

### Notes for teachers

#### At a glance

In this activity students view the 'You've got a Nerve' video and learn that Charles Sherrington named the gap between neurons synapses.

They then think about why we use models to explain difficult scientific concepts such as why synapses are important and how impulses travel across them.

Groups construct a model of what happens at a synapse using stop-motion animation before using their model to explain how some drugs and toxins work by interfering with synapses.



#### Learning Outcomes

- Students construct an animation to explain what happens at a synapse.
- Students apply knowledge to explain how drugs work.

### Each pair of students will need

- 1 copy of the pupil worksheet
- Tablet or smartphone with suitable app installed for stop-motion capture such as iMotion on iOS (iPads, iPhones) and Lapse it on Android. Alternatively, a digital camera can be used.
- Materials for making the animation: paper, card, modelling clay, mini whiteboards and pens.
- 2 retort stands, bosses and clamps (optional)

### Possible Lesson Activities

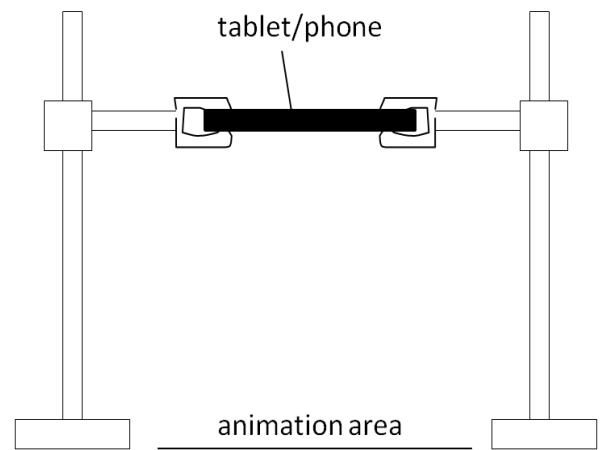
#### 1. Starter activity

- Show the class the video 'You've got a nerve'.
- Discuss how the presenter used the robot Artie to model how our muscles work (0:44 - 1:11). Explain that using models in science can help explain things that we can't easily see. Question the class as to why using models when learning about neuroscience can be useful.
- At this point you may wish to show the class some models of neurons and nerves. You can easily build a model of a neuron out of sweets (do an internet search for 'candy neuron') or use a candy lace to represent a single neuron and bunch several together to model a nerve. The spine can be modelled by following these instructions:  
<http://adventuresinmommydom.org/make-candy-spine/>

#### 2. Group activity: Creating an animation of a synapse

- Ask the students to read through the sections *A model network* and *The gaps between neurons are called synapses* on the pupil worksheet.
- Students then work in pairs or small groups to create a stop-motion animation to show what happens at a synapse. They should have a range of materials to choose from. Suitable materials include coloured paper/card or modelling clay. Students could also choose to draw diagrams on paper or mini whiteboards.
- You may wish to show the class some examples of stop-motion animation e.g.  
[https://www.youtube.com/watch?v=zy3r1zIC\\_IU](https://www.youtube.com/watch?v=zy3r1zIC_IU)
- Students will need to gather information about synapses from textbooks, internet searches and the information on the pupil worksheet. They should draw a simple storyboard on paper before they start their animation.
- The level of detail that the students include in their animation will depend on their attainment. Encourage high attainers to include the use of vesicles and explore how re-uptake of neurotransmitters and enzymes are used to stop the signal transmission.
- The animation can be made using apps on tablets or smart phones.

- Students should build/draw each stage of their animation on the desk and film frames using the device. To ensure it is held in a stationary position the device can be **gently** held horizontally above the desk using retort stands.
- If tablets/phones are not available then digital cameras can be used instead. Students take photos of the stages of their animation and then flick through them on the camera to view the animation or upload the photographs into a movie-making software e.g. Windows Movie Maker.
- Groups can share their final animation with the rest of the class.



### 3. Plenary

- Discuss why using a model such as the one they have just created helps to explain difficult scientific concepts.
- Ask the students to read through the section *Drugs and toxins can interfere with synapses* on the pupil worksheet.
- They then work alone to apply their knowledge of synapses learnt from the animation to write down an explanation of how these drugs work. Lower attaining students can just look at botox.
- Ecstasy (MDMA) works by increasing the amount of the neurotransmitter serotonin in the brain. It does this by blocking serotonin re-uptake pumps on the pre-synaptic neuron. After binding with receptors on the post-synaptic membrane and initiation of the impulse the serotonin does not get removed so repeated impulses occur. This induces feelings of euphoria.
- Botox causes muscle paralysis by blocking impulses between motor neurons and muscles. It does this by binding to the neurotransmitter receptor on muscles. It is used in cosmetic surgery to inhibit muscle contraction and prevent wrinkles forming.

### Suitable websites for research

Information from BBC Bitesize on synapses. Includes a simple animation.

[http://www.bbc.co.uk/schools/gcsebitesize/science/add\\_ocr\\_pre\\_2011/brain\\_mind/informationrev2.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_pre_2011/brain_mind/informationrev2.shtml)

Animation with a little more detail including the function of vesicles and re-uptake channels.

<http://safeshare.tv/w/QUExpPbyeK>

<http://www.oxfordsparks.net/video/youve-got-nerve>