



This will be the presentation of my project: I'll not be saying anything new and many of you may think that it's not very interesting, because already know those facts; but for the public can be very interesting precisely for the same reason: they do not know them!



We are all slide rule collectors, when we speak about our hobby we always communicate with people who have the cultural base to understand what we say and who likes it.

It is different in an exhibit, or in a school. Most of the people do not understand or is not interested in what I am saying and are not interested. Most of the time neither professors nor students have the slightest idea of what a slide rule is.

A different approach is needed ...



All I can do is to introduce people to the old computing tools and systems. If I am not so boring, they may afterward search additional information themselves.

All I can do is to sow a seed and sometimes it happens that I've created a monster: another slide rule collector!

I'm an amateur, there are no funds or organizations behind me.



Old Computing & New Generations

teaching slide rules and other historical calculating instruments at schools and science fairs



IM 2014 - September 5th and 6th - Delft, The Netherlands

if we don't pass on our knowledge, soon slide rules will be forgotten



I: introduction



The landscape framed by skyscrapers and everything we associate with modernity was designed with computers conceived in the 16th century, but young people have no idea of the tools that have made it possible. The modern world has short memory and soon the remembrance of the ancient calculating instruments will disappear.

This is my effort to keep them alive, through exhibits, conferences and lectures: it takes just a few minutes to communicate the existence of a world "*before computer*", a world where with simple tools the man reached the Moon!



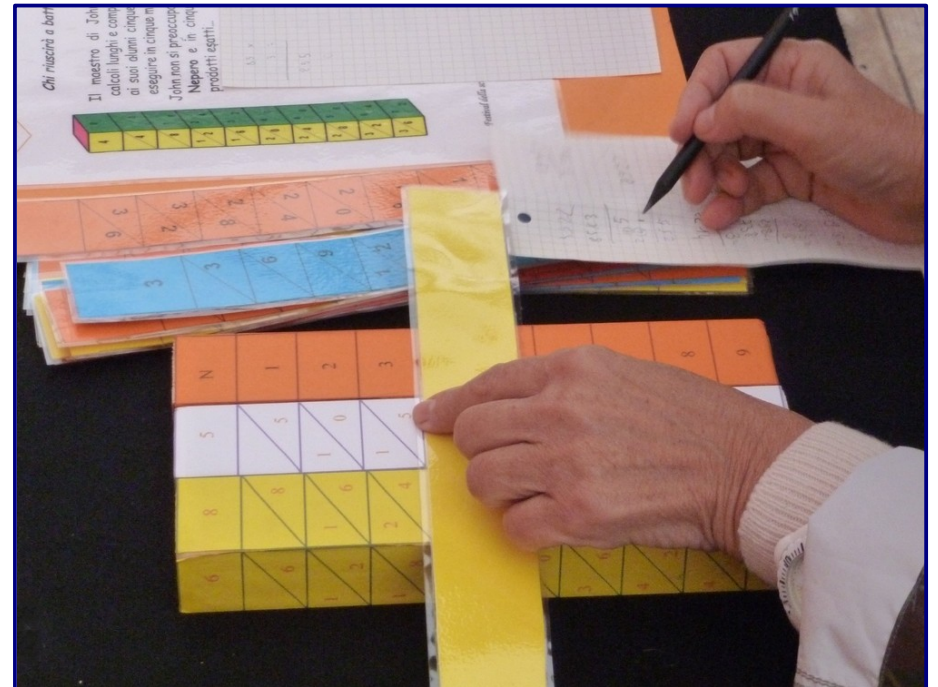


Using my collection I explain the most significant calculators, from the abacus to the HP 35.

The minimum “*exhibit kit*” is easily transportable, but I can create a true museum exhibition, with educational aids and interactive simulations.

Sometimes I add a brief panoramic of the traditional methods of navigation and, to complete the history of ancient technologies, I can show a telegraph station, telephones, typewriters and anything else necessary to recreate an office of the era.





ARC

Storia del Calcolo

WAS THERE LIFE BEFORE THE CALCULATOR?

Il calcolo prima dell'era digitale

Il mondo di oggi, il passaggio da un mondo analogico a uno digitale, è stato progettato e realizzato grazie a questi strumenti.

... utilizzavano un semplicissimo regolo abacologico, che disponeva solo di 10 cifre (0-9) e veniva utilizzato per calcoli aritmetici.

Non è un caso che il regolo abacologico sia stato utilizzato anche per calcoli complessi, come quelli necessari per la progettazione di ponti e macchine.



From 2008 I show every year at “*Cagliari Festival Scienza*”, the Sardinian science fair with more than 10,000 visitors and sponsored by the U.N.E.S.C.O., a brief history of the mechanical calculators and the slide rules.

The opportunity to touch and try the calculators has made the difference and there were always many people waiting to visit my stand. In 2013 I had more than 1,500 reservations: it is an average of three shows for 30 people each hour ... no time to rest!

The best compliment I got from a group of young girls who advised everyone: “*go to see the old computers, they are so cool*”. An unexpected success for a boring topic!



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cagliari

IV edizione



estivalscienza

fra cielo e terra

4 - 12 novembre 2011

19 novembre 2011

ExMa' Cagliari



In 2013, I won the *Science on Stage Italy* concurs for the best 12 innovative teaching projects of the year, and I was invited as official Italian delegate at *Science on Stage Europe 2013*, a biennial festival where around 350 pedagogues from 29 countries met to share their most innovative teaching ideas. It was possible for me to “*teach to the teachers*” how to present slide rules and I made for the Polish television a 10 minute program, entitled “*Unplugged calculators: making a bridge between past and future*”.



CROSSING BORDERS IN SCIENCE TEACHING

SCIENCE ON STAGE FESTIVAL 2013
SŁUBICE – FRANKFURT (ODER)



350 biology, chemistry, physics and mathematics secondary teachers as well as primary school teachers from all over Europe will present their most innovative teaching ideas, workshops, master classes and performances. Participants will be chosen through competitive national events in 27 countries. www.science-on-stage.eu

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President of the Republic of Poland
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SCIENCE  ON STAGE 2013
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II: the theoretic program



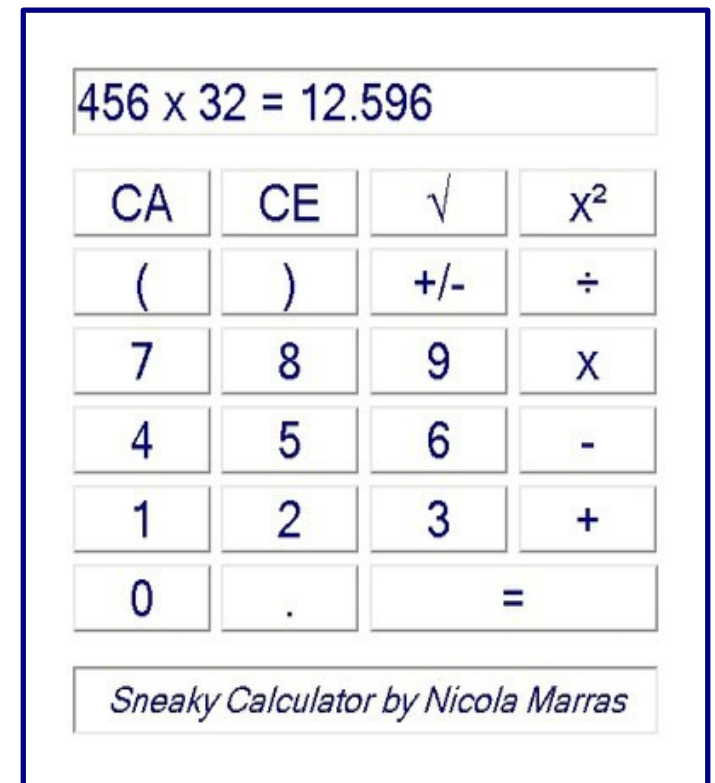
Nowadays calculations are delegated exclusively to electronic devices and the results are sometimes uncritically read on the display, without any idea of how they are produced.

People punch numbers into a calculator and expect it to provide the correct answer: the skills of estimation and carrying decimals are no longer practiced.



With a calculator, modified to give incorrect results, I can show how easy it is to run into errors and that we should not blindly trust electronic aids.

The digital display is not “*Word of God*”, this is what I hope will remain imprinted.





For many students the result of $2+3\times 4$ is 20 (not 14!), but with slide rules they learn to recognize the order of operations. With “*pascalines*” and “*addiators*” children understand easily the addition and the “*Consul Monkey*” is the best way to teach the multiplication table.



CALCOLATORI



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The Asimov' science fiction story "*The feeling of power*", assuming a return to the old methods of calculation, ends with these words:

“Nine times seven, thought Shuman with deep satisfaction, is sixty-three, and I don't need a computer to tell me so. The computer is in my own head. And it was amazing the feeling of power that gave him”.



For a better vision of mathematics, my exhibits aims to:

- arouse curiosity about ancient computers;
- illustrate an *entertaining history* of computational tools;
- explain the difference between digital and analog;
- remember how some of these tools are still needed;
- teach the practical use of pascalines, addiators, nomograms and slide rules;
- demonstrate that it is essential to critically use calculators and computers.





I strongly believe that nobody can learn mathematics without having a rough idea of how calculations were carried before the digital era: it would be like studying history starting only from the Industrial Revolution. I fully subscribe the IT History Society's mission: *“ensuring the future by preserving the past”*.



...a queste addizionali, le Chen Abbe e le Sida Koller, i primi calcolatori meccanici a pila, si basavano sul principio di addizione e sottrazione. Le Chen Abbe erano i modelli più prestigiosi e versatili. Le Sida Koller apparvero nel 1923 sulla scena del mondo e divennero i modelli più pratici e versatili. Le Sida Koller apparvero nel 1923 sulla scena del mondo e divennero i modelli più pratici e versatili. Le Sida Koller apparvero nel 1923 sulla scena del mondo e divennero i modelli più pratici e versatili.

La chiusura di un'epoca

Ancora negli anni '60 le calcolatrici meccaniche venivano utilizzate in tutte le applicazioni commerciali e bancarie. I primi calcolatori elettronici apparvero infatti con gli ingegneri Alcatel e non si fu conosciuti fino al 1970, quando la diffusione del transistor e dei LED permise la realizzazione di apparecchi piccoli ed economici. La calcolatrice elettronica, ed i modelli basati sui circuiti integrati, rimasero in commercio fino a quando la produzione di nuove calcolatrici non cessò di essere prodotta. Oggi nessuno vi ricorda più della sua esistenza.

www.nicolamarras.it/calcolatoria



As a static exposition of scientific instruments cause just a mild curiosity, I make a "*dynamic*" exhibit focused in quickly teaching "*how to*" use them. Math on the move!

With my educational material, downloadable for free from my website, the teachers can after easily illustrate in the classroom the working methods of a past so recent.





III: facing the reality





I make a test in the town streets, showing a slip-stick: 99% of the people don't know what it is and they cannot believe that such a ridiculous tool made possible the conquest of the Moon.

Many people think to be on a television candid camera, in a program that search for idiots who believes in those things.



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The typical attitude of many students is:

- I do not know logarithms, not interested either;
- I do not know what a slide rule is, not interested either;
- I am a fast guy, I do not like boring topics.

So, about what is your lesson?

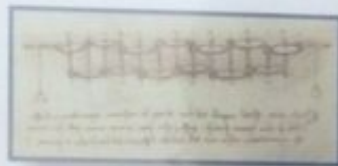
Hard to approach, I have to do it carefully, like walking on thin ice.



WAS THERE LIFE BEFORE COMPUTER?

il calcolo prima dell'era digitale

Il mondo di oggi,
il paesaggio disegnato dai grattacieli, tutto
con sistemi e macchine di calcolo concepiti nel



Leonardo da Vinci: probabile progetto
di calcolatore meccanico

... sembravano insostituibili:
il compasso di Galilei e
calcolatori di Pascal
finanziario; col reg
tutto, dall'ammira

No

si

Leonardo



IV: solutions



We, the collectors, do not realize that our beloved slide rules can become terribly boring for the public, the approach must be careful to overcome the resistance. People do not like calculators that do not give quick results and we must at first wake up their interest and then grow it up.





First I start with a classic pascaline, it is very easy and people can see as I am sometimes faster than a modern calculator, but slide rules are too difficult for students with no idea of logs.

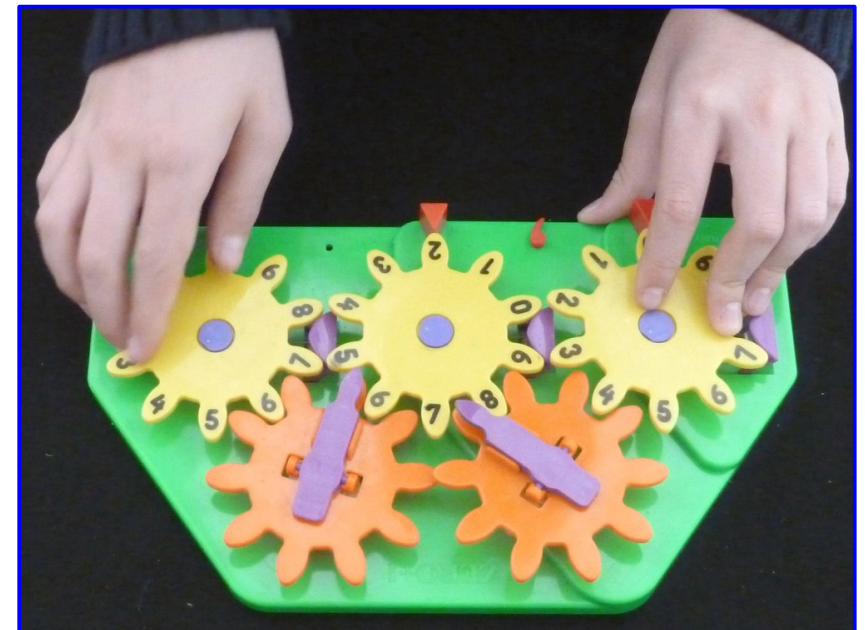
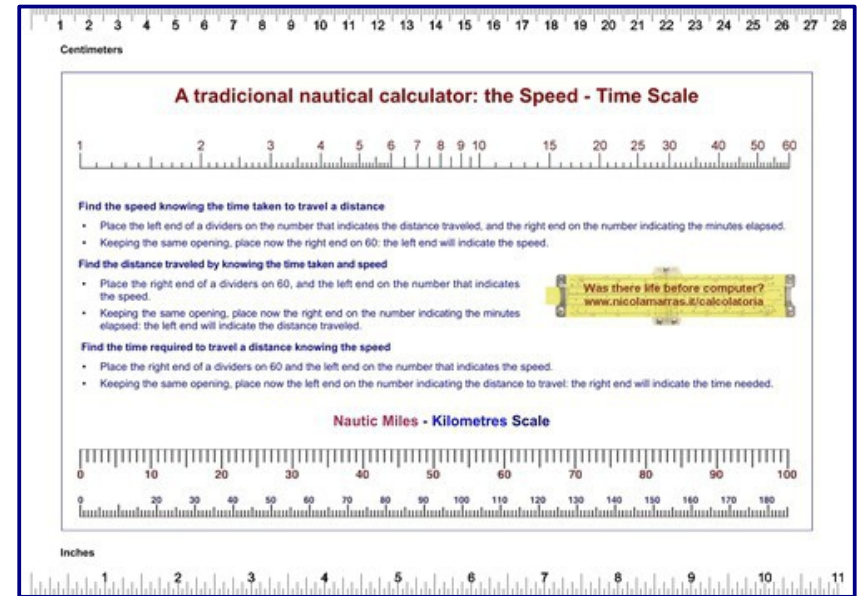
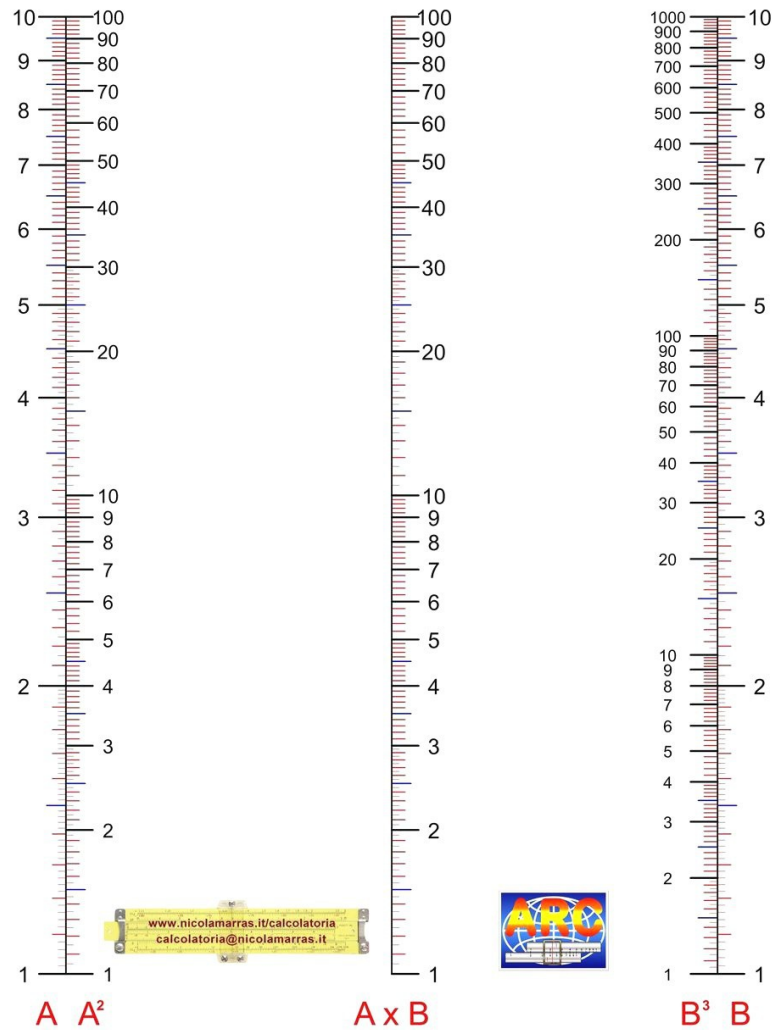
I show a linear scale and a log scale, giving some example to solve with the last: *“obtain the fuel required for a trip when the rate of fuel consumption is 20 liters per hour and the estimated running time is 3 hours”*.

A practical problem show how these instruments are not theoretical absurdities but useful tools. Then I use the nomograms, easy to read, to introduce the slide rules.



The paper scientific calculator

With the *nomography* you can do all the calculations: to multiply connect with a ruler the two factors A and B of the outer scales and read the result in the central scale, to divide reverse the process. You can also square and cube a number (or do the square and cubic root). Graphic by Alvaro Gonzales - arc.reglasdecalculo.org.



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What slide rule is best? A normal one is too difficult for those modern students. In my experience the best is the E6-B. I use the model designed by Ben Jackson: can be built in few minutes just with the help of a pair of scissors and is very easy to read.

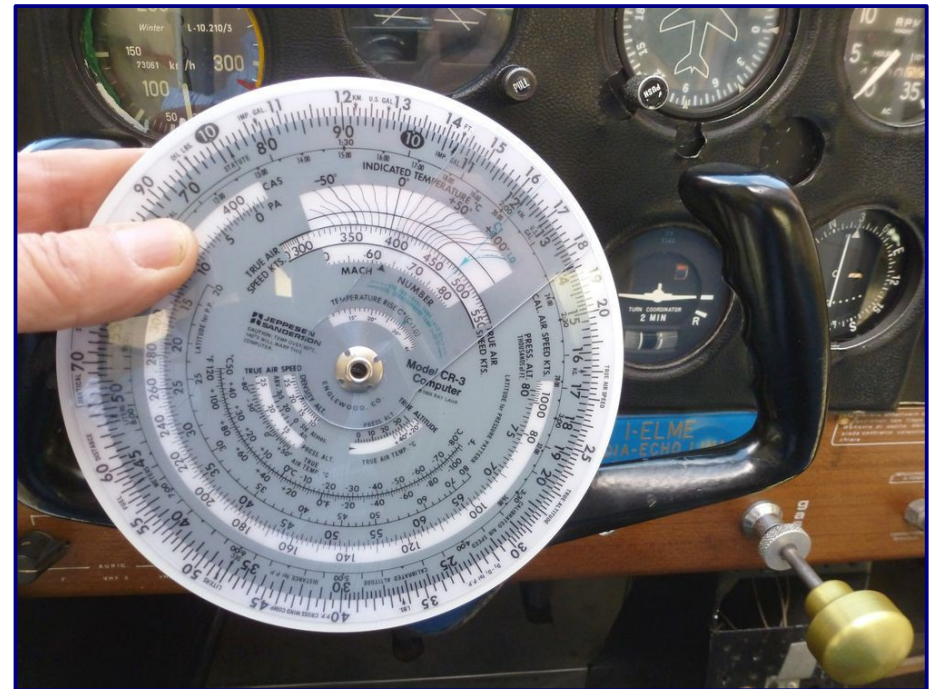
I have also classical models of slide rules, mostly designed by the ARC members, but must be taught in school. No time in a 10 minutes show!

The E6-B is useful to solve practical problems that captivate the youngsters: *“we are flying from Rome to Venice, then an unexpected front wind slows our speed of 20 miles/hour: with our rate of fuel consumption the gasoline will be sufficient, or we must search for an alternate landing?”*



Of course I can show only simple problems: no time for the graphic wind triangle, this can be done later by the teacher or by themselves, if interested.

Once, with my aero club, I exposed an airplane in the fair. A great success and the Italian Air Force supported me in the teaching!





Storia del Calcolo

est/nal
est/nal
La navigazione degli antichi

est/nal
est/nal
Dall'estimazione al GPS



Il primo navigatore italiano

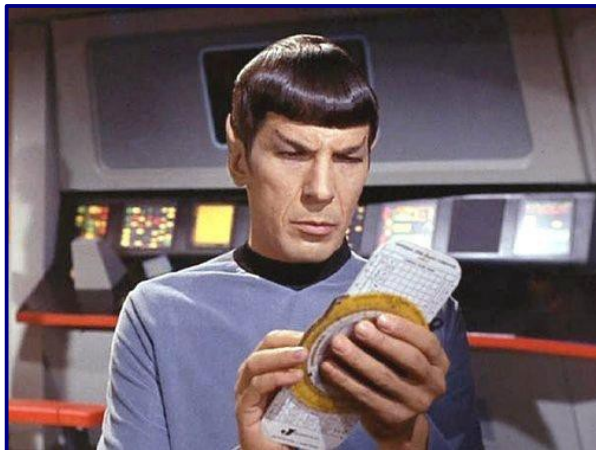
Il primo navigatore italiano

Il primo navigatore italiano

Il primo navigatore italiano



With *my easy to build* E6B the students feel immediately like Mr. Spock, but it is a real instrument and can also be used on an aircraft!



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Also I explain how slide rules can be used for rallies, another fascinating topic for boys: *“a car in a competition must average 28 m.p.h. and the distance to be covered is 42 miles: how long should it take?”*

I also show the E6-B watch and how I use it in classic races: the attention is always guaranteed!



From 2014, due to restrictive laws, I cannot teach anymore in the schools, neither for money nor for free.

The only solution left is to organize informal meetings with the teachers, to illustrate my program, and give conferences to “*teach how to teach*” the old calculation systems. From my website it's possible to download all the needed material. I hope this program will become official in some schools.

I can just keep working with the Science Fairs and I have presented the application to participate at *Science on Stage 2015* in London. I'm also trying to produce a short TV spot about old computing.





Most teachers have never seen a slide rule or heard about it.

I show slide rules and pascalines to them, so after they may afterward teach them in their classroom.



THE END

This was my effort to keep old calculators alive.
Let us remember those who created the modern world using technology, not depending on it.
We often use electronic as the alcoholic does with the street lamp: to lean on and not to make light.
Fermi, Oppenheimer and Von Braun had a slide rule less powerful than any smartphone and calculation is now within the reach of everybody, how many will be able to do better?





fare Scienza

ARC

SPECIAL THANKS TO:

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Gonzalo Martin

Jorge Victoria

Science On Stage Europe

Science On Stage Italia

Scienza Società Scienza

Slide Rule Museum

The Oughtred Society

U.K.S.R.C.

AND MANY MORE ...



SCIENZA
Società



I tried to be fast and no boring, for more information my book *Was There Life Before Computer* and all the didactic material are in the included CD, or can be downloaded for free at www.nicolamarras.it/im14

