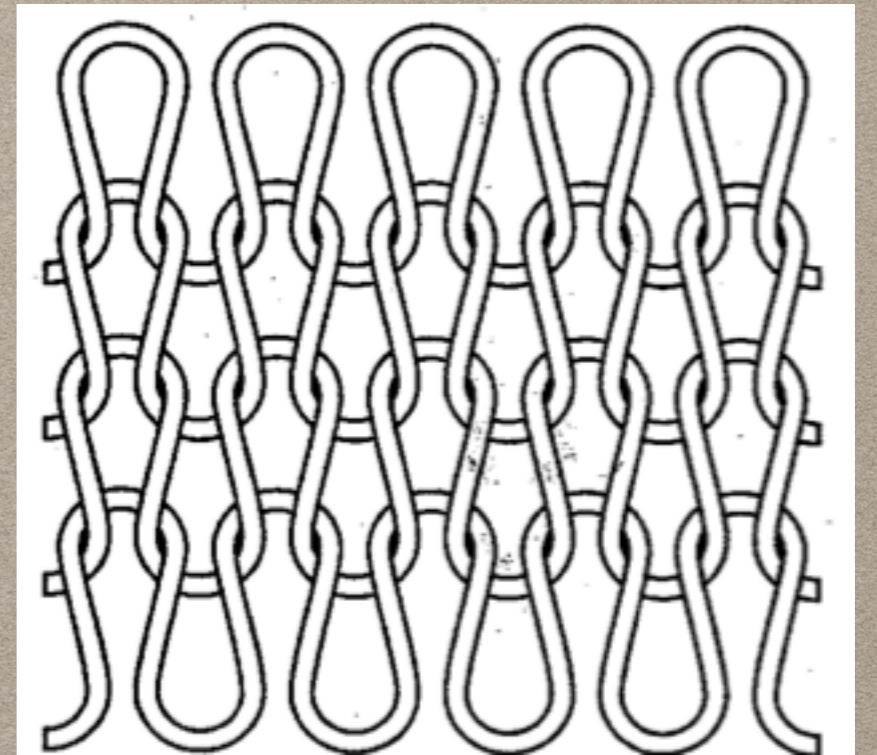




**MATH AND KNITTING**  
**(AND CROCHET AND WEAVING AND...?)**

# WHAT IS KNITTING?

- Yarn
- Two needles
- create a row of loops, one loop at a time; & repeat!



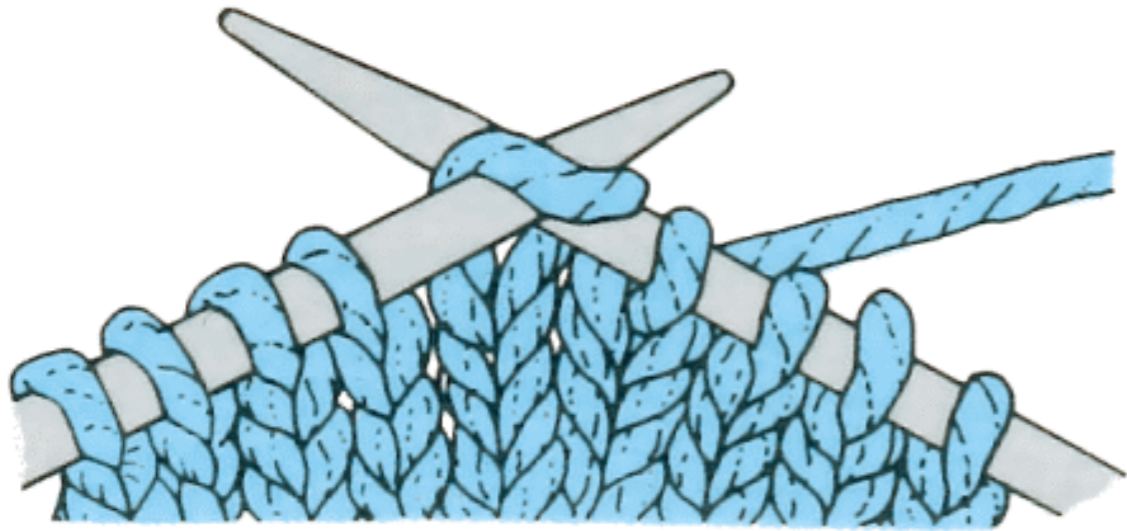


Fig 30

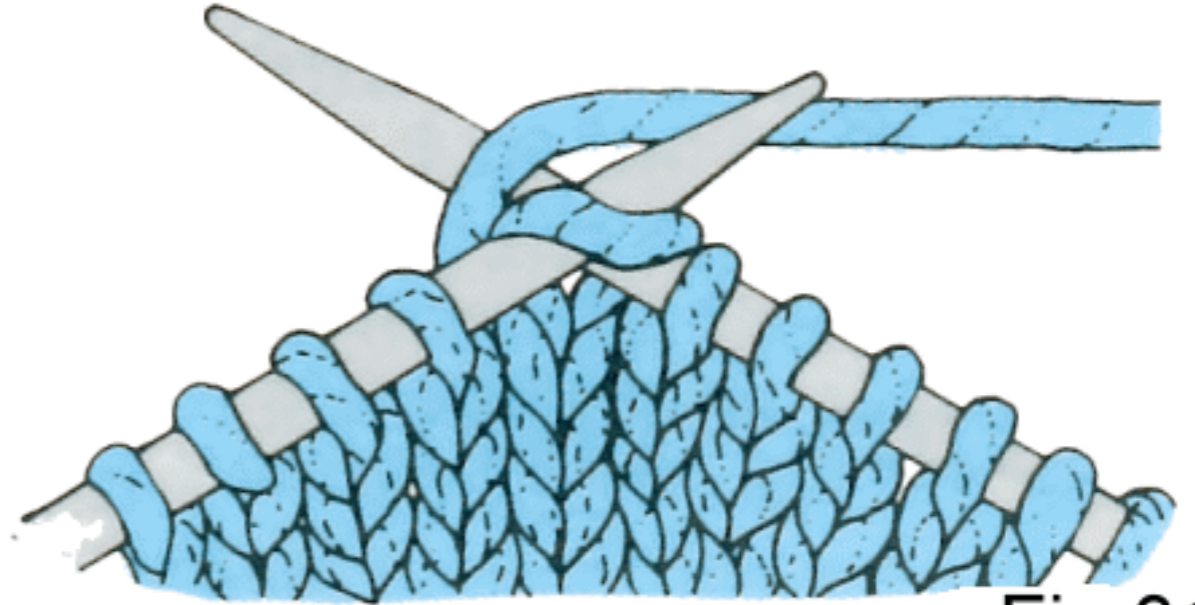


Fig 31

<https://www.youtube.com/watch?v=lsrAA4djRIA>

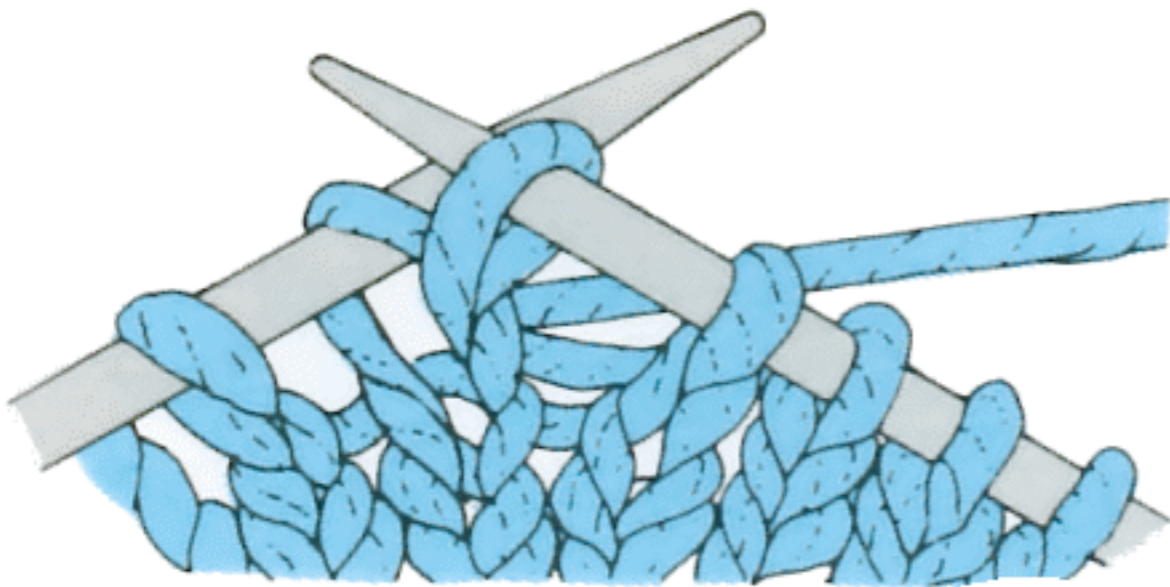


Fig 32

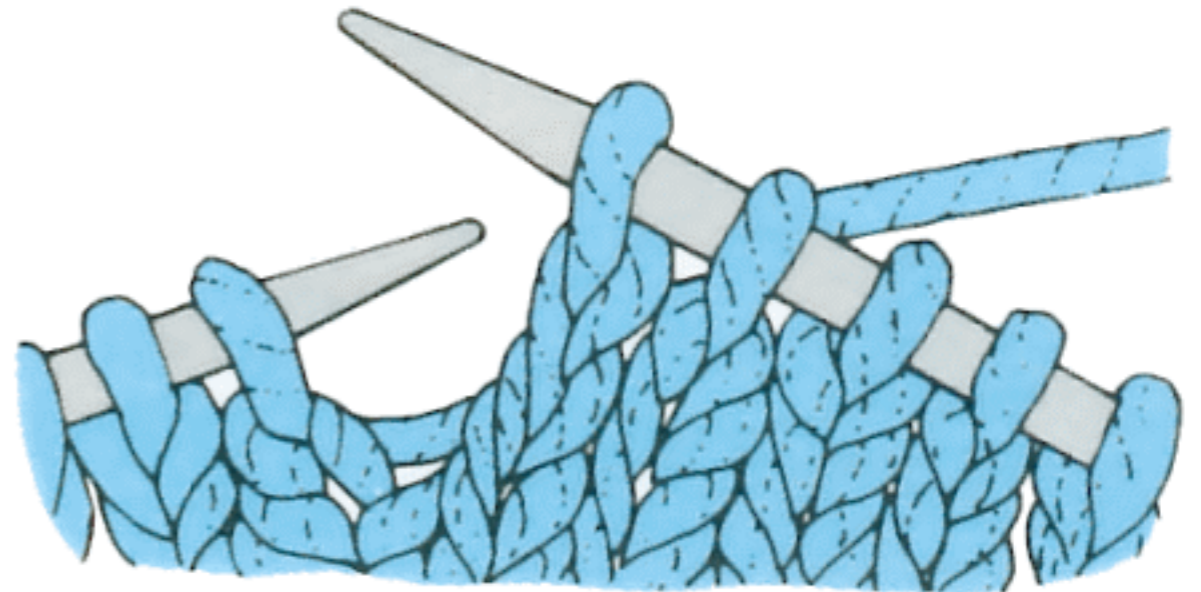
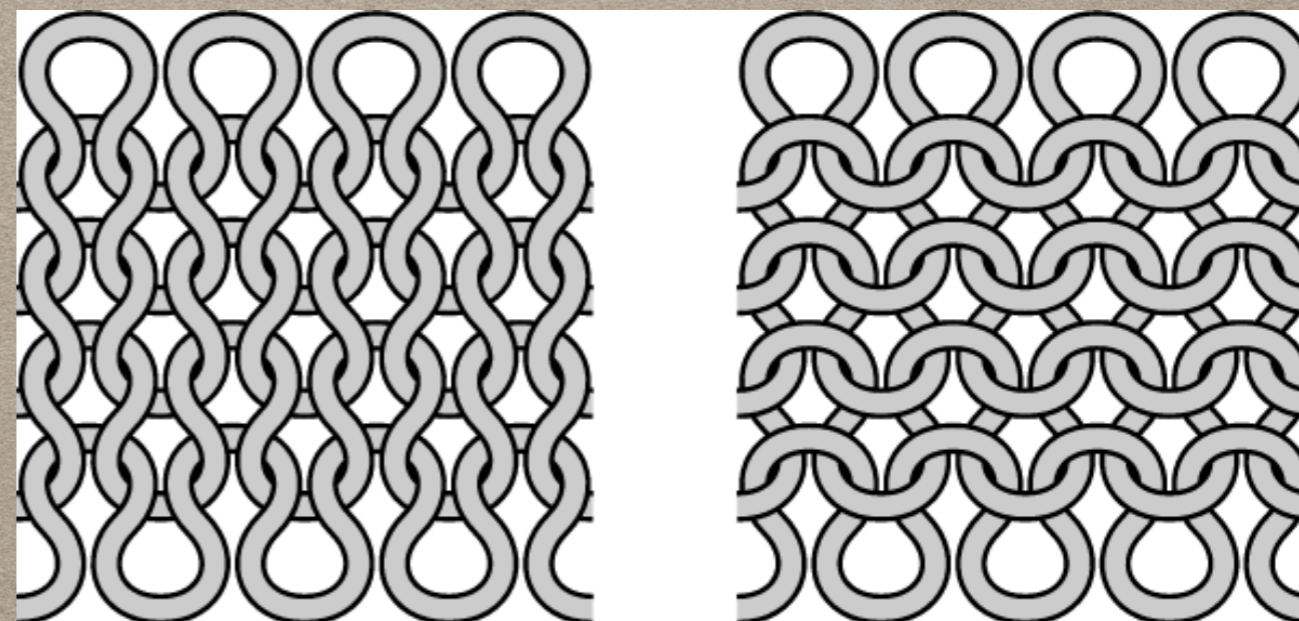


Fig 33

# KNITTING AND PURLING



# BEYOND THE BASICS: LACE...



# ...CABLES ...



# ... COLORS ...



# ...COLORS...





# ...CABLES, LACE, AND COLORS...



# PATTERNS, CHARTS, RESULTS

Row 1 (RS): In MC, k3, (yo, k1)x32, k2. (69 sts)

Rows 2, 4 and 6 (WS): In MC, k2, purl to 2 from end, k2. (69 sts)

Rows 3 and 5 (RS): in MC, k2, ssk, (yo, k1, yo, s2kp2)x15, yo, k1, yo, k2tog, k2. (69 sts)

Row 7 (RS): In CC, k4, (yo, k1, yo, k3)x15, yo, k1, yo, k4. (101 sts)

Row 8 (WS): In CC, k2, purl to 2 from end, k2. (101 sts)

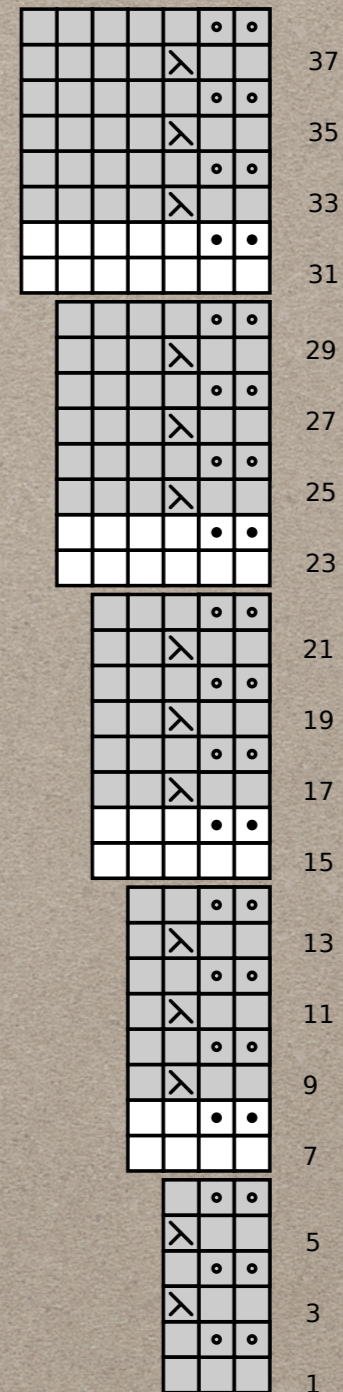
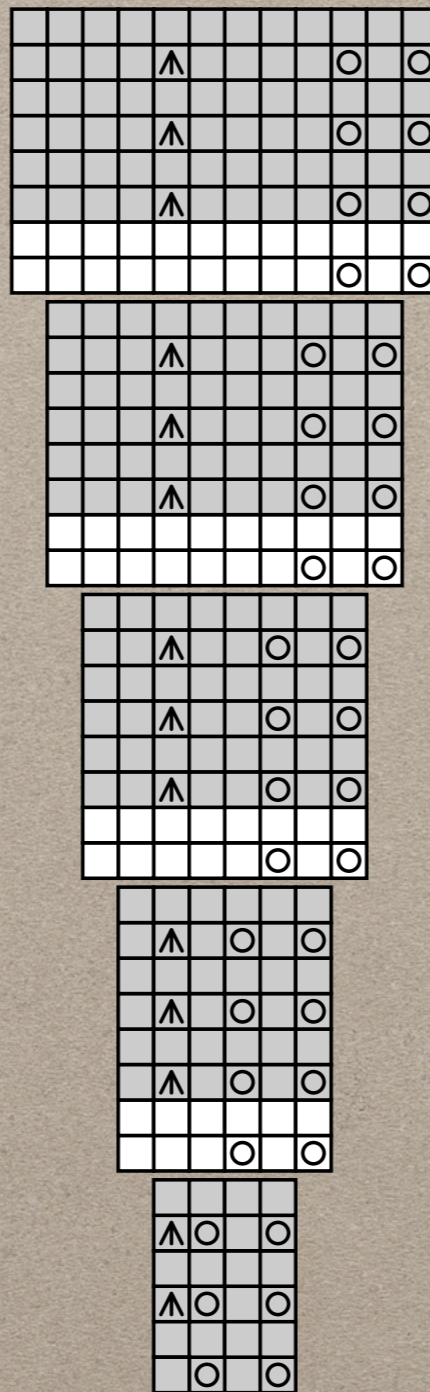
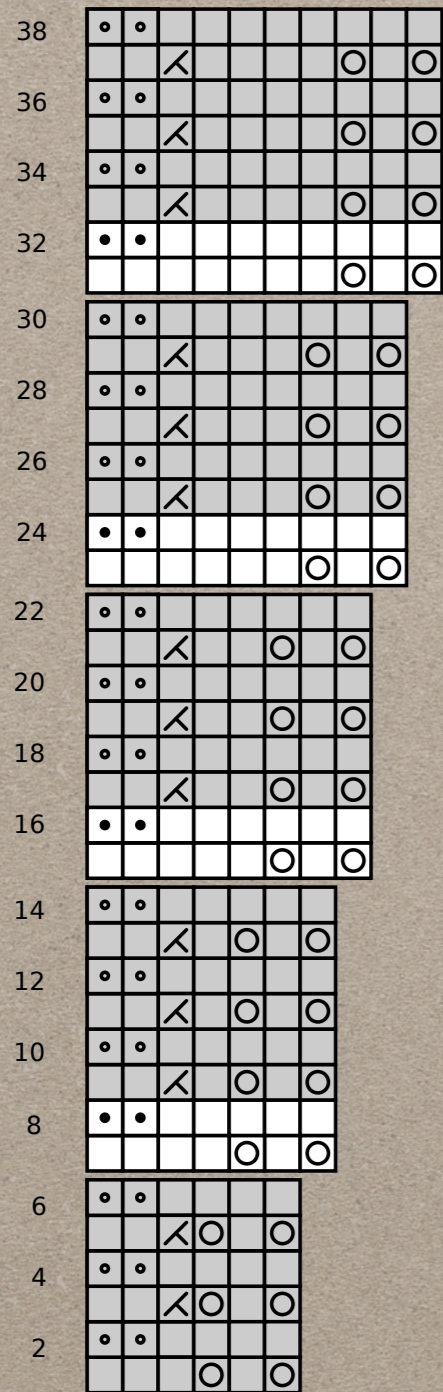
Rows 9, 11 and 13 (RS): In MC, k2, ssk, k1, (yo, k1, yo, k1, s2kp2, k1)x15, yo, k1, yo, k1, k2tog, k2. (101 sts)

Rows 10, 12, and 14 (WS): In MC, k2, purl to 2 from end, k2. (101 sts)

Row 15 (RS): In CC, k5, (yo, k1, yo, k5)x15, yo, k1, yo, k5. (133 sts)

Row 16 (WS): In CC, k2, purl to 2 from end, k2. (133 sts)

# PATTERNS, CHARTS, RESULTS



**Key:**

- ? Work "?" in main color
- ? Work "?" in contrast color
- Knit on RS  
Purl on WS
- Purl on RS  
Knit on WS
- o yarn over
- ^ s2kp2
- / ssk
- \ k2tog

Repeat 15 times

# CROCHET

- yarn
- one hook
- create a row of knots, one knot at a time; & repeat!





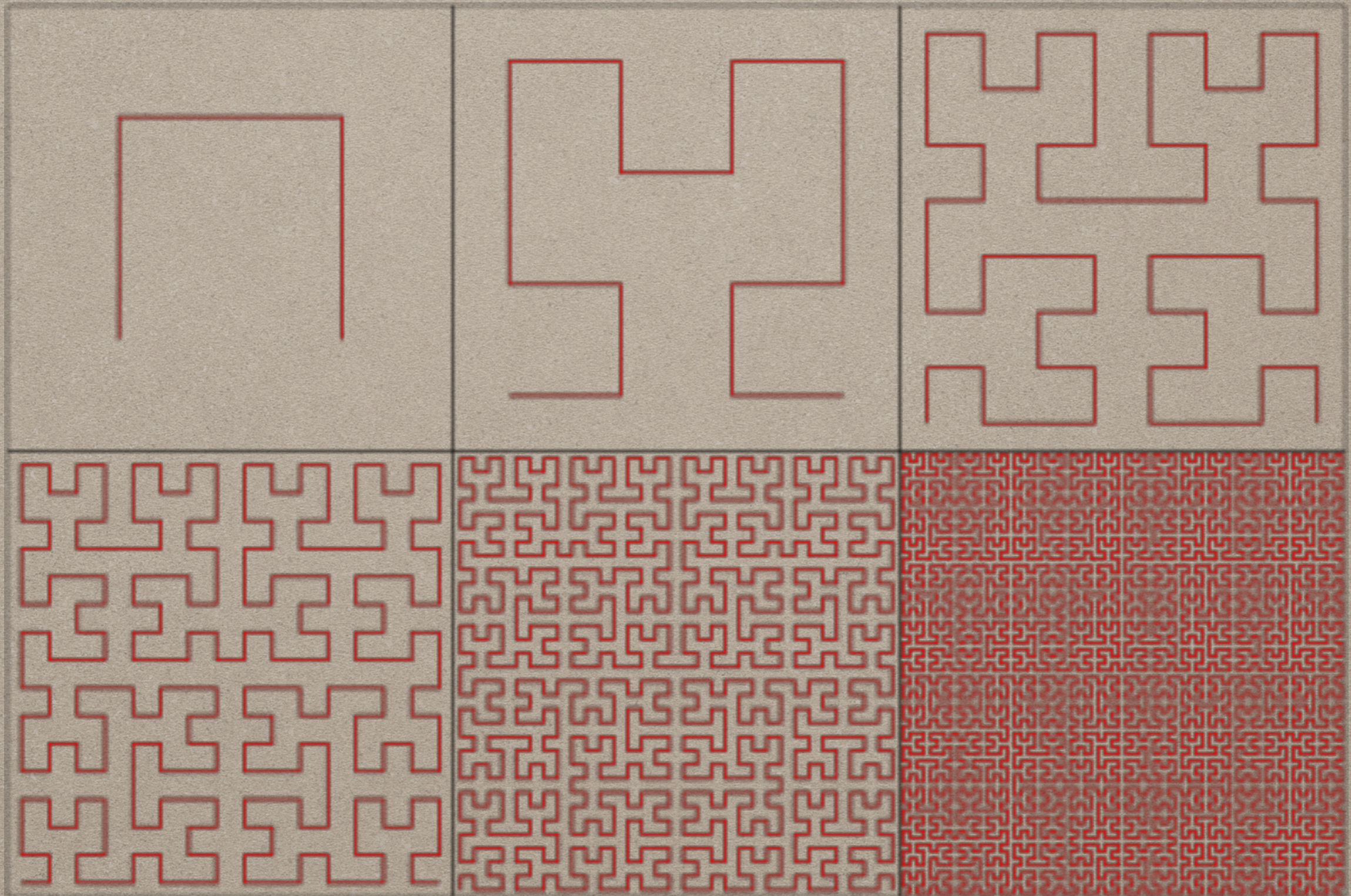
# WEAVING



- a loom
- yarn
- warp and weft
- Jacquard machine, 1804, and punch cards



# SPACE-FILLING CURVE



# THINGS MATHEMATICIANS LOVE:

- Fractals!





# HYPERBOLIC PLANE

Curvature is the difference between a ball, a plane, and a pair of pants.



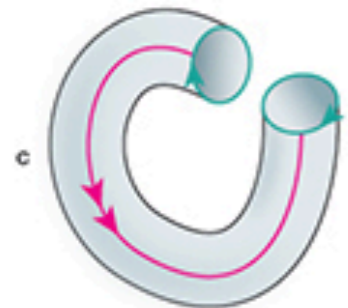
# OTHER SURFACES



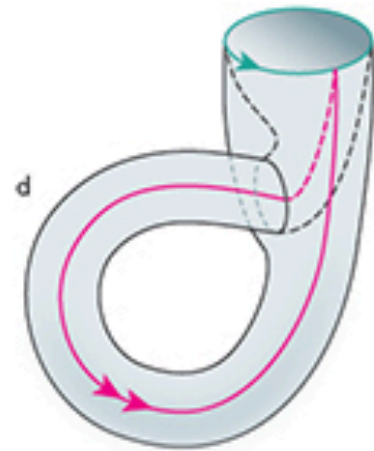
a



b



c



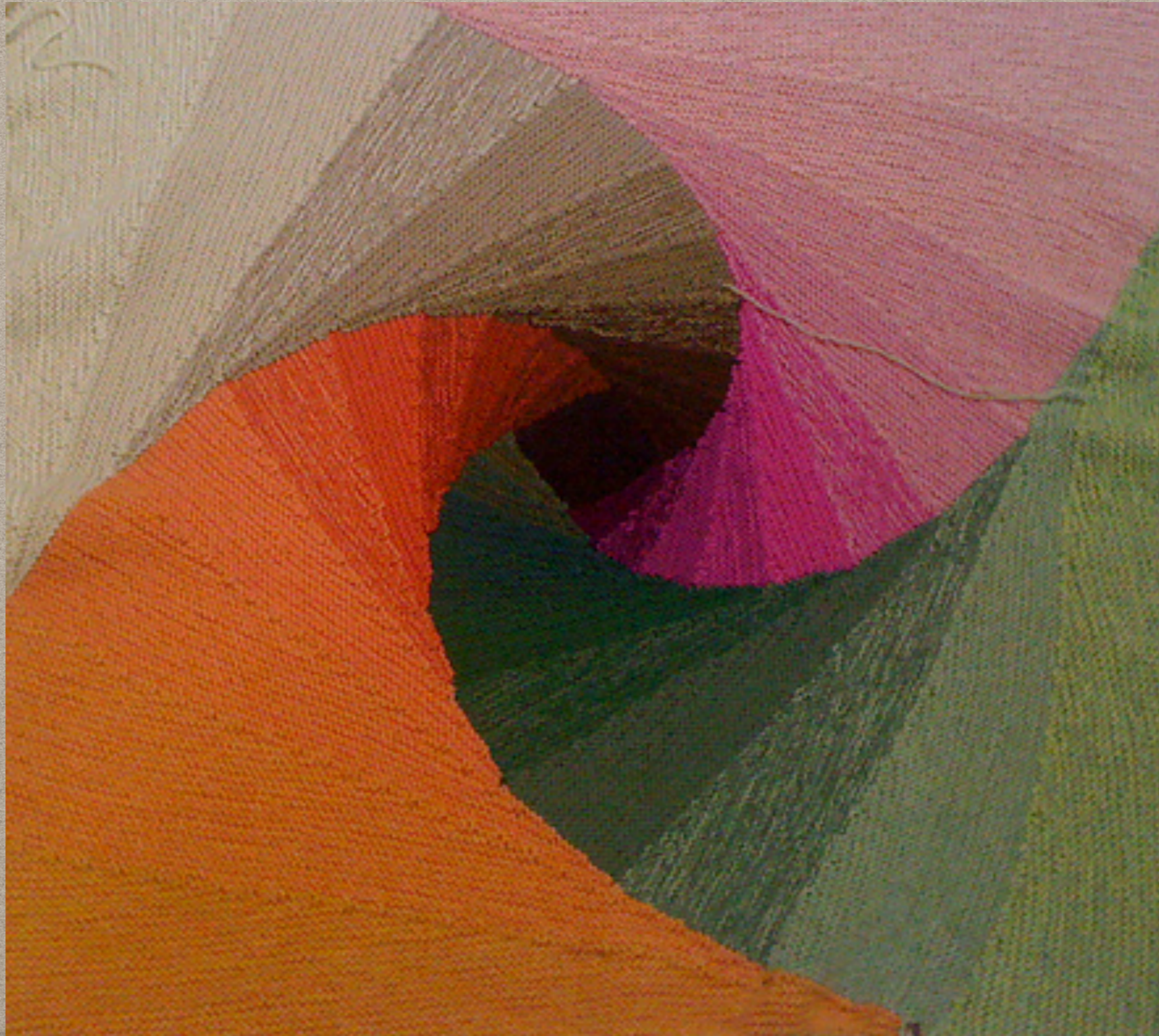
d



# 3D GEOMETRY



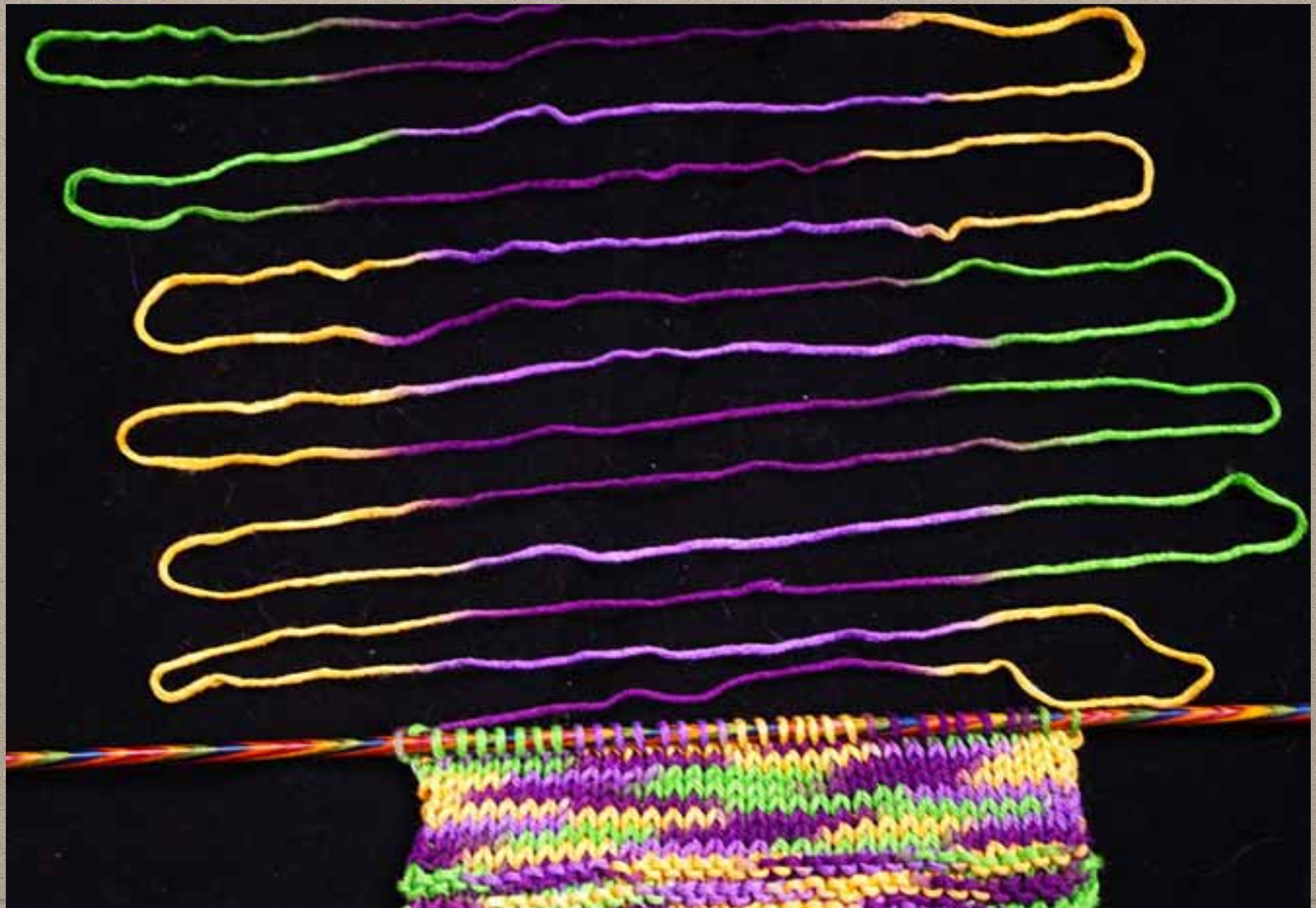
# OPTICAL ILLUSIONS



# OPTICAL ILLUSIONS



# POOLING PATTERNS



# POOLING PATTERNS



# NEURAL NETS

- Janelle Shane trains AIs called neural nets on data sets and asks them to create new things:





- Including ... knitting patterns!







# RESOURCES

- Ravelry
- Youtube, Craftsy
- WEBS – [yarn.com](http://yarn.com)
- Yarn conventions (YarnCon!)
- Evanston Stitchworks, Lorna's Laces

# CREDIT WHERE CREDIT IS DUE

Photos from ravelers jojo4444 (Evenstar by Susan Pandorf), Beeswax Cowl by Amy van de Laar, laril (Estonia, Kaffe Fasset), knitosophy (#33 Heart Blanket, Bonnie Franz), Dayanaknits (Anatolia by Marie Wallin), Baa-ble hat by Donna Smith, Wishmaker Mitts by Erica Heusser, Tianaeve (Sagitta by Amanda Scheuzger), chronographia's "Sierpinski's Beanie and Mitts", azly (Talant the camel, Annie Hider), kristyann and Hornet (Curve of Pursuit, design by WoolyThoughts), pixieface's scream queen, and last but not least, sarah-marie belcastro (torus from "Making Mathematics with Needlework")