



## ***SCIENCE WEEK 2011***

# **Teacher Activity Pack**

### **Contents:**

- About the Company
- Teacher instructions
- Selection of activities suitable for either before or after the performance
- *ROCK ME, GALILEO!* crossword



## ABOUT THE COMPANY

**Perform! Educational Musicals** is a multi award-winning theatrical producer and one of the largest touring theatre companies throughout Australia and New Zealand.

The company specialises in touring educational musicals for schools and has been operating in Australia for over ten years. In that time we have toured to over 150,000 students annually in schools across five states. In all, the company and its writers have toured our specialty educational musicals to **over one million students** across several countries including Australia, New Zealand, Singapore, the United Kingdom, the United States of America and Papua New Guinea.

In Australia we tour an annual **Science Week** musical in collaboration with ASTA. These productions promote the curriculum by inspiring students with the limitless fun and possibilities offered by science both in their everyday life and as a future career.

The performances, which take place within schools, are **highly interactive** for the students and feature action-packed narratives, appealing, identifiable characters, loads of **comedy** and irresistible **songs** that captivate and engage all audiences from ages 11 to 15 years (as well as their teachers). Question time at the conclusion of the performance reinforces the learning outcomes, and this specially designed Teacher Activity Pack sent prior to the performance offers a comprehensive selection of classroom exercises for both before and after the show.

**The Composers** – Dean Bryant & Mathew Frank                      [www.bryantandfrank.com](http://www.bryantandfrank.com)

Dean and Mathew are both graduates of the Western Australian Academy of Performing Arts where they originally workshopped their first musical, *Prodigal*. This musical was subsequently produced in Melbourne (Green Room Award – Best Original Score) and then off-Broadway at the York Theatre Company. Other musicals include *The People in Your Pocket* (Centenary of Federation School Tour), *Once We Lived Here* (Pratt Prize Commission), *The Silver Donkey* (US High School Tour 2006 & 2008) and *Virgins* (Malthouse Theatre and New York Music Theatre Festival).

Mathew is Head of Music at the Children's Performing Company of Australia and has musically directed in Melbourne, Perth, Sydney and New York City. Dean directed the Australian premiere of *The Last Five Years* (Green Room and Helpmann Award nominations - Best Director). They both were Assistant Director and Assistant Musical Director on the Melbourne Theatre Company's Australian premieres of *Urinetown*, *25<sup>th</sup> Annual Putnam County Spelling Bee* and separately on *The Sapphires* and *Hitchcock Blonde*. Dean is also Associate Director for *Priscilla Queen of the Desert The Musical*.

To find out more about **Perform! Educational Musicals** or to contact the company, please log onto our website at [www.performmusicals.com](http://www.performmusicals.com)

**PERFORM! EDUCATIONAL MUSICALS**  
1 SURREY STREET, BENTLEIGH EAST, VICTORIA, 3165  
T: 1300 652 470 F: (03) 9576 5658 E: [info@performmusicals.com](mailto:info@performmusicals.com)



## TEACHER INSTRUCTIONS

- **TEACHER ACTIVITY PACK:** Please copy and distribute to all relevant teachers **PRIOR** to the performance.
- **PERFORMER ARRIVAL TIME** Performers will arrive approximately 30 minutes before the scheduled performance start time.
- **STUDENT NUMBERS:** Please know **IN ADVANCE** the number of students attending and inform our Team Leader at the conclusion of the performance.
- **START TIME:** Please ensure students are lined up outside the performance space 5 minutes before the commencement of the show to guarantee a prompt start. We are not able to work within your school bell times if the performance does not start on time.
- **PERFORMANCE SPACE REQUIREMENTS:** Power access is required in the space to power our sound equipment.  
*Please note:* a small or medium sized room such as a multipurpose room or small hall is more effective acoustically and atmospherically than a large space such as a gym. Please make the performance area available 30 minutes prior to the commencement of the show so that the performers can prepare the space.
- **SAFETY:** Please ensure the space is clean and clear for the safety and wellbeing of your students and the performers.
- **TEACHER PRESENCE:** We request teacher presence and support for the performers at all times during the show.
- **PRICE:** \$5.00 (+GST) per student (Your school may have already paid a deposit which will be deducted off the final invoice).
- **MINIMUM NUMBER OF STUDENTS:** 140 students are required per show otherwise a flat fee of \$700 (+GST) will apply per performance.
- **PAYMENT OF BALANCE:** A tax invoice for the balance will be forwarded to you the day *after* the performance, so please **do not prepare a cheque on the day.** We have instructed the performers not to handle any money or financial issues. These should all be directed to our office.



## **TEACHER INFORMATION AND ACTIVITIES**

1. *Rock Me Galileo* synopsis and themes
2. General discussion points
3. Student group activities
4. Related web sites and further activities

### **SYNOPSIS and THEMES**



*Rock Me Galileo* is a modern-day version of the philosophical discussions that the inspirational Galileo Galilei employed to explore his ground-breaking scientific ideas – especially those concerning heliocentrism (the Sun is the centre around which the Earth revolves) and his law of falling bodies.

The main objective is to present the major points of Galileo's life and scientific discoveries and focus on the 400 years that have passed since Galileo first pointed a telescope towards the night sky. The two main characters, Maggy and Derek, are two opposite personalities who use their differences to discuss astronomy, especially as it pertains to Galileo and his discoveries. They discuss Galileo's findings in a way that makes clear how relevant they are to our contemporary daily lives, and how much fun science and astronomy actually are.

Maggy is an out-of-work musician who receives benefits from the Office of Meaningful Employment by presenting educational seminars to high school students. Derek is an Auditor for the Office of Meaningful Employment and has been sent along to assess Maggy in the school setting, as there have been complaints about her content and delivery. Initially they mistrust each other, but as they work together to deliver the Fact Sheet in a way that is both factual and entertaining they form a bond – each making the other feel more important and useful than when they started.



The major points are:

- Galileo's refinement of the telescope and his subsequent discoveries.
- In Galileo's time, scientists were called 'Philosophers'. Galileo was the first to insist theories must be tested and proved via experiments to be validated, thus defining the role of a Scientist as opposed to a Philosopher.
- Galileo was extraordinarily courageous in questioning conventional thinking. He knew his discoveries were revolutionary and subversive and despite personal risk, he persevered.
- Galileo's law of falling bodies: Aristotle before him believed that heavier objects fall faster than lighter ones. Galileo however proved that all objects fall at the same rate in a vacuum, regardless of their density.
- Heliocentrism: Galileo proved that the planets including the Earth orbit the Sun, as opposed to the previous belief ('geocentrism') which placed the Earth at the centre of the Universe.
- Galileo's moons: Galileo discovered Jupiter had four moons encircling it. This meant that not everything in the Universe revolved around the Earth.
- Theory of projectiles: Galileo proved that the path of a projectile is parabolic.
- Careers in science

Post show question time in conjunction with this Activity Pack is designed to extend these themes by then encouraging students to investigate and take real action within their own lives, families and community.

### **DISCUSSION POINTS**

- Galileo did not invent the telescope, but instead he improved the spyglass and turned it towards the night sky, seeing things that had never been seen by the human eye before. Most inventions aren't created from nothing, but are refinements of something that already existed. Find an object that is important in your everyday life, and discuss the people and steps that allowed it to come into existence.
- A curious fact in Galileo's life at the University of Pisa was his refusal to wear a toga. Why do you think it was considered important to wear this cumbersome piece of clothing in the first place? Why do you believe Galileo refused to wear one? Choose a particular area of science and find out what the specialists in that field are required to wear and why.
- How does a telescope work? What are the basic types and what are the differences between them?



- Science and philosophy are now very different fields – Philosophy is now classed under the Arts, in fact. During Galileo’s time philosophy was science. What makes science and philosophy different now and what made them the same prior to Galileo’s time? What beliefs of Aristotle and other scientist/philosophers prior to Galileo could now be classed as science, and which of their beliefs classed as philosophy?
- Galileo was not the first scientist to propose that the Earth revolved around the Sun. Copernicus was hugely influential in this idea, but escaped attention. What were Copernicus’ basic ideas? Why was he able to escape attention from the Catholic Church? Other important scientists in this field around a similar period were Kepler and Brahe. What are their contributions to our understanding of the planetary system?
- We live in a secular society but in the 1600s every major (and many minor) decisions had to be approved by the Church. Make a list of some of the decisions you and your parents make without any form of government intervention. Now cross out the ones you believe the Church of the 1600s would have been able to have power over. There won’t be many left. Discuss the courage it would require to publish opinions that might be contrary to the officially sanctioned opinions.
- There is a huge range of careers that are science related – some practical-based, some theoretical. Have every student choose something in life that they are passionate about and then research an area of science that connects to that particular interest. For example, Maggy is interested in playing electric guitars – what branches of science were necessary to enable the guitar to be amplified?
- One of the major themes of *Rock Me Galileo* is the idea that scientists, rather than unquestionably following conventional norms, tend to shift the way that society thinks, and are often required to be courageous and to face ridicule for their forward-thinking. 400 years ago it was unbelievable that the Earth revolved around the Sun, though now we accept it as true. What ideas seem unbelievable now, but could one day be accepted as truth? Ten years ago iPods and mp3 players didn’t exist in any popular form – and now almost everyone has one. List some ideas that are unachievable right now, but are currently being researched and developed and could become as common as an iPod in the next decade?
- Science and knowledge were Galileo’s passion, just like music and songwriting are Maggy’s passion. The Catholic Church tried to stop Galileo (and failed) just like people not coming to Maggy’s gigs made her think she should stop. But doing what you want is its own reward – if it makes you happy, then it’s worth doing. What is your passion – what would you do with your life if you could do anything? What makes you think you can’t do it? What steps would you have to take now to be doing what you dream of in ten years time?



- Astronomy in Australia: Research the significance of Australian Astronomy on the world stage. What are our resources and in what ways does our location favour us? What projects are currently under way and in what ways can you participate?

## **STUDENT ACTIVITIES**

### **Truth Must Be Tested**

Galileo is called the father of modern science because he held that theories must be tested with experiments in order to be held to be true. Separate into groups and come up with some theories about everyday phenomena. Find a way to prove the theory. The group that can prove the most number of theories is the winner.

### **Science vs Philosophy**

Prepare a list of beliefs and theories (for example “Gravity makes apples fall from a tree” or “The human spirit ascends to heaven”). Have students decide what is science and what is philosophy and why.

### **Planetary Perspective**

In a large space allot students to be the Sun, the Earth, the Moon, Mars, Mercury, Venus, Jupiter and Saturn. Position the Earth at the centre and have the rest of the students circle the Earth in the orbits that were believed to exist before Galileo. Now add in Jupiter’s moons and rearrange the system so that the Sun is the centre.

### **Animals and Science**

In “There’s So Much You Can Do In Science” a number of different animal-related careers are mentioned. Allocate a student for each of the various careers (Ethologist etc) and the rest of the class then chooses to be one of the particular animals those scientists study. Act like your animal and it is the scientist’s job to find all the animals in that particular group – for example, the Arachnologist would find all the students acting like spiders and get them into a group. The first scientist to collect all his/her animals is the winner.



### Astronomy in Entertainment

Astronomy is hugely present in popular movies – Star Wars, Star Trek etc – choose your favourite space-related movie and find a scientific idea within that movie. Most ideas within entertainment are based on a believable principle, and then hugely exaggerated. Discuss the truthful part of the idea. What has been exaggerated?

Discuss what concepts have been presented in TV and film and then turned into reality – for example the Star Trek Communicator device was the inspiration for the modern day mobile phone, the laser gun, the Space Shuttle etc.



## GLOSSARY OF TERMS USED IN THE PRODUCTION

**Telescope** - An arrangement of lenses or mirrors or both that gathers visible light, permitting direct observation or photographic recording of distant objects.

**Lens** - A ground or moulded piece of glass, plastic, or other transparent material with opposite surfaces either or both of which are curved, by means of which light rays are refracted so that they converge or diverge to form an image.

**Sine Waves** - a continuous, uniform wave with a constant frequency and amplitude

**Theory** - A set of statements or principles devised to explain a group of facts or phenomena, especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena.

**Philosophy** - Investigation of the nature, causes, or principles of reality, knowledge, or values, based on logical reasoning.

**Science** - The observation, identification, description, experimental investigation, and theoretical explanation of phenomena.

**Projectile** - Any object, especially a missile, that is fired, thrown, launched

**Parabola** - a conic section formed by the intersection of a cone by a plane parallel to its side

**Heliocentrism** - Model of the solar system centred on the Sun, with Earth and other planets revolving around

**Inquisition** - a judicial institution of the Roman Catholic Church (1232--1820) founded to discover and suppress heresy

**Cetology** - The study of whales.

**Orinthology** - the study of birds, including their physiology, classification, ecology, and behaviour



## **USEFUL WEBLINKS & FURTHER ACTIVITIES**

The Galileo Project

<http://galileo.rice.edu/about.html>

International Astronomical Union

<http://www.iau.org>

Science Experiments - The CSIRO website has some fantastic experiments that can be done at home or school regarding astronomy at

<http://www.csiro.au/csiro/channel/SpaceAndAstronomyActivities.html>

Curtin University has some great student activities and relevant articles

<http://astronomy.curtin.edu.au/outreach/activities.cfm>

Astronomy and Australian Indigenous People

<http://www.assa.org.au/nacaa/aaaip.pdf>

Solar System Jigsaw

An interactive resource to teach about our solar system

<http://www.bbc.co.uk/science/space/playspace/games/jigsaw/launch.html>

Australian Astronomy

<http://www.astronomy.org.au/>

Introduction to Astronomy

<http://www.assa.org.au/observing/welcome/>

If any of your students would like to write to us or find out more details about our company please visit:

*Perform! Educational Musicals*      [www.performmusicals.com](http://www.performmusicals.com)

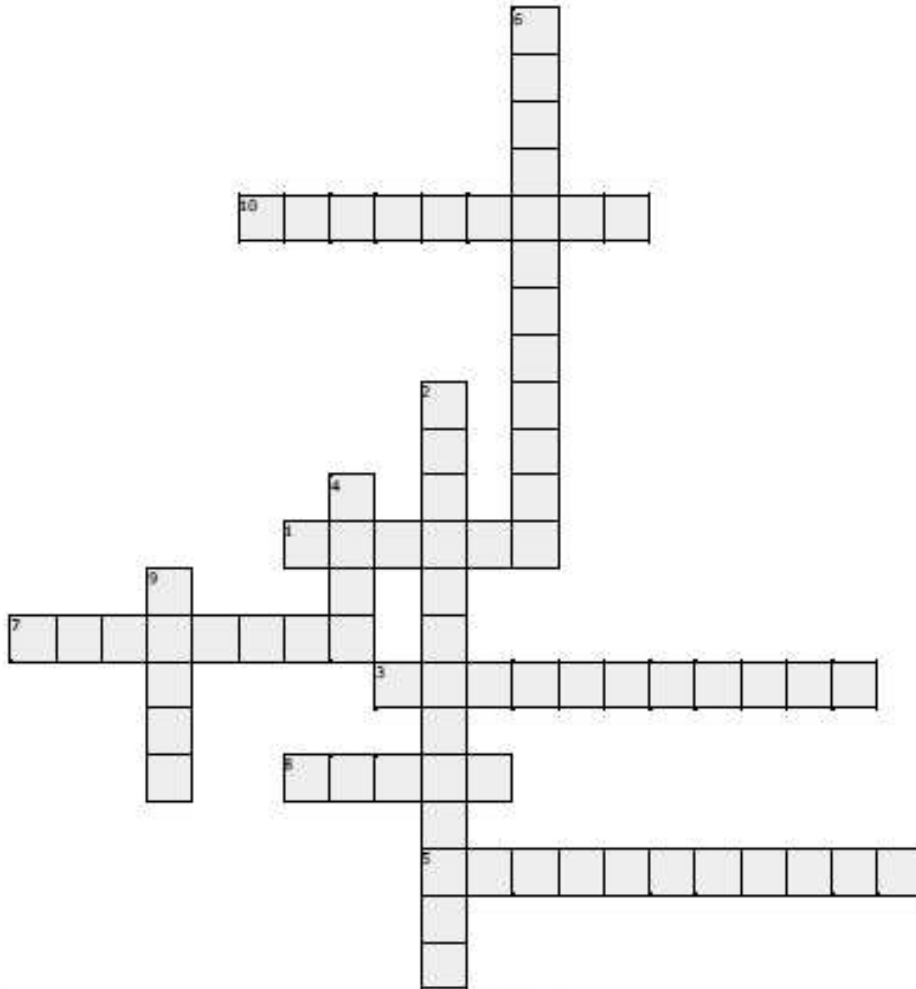
And for more information about National Science Week, please visit:

[www.scienceweek.info.au](http://www.scienceweek.info.au)



## Rock Me, Galileo! Crossword

Using your knowledge about Galileo and his theories from the show, complete the crossword below.



**Across:**

- 1. Galileo's experiments in how fast objects fall helped to develop his theory of falling \_\_\_\_\_
- 3. Galileo's work was published in which country?
- 5. Galileo was interrogated about his theories by the \_\_\_\_\_
- 7. Galileo worked out that the path of a projectile will always be a \_\_\_\_\_
- 8. Galileo discovered these appear on the sun.
- 10. Galileo invented stronger lenses for the \_\_\_\_\_

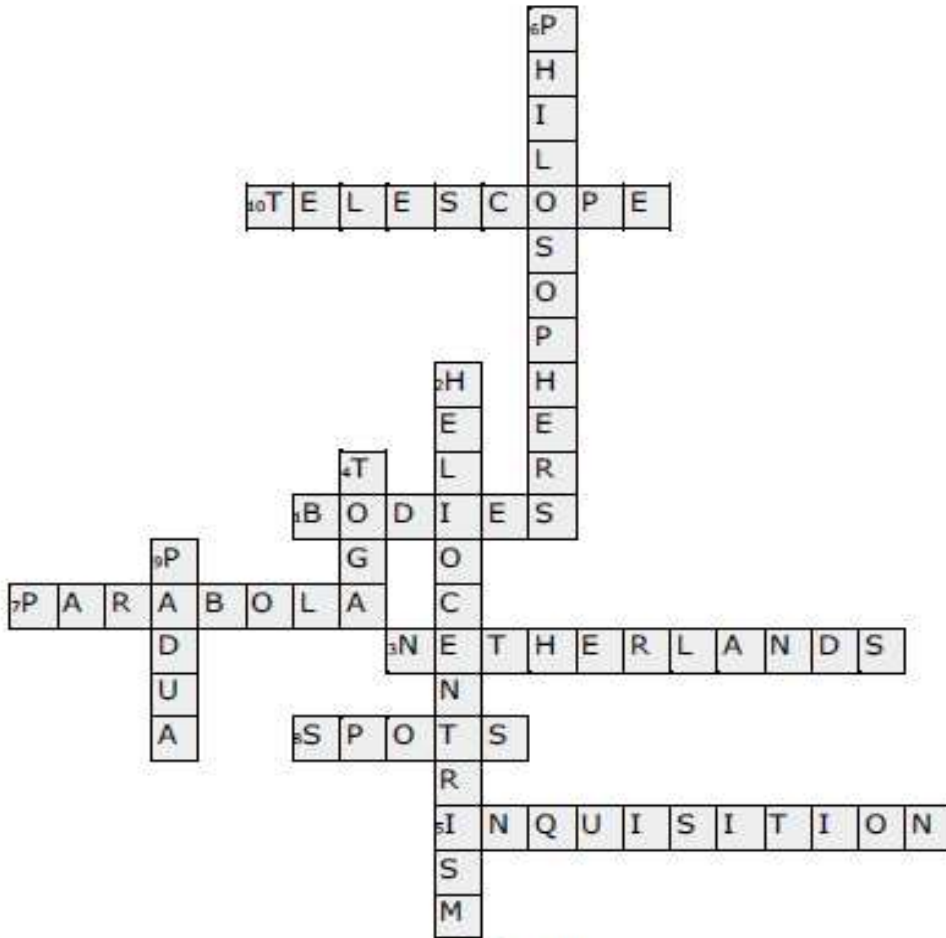
**Down:**

- 2. The name of the theory that argues planets revolve around the sun.
- 4. While working at the university, Galileo refused to wear this.
- 6. In Galileo's day, scientists were known as \_\_\_\_\_
- 9. The name of the university where Galileo was offered a permanent job



## Rock Me, Galileo! Crossword KEY

Using your knowledge about Galileo and his theories from the show, complete the crossword below.



**Across:**

- Galileo's experiments in how fast objects fall helped to develop his theory of falling \_\_\_ (BODIES)
- Galileo's work was published in which country? (NETHERLANDS)
- Galileo was interrogated about his theories by the \_\_\_ (INQUISITION)
- Galileo worked out that the path of a projectile will always be a \_\_\_ (PARABOLA)
- Galileo discovered these appear on the sun. (SPOTS)
- Galileo invented stronger lenses for the \_\_\_ (TELESCOPE)

**Down:**

- The name of the theory that argues planets revolve around the sun. (HELIOCENTRISM)
- While working at the university, Galileo refused to wear this. (TOGA)
- In Galileo's day, scientists were known as \_\_\_ (PHILOSOPHERS)
- The name of the university where Galileo was offered a permanent job (PADUA)