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PROFILE

Ben Sangari: "It's About the Science, Stupid!"

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Since last May, Brazilians in Saõ Paulo and Rio de Janiero have been treated to a new kind of exhibition at some of their most iconic art museums. Thanks to the efforts of the innovative entrepreneur Ben Sangari and his brilliant Instituto Sangari team, two very different and equally wonderful evolution exhibitions are thrilling record crowds of adults and schoolchildren with the beauty and glory of science. First came *Darwin*, which originated at the American Museum of Natural History (AMNH) in New York City in November, 2005. Next was the AMNH show *The Genomic Revolution* (A separate review of the exhibitions follows this article). Both shows have been translated and expanded to reflect Brazilian history and environments. *Darwin* and *The Genomic Revolution* will be touring Brazil at length, offering the general public and countless more schoolchildren a compelling introduction to the subject and implications of evolution. This is just one opening volley in a scientific revolution Sangari hopes to achieve in public education.

How does a revolution get started? The classic scenario features a charismatic young visionary with heroic leadership skills, whose fiery message calls up the masses to fight at the barricades for their rights. But what if the battlefield were the classroom? What if the hearts and minds to be changed belonged to the 2.5 million elementary and secondary teachers of Brazil? What if the firebrand were more businessman than wild-eyed radical? That firebrand would be Ben Sangari, and that revolution has already begun—with a few strokes of the pen. Just a few months ago, Instituto Sangari signed a contract with Brazil's richest state, the populous Federal District of Saõ Paulo, which may well prove to be the educational "shot heard round the world."[1]

A British transplant of Iranian origin, Ben Sangari looks far more Etonian than revolutionary with his polished manners, combed-back hair and trimly tailored suits (Fig. 1). A bit over forty, clean-shaven, deeply cultured and well educated, he seems very much the English gentleman—although Sangari is now permanently settled in Brazil. Take the personal tour of his vast Saõ Paulo factory where the revolution's educational matériel is produced and assembled and you will detect a grand industrialist spirit infused with the passionate enthusiasm of a born teacher. The factory is built to supply thousands of Brazilian elementary and junior high schools with what amounts to an entire curriculum in a cabinet. CTC for short, its full name in Portuguese is *Ciencia e Tecnologia com*

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[1] From the *Concord Hymn* by Ralph Waldo Emerson, written in 1837 in dedication of a monument commemorating the Revolutionary War battle of Lexington and Concord:

By the rude bridge that arched the flood,
Their flag to April's breeze unfurled;
Here once the embattled farmers stood;
And fired the shot heard round the world.

The foe long since in silence slept;
Alike the conqueror silent sleeps,
And Time the ruined bridge has swept
Down the dark stream that seaward creeps.

On this green bank, by this soft stream,
We set to-day a votive stone,
That memory may their deeds redeem,
When, like our sires, our sons are gone.

O Thou who made those heroes dare
To die, and leave their children free, —
Bid Time and Nature gently spare
The shaft we raised to them and Thee.

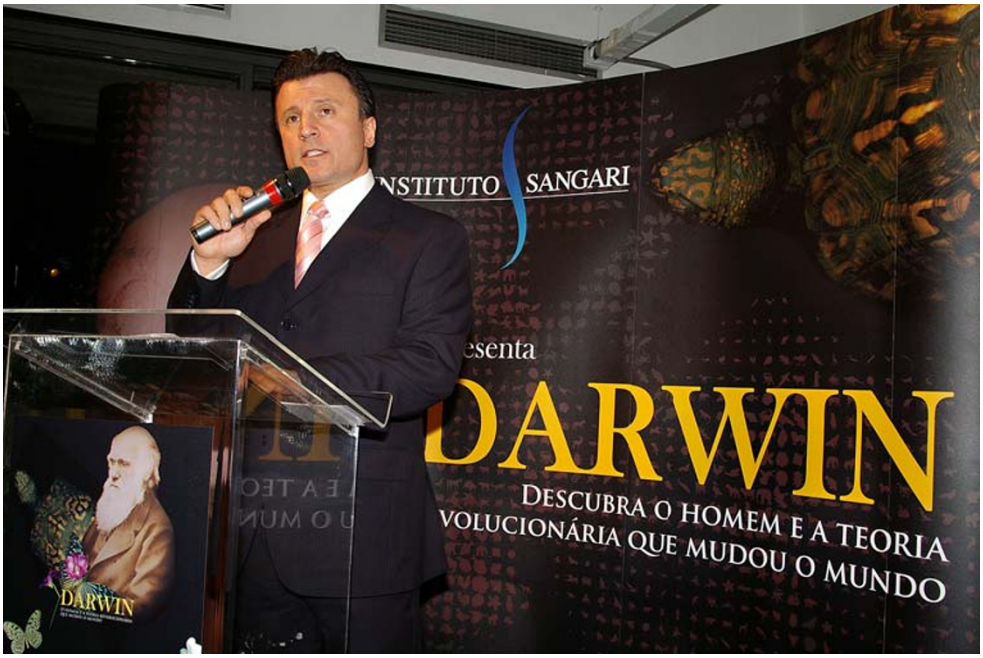

Fig. 1 Ben Sangari, President of Instituto Sangari. Credit: Monica Carvalho—Casa Catorze

Criatividade (Science and Technology with Creativity). After 10 years of testing and fine-tuning involving schools throughout Brazil and hundreds of education professionals, CTC offers a series of hands-on lessons about the natural world that promote creative thinking, integrated multi-discipline learning, and the growth of self-esteem (Fig. 2).

The drive that fuels Sangari's vision of social revolution is decidedly more Ghandi than Che: it demands freedom for a change in the viewpoint and practice of the people themselves, rather than a change of politics. But perhaps what the CTC version of "power to the people" most recalls is what Henry Ford gave the world: a way to build an engine almost anybody could afford. Ford developed the production line, created the Model A and established US automobile manufacture as one of the nation's leading twentieth century industries. Now, as Brazil is poised at the twenty-first century's opening decade to surge forward as an economic world leader, the engine Ben Sangari wants to build is a new generation of scientifically literate students. He sees science as the engine of culture that "everything else stems from" and updates Bill Clinton's insight that "it's the economy, stupid!" with his mantra for the future: "It's the science, stupid!" (Fig. 3).

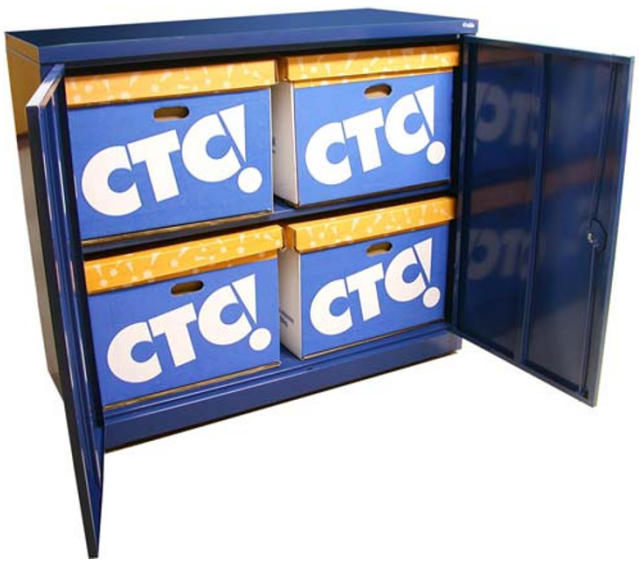

Fig. 2 Steel CTC cabinets keep termites at bay. Credit: Instituto Sangari

Ben tells a key story about his own self-discovery through science. After a build-your-own-circuit kit fell into his hands around the time he was eight or nine, a trial-and-error session of experimentation led to a literal light-bulb experience. He swears that the thrill of wiring a circuit, hitting the switch and seeing the light changed his life forever. He remembers that, "What I felt was, 'I can.' It was the most powerful feeling I ever had in my life. I grew up with an incredible confidence: with my hands and my head applied, I can do anything." Years later, Ben Sangari drew on that very experience to develop a CTC kit which supplies the batteries, wire, switch, light bulb, and all—and challenges students to figure out the connections as he did himself. At one CTC inner-city pilot program in Saõ Paulo, an on-site video interview captured a young student who had just successfully completed the experiment. Sangari glows with pride as he recounts the boy's halting efforts to express his feelings. After a good deal of camera-shy foot shuffling and tongue-tied searching for words to express an entirely new concept, "He came up with the most amazing thing," Sangari marvels. What this underprivileged child of

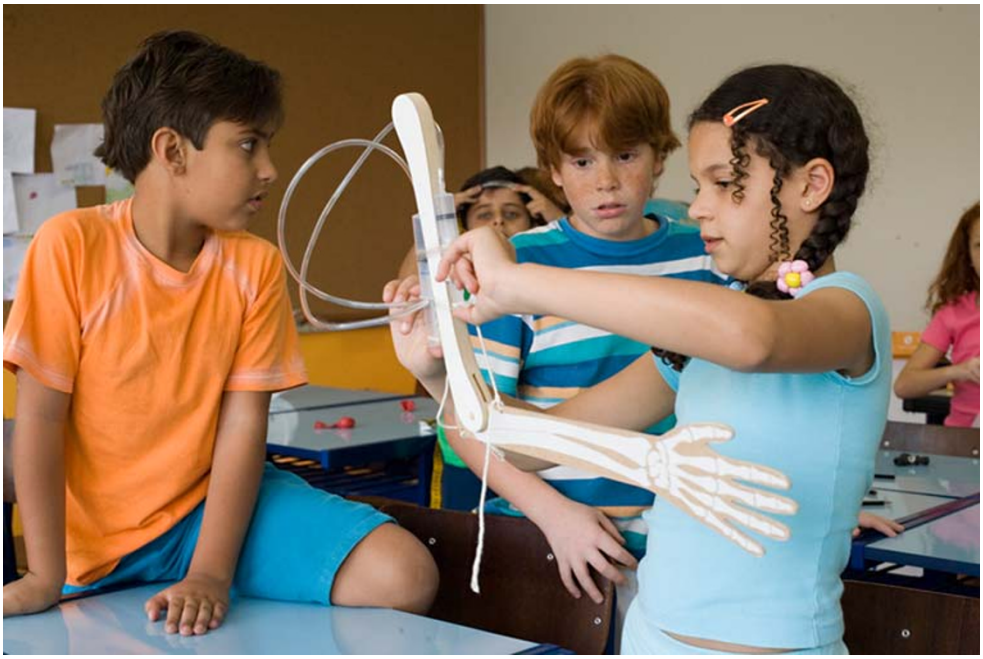

Fig. 3 The core curriculum ranges from basic biology to physics. Credit: Instituto Sangari

the ghetto said was, "I want to be better." As far as the father of CTC is concerned, "That's it! I'm done with that kid. Now I'm sure he can go on and have the most amazing life. That's what education should be about. It's not about the content, it's not about the exams. It's about getting those kids to understand their own potential." (Fig. 4).

Possibly the most radical aspect of CTC is an avowed effort to take the accent off teachers and make students the stars of the classroom. Like many successful businessmen, Sangari is a savvy psychologist, who observes, "it's human nature, you know, when we do things to improve the educational system, even subconsciously perhaps, we're trying to do things to improve the life of the adults. We're kind of forgetting the kids." He thinks the role of the teacher should be to stimulate learning and create an environment where students take responsibility for finding solutions to the challenges posed by CTC lessons. "I am not sure we can actually teach," muses Sangari.

Sangari laments that what teachers learn in training programs categorically does not help improve student performance, according to research including a major 2005 US Federal study. What does happen is that the novice is generally thrust into a classroom with zero support system. This process Sangari likens to the clinical practice of a solo physician: substitute a thermometer and stethoscope for the blackboard and chalk-doctoring minus the nurses and orderlies, the four-star medical facilities, the sophisticated drugs and so on, that make modern medicine the miracle it is. So while the CTC approach is profoundly student-oriented, it does provide masses of teacher support too. It is just that this kind of support is a lot more user-

Fig. 4 Fun with electricity can lead to scientific enlightenment. Credit: Instituto Sangari

friendly than taking a college science course. There are detailed teacher guides to back up every class lesson, along with videos and web support. And just as with the students, it is a self-teaching approach with plenty of opportunity to grasp basics quickly, then explore at will … plus, it is so clear that even a substitute could step in and stay with the program. There is also an extended master-teacher/mentoring hierarchy reaching down from headquarters to Sangari-trained educational specialists throughout CTC school districts around the country who serve as mentors to reach individual teachers and also keep up the flow of feedback from the field (Fig. 5).

Sangari thinks of the movie "Matrix" as a sort of metaphor for what CTC should do for a teacher. "That exoskeleton concept where you take a normal human and turn it into a superhuman, that was interesting: How do you create an exoskeleton for a teacher? Every teacher that I have met wants to do a good job. Everyone wants to have some form of job satisfaction, and they want to see that light going on in the minds of their students—that is the greatest reward, and when that happens, that justifies their lives. How do you help them become better teachers without asking the impossible? Without asking them to become different people?"

Sangari's answer, of course, is to give them CTC, but like most worthwhile projects, it was not easy, it cost a lot more money, and took a lot longer than expected. "It was very ambitious," Sangari admits. "I felt that it would be something that would take us two or three years to do. It ended up taking almost ten years with a budget that is orders of magnitude different than what I had imagined." It took so long, he explains, because "you need something on a mass scale that's reproducible, scalable, something that works in the capitol, in the urban areas, in rural areas, in suburbs, the interior, the area of the Amazon where you don't even have roads. It's got to work in the worst schools, the best schools, with the best teachers, the worst teachers." Furthermore, it has to work under the worst conditions as well as the best. For example, while wood might have been good to use for CTC cabinets, the swarming termites of Brazil's tropical regions made metal the only choice. Likewise, while renewable CTC materials such as packets of seed and soil are restocked often, research elements such as hand lenses and microscopes feature sturdy, low-tech design built to last (Fig. 6).

Regardless of a nation's wealth, Sangari sees the same educational deficits in every country. "We're having problems with basic reading and writing, with mathematics,

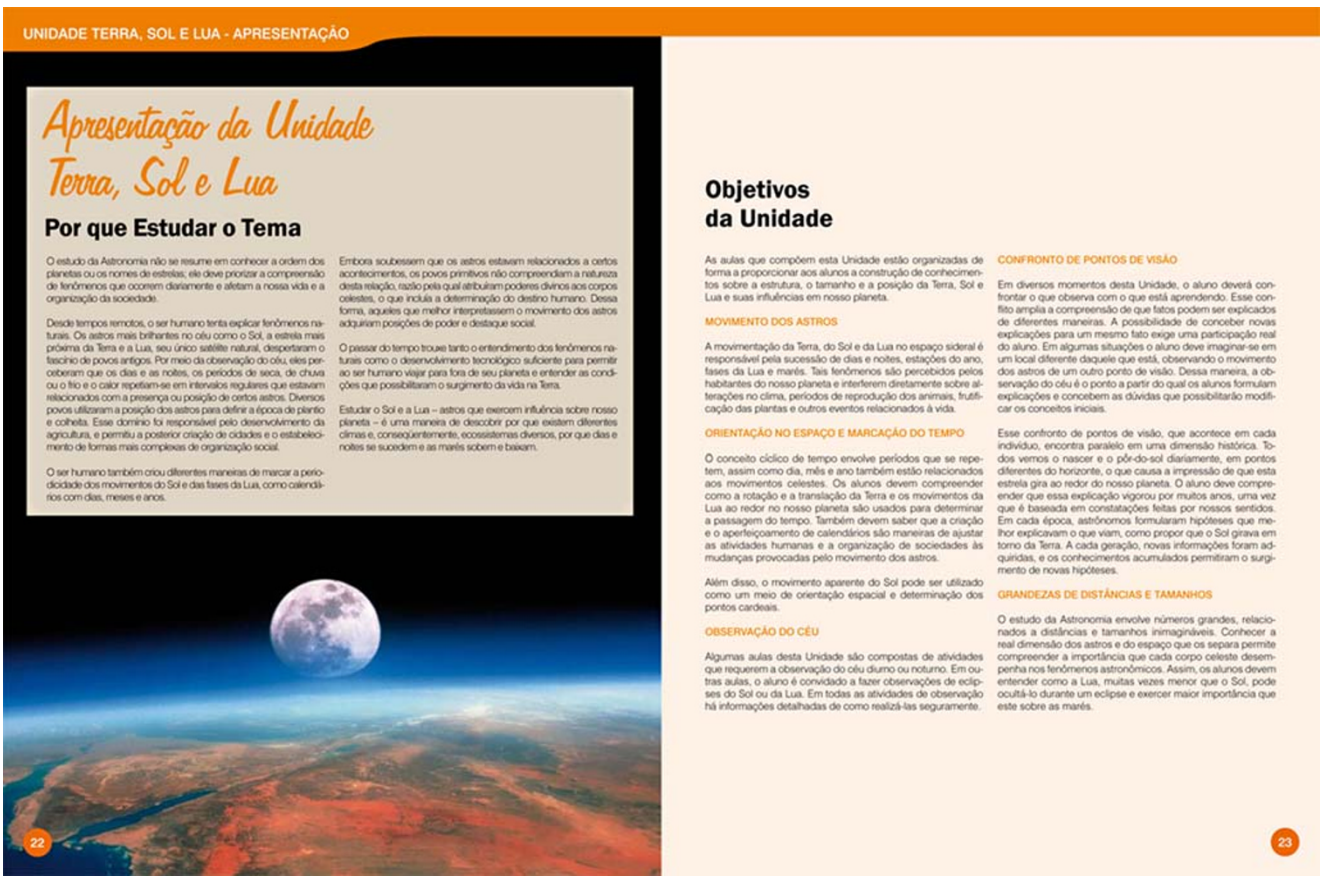

Fig. 5 Each CTC unit includes clear, well-researched teacher materials. Credit: Instituto Sangari

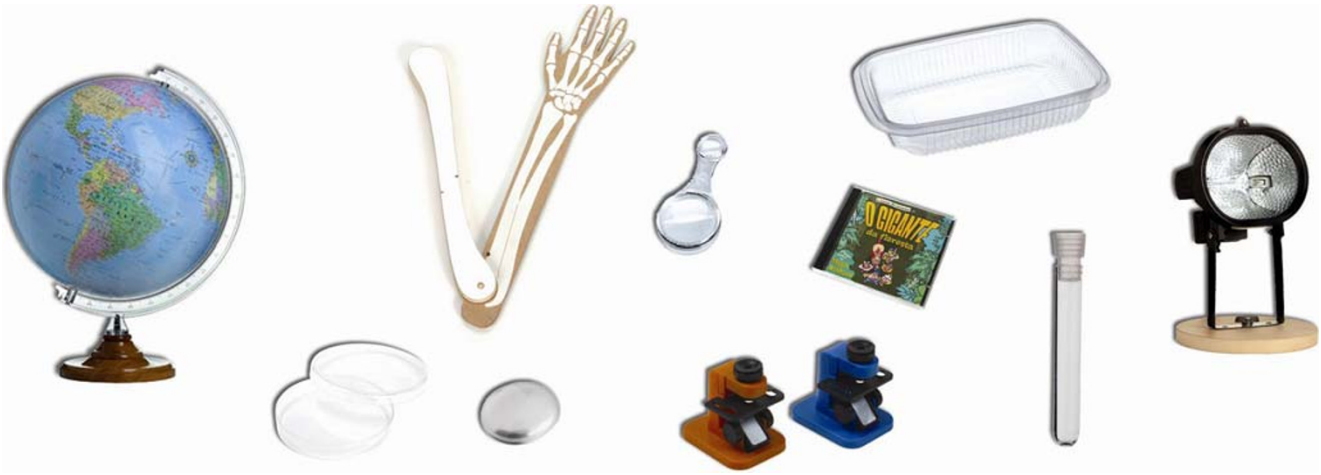

Fig. 6 Durable, low-tech elements of the CTC program are built to survive many classroom cycles. Credit: Instituto Sangari

let alone science. This is not a problem just in Brazil, or just in the States, it's everywhere." The solution is an integrated approach where age-appropriate science projects give students concrete challenges that motivate them to read and calculate in a meaningful context. The model is so successful and powerful that reports from all over Brazil reveal teachers using CTC kits as the basis for lessons in reading and mathematics too. Lessons employ the very elements surrounding the school—air, earth, water, plants—to get kids involved with the curriculum and cooperating with one another. Each unit is designed to strengthen problem-solving and decision-making skills that are in turn dependent on the development of observation and analytical skills, as well as logical thinking and investigative powers. In short, CTC accents all the natural experimentation, curiosity, sense of independence, and downright fun too often drained from childhood in the schoolroom setting (Fig. 7).

As a father himself, Sangari knows first-hand how fearless and adventurous even the youngest babies are as they set out to master their universe. That experience gave him the gut knowledge to counter professional educators who believe children must be literate before they tackle the principles of science. He compares the three R's to the screwdrivers and wrenches handed to a student of auto mechanics: you don't start with a 6-month course about tools. "The teacher says, 'here is an engine—take it apart. You pick up the tool box and figure it out.' That's why I can say with conviction that you don't need to know how to

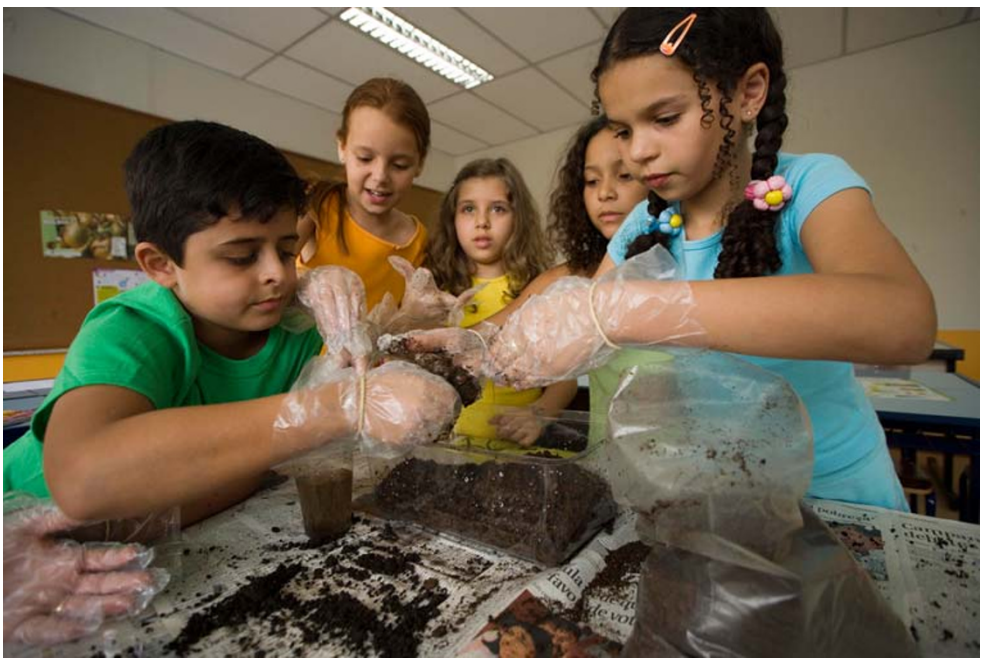

Fig. 7 Working together on a plant unit offers good fun, good science, and valuable lessons in teamwork. Credit: Instituto Sangari

read and write to learn. But you do need to instill the *desire* to learn to read and write." Admittedly, CTC puts process before content, and entire curriculum topics, such as evolution, are missing entirely. "It's about giving them the basics," Sangari explains. "It's about getting them excited so they want to learn." After all, Brazilian elementary schools dedicate just one hour a week to science study, he reports, although Instituto Sangari has negotiated the allotment up to four hours a week in its contract with the Federal District.

Successful as it is, CTC remains a work in progress. "We are going to create an evolution component and a lot of other components," Sangari promises, but he points out that if school is not interesting, students would not connect with the content anyway, while "If the kid gets stimulated enough, he can go on Google and in two minutes, it's all there for him if he really wants it. Evolution is there. You just have to wake them up to it. I feel we are doing this." If you count his two traveling exhibits, about the genome and Charles Darwin, it could be argued that Sangari is busy waking up the entire nation to evolution (Fig. 8).

So is there a CTC revolution coming soon to your neighborhood? Maybe not this semester, but anybody familiar with Ben Sangari's energy and drive will not be surprised to learn that CTC is already in some European and Southeast Asian schools, while Instituto Sangari lists a prominent US educator as a member of the board, and the English translation of CTC is currently under way.

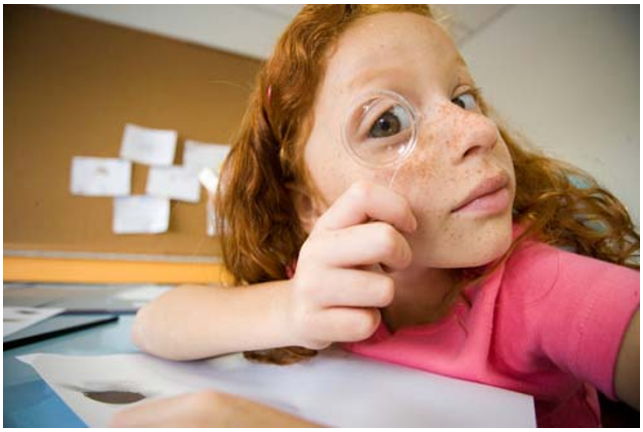

Fig. 8 As Charles Darwin knew, simple tools can open new worlds to the prepared mind. Credit: Instituto Sangari