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Introduction
This catalogue contains details about the Science: Working scientifically digital curriculum resources made available by The Learning Federation (TLF) to all schools in Australia and New Zealand. The content supports and enhances students’ understanding of key scientific concepts in a range of contexts for the P–12 years.

The content includes:
- hundreds of interactive learning and assessment objects
- a large and diverse range of digitised items such as images, film clips, maps, songs, posters and documents, all with detailed teachers' notes.

Learning and assessment objects
The learning and assessment objects are based on current research findings in science education and pedagogy. The objects foster skills, such as scientific inquiry, data interpretation, analysis and synthesis, that are transferable to daily life and to offline learning opportunities.

The objects promote scientific literacy and are organised around scientific concepts with real-life applications for students. They contain open-ended investigative tasks, tools, activities and processes that enable students to engage in 'real' science experiences and to construct and test their own scientific understandings.

Many of the objects also provide meaningful models, simulations and demonstrations of scientific concepts and practices. These objects provide teachers and students with experiences that are not universally available because, for example, they require expensive equipment or occur over extended periods of time.

Other objects are short activities that allow students to explore and practise a range of scientific concepts and skills.

Learning objects are generally published in series and some are also aggregated into single, larger learning objects. Aggregated learning objects are identified with the 🛠️ symbol.

An asterisk (*) on the series title indicates that not all the learning objects in that series have been released. The remaining learning objects will be released progressively.

Some learning objects contain non-TLF content. See the acknowledgements and conditions of use in the learning objects for details.

Digital resources
A remarkable range of digitised items licensed from leading Australian and New Zealand cultural and scientific institutions is also available. These items include:

- clips from documentaries, newsreels, television programs and feature films
- photographs, line drawings, maps and documents
- audio files of interviews, broadcasts and speeches.

With each item, TLF supplies an educational value statement comprising a description and contextual information that enriches the value of the asset for the teacher.

This catalogue contains a representative sample of digital resources licensed from TLF's partner institutions useful for the Science: Working scientifically strand.

Themes
This catalogue also includes examples of how teachers can draw on the extensive range of content to create thematic collections to challenge and engage students.
Other catalogues
You can download catalogues for each of the Science strands at: www.ndlrn.edu.au

A comprehensive Index of Science digital curriculum content is also available for download.

Accessing and viewing the content
Government and non-government education authorities in each Australian state and territory and in New Zealand have responsibility for facilitating access to the pool of digital content. Full details about how to access the content, including the necessary technical and software requirements for viewing it, can be found at:

www.ndlrn.edu.au
Learning objects

Kitchen stacker series (Years 1–3)

Students discover that common properties and attributes form the basis for classification systems. Students help Felix Fusspot, Tina Tidy and Polly Put-Away organise grocery items in kitchen cupboards according to common properties, for example size, colour or container type. They learn that items with more than one common property can be grouped in different ways.

Features include:
- dynamic category labels that correspond to shared properties
- an introduction to common properties as the basis for classification systems
- collections of items with properties that can be grouped in different ways
- an option to print customised categories and list members of each group.

Students:
- classify items according to their properties
- analyse the properties of a collection of items and classify them in different ways.

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**Kitchen stacker: sort the groceries 1**
L2347 – Years 1–2

Students drag and drop groceries into kitchen cupboards according to one common property such as size, colour or container type, for example as large, red or boxes. Labels on the cupboards provide written cues. Students then group the items according to two common properties.

**Kitchen stacker: sort the groceries 2**
L2348 – Years 1–2

Students drag and drop groceries into kitchen cupboards according to a common property such as size, colour or container type. This time there are no labels on the cupboards. They sort by matching to an initial visual cue. Students then group the objects according to two common properties.

**Kitchen stacker: sort and label**
L2349 – Years 2–3

Students sort items with two common properties into five cupboards. The learning object dynamically displays category labels that correspond to shared properties to assist the students.
| **Kitchen stacker: label the cupboards**  
L2350 – Years 1–2 |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Students sort items with three common properties into six cupboards. The learning object dynamically displays category labels that correspond to shared properties to assist the students.</td>
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</tbody>
</table>

| **Kitchen stacker: create your own**  
L2351 – Years 2–3 |
<table>
<thead>
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<tbody>
<tr>
<td>Students drag and drop groceries into six kitchen cupboards, sorting them according to a common property of their own choosing. Students then label their cupboards and can print their work, which show the items in the labelled cupboards. A printout of the student's labelled work is available.</td>
</tr>
</tbody>
</table>

| **Kitchen stacker 1**  
L2345 – Years 1–2 |
<table>
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<tbody>
<tr>
<td>This is an aggregated learning object combining <em>Kitchen stacker: sort the groceries 1</em>, <em>Kitchen stacker: sort the groceries 2</em> and <em>Kitchen stacker: sort and label</em>. It has audio support.</td>
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</table>

| **Kitchen stacker 2**  
L2346 – Years 2–3 |
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<tbody>
<tr>
<td>This is an aggregated learning object combining <em>Kitchen stacker: sort the groceries 1</em>, <em>Kitchen stacker: sort the groceries 2</em>, <em>Kitchen stacker: label the cupboards</em> and <em>Kitchen stacker: create your own</em>. A printout of the student's labelled work is available from <em>Kitchen stacker: create your own</em>.</td>
</tr>
</tbody>
</table>
Colossal fossils series (Years 5–8)

Students take on the role of a megafauna palaeontologist. They excavate fossils at dig sites and prepare fossils for removal using appropriate archaeological tools.

Features include:

- illustrations of the relationships between dentition and diet
- demonstrations of how palaeontologists excavate fossil sites, prepare specimens and analyse them to identify species
- species descriptions of several large extinct animals
- an interactive notebook to record student observations
- a printout of information about the megafauna species selected
- randomly generated fossils to analyse and identify, which allows for repeated use.

Students:

- learn how scientific tests (such as ESR dating, features analysis and pollen analysis) help to identify fossils
- analyse a megafauna jaw fossil and identify its species
- relate the structure of teeth and jaws to their functions and body size
- systematically record observations and use them to make deductions.

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Colossal fossils: the dig
L2011 – Years 5–8

Students join a team of palaeontologists working on an Australian megafauna dig site. Students use appropriate archaeological tools, such as a pick, a scraping knife, glue and plaster, to dig up and remove a megafauna jawbone or skull.

Colossal fossils: jaw analysis: fossil 1
L6949 – Years 5–8

Students examine the jaw of *Kolopsis torus*.

Colossal fossils: jaw analysis: fossil 2
L6900 – Years 5–8

Students examine the jaw of *Propleopus*. 
<table>
<thead>
<tr>
<th>Colossal fossils: jaw analysis: fossil 3</th>
<th>L6901 – Years 5–8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students examine the jaw of <em>Zygomaturus</em>.</td>
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</table>

<table>
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<tr>
<th>Colossal fossils: jaw analysis: fossil 4</th>
<th>L6902 – Years 5–8</th>
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</thead>
<tbody>
<tr>
<td>Students examine the jaw of <em>Megalania prisca</em>.</td>
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</table>

<table>
<thead>
<tr>
<th>Colossal fossils: jaw analysis: fossil 5</th>
<th>L6903 – Years 5–8</th>
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</thead>
<tbody>
<tr>
<td>Students examine the jaw of <em>Procoptodon goliath</em>.</td>
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<table>
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<tr>
<th>Colossal fossils: jaw analysis: fossil 6</th>
<th>L6904 – Years 5–8</th>
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<tbody>
<tr>
<td>Students examine the jaw of <em>Thylacoleo carnifex</em>.</td>
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<tr>
<th>Colossal fossils: jaw analysis</th>
<th>L2013 – Years 5–8</th>
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<tbody>
<tr>
<td>The fossils include all of those examined in the other jaw analysis learning objects as well as two others: <em>Diprotodon optatum</em> and <em>Palorchestes painei</em>.</td>
<td></td>
</tr>
</tbody>
</table>
Fair test series (Years 5–8)

Students conduct experiments in a plant research laboratory to investigate the effects of different variables on the growth of different vegetables.

Features include:
- simulations of lab-testing and data-gathering procedures
- records of experimental results
- a printable report recording the student's prior knowledge, their understanding of fair tests, their ability to set up a fair test and interpret the results, and their reflection on how their knowledge has improved in the assessment objects.

Students:
- identify ways living things interact with each other and the environment
- set up a fair test to investigate variables affecting plant growth
- carry out a fair test, analyse the results and decide whether the data supports the question being tested
- analyse data tables
- understand the role of controlled experiments and repeated trials in scientific investigation.

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**Fair test: growing tomatoes**  
L1184 – Years 5–8

Students are asked to finalise the seed packet information for tomato seeds by the 'marketing department'. They must determine the values to be printed on the packet for optimum nitrogen level, temperature, light intensity and light duration by conducting a range of 'fair tests' in the plant research laboratory.

**Fair test: growing peas**  
L1185 – Years 5–8

*Fair test: growing peas* uses the same task, laboratory and motivation as *Fair test: growing tomatoes*, however it focuses on pea plants.

**Fair test: growing lettuce**  
L1186 – Years 5–8

*Fair test: growing lettuce* uses the same task, laboratory and motivation as *Fair test: growing tomatoes*, however it focuses on lettuce plants.
Fair test: use a fair test: assessment
L9260 – Years 7–8

Students use a fair test and analyse the results to decide the best answer to a customer's question about how much light is needed to grow tomatoes successfully.

Fair test: design a fair test: assessment
L8487 – Years 7–8

Students examine the effect of temperature on growth. They research the answers to questions about how to achieve optimum hydroponic growth conditions.

Fair test
L540 – Years 5–8 🚀

This is an aggregated learning object combining the three other learning objects.
## Meet a scientist series (Years 5–9)

Students meet a variety of scientists and develop a broad understanding of the science profession and of scientists as people.

**Features include:**
- biographical information about a scientist, including professional activities and personal interests
- illustrations of how scientists live and work
- interview transcripts, sound clips, photos and videos
- demonstrations of real-world applications of science.

**Students:**
- explore biographical information about a scientist, including their professional activities and personal interests
- explore the diversity of scientific activities associated with various branches of sciences
- compile a biographical summary about a scientist, using information presented in a range of media types
- consider whether the actual characteristics of a scientist differ from stereotypes.

<table>
<thead>
<tr>
<th>Meet a scientist: geologist and environmental scientist</th>
<th>L499 – Years 5–8</th>
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<tbody>
<tr>
<td>Students explore information about an environmental scientist.</td>
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<table>
<thead>
<tr>
<th>Meet a scientist: geologist and environmental scientist [no spoken instructions]</th>
<th>L500 – Years 5–8</th>
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<tbody>
<tr>
<td>Students explore information about a geologist and an environmental scientist.</td>
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<thead>
<tr>
<th>Meet a scientist: virologist and electronics engineer</th>
<th>L634 – Years 5–8</th>
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<tbody>
<tr>
<td>Students explore information about a virologist and an electronics engineer.</td>
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</tbody>
</table>
Meet a scientist: virologist and electronics engineer [no spoken instructions]  
L635 – Years 5–8  
Students explore information about a virologist and an electronics engineer.

Meet a scientist: nanotechnology: microbiologist  
L2546 – Years 7–9  
Students explore information about a nanotechnology microbiologist.

Meet a scientist: nanotechnology: program manager  
L2547 – Years 7–9  
Students explore information about a nanotechnology program manager.

Meet a scientist: nanotechnology: project manager  
L2548 – Years 7–9  
Students explore information about a nanotechnology project manager.

Meet a scientist: environmental scientist  
L503 – Years 5–8  
Students explore information about an environmental scientist.
Meet a scientist: environmental scientist [no spoken instructions]
L504 – Years 5–8
Students explore information about an environmental scientist.

Meet a scientist: virologist [no spoken instructions]
L506 – Years 5–8
Students explore information about a virologist.

Meet a scientist: virologist
L505 – Years 5–8
Students explore information about a virologist.

Meet a scientist: geologist
L501 – Years 5–8
Students explore information about a geologist.

Meet a scientist: geologist [no spoken instructions]
L502 – Years 5–8
Students explore information about a geologist.
<table>
<thead>
<tr>
<th><strong>Meet a scientist: venom researcher</strong></th>
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<tr>
<td>L509 – Years 5–8</td>
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<tr>
<td>Students explore information about a venom researcher.</td>
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<tr>
<th><strong>Meet a scientist: venom researcher [no spoken instructions]</strong></th>
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<tr>
<td>L510 – Years 5–8</td>
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<tr>
<td>Students explore information about a venom researcher.</td>
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<tr>
<th><strong>Meet a scientist: materials researcher and venom researcher</strong></th>
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<tr>
<td>L636 – Years 5–8</td>
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<td>Students explore information about a materials researcher and a venom researcher.</td>
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<tr>
<th><strong>Meet a scientist: materials researcher and venom researcher [no spoken instructions]</strong></th>
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<tr>
<td>L637 – Years 5–8</td>
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<tr>
<td>Students explore information about a materials researcher and a venom researcher.</td>
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<tr>
<th><strong>Meet a scientist: electronics engineer</strong></th>
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<tr>
<td>L507 – Years 5–8</td>
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<tr>
<td>Students explore information about an electronics engineer.</td>
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</table>
Meet a scientist: electronics engineer [no spoken instructions]
L508 – Years 5–8

Students explore information about an electronics engineer.

Meet a scientist: materials researcher
L511 – Years 5–8

Students explore information about a materials researcher.

Meet a scientist: materials researcher [no spoken instructions]
L512 – Years 5–8

Students explore information about a materials researcher.

Meet a scientist: materials researcher and venom researcher contains non-TLF content. See Acknowledgements in the learning objects.
Interpreting changes of state series (Years 7–8)

Students explore the three main states of matter and changes of state by viewing changes in water at the physical and particle level as the water is heated and cooled.

Features include:
- physical and particle level animations showing water as it changes state between its solid, liquid and gas forms
- options to print the data tables, graphs and summaries describing the changes in water when it is heated or cooled
- additional extension questions as an optional printout.

Students:
- are introduced to both the reasons behind changes in properties as substances change state and the unique properties of water through multiple-choice questions
- conduct a virtual experiment in which they heat water, and then record, graph and interpret the observed changes
- record and graph changes over time as water is heated, and predict the graph that will be obtained if water is cooled
- interpret and explain the shape of the temperature–time graphs obtained when water is heated and cooled.

**Interpreting changes of state**
L9122 – Years 7–8

Students observe the behaviour of water particles during heating and cooling and explain properties of solid, liquid and gaseous water, and the processes involved in their changing states, in terms of kinetic theory.

**Interpreting changes of state: heating**
L9128 – Years 7–8

Students explore how particle theory and the kinetic theory of matter can be used to explain properties of water and the physical changes that occur when it is heated.

**Interpreting changes of state: cooling**
L9129 – Years 7–8

Students observe the behaviour of water particles during cooling and explain properties of solid, liquid and gaseous water, and the processes involved in their changing states, in terms of kinetic theory.
Science reporter series (Years 7–10)

Students meet a variety of science reporters and develop a broad understanding of the science profession and of scientists as people.

Features include:
- biographical information about a scientist, including professional activities and personal interests
- illustrations of how scientists live and work
- interview transcripts, sound clips, photos and videos
- demonstrations of real-world applications of science
- an option to print an article complied by the student.

Students:
- explore biographical information about a scientist, including their professional activities and personal interests
- explore the diversity of scientific activities associated with various branches of sciences
- compile a biographical summary about a scientist, using information presented in a range of media types
- consider whether the actual characteristics of a scientist differ from stereotypes.

Science reporter: geologist and environmental scientist
L513 – Years 7–10

Students explore the biographical profile of a geologist and an environmental scientist.

Science reporter: geologist and environmental scientist [no spoken instructions]
L514 – Years 7–10

Students explore the biographical profile of a geologist and an environmental scientist.

Science reporter: geologist
L515 – Years 7–10

Students explore the biographical profile of a geologist.
<table>
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<tr>
<th>Science reporter: geologist [no spoken instructions]</th>
<th>L516 – Years 7–10</th>
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<tr>
<td>Students explore the biographical profile of a geologist.</td>
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<tr>
<th>Science reporter: environmental scientist</th>
<th>L517 – Years 7–10</th>
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<tr>
<td>Students explore the biographical profile of an environmental scientist.</td>
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<tr>
<th>Science reporter: environmental scientist [no spoken instructions]</th>
<th>L518 – Years 7–10</th>
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<tr>
<td>Students explore the biographical profile of an environmental scientist.</td>
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<tr>
<th>Science reporter: virologist</th>
<th>L519 – Years 7–10</th>
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<td>Students explore the biographical profile of a virologist.</td>
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<tr>
<th>Science reporter: virologist [no spoken instructions]</th>
<th>L520 – Years 7–10</th>
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<tr>
<td>Students explore the biographical profile of a virologist.</td>
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<tr>
<td>Science reporter: electronics engineer</td>
<td>L521 – Years 7–10</td>
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<tr>
<td>Students explore the biographical profile of an electronics engineer.</td>
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<tr>
<th>Science reporter: electronics engineer [no spoken instructions]</th>
<th>L522 – Years 7–10</th>
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<tr>
<td>Students explore the biographical profile of an electronics engineer.</td>
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<tr>
<th>Science reporter: venom researcher</th>
<th>L523 – Years 7–10</th>
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<td>Students explore the biographical profile of a venom researcher.</td>
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<tr>
<th>Science reporter: venom researcher [no spoken instructions]</th>
<th>L524 – Years 7–10</th>
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<tr>
<td>Students explore the biographical profile of a venom researcher.</td>
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<tr>
<th>Science reporter: materials researcher</th>
<th>L525 – Years 7–10</th>
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<tr>
<td>Students explore the biographical profile of a materials researcher.</td>
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</table>
Science reporter: materials researcher [no spoken instructions]
L526 – Years 7–10
Students explore the biographical profile of a materials researcher.

Science reporter: venom researcher and materials researcher
L640 – Years 7–10
Students explore the biographical profile of a venom researcher and a materials researcher.

Science reporter: venom researcher and materials researcher [no spoken instructions]
L641 – Years 7–10
Students explore the biographical profile of a venom researcher and a materials researcher.

Science reporter: virologist and electronics engineer
L638 – Years 7–10
Students explore the biographical profile of a virologist and an electronics engineer.

Science reporter: virologist and electronics engineer [no spoken instructions]
L639 – Years 7–10
Students explore the biographical profile of a virologist and an electronics engineer.
Science reporter: nanotechnologist
L2549 – Years 7–10

Students explore the biographical profile of a nanotechnologist.

Exploring atoms: atom structure (Years 9–10)

Students are exposed to the original Rutherford experiments and their importance in the development of atomic theory. From a range of alternatives, students also choose the best atom model to explain the results of a particle experiment.

Features include:
- a simulation of a Rutherford experiment using particles
- alternative models to interpret the observed results of a particle experiment
- background information about Ernest Rutherford and his experimental equipment.

Students:
- explore the importance of the Rutherford experiments in the development of atomic theory
- choose the best model to explain the results of a particle experiment.

Exploring atoms: atom structure
L2562 – Years 9–10

Students view a number of alternative atom models. They fire charged particles at atoms and determine which model best fits the results.

Exploring atoms: atom structure contains non-TLF content. See Acknowledgements in the learning object.
Mystery disease series (Years 9–10)

Students act as an expert epidemiologist brought in to investigate the outbreak of a contagious disease in a town.

Features include:
- a demonstration of how contagious diseases are transmitted and diagnosed, the source identified and control measures implemented
- descriptions of symptoms, diagnosis and treatment for a range of contagious diseases
- information on a range of pathogens and their global distribution
- a look at the importance of a systematic, evidence-based approach to decision making in epidemiology and public health
- a town map simulating the progressive spread of a disease and showing possible sources of its transmission
- results of pathology tests to confirm each student's diagnosis, plus feedback on the effectiveness of the control measures that they have recommended.

Students:
- explore how infectious diseases spread within a community
- compare the physical effects of infectious diseases on people
- relate public health measures to control of infectious diseases
- identify types of scientific evidence that are used to make decisions on disease diagnosis and public health strategies.

Mystery disease: outbreak in Glenbrook
L2016 – Years 9–10

Students investigate an outbreak of hepatitis A.

Mystery disease: outbreak in Stratton
L2017 – Years 9–10

Students investigate an outbreak of cryptosporidiosis.

Mystery disease: outbreak in Waverly
L2018 – Years 9–10

Students investigate an outbreak of meningococcal disease.
Mystery disease: outbreak in McArthur Vale
L2019 – Years 9–10

Students investigate an outbreak of whooping cough.

Mystery disease: outbreak in Nelson
L5316 – Years 9–10

Students investigate an outbreak of Ross River virus.
Content from other sources

Forensic science series (Years 9–12)

Students explore how various samples are collected, organised and analysed for scientific analysis. They compare a range of samples and observe differences.

Features include:
- feedback on student’s observations.

Students:
- identify ways that science is used responsibly in the community
- compare a range samples and observe differences
- explore how evidence is collected and organised for scientific analysis.

Forensic science: DNA
L1462 – Years 9–12

Students explore the basic properties of DNA and discover how DNA samples are collected and analysed by police. They find out how to identify differences between DNA samples and how DNA fingerprinting can be used to identify a person and help to solve a crime.

Forensic science: blood
L1463 – Years 9–12

Students find out how blood samples at crime scenes are compared with known blood types to identify suspects. They see how antibodies and antigens are used to identify blood types and test a blood sample to identify its type. The content includes a table showing percentages of blood types in the Australian population.

Forensic science: fibres and hairs
L1464 – Years 9–12

Students look at a magnified view of common fibres such as linen, silk, nylon, cotton and wool. They examine the structure of a human hair and find out how fibres and hairs are collected and tested.

Forensic science: fingerprints
L1465 – Years 9–12

Students examine the structure of fingerprints, including the main types of ridge patterns and interconnecting lines, and identify differences. They find out how fingerprints are collected at crime scenes and compared with records to identify suspects.
Forensic science: footprints
L1466 – Years 9–12

Students look closely at a footprint made by a boot and see how footprint casts are made by police. They find out how footprint impressions at crime scenes are compared with shoes to identify suspects.

Forensic science: handwriting
L1467 – Years 9–12

Students examine the structure of handwriting, including signatures, and see how handwriting is analysed by police. They make samples of their own handwriting and compare samples with others to identify differences. They explore how handwriting is commonly forged and how forgeries are identified by police.

Forensic science: identikit
L1468 – Years 9–12

Students explore how identikit pictures are used to describe physical characteristics of a person's face and head. They look closely at a photo of a person, build an identikit picture, then identify the suspect in a police line-up.

Forensic science: building a profile
L1469 – Years 9–12

Students explore how criminal suspects are described in police profiles. They build their own profile by taking fingerprints, drawing an identikit picture and recording physical characteristics such as height, weight and blood type.
EagleCat: plants (Years 8–10)

Students explore the optimum growth conditions for five different Australian plants.

Features include:
- five simulated Australian biomes in which students can test hypotheses about which plants are best adapted for a particular biome
- a mechanism to record experimental data and print it out
- a research challenge idea for students to investigate.

Students:
- manipulate variables of temperature, soil moisture and salinity and observe the effects on plant growth for five different plants
- collect data on plant growth and test hypotheses about which plants are best suited to particular biomes.

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**Digital resources**

**Australian Voices**

The Australian Voices project is a collection of recorded interviews commissioned by TLF that relate directly to other sound, still or moving image items in TLF’s pool of digital curriculum content. The interviews include firsthand accounts from people in fields such as creative arts, science, medicine, sport and politics. They speak about experiences such as war, natural disasters, working and everyday life.

Refer to the Index of Science digital curriculum content for a complete list of Australian Voices recordings available for science. You can use the search options in your educational jurisdiction’s gateway to TLF to view the content.

<table>
<thead>
<tr>
<th>Gus Nossal speaks on being a research scientist, 2008</th>
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<tr>
<td>This is an edited sound recording of one of Australia's best-known research scientists and immunologists, Sir Gustav Nossal, outlining his views on medical research. He discusses the qualities necessary for a person to be a successful scientific researcher and talks about the nature and future of science research, suggesting that there is 'vastly, vastly more' yet to be discovered than is currently known.</td>
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<tr>
<th>Andy Thomas describes being a cosmonaut, 2008</th>
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<tr>
<td>Australian astronaut Andy Thomas describes how he prepared to spend almost five months as a cosmonaut in 1998 aboard the Russian space station Mir, in company with two Russians. Thomas (1951–) spent 141 days aboard Mir as an astronaut of the US National Aeronautics and Space Administration (NASA).</td>
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<tr>
<th>Colin Gramp discusses wine industry changes, 2005</th>
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<tr>
<td>Colin Gramp (1921–) explains how he became the first in Australia to introduce cold fermentation of grape juice (mixed with other ingredients) in controlled-temperature pressure tanks. The technique produced better quality wines, especially white wines, than the previous method of open-tank fermentation.</td>
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<tr>
<th>Robyn Williams talks about inspiring young scientists, 2008</th>
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<tr>
<td>This is an edited sound recording of the leading science journalist and broadcaster Robyn Williams offering advice on how to encourage children to be interested in science. Williams states that the ‘greatest challenge’ is to exploit and maintain the 'natural' interest displayed in early childhood. He suggests that children need to be told that science is a process of exploration that does not necessarily lead to the right answers. This recording was made in December 2008.</td>
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<th>Jurij Semkiw remembers Australia's first computer, 2006</th>
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<tr>
<td>Australians were among the first people in the world to use and develop computers. CSIRAC occupied about 40 square metres and was the fourth electronic stored-program computer ever developed. Jurij Semkiw, who worked on CSIRAC during 1955–64, describes how the computer was a training ground for Australia's first generation of computer scientists.</td>
</tr>
</tbody>
</table>
Created by the Australian Film Commission and now managed by the National Film and Sound Archive, australianscreen online (ASO) is an innovative website with more than 2,000 moving-image clips from Australian feature films, documentaries, newsreels, short films, home movies and animations. As the education partner in this major project, TLF has selected hundreds of clips and provided accompanying teachers' notes.

**Super Flu – Race Against a Killer, 2005: Avian flu in Hong Kong**

In 1997, avian (bird) influenza in Hong Kong crossed over into the human population and resulted in many deaths. This clip includes a representation of the hospitalisation of a three-year-old boy and footage of dead and dying poultry. About 1.5 million chickens were killed in an effort by authorities in Hong Kong to contain the outbreak. Virologist Albert Osterhaus describes how, with the help of fellow virologist Robert Webster, he identified that the boy was infected with the H5N1 strain of avian influenza, the first time this strain was seen to jump directly to humans.

**The 7.30 Report – Pneumococcal Vaccine, 2003: Measuring the cost**

The clip presents different sides of the debate about whether the pneumococcal vaccine should be provided free to infants. The story was aired on *The 7.30 report*, a current affairs television program that aims to give balanced coverage. Thus the clip includes interviews with advocates of a free vaccine and gives then-federal health minister Senator Kay Patterson a chance to explain why the government had decided not to fund free vaccines.

**The Human Journey, 1999: Inspired detective work**

The clip shows palaeoanthropologist Dr Ron Clarke and his assistants in a cave in South Africa where, in 1997, they discovered the adult skeleton of an upright hominid, a species of early human. Clarke points out the features of the skeleton, which is embedded in the cave and which he estimates to be 3.3 million years old.

Images reproduced courtesy of australianscreen online
CSIRO

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is Australia’s national science agency. TLF makes available hundreds of CSIRO’s scientific still and moving images in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of digital items available for science. You can use the search options in your educational jurisdiction’s gateway to TLF to view the content.

**Collecting insects at night – asset 1**
This shows a direct method of collecting insects that relies on their attraction to light at night. A scientist is collecting specimens from a white sheet. Collecting specimens helps researchers to gain data on insect populations, species diversity and geographical distribution.

**Designing a drug to target the flu virus**
This animation shows how CSIRO scientists used molecular modelling to find molecular structural pockets that can be targeted by drug molecules to prevent replication of the influenza (flu) virus.

**Measuring pH**
This clip shows scientists in a laboratory measuring the pH of tap water, sea water, orange juice and rainwater. The pH is a quantity derived from the concentration of hydrogen ions in the solution. The higher the hydrogen ion concentration, the more acid the solution, and the lower the pH.
Getty Images

TLF has licensed hundreds of high-quality images from the extensive Getty Images collection to include in the digital curriculum content pool.

Refer to the Index of Science digital curriculum content for a complete list of images available for science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

**Australian astronaut Andrew Thomas, 2005**
This photograph shows Australian Dr Andrew S W Thomas wearing the mission uniform of an astronaut of the National Aeronautics and Space Administration (NASA). Thomas (1951--) is Australia's first astronaut, a distinction achieved in May 1996 when he served on the crew of flight STS-77 aboard the space shuttle *Endeavour* as a mission specialist. During the mission Thomas took part in a range of experiments designed to test such technologies as the global positioning system.

**Field technician spraying strawberry plants, 1987**
The first field trial of a genetically modified bacterium on strawberry plants was carried out in Brentwood, near San Francisco, USA. This shows a field technician spraying strawberry plants with a solution containing genetically modified bacteria.

**DNA sequencing gels for genetic and medical research, close-up**
This is a close-up photograph showing the results of four DNA sequencing gels. To sequence a DNA fragment, scientists first extract DNA from tissue such as leaf, blood or hair. The cells of the tissue are broken open and restriction enzymes are added to cut the DNA at specific places, producing segments of different lengths. An alcohol solution separates the DNA from the other molecules.
National Archives of Australia

The vast collection of items in the National Archives of Australia reflects the actions, decisions and interactions of the Australian Government. TLF has licensed hundreds of items for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of items available for science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

**Measuring the ozone in 1978**
This image shows a Dobson photoelectric spectrophotometer being used to measure ozone levels at Macquarie Island in Antarctica in 1978.

**Scientific research in Antarctica in 1966**
This photograph portrays a scientific researcher examining snow and ice crystals. In the 1960s considerable research was conducted in Antarctica into radio wave propagation in the Antarctic ionosphere, based on examination of properties of the Antarctic ice sheet.

**Cloud seeding near Sydney, 1957**
This shows a cloud-seeding operation over the Pacific Ocean near Sydney in 1957. The photograph shows two Royal Australian Air Force (RAAF) DC-3 planes flying above some cumulus clouds. Cloud seeding is a means of manipulating weather to produce rain.
# National Film and Sound Archive

The National Film and Sound Archive holds more than one million audiovisual items dating from the 1890s to the present day. Newsreels, songs, home-movie footage and early silent era films that document aspects of the Australian experience are represented within the collection. TLF has licensed hundreds of items for inclusion in the pool of digital curriculum content.

Refer to the [Index of Science digital curriculum content](#) for a complete list of images available for science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

<table>
<thead>
<tr>
<th>TLF ID: R4125</th>
<th>'The Mawson Australasian Antarctic Expedition 1911–1913' – asset 5</th>
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<tr>
<td>This excerpt shows Mawson’s expedition team unloading all the equipment and supplies for setting up the base camp at Cape Denison in January 1912. It also shows two men setting up some scientific equipment, and a team member trying to ride a seal over the snow.</td>
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*Reproduced courtesy of National Film and Sound Archive. Directed by Frank Hurley.*

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<th>TLF ID: R4448</th>
<th>'Fight to combat TB', 1945 – asset 2</th>
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<td>This film focuses on the infectious lung disease tuberculosis (TB), also known as consumption and phthisis. By 1945, TB had already been a scourge for thousands of years. It is still one of the deadliest infectious diseases, with nine million new cases diagnosed each year.</td>
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*Stock Footage supplied courtesy of Film World Pty Ltd and Cinesound Movietone Productions. Produced by Cinesound Productions.*

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<tr>
<th>TLF ID: R4634</th>
<th>Making a glass eye, 1937 – asset 3</th>
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<td>This clip features an ocularist (maker of artificial eyes) at work. The excerpt shows the ocularist paring away sections of the glass of an almost-completed replacement eye to create a convex shape, and shaping the eye to fit by fusing extra glass to the back.</td>
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</table>

*Stock Footage supplied courtesy of Film World Pty Ltd and Cinesound Movietone Productions. Produced by Cinesound Productions.*
National Library of Australia

As Australia's largest reference library, the National Library of Australia preserves a wide variety of Australian artefacts and national treasures. It holds a comprehensive collection ranging from iconic photographs and prints to sheet music and ephemera. TLF has licensed hundreds of these items for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of images available for science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

TLF ID: R3949

Cactoblastus being released, c1926

This asset shows the release of the Cactoblastis cactorum moth, which is regarded as the world's most spectacular example of biological control of prickly pear, an introduced weed. The following is an image from the educational value statement provided by TLF for this resource.

Powerhouse Museum

Powerhouse Museum holds a unique and diverse collection of more than 385,000 items that span history, science, technology, design, industry, decorative arts, music, transport and space exploration. TLF has licensed hundreds of these items for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of images available for science. You can use the search options in your educational jurisdiction’s gateway to TLF to view the content.

Chemists researching properties of tea-tree oil

This is a photograph of two scientists in the laboratory of a tea-tree oil manufacturer. Tea-tree oil products must meet certain standards before they are released to the public, with each product requiring different tests.

Penicillin production, c1940s

This asset illustrates an aspect of the early production of penicillin. Penicillin is based on a mould that kills the staphylococcus bacteria; it arguably represents one of the greatest advances in medical history, having saved the lives of millions and freed people from the fear of infection from small cuts and common bacteria.

National Trachoma and Eye Health Program, 1977

This image shows Fred Hollows (1929–93) at work. As Professor of Ophthalmology at the University of New South Wales, Hollows persuaded the Federal Government and the Royal Australian College of Ophthalmologists to establish the National Trachoma and Eye Health Program (the Trachoma Program) in 1976.
Medical scientists at work (Years 6–10)

Understanding diseases, their causes, how they spread, and their treatment is the work of medical science. This collection of learning objects, photographs, images and film clips provides opportunities to assist students to understand the roles of scientists who work in this field of human endeavour.

Science reporter: virologist
Students explore the biographical profile of a virologist to learn about their life and work. They find out why they enjoy their area of research and then choose photos and interview responses to build a feature article for a newspaper.

Mystery disease: outbreak in Nelson
Mystery disease: outbreak in Glenbrook
Mystery disease: outbreak in Waverly
In the three 'Mystery disease' learning objects included in this collection, students act as an expert epidemiologist brought in to investigate the outbreak of a contagious disease in a fictitious town. Students investigate the spread of a mystery illness and decide which disease is responsible for the illness. Students undertake a number of tasks to assist them in making their diagnosis, including examining patients, matching patient symptoms to diseases in a medical manual, and determining which medical tests are needed to confirm the diagnosis.

Once the specific disease has been isolated, students must identify how the disease is spread and where the disease-causing micro-organisms may be found, then suggest control measures such as quarantine or vaccination.

Finally, students are provided with the results of pathology tests to confirm their diagnosis, plus feedback on the effectiveness of control measures they have recommended. Diseases include meningococcal disease, Ross River virus, whooping cough and hepatitis A.
'Immunisation. Goodbye to the plague', 1989 – asset 1
This is a clip from an educational film produced for the Department of Community Services and Health that was released in 1989 by the Australian Government to promote the benefits of immunisation. A narrator describes a range of diseases and infections that have afflicted his family and acquaintances and that are now preventable by immunisation. The clip shows children suffering from polio and some of its long-term repercussions as they learn how to walk again.

First production of Salk vaccine in Australia, 1956 – assets 1–4
The clips in this title were taken from a 1956 Cinesound review newsreel item announcing the production of Salk anti-polio vaccine at Melbourne’s Commonwealth Serum Laboratories. They show the scientists at work in the laboratory and the various processes involved in making the vaccine, emphasising the quality control and safety checks used in the production of Salk vaccine in Australia.

The 7.30 Report – Pneumococcal Vaccine, 2003: Measuring the cost
This clip shows a current affairs report that explores the issue of free pneumococcal vaccines for all infants to help prevent pneumococcal meningitis.

Ian Frazer discusses the cervical cancer vaccine, 2008
In 1990, Ian Frazer (1953–) and Jian Zhou (1957–99) were using DNA technology to produce the human papillomavirus (HPV) when they made the discovery that led to development of the first vaccine to prevent and treat cervical cancer. HPV is a family of more than 100 viruses, including those causing warts and those associated with tumours of the genital tract such as cervical cancer.