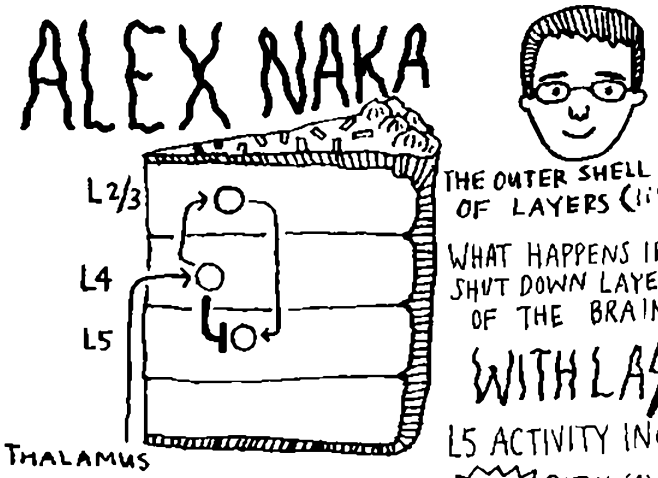

A SMALL SAMPLE
OF BRAIN RESEARCH
CONDUCTED AT Berkeley
NEURO
RETREAT
2015

ALEX NAKA



THE OUTER SHELL OF THE BRAIN CONSISTS OF LAYERS (like a delicious cake!)

WHAT HAPPENS IF WE SHUT DOWN LAYER 4 OF THE BRAIN WITH LASERS!?

L5 ACTIVITY INCREASES.....

BUT HOW? ALEX FOUND A NEW PATHWAY IN THE BRAIN WHERE LAYER 4 BRAIN CELLS USUALLY TELL LAYER 5 TO BE QUIET. WHEN YOU SHUT DOWN LAYER 4, LAYER 5 CAN BECOME MORE ACTIVE!

HOW DOES MY BRAIN KNOW WHEN I AM THIRSTY?

NICK JOURJINE

1. find a gene that disrupts drinking when that gene is broken
2. find out what that gene does in the brain

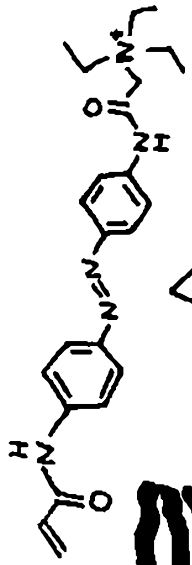
THIS GENE IS CALLED NANCHUNG

nanchung is found in brain cells that tell the fly how much water it has. these cells also tell the brain to eat sugar!

KATIE BENTHALL

THERE IS A GENE INVOLVED IN AUTISM THAT KATIE STUDIES. BRAIN CELLS WITH THIS GENE HELP CONTROL MOVEMENT. KATIE IS GOING TO BREAK THIS GENE AND SEE WHAT HAPPENS. SHE FOUND THAT CERTAIN CELLS BECOME MORE EXCITED

BRISTOL DENLINGER



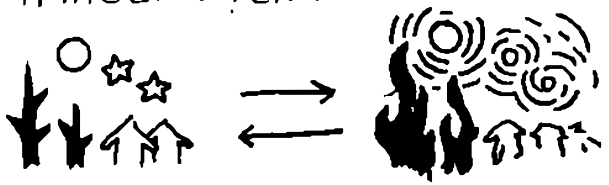
OPTOPHARMACOLOGY IS A TECHNIQUE THAT RESTORES LIGHT SENSITIVITY TO THE EYE THROUGH THE ADDITION OF A "PHOTOSWITCH" MOLECULE. BRISTOL WANTS TO FIND A WAY TO TREAT BLINDNESS BY USING THIS TECHNIQUE. THE PHOTOSWITCH ONLY ACTS ON CELLS IF THE LIGHT DETECTORS IN THE EYES HAVE DIED, WHICH MEANS THAT THE PARTS OF THE EYE THAT WORK FINE WON'T BE AFFECTED BY THE PHOTOSWITCH. THIS STRATEGY OF REANIMATING BLIND TISSUE WILL HOPEFULLY LEAD TO RESTORED VISUAL FUNCTION.[2]

DYLAN PAITON

WHAT MAKES AN IMAGE *ARTISTIC*?

ONCE YOU ANSWER THAT QUESTION, CAN YOU APPLY THAT STYLE TO ANOTHER PICTURE? YES!

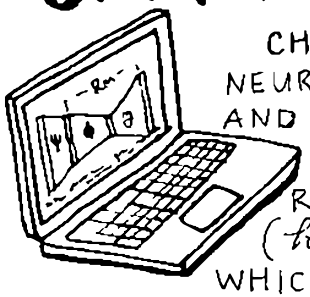
DYLAN USES A DEEP NEURAL NETWORK WITH CERTAIN FILTERS TO ACHIEVE THIS. USING AN ALGORITHM BASED ON HOW THE BRAIN WORKS, YOU CAN ADJUST THE AMOUNT EACH FILTER CONTRIBUTES TO THE FINAL IMAGE. DYLAN CAN ALSO TAKE FAMOUS PAINTINGS AND CONVERT THEM TO MORE REALISTIC AND LESS STYLIZED IMAGES![3]



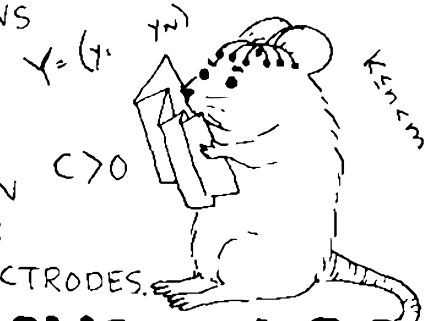
ALEX ANDERSON

HAVE YOU EVER WATCHED A GO-PRO VIDEO FILMED ATTACHED TO SOMEONE'S HEAD? IT'S REALLY DISORIENTING. HOWEVER, THIS VIDEO IS PRETTY MUCH THE INFORMATION THAT IS HITTING THE BACK OF YOUR EYEBALL WHEN YOU ARE TRYING TO SEE. OUR BRAINS HAVE A SOPHISTICATED MECHANISM TO TAKE THE SHAKY VIDEO OF THE WORLD THAT LANDS ON OUR EYES AND TURN IT INTO SOMETHING STABLE. ALEX IS DOING WORK TO STUDY HOW THIS HAPPENS.

CHARLES GARFINKLE



CHARLES IS A COMPUTATIONAL NEUROSCIENTIST WHO USES MATH AND COMPUTERS TO UNDERSTAND HOW BRAINS MIGHT WORK. RECENTLY HE PROVED A THEOREM (*his mom is very proud of him*) WHICH EXPLAINS HOW IT'S POSSIBLE THAT ANOTHER SCIENTIST WAS ABLE TO CORRECTLY GUESS THE LOCATION OF A RAT IN A BOX BY MEASURING ITS BRAIN ACTIVITY WITH ELECTRODES.



ELENA RYAPOLOVA-WEBB

ELENA IS STUDYING THE PARTS OF THE BRAIN THAT INTERPRET INFORMATION FROM A MOUSE'S WHISKERS SOME NEURONS ARE MORE ACTIVE WHEN A WHISKER IS STICKING OUT, BUT OTHER BRAIN CELLS ARE MORE ACTIVE WHEN THE WHISKER IS PULLED BACK. ELENA IS STUDYING HOW NEURONS THAT RESPOND TO WHISKER STIMULATION AND MOVEMENT COMMUNICATE WITH OTHER BRAIN AREAS HER WORK WILL TELL US HOW THE BRAIN PROCESSES SENSORY INFORMATION

CITATIONS

1. Pluta, S., Naka, A., Veit, J., Telian, G., Yao, L., Hakim, R., Taylor, D. & Adesnik, H. A direct translaminar inhibitory circuit tunes cortical output. *Nat Neurosci.* 2015

2. Tochitzky, I. & Kramer, R.H. Optopharmacological Tools for Restoring Visual Function in Degenerative Retinal Diseases *Curr Opin Neurobiol* 34·74-78, 2015

3. Gatys, L.A., Ecker, A S. & Bethge, M. A Neural Algorithm of Artistic Style arXiv 1508 06576 2015

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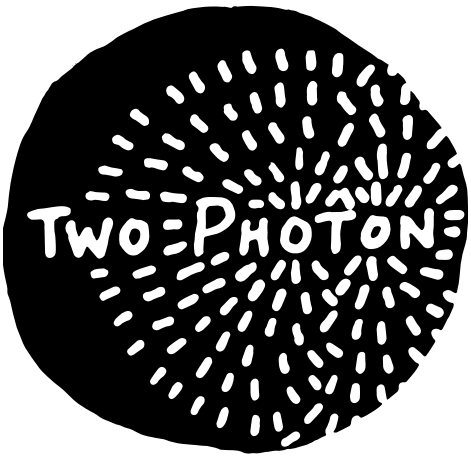
This zine was a bite size sample of the amazing research being conducted in neuroscience at UC Berkeley. From tiny molecules to living organisms to computational models, we try to understand how that little 3 pound brain inside your head can interpret the world around us, and we love doing it! Our work is built upon the discoveries of those before us and will hopefully be the foundation of discoveries to come.



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