

GET CREATIVE, YOUR BRAIN IS UNIQUE. Dive into your stash and find your favorite yarn — that means anything that you can crochet, not just wool.

Choose from all the colours of the rainbow, except red or black. The cell body should be mostly one colour. Have fun and splash out with highlights, but try to keep the axon & dendrites of a single neuron similar colours to eachother.

For the exhibition at Hazelhurst Regional Gallery & Arts Centre in August 2014, donated neurons will be combined into a sculpture of the area of the brain known as the Cerebral Cortex. Colour suggestions are provided with this in mind. However, we want you to enjoy the experience, so don't be afraid to bend the rules a little. Play and get inspired by the many neuron shapes.

Hints and fun stuff*

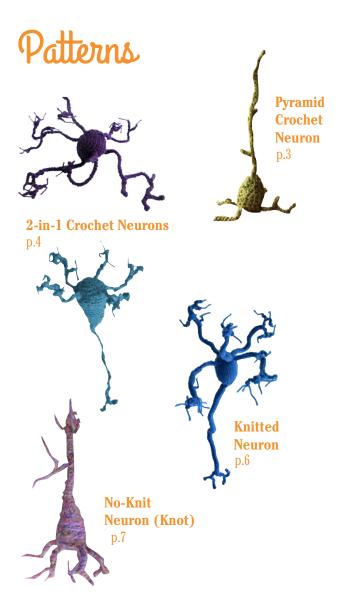
CHANGE THE COLOUR OF YOUR BRAIN — by knitting /winding a thin thread of a brighter or slightly different colour with your main yarn. You will be amazed at how little it takes to brighten up your brain cell, or to change the overall colour. Tapestry wool and machine knitting wool works well, as does sewing thread.

BRIGHTEN UP YOUR SYNAPSES – stitch beads or small buttons to the ends of axon branches to make junctions (also known as boutons) for your synapses.

SHINE FROM THE INSIDE – the nucleus is the centre of the cell, let yours show. Stitch a safety pin or a thumbnail sized 'eye' on your cell. Include your initials, add a tiny picture of some-thing that you love, use your favorite technique – cross stitch, beading, leatherwork...show what you are made of.

* for activities not involving young children





Meet the Neural Knitworks team

Textile artist Pat Pillai's idea to knit and weave brain cells was the winning pitch at the 2013 Ultimo Science Festival Art & Science Soiree in Sydney.

With encouragement from the Soiree's organiser Sophie Weeks and fellow artist Rita Pearce, the idea for the Neural Knitworks exhibition at Hazelhurst Regional Gallery soon took hold.

Inspiring Australia's NSW Manager Jackie Randles worked with the artists to extend the concept beyond the gallery as a National Science Week community art project. Input also came from Jenny Whiting, Heather Main, Deirdre Molloy,

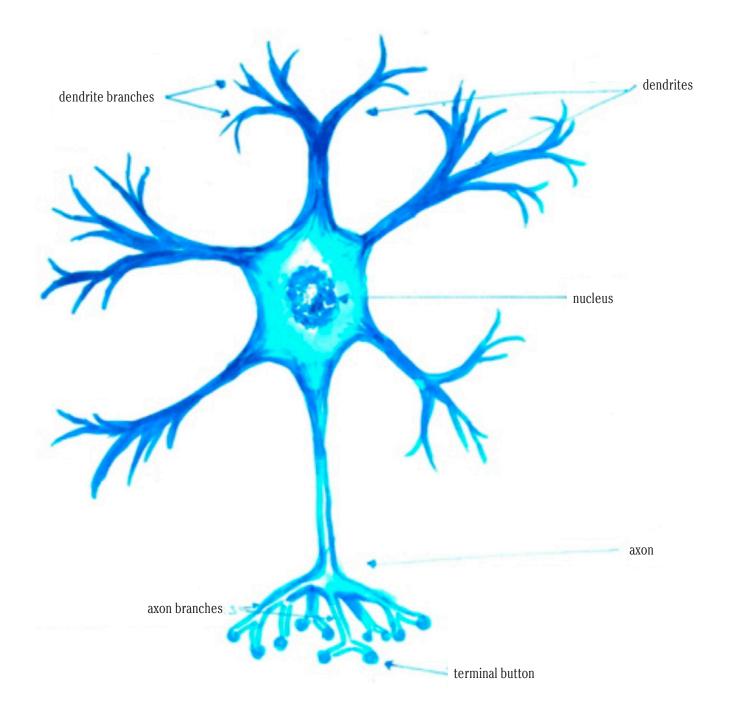
Design: Deirdre Molloy : showcreative.com

Sarah McKay, Rod Dowling, Kuldip Sidhu and Carrie Kibbler.

Huge thanks to the many scientific researchers who provided access to inspirational images used as the basis of patterns, and to all those who have offered support and assistance along the way to bring this big woolly project to life.

Founding partners include Hazelhurst Regional Gallery, Inspiring Australia (NSW), ANSTO, Your Brain Heath, Brain & Mind Research Institue, the Centre for Healthy Brain Aging, and Alzheimer's Australia Dementia Research Foundation.

Neuron Anatomy & Glossary



Knitting Glossary

kfb: knit into front and back of stitchk2tog: knit two togetherStocking stitch: knit one row, purl one row – the work will roll into a tube

Pick up stitches: slip the tip of a needle under the "bar" between knitted stitches, and place the yarn between the needle and the knit piece. With the needle, pull the yarn from under the bar, creating a loop, as you would for a standard knit stitch. Repeat with the bar immediately to the left.

Crotchet Glossary

ch : chain **sc** : single crochet (UK) **dc** : double crochet (UK).



Patterns

Pyramid Crochet Neuron by Jenny Whiting

Materials

- 4.5- 5mm hook
- 6 8ply yarn, bright colours other than red preferred
- Size can vary, aim for cell body 6 -7 cm long
- Wadding, fabric or recycled plastic for stuffing
- 1-2mm wire (optional)

Base:

 $2 \mathrm{ch}$

Rd 1: 6 dc in 2nd ch from hook, sl st to 1st dc. [6dc] Rd 2: 1 ch, 2dc in each dc, sl st to 1st dc. [12dc] Rd 3: 1ch, 2dc in 1st dc, 1 dc in next 3 dc, 2 dc in next dc, (1 dc in next 3 dc, 2 dc in next dc). Repeat from (to). Sl st to 1st dc. [15dc]

1st Side:

Row 1: 1 ch, dc in 2nd dc, { 1 dc in each of next 4 dc, 1 ch, turn.

Row 2: 1 dc in each of next 5 dc, 1 ch, turn

Row 3: 1 dc in each of first 2 dc, dec dc over next 2 dc, dc in last dc, 1 ch, turn.

Row 4: 1 dc in first dc, dec dc over next 2 dc, dc in last dc, 1 ch, turn

Row 5: (optional – leave out row 5 for a more stumpy cell body) 1 dc in each dc, 1ch, turn.

Row 6: 1dc, 1dec dc over next 2 dc, 1ch, turn Row 7: 1dec dc in next 2 dc. Fasten off.}

2nd side:

Join in yarn in next dc of base and dc in same stitch. Repeat from { to }

3rd side: as for 2nd side

Forming cell body

Fold up two of the sides and either stitch them together, or single crochet them together by doing 1 sc into the ends of each of the aligned rows. Crocheting them together gives quite a defined edge. Attach remaining side to first side along one edge. Stuff with stuffing and stitch up remaining seam.

Axon: attach yarn into the single dc on the top of one of the sides. 1 dc in that stitch and into the top stitch of each side [3 dc], sl st into 1st dc. If it's a bit tricky to find the stitches — don't worry - just do your best so you have about 3 stitches on your

hook. Do a couple of rounds of dc into each stitch then hook through each dc, yarn over hook and pull through all loops on hook so you are left with one stitch.

Chain as many as you like (30-40 is a good guide) to give the length of axon you want. Turn, sc into each ch, sl st onto top of cell body. Fasten off.

Dendrites: make several (3-6 is a good guide) dendrites around the base of the cell body. To make branched dendrites, see below. {Attach yarn at desired position and make 6-15 chain depending on desired length of dendrite. Turn, sc into each ch to end, sl st back into starting point. Fasten off.} Repeat from {to} for each dendrite.

Branches: to make branches on your axon or dendrites as you sc back along your length of chains, stop where you want your branch, make a few extra chains, turn, sc in each ch back to the starting stretch of chains and carry on back to the cell body.

To give the axon (or dendrites) more strength, cut 1mm wire twice the length required plus 2cm. Bend the wire in half, thread through the axon or dendrite starting inside the cell body and working to the end. At the end, twist the doubled end through a loop of crochet and double over again to secure it. Twist the raw ends together inside the cell body, catching some of the stuffing, bend wire in toward the centre so no sharp end protrudes. **Congratulations: you have created a neuron.**

FEEL FREE TO PLAY – for a slightly larger cell body try adding 2 extra rounds to the base:

Rd 4: 1ch, 2dc in 1st dc, 1 dc in next 4 dc, 2 dc in next dc, (1 dc in next 4 dc, 2 dc in next dc). Repeat from (to). Sl st to 1st dc. [18dc]

Round 5: 1ch, 2dc in 1st dc, 1 dc in next 5 dc, 2 dc in next dc, (1 dc in next 5 dc, 2 dc in next dc). Repeat from (to). Sl st to 1st dc. [21dc]

1st Side:

Row 1: 1 ch, dc in 2nd dc, { 1 dc in each of next 6 dc, 1 ch, turn.

Row 2: 1 dc in each of next 7 dc, 1 ch, turn

Row 3: 1 dc in each of first 3 dc, dec dc over next 2 dc, dc in last 2 dc, 1 ch, turn.(6sts)

Row 4: 1 dc in first 2 dc, dec dc over next 2 dc, dc in last 2 dc, 1 ch, turn (5sts)

Row 5: continue as for side1, row 2 in the original pattern.



Patterns²⁻ⁱⁿ⁻¹ Crochet Neurons</sup> by Pat Pillai

Materials and first 8 rows are the same for both Pyramid Neuron or Stellate Neuron.

Hook and yarn sizes are just a guide. Using a 4.5 hook with 8ply gave the measurements below. Work the whole pattern continuously, do not join at the end of each round. Mark the beginning of the round with a safety pin.

Materials

- 4.5 5mm hook
- 6 8ply yarn, ½ ball or less
- Safety pin/marker, move at the beginning of each round.
- Small amount of wadding or recycled plastic for stuffing
- 1-2mm wire for reinforcing dendrites and axon (optional)
- Darning needle

Base for pyramid or stellate neuron

 $2 \,\mathrm{ch}$

Rd 1: 6 dc in 2nd ch from hook. [6dc]

Rd 2: 2dc in each dc. [12dc]

Rd 3: (1dc in next dc, 2 dc in next dc) rpt to marker (18 dc)

Rd 4: (1 dc into next 2 dc, 2dc into next dc), rpt to marker (24sts)

Rd 5: (1 dc in next dc, 2 dc in next dc) rpt to marker (36 sts) Base now measures approx 6 - 6.5cm

Rd 6 to 8: 1dc into each dc (Depth of sides now measures 2-2.5cm, make an extra dc rd if needed.)

Stop here if making the stellate neuron, and find the instructions that follow 'Dendrites'

Pyramid neuron Rd 9: 1dc into each dc

Rd10: (1dc into 2nd dc from hook, 1 dc into next 4 sts) rpt to marker (30 sts)

Rd 11: (1dc into 2nd dc from hook, 1 dc into next 3 sts) rpt to marker (24 sts)

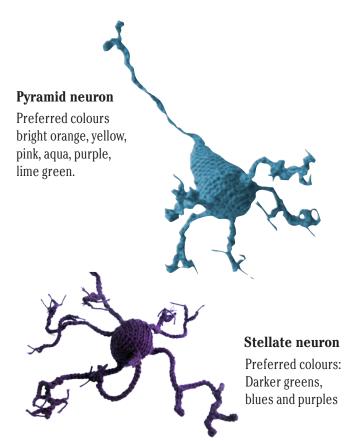
Rd 12: 1dc into each dc

Rd 13: 1dc into 2nd dc from hook, 1 dc into next dc) rpt to marker.(16sts) Height now 3.5 cm approx.

Rd 14 & 15 1dc into each dc next 2 rows (Height now 5cm approx.

Rd 16: (1dc into 2nd dc from hook, 1 dc into next 2 dc,) rpt to marker (12sts)

Rd 17: 1dc into each dc next. Save your loop on the safety-pin while you add stuffing. Retrieve loop,



Rd 18: (1dc into 2nd dc from hook, 1 dc into next) rpt to marker (8sts)

Remove marker and make 1dc into each dc until height from base is 7-8cm, stuffing as you go. Continue round decreasing by making (1dc into 2nd dc from hook, 1 dc into next) until 3sts remain, work on these 3 stitches for two or three rounds then continue as for 'easy axon', or continue on 3 stitches for the length of the axon.

Easy Axon: Continue on 3sts for 3 or 4 rows then pull loop through all three stitches and extend the loop to at least 90cm long or as long as you like (90cm makes an 18cm chain approx). Measure the free yarn up against the loop so that you have a triple strand of yarn. Cut this single strand at the point where it lines up with the top of the loop. Pull the big loop back in and keep making chains until you have used up almost all the free yarn to give give your axon.

Before ending off, thread another 3 strands of yarn through the loop, pull the loop tight. Use the added strands to make terminal branches by knotting, plaiting or chain crochet. Axon terminals are similar in size to the rest of the axon, with a terminal button, so end with a knot or sew on a bead or button. Tidy ends



with darning needle. If desired, thread thin wire through axon to make it stand up.

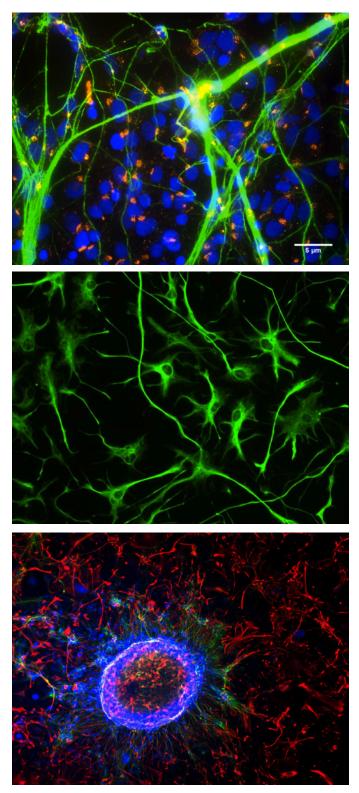
Dendrites: Cut 3 long strands of yarn and pull through the cell body where you want your dendrite. Leave about 10 cm on one side and make a long chain with the rest. Add branches at the end as for the axon, add as many as you like. There are many diagrams on the internet to inspire you. Dendrite branches tend to taper at the end, so it's OK to leave ends hanging. Thread with wire if desired.

Stellate neuron continued: Rd 9: (1dc into 2nd dc from hook, 1 dc into next 2 sts) rpt to marker (27sts)

Rd 10: (1 dc into 2nd dc from hook, 1 dc into next st) rpt to marker (18st)

Remove marker and continue decreasing in the same pattern until 8 st remain, add stuffing, squashing the cell body to a fat disc 7-8cm diameter x 4-5 cm deep.

Now either continue to decrease until 3 sts remain, as for pyramid cell, or end off, leaving the circle open to add a circular nucleus later. Add an axon and dendrites by looping through the cell as above. 🎨



Scientific Images by Ernst Wolvetang, above and on p9.



Patterns

Knitted Neuron by Gabrielle Theriault adapted by Pat Pillai

Materials

- 8 ply or double knitting yarn, bright colour except red
- (sample used less than ½ ball of 100% acrylic knitting yarn)
- size 6 (3.75 mm) needles, double pointed if you have them
- Tapestry needle
- Small amount of stuffing & a few pipe cleaners
- Safety pin or spare yarn

Finished size

Body approximately 7.5 cm (3 "). Example: Dendrites 30cm (6") Axon 30cm (14"), make longer or shorter as you wish.

Gauge

5cm (2") = 10 sts and 14 rows in stocking stitch. Like most knitted toys, gauge isn't super important. Just make sure that the stuffing doesn't show between the stitches.

Soma (cell body)

Cast on 6 stitches

1. [kfb] 6 times (12 sts) 2. Purl all 3. [kfb, k1] 6 times (18 sts) 4. Purl all 5. [kfb, k2] 6 times (24 sts). Tie a spare piece of yarn to mark the beginning of the round. 6. Purl all 7. [kfb, k3] 6 times (30 sts) 8. Purl all 9. Knit all 10-15. Repeat row 8 & 9 three times 16. [k2tog, k3] to end(24 sts) 17-18 Repeat row 8 & 9 19. [k2tog, k2] to end (18 sts) 20-21 Repeat row 8 & 9 22. [k2tog, k1] to end (12 sts) 23. Purl all 24. [k2tog, k2] to end (9 sts) 25. Purl all 26. [k2tog, k1] 3 to end (6 sts) 27. Purl all 28. [k2tog, k1] 2 to end (4 sts)

Axon

Using these 4 stitches, continue in stocking stitch for 10 inches (or as long as you like).

Axon terminal branches

Place one stitch on a safety pin or spare piece of yarn. First branch: Continue with the 3 other stitches in stocking stitch for a few inches, then knit the first 2 stitches together and continue in stocking stitch on 2 stitches for a few more rows, K2tog,

then cut yarn leaving 10cm to work with, and pull the yarn tightly through the remaining stitches.

Second branch: Pick up the stitch that was left behind on the safety pin, the pick up two more stitches (see glossary p1) and knit the axon branch as for the first one, making it longer or shorter as you like.

Third branch: Pick up three stitches from the base of the first 2 branches, two from one row and two from the row above. Knit in stocking stitch for about 1 inch, then knit the first 2 stitches together and continue as for other branches.

Minor branches: To make more small branches on your axon (or dendrite), pick up two or three stitches on a branch and work in stocking stitch for as long as you wish. Make short ones, long ones, have fun! To finish, tuck in the loose yarn from the end of each branch. To make a terminal button, tie a knot, repeating the knot several times so that the yarn forms a small hard ball, then tuck the end in. If you are not giving the neuron to a small child, you may wish to sew on a bead or small button instead.





No-Knit Neuron by Pat Pillai

Materials

- old t-shirt or a piece of fabric cut into a 18cm x 6cm rectangle and a 21cm square
- 6 or more pipe cleaners
- 2 or 3 rubber bands
- A ball of yarn, any thickness*, or stretch fabric cut into long narrow strips 0.5cm wide, sewing cotton and thin yarn for highlights (optional)

Preferred colours: yellow, orange, bright pink, lime green, light purple

Every neuron has a cell body with a nucleus inside it, an axon at one end and one or more dendrites branching out in other directions. (see diagram on page 2)

* Yarn can be any thickness, thin yarn – work two lengths together.

Method Nucleus





Fold the small rectangle in half to form a square. Bring each corner into the centre like an envelope, squeeze the envelope into a rough ball & secure with a rubber band or a few stitches.

Cell body



Fold the square into a triangle and roll into a cone, push the nucleus firmly into the centre, tuck the ends in over the nucleus.



Stretch a rubber band around the cone two or three times to hold everything together.



Add an axon by sliding a pipe cleaner under the rubber band, with one end extending a few cm toward the middle of the cone.



Covering the axon



Thread yarn under the rubber band, wrap it around the cell body a few times, tie a knot at the beginning of the axon (red) then wind until $\frac{1}{2}$ cm from end.

Adding an axon terminal and terminal buttons



Add extra pipe-cleaner to make terminal branches as shown, (pink). Continue to cover by winding, form a knob



Alternately, tie in three or more strands of yarn where you want the branch, then plait or knot to the thickness of the axon, end with a knot.

Adding Dendrites



Slide another pipecleaner under the rubber band, as for the axon.



Bend pipe-cleaner 2.5 cm from one end, point both ends away from the

Add more 'dendrites' in the same way as the first.

Repeat until you have 5 or more dendrites. Push the pipe-cleaners apart so there is space between the dendrites.

Weaving and winding to cover the cell body







Tuck the end of your yarn into the rubber band near the axon. Start winding around the cell body, wind the wool over the top of the bent pipe-cleaners (dendrites) until you are about 2 cm from the fat end.



Attends No-Knit Neuron by Pat Pillai (continued)





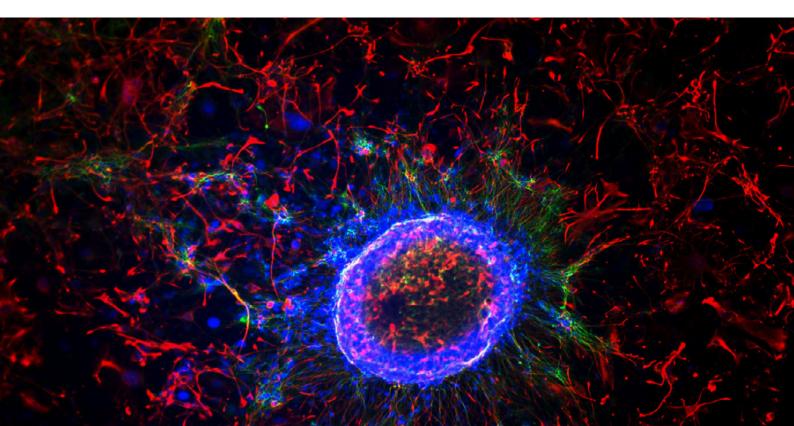
Hold the cell body firmly in one hand, pass all the way around the top of the first dendrite, then continue winding in the same direction, repeating the last step for each dendrite you come to until you are 1cm from the edge of the cell body.

Wrap the yarn around the top of the next dendrite, then crisscross over the fat uncovered section between dendrites. Repeat until covered. From time to time loop the yarn back across the cell body and around the axon to keep the yarn in firmly in place.

Covering dendrites.

Cover the main dendrites and add branches as for axon (above). Instead of making rounded ends, taper the branches. If you want to, vary the width of branches by adding a strand of thin highlight yarn or unraveling the ends of thick yarn to make smaller 'twigs' Tie off a few centimeters from the end, leaving single strands of yarn free to form even smaller branches dendrite branches are thinner than the main dendrite. Add as many as you like - have fun.

Congratulations – you have created a pyramid neuron.





JOIN this community art project promoting mind and brain health. Whether you're a whiz with yarn, or just discovering the joy of craft, now you can crochet wrap, knit or knot – and find out about neuroscience.

Neurons are electrically excitable cells of the brain, spinal cord and peripheral nerves. The billions of neurons in your body connect to each other in neural networks. They receive signals from every sense, control movement, create memories and form the neural basis of every thought.

Neural Knitworks invites you to create textile neurons that will contribute to a travelling art exhibition. Your creations will be joined with others to weave a sculptural, knitted 'neural network'. No knitting experience is required and people of all ages can participate.

Have fun as you:

- design your own woolly neurons, or get inspired by our scientifically-informed knitting, crotchet or knot patterns
- natter with neuroscientists and teach them a few of your crafty tricks
- increase your attention span and test your memory.

Calm your mind and craft your own brain health as you:

- forge friendships
- solve creative and mental challenges
- practice mindfulness and relaxation
- teach and learn

Neural Knitworks are based on the principle that yarn craft, with its mental challenges, social connection and mindfulness, helps keep our brains and minds sharp, engaged and healthy.

Workshops

Learn how to create neurons at this free Hazelhurst Open Day Neural Knitworks workshop: Sunday 4 May 10am–3.30pm.

Host your own Neural Knitwork!

You'll just need your favourite yarn, needles, copies of our scientifically-based neuron-crafting patterns and a comfy spot in which to create.

Gather together a group of friends who knit, crochet, design, spin, weave, artists and crafters, or anyone keen to give it a go. Those who know how to knit can teach others how to do it, and there's even an easy no knit patterns that you can knot.



Download a neuroscience podcast to listen to and you've got a Neural Knitwork! Visit our event organisers online toolbox for tips and resources to help you host a

successful event. List your event on the National Science Week calendar to take advantage of multi-channel promotion.

Send us your neurons

Neural Knitworks needs an enormous number of handmade neurons to create its first installation at Hazelhurst Regional Gallery in August 2014. Please help us raise awareness of mind and brain health in the community by mailing your crafted neurons or dropping them in to:

Neural Knitworks, Hazelhurst Regional Gallery & Arts Centre, 782 Kingsway, Gymea NSW 2227

The gallery is open 10am–5pm daily. Completed neurons must be received by Monday July 21.

Note that neurons will not be returned so we suggest you post photographs of your creations in our Facebook group before you send them to us. Join Neural Knitworks on Facebook to share and find information about workshops, knit-ins and public talks featuring neuroscientists. If you have created a great pattern you want to share, you can upload it to the group 'Files'.

Textile artist Pat Pillai's idea to knit and weave brain cells was the winning pitch at the 2013 Ultimo Science Festival Art & Science Soiree in Sydney. Thanks to all those willing to contribute their neurons to help bring this woolly brain artwork to life!





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