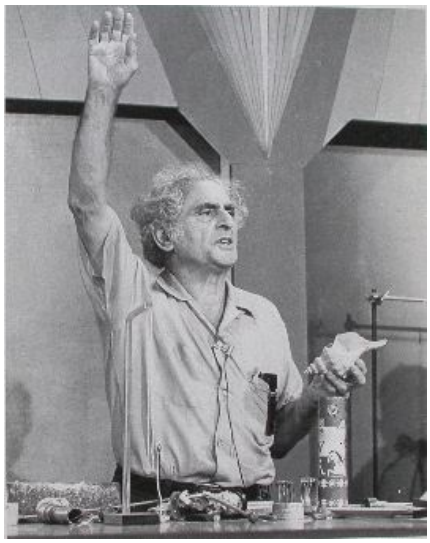
JULIUS SUMNER MILLER

1909 - 1987

by Rod Cross, Physics Department, University of Sydney, July 2003.



1979 International Science School for high school students

Julius Sumner Miller became a household name in Australia as a result of his nationally televised appearances, from 1963 to 1986, in which he presented a vast collection of demonstrations in physics. He delighted in showing "how Nature worked its wondrous ways", but rarely offered any detailed explanations of the effects that he demonstrated. Instead, he preferred to encourage his audience to seek out the answers themselves, this being his primary objective. Bubbling with infectious enthusiasm not normally associated with the serious scientist, he brought each presentation to life with details of the history of the subject and the origins and meanings of the words used to describe it. No presentation was ever dry. It always had a strong element of drama, punctuated loudly with phrases such as "Watch it now! Watch it!" or "He who is not stirred by the beauty of it is already dead!" He liked to set traps to keep people on their toes. He would hold up an empty glass, ask the audience to verify that it was indeed empty and then berate them for not noticing that it was full of air. He would usually ask for a show of hands before each demonstration as to whether outcome A or outcome B would occur. He would sometimes add "hands up those who don't know", and then occasionally add "hands up those who don't care".

Julius made 26 visits to Australia, primarily to give lectures at the annual Science School for High School students in the physics department at Sydney University, organised by Professor Harry Messel. In the early days, these were presented on national television, together with the lectures given by other distinguished scientists from around the world. Julius was also in great demand as a TV personality and presented many additional hours of programs on

TV entitled “Why Is It So?” He had previously recorded similar TV shows in the USA in the early 1950’s and was already famous in the USA from his appearances on The Groucho Marx Show, The Steve Allen Show, Disney’s Mouseketeer Show, The Art Linkletter Show, The Johnny Carson Show in Los Angeles and New York, and The Mike Douglas Show in Philadelphia.

Julius also became well known in Australia from his appearance in TV advertisements for non-stick saucepans, Ampol Petroleum and Cadbury’s Chocolate. Throughout his years in Australia, he was ably supported by Ray Anderson, the technical officer in the School of Physics responsible for maintaining the lecture demonstration equipment in the School. Ray and the workshop staff built hundreds of pieces of demonstration equipment, some of which are still in use today.

Making a point at the 1971 Science School

1972 With the Helmholtz resonators belonging to the School of Physics, Sydney University. These are hollow spheres made of brass, used to detect sound waves at a well defined frequency. They are now (in 2003) in the Physics Museum.

In brief

The youngest of 9 children, born to parents from Lithuania and Latvia who migrated to the USA and who settled on a small farm in Billerica, 30 km north of Boston.

1933 Completed MSc in physics at Boston University

1934 - 36 Servant in doctor's residence (times were tough during the depression)

1937 - 1949 Physics Department, Dillard University, New Orleans

1949 Physics Department, Michigan College of Mining and Technology

1952 - 1974 Physics Department, El Camino College, California.

1965 - 1985 Visiting Lecturer, US Air Force Academy

1963 - 1986 Visiting Lecturer, Physics Department, University of Sydney

From his book, The Days of My Life (Macmillan, Melbourne, 1989)

He lived on his parents' farm until he was seventeen. The first one third of this book is devoted to life on the farm, which he recalls (at age 74) in sufficient detail to reveal an unusually deep fascination with nature even at a very early age. The following excerpts are typical, presented in a manner that only he could:

Now one day when ploughing in a field hard by the country road a stranger approached on foot. I was driving the team, Papa held the plough. We stopped, greeted the man. He was a farmer's advisor, from the Government he said. He was making the rounds in our neck of the woods telling the farmers what to plant where. With a look at the furrow turned and a bit stirred with his foot he said "Good for corn". With this, Papa shouted "gid-up" and we left the man forthwith. His judgement was absurd. Even I at age eight knew better. Corn in that soil would sprout, grow seven centimetres tall and turn yellow. Too wet and soggy. Good for rutabaga turnips, which we planted and which prospered. Since then I have always looked circumspectly at the experts. (p26)

Jippy was in my life some six years or so and in my memory for more than sixty. Only a man who was once a boy who once had a dog can tell you what I mean. I often felt that even the horses and the cows were now alone, for Jippy often cavorted with them. The memory of Jippy is a sacred thing. The bond that can be between two living creatures is a witness to the spiritual elements of life. (p50)

(At school, grades 1 to 8). I liked geometry. A proposition, a theorem, is stated and then you are to prove it. This is a rigorous exercise and finally you can say QED. What a delight that was. Of course, we never thought the fifth postulate was so big a thing. After all, we knew what parallel lines were. But years later I learned that giants in geometry like Gauss

and Bolyai and Riemann and Lobachevski and Sophus Lie were tormented with it. I was never tormented with it. It was just clear and simple. Special too in my memory is the Pythagorean Theorem. It talks about squares on the sides of a right angle. I extended the theorem to equilateral triangles on the sides. It was called, properly called, the Millerean Theorem. (p85)

(In 1950). My first TV series on demonstrations in physics - titled "Why Is It So?" were now seen and heard over the land. The mail was massive. The academics were a special triumph for me. They charged me with being superficial and trivial. If I had done what they wanted my programs would be as dull as their classes! I knew my purpose well and clear: to show how Nature behaves without cluttering its beauty with abtruse mathematics. Why cloud the charm of a Chladni plate with a Bessel function? (p212)

(In Sweden). We are now at the eating place on a river-bank with outdoor tables. At one such sits a young man with his girl. The table is set. On the tablecloth rest the usual paraphernalia, meaning the articles for the purpose at hand. I speak to the pair in English: "I am going to show you the physics of Isaac Newton." Not a word is understood! So my Swedish colleague makes it clear. "This American professor will demonstrate Newton's First Law." I adjust the several items, inspect the tablecloth. It drapes over the edge in a graceful way, no lumps, no ribs. In a flash, with both hands I deliver a sharp sudden pull. With the cloth in hand, free of the table, with a swirl like a toreador I bow to the gathering - for others have now assembled - and with bended knee humble myself in a gesture of civility and respect. Not a thing on the table had stirred! (p228)

For my very first TV adventure in Australia on Bob Sanders' "People", with nothing of my stuff at hand, I had gathered up an array of sticks and strings and sundry items including some paper straws and raw potatoes. The physics is this: hold the potato in one hand and with the other drive a straw through the raw potato. It turns out that a paper straw does not have the strength, the rigidity along its length to endure the compression. To remedy this, with finger and thumb we squeeze the straw, thus trapping some air which now acts as a piston. I have done this a thousand times around the world, but in this case it did not work! Said I with boldness: "Australian straws ain't worth a damn." And who'd believe it? The next morning in my laboratory in the school of physics at Sydney University I found one million straws in a great heap with a cable reading: "you might find one of these fitting your requirements." And therewith I sat amongst the straws with straws stuck in my hair and ears. But clearly I had made a mistake. I should have said: "Australian potatoes ain't worth a damn," and I'd have cornered the potato market! (p234)

J.S. Miller, Millergrams, Ure Smith, Sydney, 1966

In 1966, The Australian newspaper published each day a question posed by Julius, and an answer to the previous day's question. Arnold Earnshaw at the newspaper coined these "Millergrams". They were subsequently published as a series of 112 Q's and A's in a small book called Millergrams. In the preface, Julius says:

The hope I have here is simply summed up: To stir your imagination, awaken your interest, arouse your curiosity, enliven your spirit - all with the purpose of bringing you to ask, as young Maxwell put it, "What's the go of it?" - or, as Kepler had it, "why things are as they are and not otherwise". Or, more simply in my own phrase, WHY IS IT SO?

J.S. Miller, Why is it so? The second book of Millergrams. Penguin Books Australia, 1988. This book is similar to the first, with a few additional Millergrams.

Here is a sample of the Millergrams, slightly abbreviated (answers at the end):

Q1. You know how light a cork is - it weighs practically nothing. Now we have a ball of cork - a sphere of cork - 5 feet in diameter. What does it weigh? Could you lift it?

Q11. Consider a flat metal plate with a circular hole in the middle. You heat the plate by putting it in an oven. What happens to the hole? Nothing? It gets bigger? It gets smaller?

Q17. How tall a mirror do you need to see all of you?

Q18. Rest a meter stick on the outstretched index finger of both hands. Let the stick be horizontal. Now push the fingers toward each other smoothly and gently. What do you find?

Q28. A man is carried up an escalator in one minute. He can walk up the stationary escalator in 3 minutes. How long will it take him to walk up the moving escalator?

Q32. A juggler comes to a foot-bridge of rather flimsy design. He has in hand four balls. The safe load is no more than the juggler himself and one ball. Can he get across the bridge by juggling the balls, always having at most one ball in the hand (and three in the air)?

Q38. How can you measure out half a cup of hard, solid butter without melting it?

Q44. A wheel is rolling at constant speed along a horizontal road and a piece of mud is thrown off its rear-most point. Will the mud touch the wheel again?

Q53. You pour a cup of hot coffee. You are about to add some milk when the phone rings. To keep the coffee as hot as possible should you add the milk before or after answering the phone?

Q64. How long is a microcentury?

Q66. What happens to the flame of a candle if you drop the candle?

Q71. You hold in your hand a scale which supports a weight of 1 kg. The scale reads 1kg. What is the reading if you drop the whole thing?

Q78. Tie a helium filled ballon to the floor of a car so the balloon floats in the air. What does the balloon do when the car is accelerating forward? Does it stay right there? Does it go forward? Does it lag behind?

J.S. Miller, Why it is so, published by The Australian Broadcasting Commission, by John Sands Pty Ltd, Sydney, 1978. This 296 page book, complete with photographs, summarises 150 physics demonstrations recorded for TV in the ABC studios and in the School of Physics at Sydney University in the early 1970's. The book was originally published in four separate volumes. Most of the demonstrations were originally developed or collected by the School of Physics and should be well known in University physics departments. See also **J.S. Miller, Demonstrations in Physics, Ure Smith, Sydney, 1969** - a 444 page book containing 100's of demonstrations and suggestions. A small sample of the demonstrations is the following, in abbreviated form:

1. Air is blown out a funnel. A pingpong ball placed in the neck of the funnel is not blown out, even if the funnel is inverted to tip it out.

2. A pingpong ball can be supported or "levitated" in a stream of air directed at an angle to the vertical.

3. The path of least time for an object falling from one point to another point at some angle below it (eg a bead on a wire) is a cycloid. And the time is the same regardless of the starting point above the end point. The path with the shortest distance is a straight line.

4. A elliptical football spun on its short axis rises up to spin on its long axis.

5. The free end of a hinged stick falls when released, with an acceleration greater than that due to gravity. A stick hinged at one end has a cup attached near the free end. On the very end rests a ball in a slight groove. The stick is propped up with a second stick. The ball is initially located at a point directly above the final position of the cup. When the second stick is suddenly removed, the ball falls into the cup.

6. Boil some water in a flask and then stopper it tightly. Remove the flask to a cold tripod. The water stops boiling. Pour cold water on the flask and the water starts boiling again.

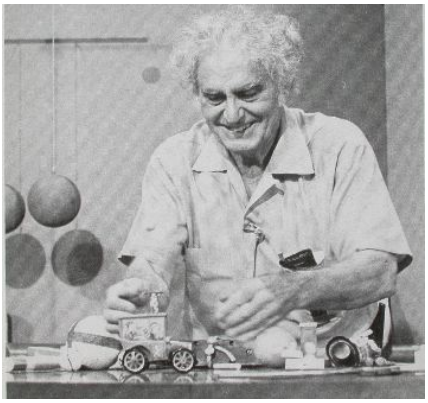
7. A flat-sided whisky bottle is filled with water. A narrow bore glass tube is inserted through a rubber stop so that the water level is above the stop. The water rises up the tube when the bottle is squeezed on the flat sides. It drops when squeezing on the narrow edges. A drop of oil at the top helps to stop the water evaporating.

8. Two balloons are inflated and connected by a tube with a valve. When the valve is opened the smaller balloon gets smaller and the bigger one gets bigger.

9. Normally we think that an object is more stable if it has a low centre of gravity. It doesn't tip over as easily. But it is easier to balance the bottom end of a long stick on the tip of your finger if a mass is added at the top end.

10. A rod can be made to oscillate back and forth by supporting it as a pendulum. Where is the axis for (a) the shortest and (b) the longest period of oscillation? The shortest period occurs when the axis is about 1/3 of the way along the rod.

We were all young once.



1979 Science school

(A1) 500 kg. (A11). The hole gets bigger. (A17) Half the person's height. (A18) Fingers always meet in the middle. (A28) 45 seconds. (A32) A falling ball exerts a force on the hand greater than its weight. (A38) First half fill the cup with water, then add butter until the water is level with the top of the cup. (A44) Yes. The mud is ejected upwards and forwards. (A53) Add the milk before answering the phone, then the coffee (plus the milk) loses heat more slowly. (A64) 53 minutes. (A66) The candle goes out. (A71) The scale reads zero. (A78) The balloon goes forwards (like a bubble in a liquid in a bottle that is accelerated).