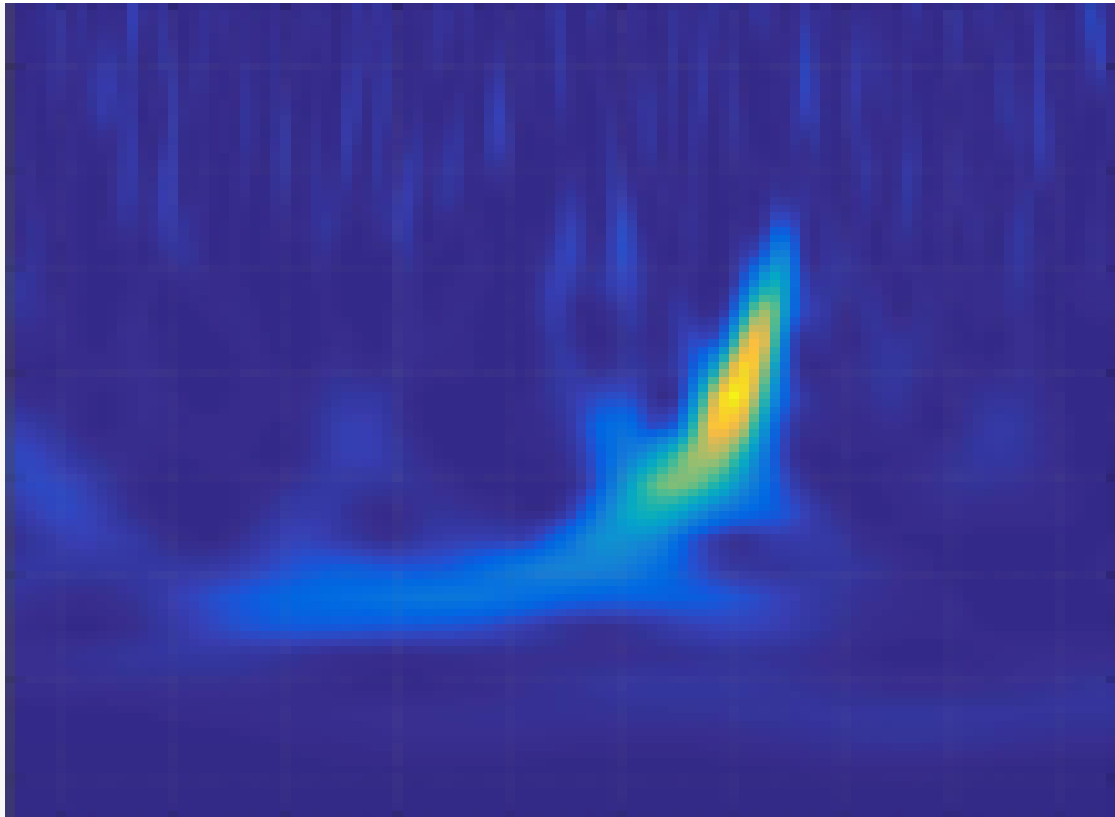


Knit Kit 3 - The First Chirp



B. P. Abbott et al, 2014, Observation of Gravitational Waves from a Binary Black Hole Merger. Physical Review Letters, 116(6)
DOI: <https://doi.org/10.1103/PhysRevLett.116.061102>

This is what the universe “sounds” like.

The Story

Dr. Brynley Pearlstone

This is rockstar science. Scientists had been trying to find gravitational waves for 100 years. Einstein thought of them, but also thought they were so small they would never be found. But when I was studying for my PhD, they were detected. At the start of 2016, I was doing work in America at the LIGO detector, when this discovery was published. There were reporters all over and it made every newspaper and TV channel. It had taken over 1,000 people and 30 years of work. One thing I took away from the experience is that all scientists are just people - friends, sons, daughters, dog-dads, artists, ping-pong players. Just normal people coming together to do something special.

The Science

When two huge black holes circle around each other, they get closer and closer, and faster and faster, until they collapse into a single massive black hole. This creates ripples in the fabric of spacetime, known as gravitational waves. These gravitational waves spread out through the universe like ripples on the surface of a pond, and get fainter as they arrive here on earth.

In the knit, each stitch in a row represents a little bit of time, and each different row is frequency (how many times each second the black holes go around each other). The brighter colours mean that in that stitch (moment in time) and in that row (at the speed the black holes are going) the gravitational

waves are louder. As time goes on, the two black holes circle each other faster, and the waves get louder. We call this shape a “chirp”, because if you turn it into a sound, it gets louder as it increases in pitch - whooooOOOOP!

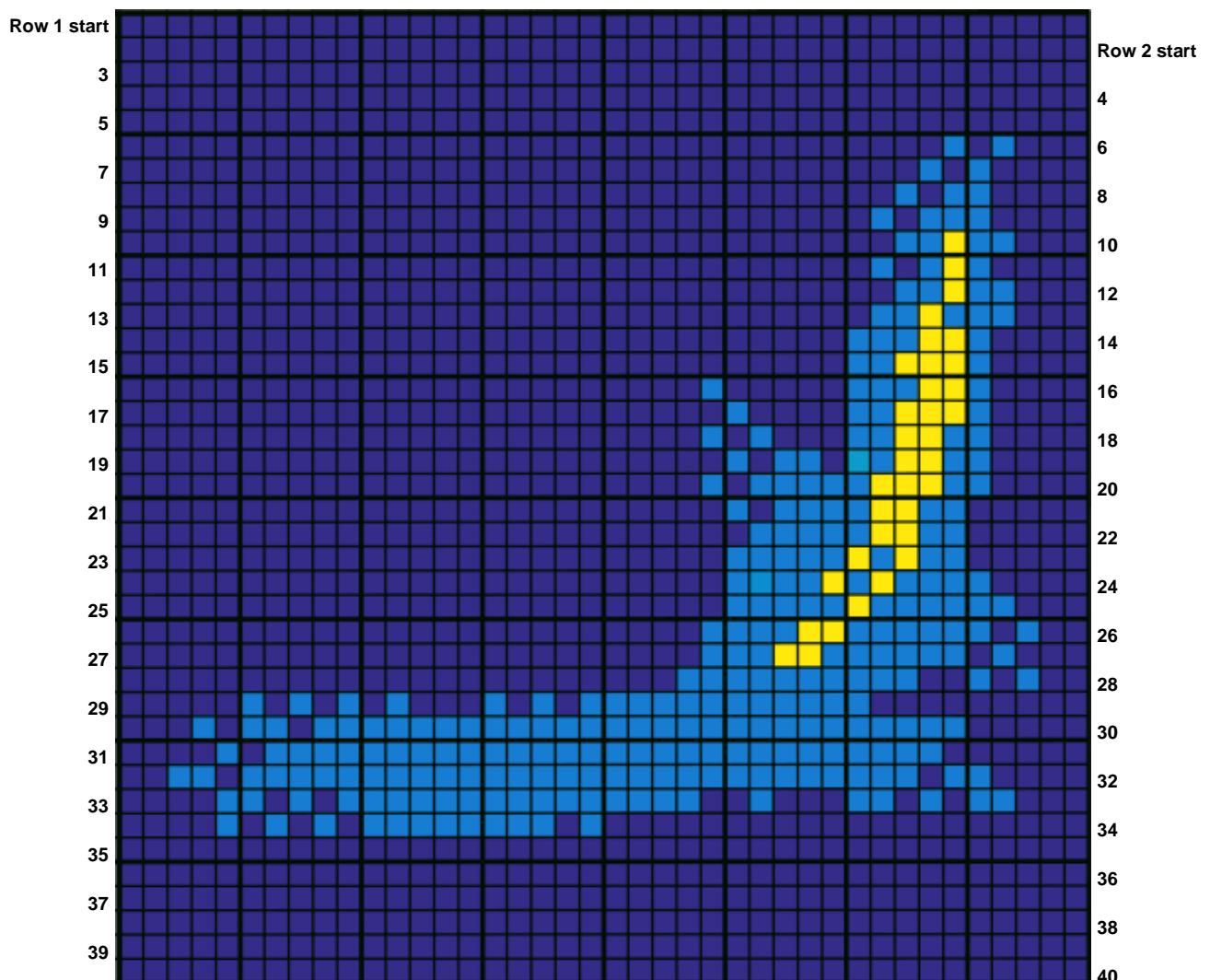
This is an easy knit. You will need:

- 3 colours of wool.
- A pair of knitting needles

And that's it!

The colours in the image are made by the scientists to help them understand the graph, so you can use the colours you want, if it helps you understand it too. In this knit, we used around 25g dark blue, 10g light blue and 10g of yellow DK wool and 4mm knitting needles.

Skills used include: Cast On, Knit, Purl, Change Colour, and Cast Off. Go to our website www.knittheuniverse.co.uk for links to handy YouTube videos to learn these skills. Remember: After casting on, knit odd-numbered rows, changing colours as you go, and purl even numbered rows, changing colours as you go.



Knitting Pattern

k – Knit p– Purl d – Dark blue l – Light blue y- Yellow

Brackets indicate stitches inside the brackets are repeated.

For example, p2d means purl 2 stitches in dark blue, and (k1y, k1l) twice, means knit 1 stitch in yellow, 1 stitch in light blue, and do this twice.

Cast on 40 stitches in dark blue (or an alternate colour).

Row 1-5: Knit odd rows, purl even rows.

Row 6: p3d, p1l, p1d, p1l, p34d

Row 7: k33d, k1l, k1d, k1l, k4d

Row 8: p4d, p2l, p1d, p1l, p32d

Row 9: k31d, k1l, k1d, k3l, k4d

Row 10: p3d, p2l, p1y, p2l, p32d

Row 11: k31d, k1l, k1d, k1l, k1y, k1l, k4d

Row 12: p3d, p2l, p1y, p2l, p32d

Row 13: k31d, k2l, k1y, k3l, k3d

Row 14: p4d, p1l, p2y, p3l, p30d

Row 15: k30d, k2l, k3y, k1l, k4d

Row 16: p4d, p1l, p2y, p3l, p5d, p1l, p24d

Row 17: k25d, k1l, k4d, k2l, k3y, k1l, k4d

Row 18: p4d, p2l, p2y, p2l, p3d, p1l, p1d, p1l, p24d

Row 19: k25d, k1l, k1d, k2l, k1d, k2l, k2y, k2l, k4d

Row 20: p4d, p2l, p3y, p5l, p1d, p1l, p24d

Row 21: k25d, k1l, k1d, k4l, k2y, k2l, k5d

Row 22: p5d, p2l, p2y, p5l, p26d

Row 23: k25d, k5l, k1y, k1l, k1y, k2l, k5d

Row 24: p4d, p4l, p1y, p1l, p1y, p4l, p25d

Row 25: k25d, k5l, k1y, k6l, k3d

Row 26: p2d, p1l, p1d, p6l, p2y, p4l, p24d

Row 27: k24d, k3l, k2y, k6l, k1d, k1l, k3d

Row 28: p2d, p1l, p1d, p1l, p2d, p10l, p23d

Row 29: k5d, (k1l, k1d) 4 times, k2d, (k1l, k1d) twice, k12l, k9d

Row 30: p5d, p27l, p1d, p2l, p1d, p1l, p3d

Row 31: k4d, k1l, k1d, k28l, k6d

Row 32: p4d, p2l, p1d, p28l, p1d, p2l, p2d

Row 33: k4d, k2l, k1d, k1l, k1d, k15l, k2d, k1l, k3d, k2l, k1d, k1l, k1d, k2l, k3d

Row 34: p20d, p1l, p1d, p8l, (p1d, p1l) 3 times, p4d

Row 35-40: Using dark blue, knit odd rows, purl even rows.

Cast off.