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Feature Article: “We find a way,
or make it!”

TEACHER CONFERENCES & WORKSHOPS



Scorpio is attending or supports these Design & Technology teacher activities:

DATTA AUSTRALIA – 11-17/10/21
Design & Technologies Week
Theme: “*Developing Creative
Problem Solvers*”

ITE – 24-26/12/2021 Technology
Education Conference, Sydney

DATTA VIC – 2-3/12/2021
Conference “*Preferred Futures*” and
Makerspace

WELCOME

We know this is a challenging moment for many of you, and we're here to help however we can.

We're here to support you, however we can. Contact us at (03) 9802 9913 or email us at sales@scorpiotechnology.com.au

LOCKDOWN: HOW CAN WE HELP?

IDEAS FOR HOME LEARNING

Non-solder version projects for Yrs. 6-8 that can be completed at home during lockdowns include:

Bluebird
Belt Driven Car
Propelled Vehicle
Captive Plane
Whirly

BLUEBIRD-NS
BELTCAR-NS
PROP-NS
CAPTIVE-NS
WHIRL-NS

Some of Scorpio's other simpler kits can easily be converted to no-solder (refer to the website – Teaching Units under Project Sheets) <https://www.scorpiotechnology.com.au/teaching-units>

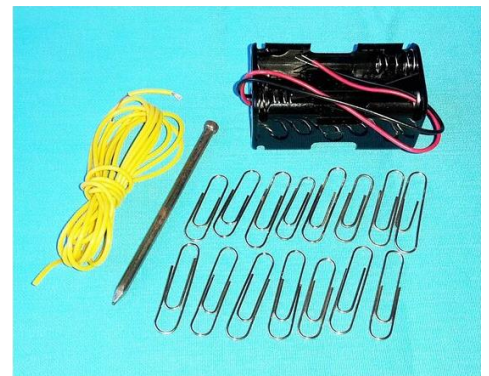
PRIMARY STEM: ELECTRICITY

Why study Electricity? We all take electricity for granted. We flip a switch and our toast is cooked, the TV starts up or a light is turned on. Electricity can be investigated in many ways. From simple circuits, making models that use batteries (e.g. Blue Brothers), to fun experiments such as basic electromagnets.

Scorpio has a great range of simple circuit kits that allow experimenting within the classroom setting and during home learning.

The Simple Circuits Extension Kit 2 – EM (Code: SIMPCEXT2) provides the parts to build a basic electromagnet. At less than \$2.35 per kit (plus batteries) each

student can make, experiment and record the results. Designed to be used as part of the Simple Circuits kit. Use the 2AA battery holder and switch from the base kit, then to change to the 4AA for more testing.



**LEARN TO MAKE,
MAKE TO LEARN**

“Strive for perfection in everything you do. Take the best that exists and make it better. When it does not exist, design it.”

Sir Henry Royce (1863- 1933)
English engineer, founder of Rolls-Royce

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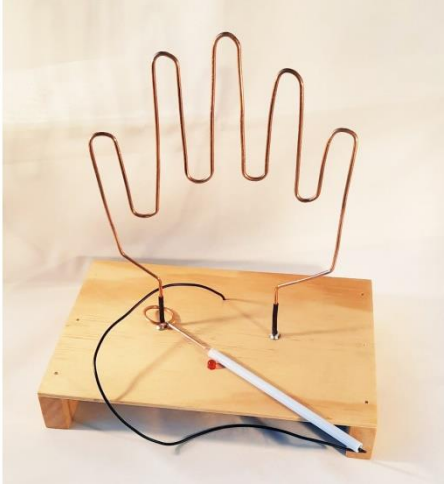
September 2021



SECONDARY: NEWEST PRODUCTS BY SCORPIO

Did you know that most of our collection is developed by **teachers and educators**? Here are two new projects that we know you and your students will enjoy.

Steady Hand Game (Code: STEADYSEC)



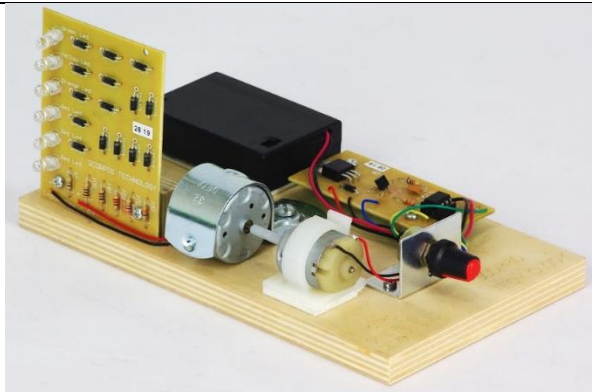
The **STEADY HAND GAME** is a simple game for students to make and assemble that illustrates simple electric circuits.

The aim of the game is for the student to avoid touching the wire with the hand held loop. Touching the wire with the loop will result in the buzzer sounding and the LED lighting up. The game makes use of the fact that electricity will only flow around a complete circuit - it will stop flowing the moment the circuit is broken. The idea is to try not to complete a circuit, so that a buzzer does not make a sound or an LED does not light up.

A Project sheet for an Electronic (Protoboard) version will follow soon.

Introductory kit. Hours to construct (including base etc): **2-4 hrs depending on experience and tools available**

The Electricity Generation Demonstration Unit (Code: DEMOELGEN)



Product can be found on the Physics – Electricity & Electromagnetism page of the website.

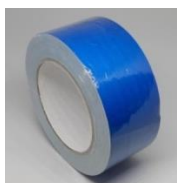
The **ELECTRICITY GENERATION DEMONSTRATION** unit is a FULLY ASSEMBLED unit designed to show Physics students that

- (1) a generator being turned at speed will generate electricity and
- (2) increasing the generator's revs (rpm or revolutions per minute) increases the electrical output.

This is easily demonstrated, as the motor's rpm increases, it lights up more LEDs: a good visual demonstration of increasing power output.

This supplied information covers the theory of how the unit works, Ohm's Law, power and efficiency. It includes a Lesson plan on: Generating Electricity using a Motor Generator Set, and spells out a series of tests that can be carried out with the unit.

NEW PRODUCTS:



Gaffer Tape - 25m

Blue - Code: TAPEGFBL

Black - Code: TAPEGFBK

White - Code: TAPEGFW

- 25 metre roll of blue or black cloth-backed tape.
- 50mm wide x 0.27mm thick.
- Matte surface, no residue, strong adhesive.
- Ideal for a variety of uses.
- Also available White Gaffer tape - 50mm x 4.5m – as used in our Solar house kit

Click on link: <https://www.scorpiotechnology.com.au/catalogues>





Dr Roman Abt
Mechanical engineer, inventor and entrepreneur

**“When faced
with a
challenge, look
for a way, not a
way out.”**

**David L. Weatherford,
(1952-2010)**

*Child psychologist, publisher,
author and writer*



Abt system

“We find a way, or make it!”

West Coast Wilderness Railway

Article written by Anita Vejins

Challenges require solutions. The challenge was to construct a train line over steep, mountains, ravines and rainforest on the west coast of Tasmania linking Queenstown to Strahan.

Mount Lyell Mining and Railway Company decided to build a railway link during the 1890s allowing mined copper to be transported to Macquarie Harbour. The terrain was difficult. Many bridges needed to be constructed over the route but the major challenge was the steep terrain which would not have been possible with a normal track. So came the call out **“We find a way, or make it!”** “

The solution was to use a rack-and-pinion system called the ABT system for the steep sections. The steepest gradient on the rack section was 1 in 12 (8.33%).

On September 11 1896, Abt Locomotive No. 1 successfully passed a series of tests that allowed her to commence operation. It was the first time this technology was used in Australia. Today, it is the only operating Abt rack and pinion railway in the Southern Hemisphere.

The ABT system

This system was designed in the 1880s by Swiss locomotive engineer Dr Roman Abt (1850 – 1933). It was an improvement on the widely used rack and pinion design Riggenschach system which was expensive to build and maintain.

Abt's design was inspired by the cogs of a clock, and involved a third central rail of solid bars with vertical teeth that engaged with small cogwheels – known as piston wheels – on the underside of the locomotive engine.

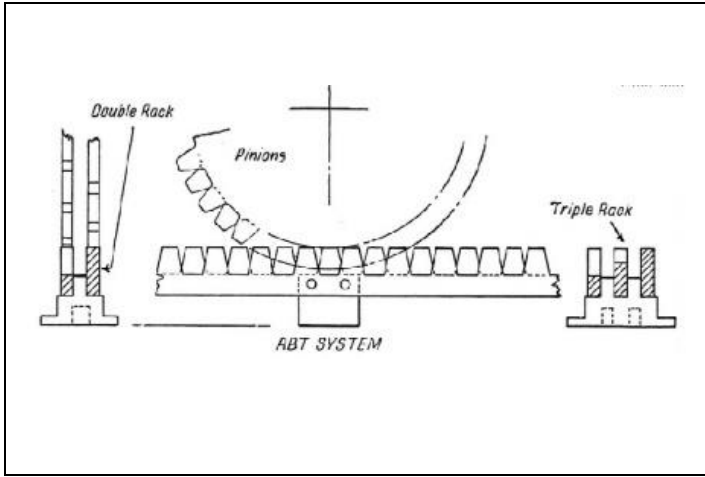
Rectangular bars were placed in pairs, teeth uppermost, on chairs bolted to the sleepers. The teeth of the rack-bars were arranged so that they were “out of step” - the teeth of one rack being adjacent to the indents on the other. A pair of stepped pinions on the locomotive engaged with the double rack, and so smoothness of action was ensured.

The system allowed trains to haul loads up steep inclines and created a braking effect going down. This system was safer and cheaper than the Riggenschach system.

What is the purpose of a rack and pinion gear?

The rack and pinion gear set has two main functions:

1. **Conversion of the steering wheel's rotational motion into the linear motion needed for the vehicle's wheels to turn.**
2. **Reduction of gears**, which makes it easier for the steering wheel to turn the wheels.



The Abt rack and pinion system

Pinion - smallest of two meshing gears and provides the input in a typical gear reduction.

Rack - a segment of a gear with an infinite radius.

Gear racks are mechanically simple, have a large load carrying capacity, and no limit to the length. A gear rack has straight teeth cut into one surface of a square or round section of rod and operates with a pinion, which is a small cylindrical gear meshing with the gear rack. Generally, gear rack and pinion are collectively called “rack and pinion”.

Rack and pinions uses:

- a central rack between the two railway rails engages with a pinion on the engine allowing a train to be pulled up very steep slopes.
- used in steering systems to change the direction of cars
- for lifting mechanisms (vertical movement)
- horizontal movement
- positioning mechanisms
- stoppers
- permit the synchronous rotation of several shafts in general industrial machinery
- machine tools such as for linear guideway systems
- used in some scales to turn the dial that displays a weight
- lateral slide gates
- toys

Need Rack and pinion project inspiration?

Check out Scorpio's project kits that use Rack and Pinion.

- Radio Controlled Vehicle
- Follow the White Line Vehicle
- Forklift
- Racks and pinion available separately for students to build their own system.

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