National Seminar on Marine Biodiversity a[illegible]rce of Food and Medicine

26 – 28 September 2002

Organised by

Suganthi Devadason Marine Research Institute

(Affiliated to Manonmaniam Sundaranar University and Recognised by U.G.C.)

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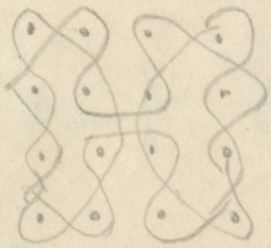
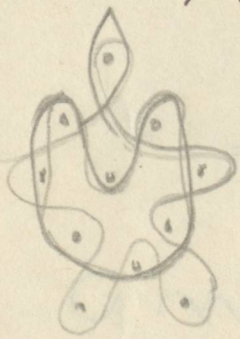
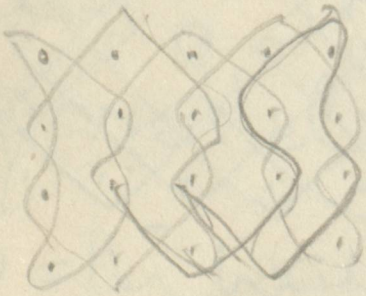
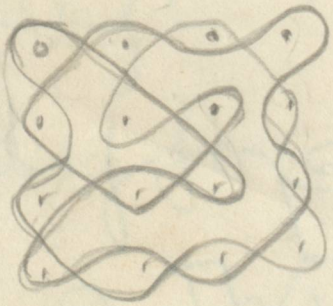
1800424600

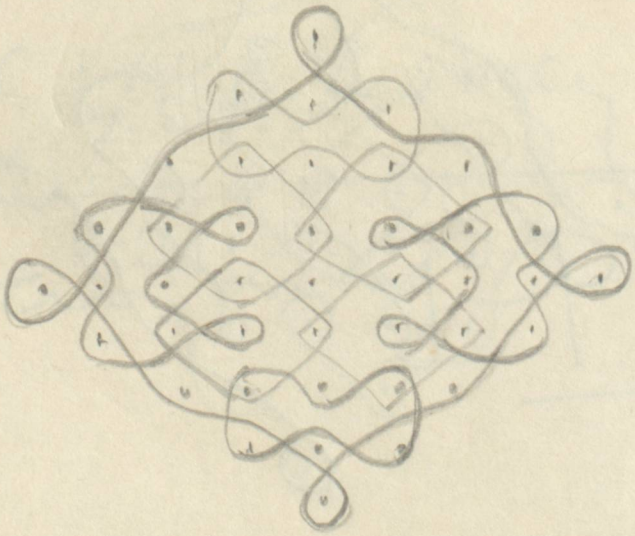
BSNL - TOLLFREE



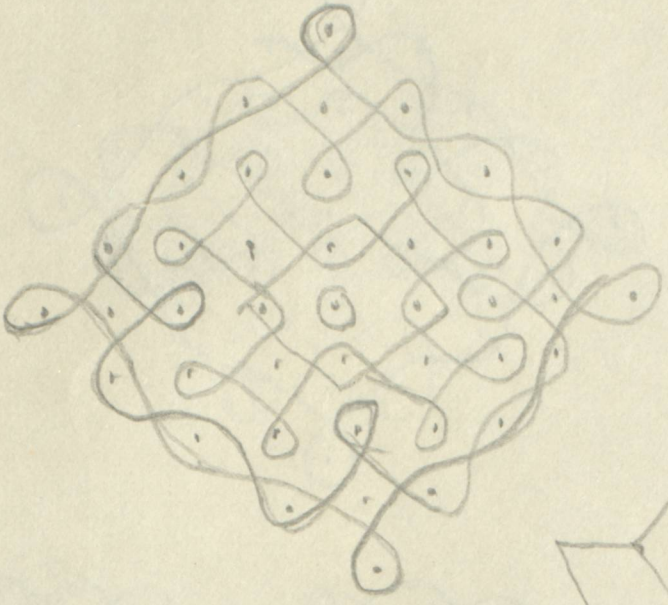


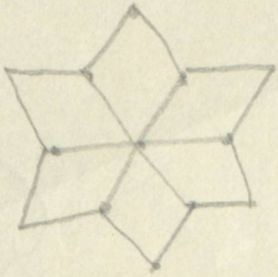


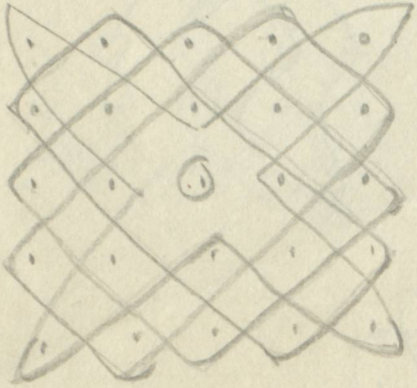




7-3 rows

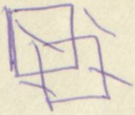
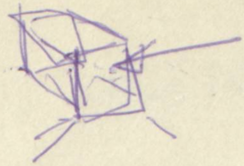






5-5

Molecular signals
that drive synaptic
are diverse and
act through multiple
parallel differentiation
pathways. This is
high Accuracy while
retaining plasticity

check tax for  

frequent flier stuff

Not all

neurones in

Contact form

Synapses eg In Retinal

Ganglion 4 Selected out-

of 43 in Contact-

ing C. elegans only

1 out of 6.

Neurons chose

Synaptic partners from

surrounding cells

NEURONS HIGHLY DIFFERENTIATED

— DISTINCT SUBCELLULAR COMPARTMENTS

(AXON – DENDRITE etc)

SPECIFIC COMPARTMENTS SYNAPSE TO OTHER SPECIFIC AND DISTINCT FUNCTION

— OR SPECIFIC POST SYN ACTION (AT SAY PERISOMATIC AFFECT ACTION POTENTIAL BUT AT DISTAL ONLY AFFECT DENDRITIC CALCIUM SPIKES)

I am proud of my brother

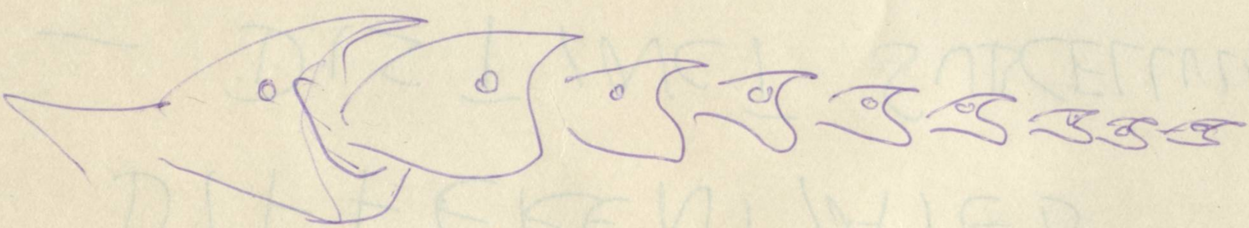
but sympathetic [illegible] people & [illegible]

[illegible]

[illegible]

[illegible]

[illegible]



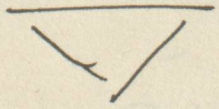
STOICHIOMETRY AT

TWO LEVELS

1. AT NUMBER OF DIFFERENT SYNAPTIC PARTNERS.

AND

2. WITH RESPECT TO NUMBER OF SYNAPSES BETWEEN SELECTED PARTNERS



MUTUAL ATTRACTION CT.

1. SPATIAL CUES (ATTRACTION REPULSION ELIMINATION)

2. TEMPORAL CUES (GUIDE POST CELLS)

NOT EXCLUSIVE - NEURONES MAY USE DIFFERENT AT DIFFERENT STAGES OF DEVELOPMENT

NEURONES LIKELY TO CONTINUE TO ESTABLISH MAINTAIN OR REMODEL SYNAPTIC CONNECTIVITY USING MULTIPLE STRATEGIES.

DYNAMIC NEURON

THE COMPLEX ENVIRONMENT DURING DEVELOPMENT

- DIFFICULT TO EXCLUDE INVOLVEMENT OF SORROUND CELLS
- BUT NEURONES ALSO FORM SYNAPSES IN CULTURE

THE FACT THAT DISSOCIATED NEURONES FORM SYNAPSES IN CULTURE MEANS THE PROCESS OF SYNAPSE FORMATION CAN BE EXECUTED BY PARTNERS ALONE

INTUITIVE MODEL

IS RECOGNITION INDUCES FORMATION - DISTINCT TAGS - TAGS THEMSELVES INITIATE (POSSIBILITY THAT OTHERS INHIBIT IS LESS APPRECIATED !)

MODEL OF ATTRACTION

1) HOMOPHILIC ADHESION MOLECULES

CADHERINS & Ig a Super (IgSF) family.

Adhesion Code ?

Tested in Retina

Subpopulation of Interneuron & retinal ganglion cells up different variant of closely related Ig SF

Side kick - 1 Side kick 2

DScam DScam Like

Ig SF shown to be instructive (RNAi etc).

MUTUAL ATTRACTION

IMPLICATED IN

SCULPTING SUBCELLULAR

SPECIFICITY AS WELL

VAST MAJORITY OF

EXCITATORY ON DENDRITIC

SPINES WHEREAS INHIBITORY

RESTRICTED TO PERISOMATIC

DOMAINS, DENDRITIC DOMAINS

OR AXON'S INITIAL SEGMENT

THIS INNERVATION SPECIFIC

PERSISTS IN PRIMARY

VISUAL CORTEX DEPRIVED

OF SENSORY & THALAMIC

INPUTS

GENETIC.

SUBCELLULAR DOMAIN SPECIFIC INPUT IN PURKINJE CELLS. TWO CLASSES OF GABAergic TO BASKET CELLS ONLY TO AXON INITIAL SEGM STELLATE TO DENDRITIC DOMAIN

RESTRICTION OF BASKET CELLS DEPENDS ON NF

N_V CAM & ANKYRIN SCAFFOLD SPECIFIC & SUBCELLULAR ARE DISTINCT IN SYNAPSE FORMATION → MORE DIFFUSE

N_V CAM KNOCK OUT MICE NOTICEABLY RESTRICTION IN INITIAL SEGMENT FORMATION BUT NOT BASKET SYNAPSE FORMATION

Repulsion FROM Non-Synaptic Partner.

Fas II SEMA II

Expressed in all muscles

Netrin B In Subset

attracts Some repulses

Some axons:

2. <Wnt 4 inhibits> M13 Differ
M12

In Innervation path

Wnt 4 in M13 not M12

In absence of Wnt 4

or its receptor Dribbled 2

NEURON THAT NORMALLY INNERVATE ONLY M12 ALSO INNERVATE M13

Cajal-Retzius AND GABA ne-
from TRANSIENT Synapses
WITH ENTORHINAL AXONS
AND COMMISSURAL AXONS RESPECTIVELY
— BOTH POPULATIONS
UNDERGO
APOPTOSIS LATER

GUIDE-POST

ABLATION OF CR
Prevents LAYER ~~FORMATION~~
SPECIFIC INNERVATION BY
ENTORHINAL AXONS

— THUS CR SERVE
AS TRANSIENT PLACE
HOLDERS.

SIMILARLY
SUBPLATE NEURONS
GUIDE LGN
INTO LAYER 4

GLIA & GLIA LIKE IN LOCAL SYNAPTIC CONNECTIVITY

AXONS FROM STELLATE GUIDED TOWARDS PURKINJE BY INTERMEDIATE SCAFFOLD & BERGMANN GLIA

- LI-TYPE ASSOCIATED molecules implicated - BG PROVIDE a SUBSTRATE FOR MEETING

11 RELATED C ELEGANS

TWO GLIAL CELL SHEATH COORDINATE INNERVATION - interneuron AIY & RIA

SHEATH CELLS Secrete AXON GUIDANCE molecule UNC6/DCC Netrin WHICH ELICITS RESPONSE 2 UNC40/DCC INRIA/AIY

Similar to GLIA CELL
SCAFFOLD FOR ECM LAYING
MOTOR NEURON ~~HSN~~ HSN

Heterotypic Inhibitory
IgSF TRANSMEMBRANE
SYG-1 & SYG-2
which bind to each other

GLIA ALSO SPECIFY
NUMBER & FUNCTIONALITY

ASTROCYTES SECRETE
MULTIPLE FACTORS
TO CONTROL VARIOUS
ASPECTS - GLIA PRODUCE
CHOLESTEROL

ASTROCYTES SECRETE

THROMBOSPONDIN

(TSP)

= which itself is sufficient to induce morphologically defined Synapses in Culture!

Morphogenetic for

INHIBIT → Work products by Two Worms LIN-44 & EGL-20

(in C. elegans DAG Synapses inhibited.

ANOTHER MORPHO-
GRAPH-

by UNC6/NETRIN
EXCLUDES PRESYNAPSE
FROM Ventral axon
of DA9
In mi absence of
of Unc-6 or cfs
repulsive recept Unc5-
- vesicles & active zone protein-
accumulate
to mi Ventral dendrite-
and axon.

~~Synapt Adhe~~

1. Neurexin – Neuroligin

---

provide bidirectional signal (Synapse Adhesion molecules also)

2. Syn CAM (IgSF in Nectin family)

NAL-1, -2 and -3
Leucine Rich Repeat Transmembrane (LRRTM-1, 2 etc)

→ NAL's Syn CAM neurexin neuroligin Carry PDZ binding ~~protein~~ motifs at C ter.
& Couple Adhesion to Scaffold proteins

I on Cells of Brain

Adaption Line 2 / CASK

Line 10 / Mint protein

link to ability bind Ca++

Channels ?

---

loss

Neurexin

of function Droso

Very Dramatic

— also Syn have

Severely reduced

Synaptic boutons

AGRIN

ANTEROGRADE-ORGANISER

Ach : Acts as

~ vc signal to disperse

non-innervated clusters

In chAT / AGRIN clones

many AchR clusters

retained.

wingless Anterograde

signal in Drosophila

NMJ

WINGLESS (Wnt1) Δ

receptor FRIZZLED (DF3)

loss of wg causes reduced

bouton size & incomplete

development whereas

over expression and

enhanced bouton

proliferation

~~wg loss of~~

wg action of DF3 —

promotes translation to nucleus of DF

& post-synaptic development

wg loss of function also

disrupts presynaptic

differentiation

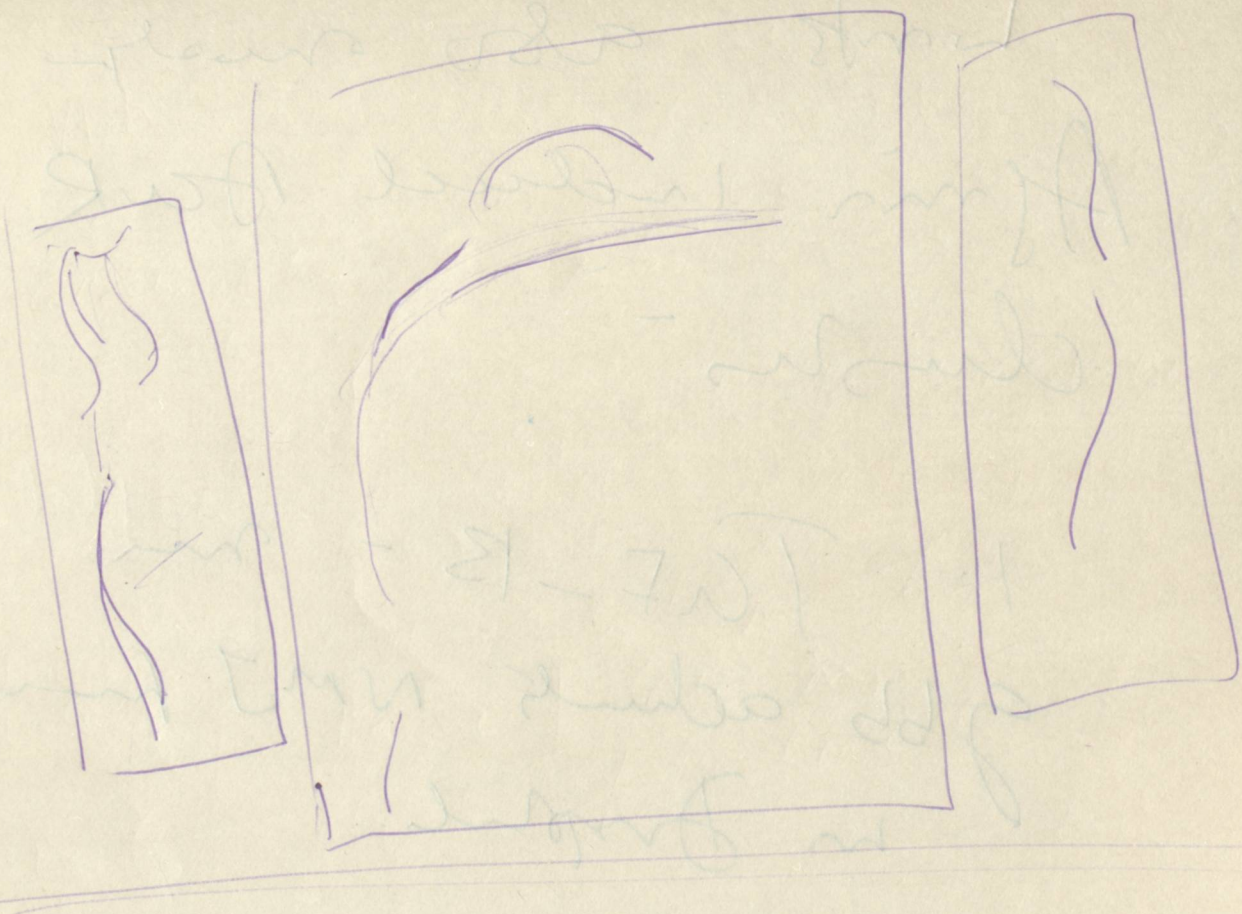
works also mostly
Agrin induced AChR
clusters -

1. TGF-B - now
gbb activates NMJ grow
in Drosophila

FGFR

Synaptic elimination
needed   mono-innervation

Synaptic pruning
mediated by Semaphorins



Lin · 14 nmlri syneps

eliminati ochri
preciociously.

Transcriptual Calls

2 synepsa mutn

Winj Spepcep –
(LIM homeodom)

Hox fn

BDNF –

goes on.

Guttal talk

Physics – [illegible]

1] Vishwesh Guttal

[illegible]

ii] Collective behaviour :: fish & bird flocks — [illegible]

[illegible]

iii] Individual [illegible] to self ordered collection

[illegible] (Mosquito [illegible]) [illegible]

Self propelled particles [illegible]

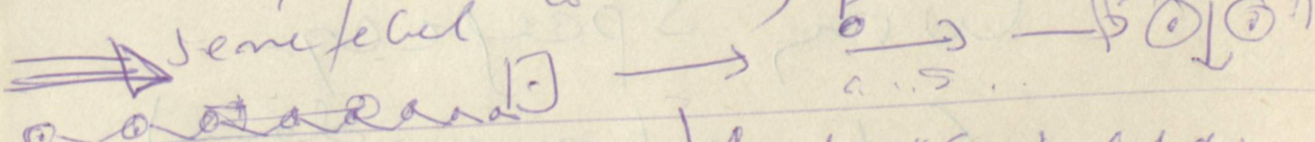
exploitation | collective [illegible]

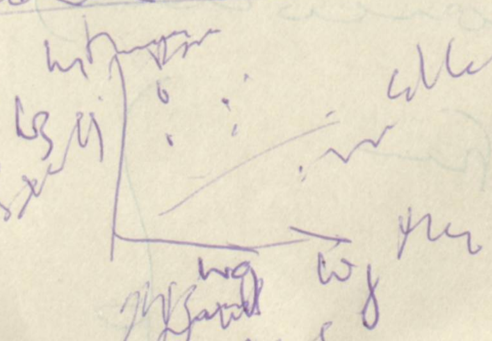
[illegible] all [illegible]

Q1 (Is it exploitation [illegible]

[illegible] exploitation [illegible] to all) [illegible]

sense [illegible]





Good [illegible]

[illegible]

[illegible] a lot?)

[illegible]