*Biology > Big idea BCL: The cellular basis of life > Topic BCL1: Cells > Key concept BCL1.3: Cell shape and size*

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| **Response activity** |
| **Zooming in** |

**Overview**

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| Learning focus: | Cells are usually too small to be seen without a microscope, but have a range of three-dimensional shapes and sizes. |
| Observable learning outcomes: | Recall that most (but not all) cells are too small to be seen without a microscope.  Estimate the numbers of cells that make up different organisms.  Describe the interacting levels of organisation within a cell (atoms, molecules, subcellular structures, and whole cells) which make life possible. |
| Activity type: | Challenge to thinking – media |
| Key words: | cell |

This activity can help develop students’ understanding by addressing uncertainty about the relative size of cells compared to other structures, as revealed by the following diagnostic questions:

* Diagnostic question: Seeing cells
* Diagnostic question: How many cells?
* Diagnostic question: Order of size – cells and cell structures

**What does the research say?**

Dreyfus and Jungwirth (1989) acknowledge that the cell is, when first introduced, an abstract concept.

A number of researchers have reported that children aged 11-16 lack an appreciation of size and scale, and that this impacts their understanding of the relative sizes of cells and other biological structures (e.g. Arnold, 1983; Dreyfus and Jungwirth, 1988; Driver et al., 1994).

The American Association for the Advancement of Science (AAAS) has reported that almost half of the students in a large sample of aged 11-18 year olds had misunderstandings about the number of cells from which organisms could be made up, with over a third believing there were no single-celled organisms and almost a quarter thinking that “about 1000” was the largest number of cells in an organism (AAAS Project 2061).

**Ways to use this activity**

If students have misunderstandings about the relative size and scale of cells compared to other structures, the use of carefully selected online media such as videos and interactive animations can provide the opportunity to explore and extend students’ understanding through a structured, teacher-led discussion.

Some useful examples are suggested on the following page.

*‘Zoom on an animal cell’ (video)*

This video zooms into, and back out of, a human hand from the skin to a single cell, with diameters and relative magnifications indicated. Available at: <https://vimeo.com/203383608>

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*‘Cell size and scale’ (interactive animation)*

This interactive animation allows the user to drag a slider to zoom into, and out of, various structures from a coffee bean to a single carbon atom, with the sizes indicated. Available at: <https://learn.genetics.utah.edu/content/cells/scale/>

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*‘Cell Biology/Introduction/Cell size’ (text only)*

An interesting list of the sizes of various cells, pathogens, cell structures, and biological molecules is available at: <https://en.wikibooks.org/wiki/Cell_Biology/Introduction/Cell_size>

**Acknowledgments**

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**References**

AAAS Project 2061. *Item CE128001: Different organisms range in the number of cells they have, from only one cell to many millions* [Online]. American Association for the Advancement of Science. Available at: <http://assessment.aaas.org/items/1/CE/281/CE128001#/1>.

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