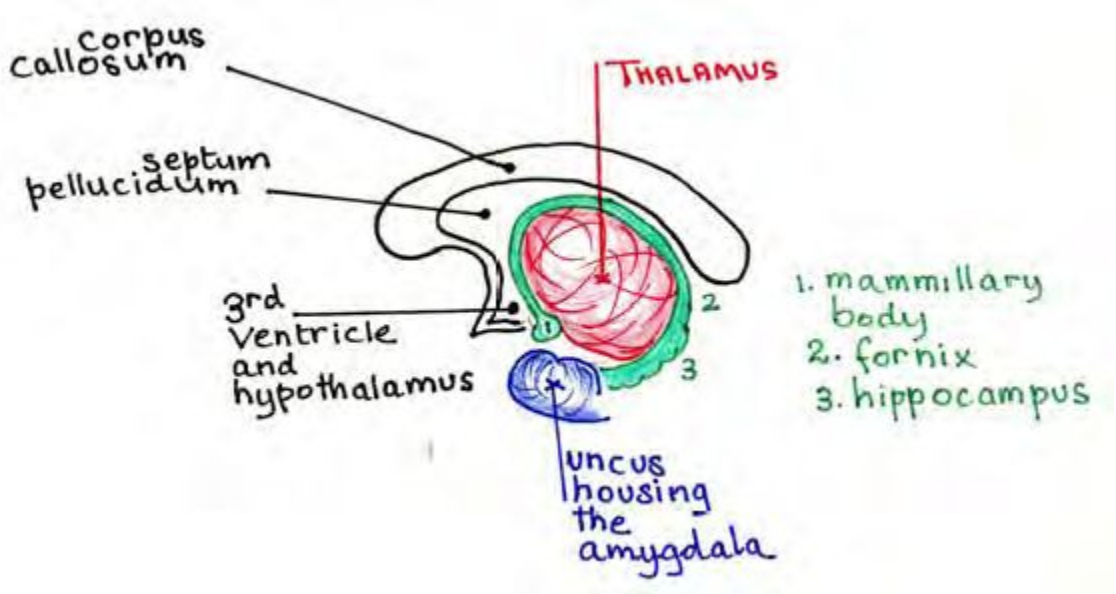
THALUMUS

- “ALL THE INPUT FROM ALL OUR SENSES FLOWS INTO IT.
- IT TAKES SELECTIVE NOTE OF WHAT SHOULD BE GIVEN HIGH PRIORITY AND LETS YOU THROW THE REST AWAY
- THE THALAMUS IS THE LARGEST COMPONENT (80%) OF THE DIENCEPHALON (THE OTHERS BEING THE HYPOTHALAMUS, SUBTHALAMUS, AND THE EPITHALAMUS).

The relationship of the thalamus and hypothalamus to the 3rd ventricle



The relationship of the thalamus to hippocampus, fornix and mamillary bodies.



FRONTAL-SUBCORTICAL CIRCUITS

CORTICAL SITE OF ORIGIN	FUNCTION	NEUROPSYCHIATRIC SYMPTOM
DORSOLATERAL PREFRONTAL	EXECUTIVE FUNCTIONS	EXECUTIVE DYSFUNCTION (SEGMENTED DRAWINGS, POOR RECALL, WORD LIST GENERATION, SERIAL HAND SEQUENCING, ETC)
LATERAL ORBITOFRONTAL	PERSONALITY (SOCIALLY APPROPRIATE BEHAVIOUR, EMPATHY)	DISINHIBITION, IRRITABILITY, LABILITY, TRACKLESSNESS, EUPHORIA
ANTERIOR CINGULATE	MOTIVATION	APATHY, RARELY MOVING, INCONTINENT,

FRONTAL-SUBCORTICAL CIRCUITS AND DISORDERS

DECREASED NEURONAL ACTIVITY

- THE FRONTAL LOBE SYNDROME
- SCHIZOPHRENIA
- BIPOLAR
- OTHER PSYCHIATRIC DISORDERS

HYPERACTIVITY NEURONAL ACTIVITY

- OBSESSIVE COMPULSIVE DISORDER

MOVEMENT DISORDERS(BASAL GANGLIA AND THALAMUS)

- HUNTINGTON'S CHOREA
- PARKINSON'S DISEASE

CEREBELLUM (LATIN: “LITTLE BRAIN”)

- IT IS PREDOMINANTLY INVOLVED IN MOVEMENT, PARTICULARLY THE COORDINATION OF MOVEMENT.
- IT IS KNOWN TO BE INVOLVED TO SOME DEGREE IN EXECUTIVE FUNCTIONING, AND CEREBELLAR DAMAGE MAY BE ASSOCIATED WITH PERSONALITY CHANGE (BLUNTING OF AFFECT AND DISINHIBITION HAVE BEEN DESCRIBED).
- MORE RECENTLY, THERE IS SOME EVIDENCE SUGGESTS A ROLE IN CERTAIN PSYCHIATRIC DISORDERS.

FIGHT OR FLIGHT RESPONSE

- “STRESS” (DISTURBANCE OF HOMEOSTASIS) TRIGGERS THE FIGHT OR FLIGHT RESPONSE, WHICH PROTECTS THE ORGANISM IN DANGER.
- HYPOTHALAMIC-PITUITARY-ADRENAL (HPA) AXIS ACTIVATION INCLUDES THE SECRETION
- CORTICOTROPIN-RELEASING FACTOR (CRF) BY THE HYPOTHALAMUS.
- THIS CAUSES THE RELEASE OF ADRENOCORTICOTROPIC HORMONE (ACTH) BY THE PITUITARY,
- IN TURN CAUSES RELEASE OF CORTISOL FOR THE ADRENAL CORTEX.
- CORTISOL PRODUCES AND MAINTAINS HIGH LEVELS OF GLUCOSE TO SUPPORT ACTIVITY

“DYSREGULATION OF THE HPA AXIS”

- CHRONIC HIGH CORTISOL LEVELS) CAN CONTRIBUTE TO

1. DEPRESSION
2. ANXIETY
3. POSTTRAUMATIC STRESS DISORDER
4. IRRITABLE BOWEL YNDROME.
5. CORTISOL BREAKS DOWN PROTEIN (TO PROVIDE GLUCOSE),
6. INHIBIT REPLACEMENT OF CALCIUM IN BONES AND
7. DAMAGE THE HIPPOCAMPUS

BRAINSTEM(RETICULAR ACTIVATING SYSTEM)

- SIMULTANEOUS STIMULATION OF THE LOCUS CERULEUS (LOCATED IN THE BRAINSTEM) LEADS TO
- NORADRENALIN PATHWAY ACTIVATION OF THE HYPOTHALAMUS, LIMBIC STRUCTURES, CORTEX AND SYMPATHETIC NERVOUS SYSTEM.
- THE MAIN LIMBIC STRUCTURES ACTIVATED IN THIS PROCESS ARE THE HIPPOCAMPUS AND AMYGDALA.

CONCLUSION

- THIS LECTURE DEFINED WHAT NEUROSCIENCES ARE AND HIGHLIGTED THE BILOGICAL PATHOGENESIS OF MOST OF NEUROPSYCHIATRIC DISORDERS .

- THIS KNOWLEDGE CONTRIBUTED IN THE UNDERSTANDING OF THE-

1. AETIOLOGY
2. DIAGNOSIS
3. PREVENTION
4. AND TREATMENT OF MENTAL DISORDERS THROUGH PSYCHOPHARMACOLOGY.