2012-2021 – A Comics&Science experience

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Abstract: How can Science be *told* in, and with comics, if ever? In recent years, the CNR Edizioni *Comics&Science* label tried to answer this question with a variety of projects, all spawned by the all-time classic comic book format. Let's recapitulate, with an open eye on future developments.

It possibly began on November 1st, 2012. Time: Noon. Place: the luxurious and much sought-after by speakers Palazzo Ducale's main hall in Lucca (Italy). The panel's title reads “What we talk about when we talk about comics and science”.

The host event was the Lucca Comics&Games festival, on its way to become the largest convention of its kind in the Western World: roughly half a million people gathering in five days to celebrate their love for comics, *manga*, sci-fi, TV series, movies, role-playing games, boardgames, videogames, *any kind* of games. In short: a massive crowd – the like of which is rarely to be seen in public places for less than national strikes, crucial political rallies or important sport events – looking for any conceivable form of entertainment, and laying their claim to the redemption of the so called “nerd culture” as – above all – a *passionate attitude*.

And this is the key to why the year before we had started musing over a crucial consideration: where if not among the hundreds of thousands attending Lucca Comics & Games were we going to find people willing to devote themselves to something – anything – with *that kind* of attention, concentration, enthusiasm for discovery, imagination and improvisation bordering obsession?

So, we actually did not do much more than giving a – not very inventive but clear and effective – name to what was already there.

Let's start from the very beginning, when humans used to express themselves by

gestures and inarticulate ramblings. Some time after that, they began to keep score of the animals they killed, the passing days and seasons, carving notches on wooden blocks or ordering pebbles and stones (greek: *khalix*; latin: *calculus*) in lines. That was probably when modelling – the assumption that "signs" can tell us meaningful things about the actual objects they stand for – and Visual Arts began traveling down the same path.

Very soon we realized how things hadn't changed *that* much: when we asked cartoonist Giuseppe Palumbo to tell a story about Archimedes, the very first image he turned out was the Greek genius focused on tracing geometric figures on his native Siracusa's shores. Which coincidentally just fits with Henry Poincaré's famous statement of 2,000 years later, about how "la géométrie est l'art de bien raisonner sur des figures mal faites" ("Geometry is the art of correct reasoning from incorrectly drawn figures").

In simpler words: science and the signs we need to "tell science" have always been there. An old and ever-present concept.

Andrea has a mathematical background and has been stricken on his way to comics, sometimes a comics character himself. Roberto is a professional applied mathematician who, in order to properly do his job, discovered how sorely he needed to *communicate* to a larger audience what his work *is*.

Back in 2012 we started the *Comics&Science* (C&S) section of the Lucca Comics & Games cultural program, with a small number of simple, targeted events (panels, book presentations): the results were encouraging and we persuaded ourselves we had to be up to the "comics" part.

Leo Ortolani – "Leo", for all his fans – was and still is one of Italy's most popular cartoonists, with a streak of trademark irriverent humor, since the early 90s. Moreover, he is a trained geologist who never forgot his training, and lovingly targeting science with his scorching jokes is something coming easy to him, with wildly funny outcomes.

For *C&S* he fine-tuned one of his many brilliant storytelling devices, giving birth to "MISTERIUS, the show with no idea of what it's babbling about, just like you", a

laughable avatar of all those pseudo-scientific TV formats trying to captivate audiences with Holy Grail stories, chemtrails and how the Pyramids were built by the aliens, all in one.

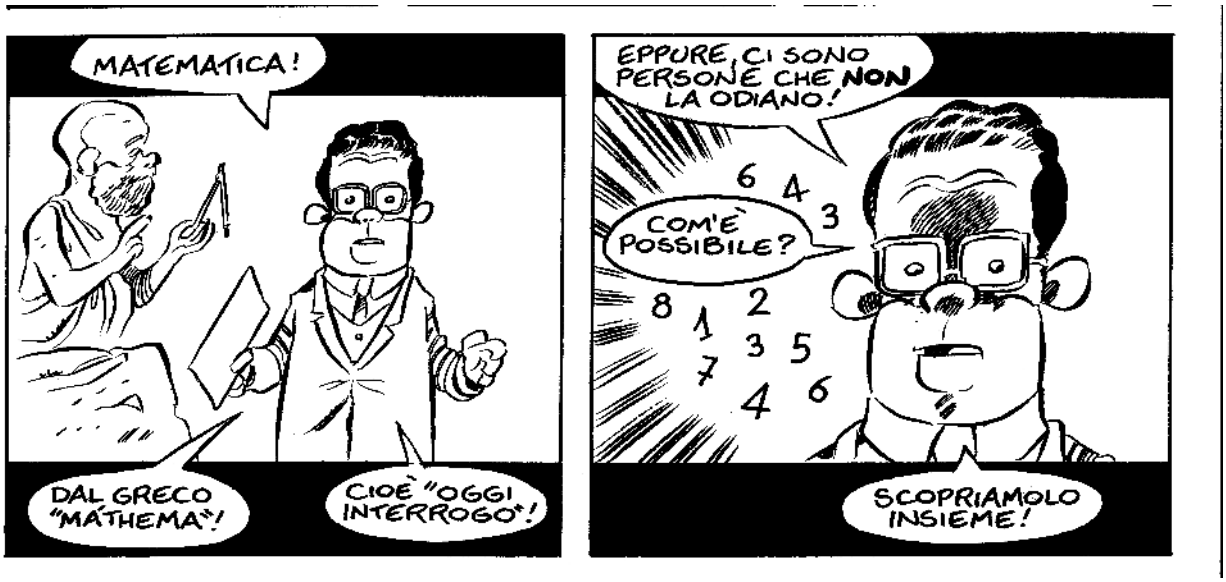

Figure 1: Leo Ortolani's take on Mathematics (from "MISTERIUS – Speciale Scienza!"; Comics&Science, October 2013).

Leo knows well how *not* to pull punches (see Fig. 1): his MISTERIUS comic book for *C&S* is a phantasmagorical explosion of unlikely characters more or less taken from real life, ineptly grappling with science. On the "more" side we find the french mathematician – and celebrated Fields medalist – Cédric Villani, who in november 2013 felt the thrill of walking down the never-so-crowded Lucca medieval streets and alleys being recognized as an Ortolani character meeting his creator.

C&S' cornerstone is an easy one to state, and somewhat more difficult to implement: talking about science at a state-of-the-art level with comics by the best cartoonists around, plus editorials and pieces delivered in a layman language and, at the same time, always – always – as scientifically accurate as possible. Stories reaching out to their audience for what they are, nothing more and not the slightest bit less: engaging, entertaining comics aspiring to be artistically relevant.

C&S is not interested in indulging in detailed, meticulous descriptions of scientific facts, history or ideas: the kind of more literal, specifically educational approach TV

shows and so many popular science books are best suited for.
This is how what we aim at, and what we think of what we do, is described in official press releases:

Comics&Science's goal is to promote the link between Science and Entertainment, strongly believing that both are crucial formative factors for all citizens' development. The "Comics" tag in its name clearly refers to our medium of choice, fully embraced by production and publishing choices only slightly revising the typical, classical comic book format, well-known and deeply loved worldwide by generations.

But what did we actually do? What do we feel proud of?
Feedbacks, to start with: both from "hardcore", "pure" comics fans and from new readers we look for in different, more strictly scientific venues.

As in research centres like Geneva-based CERN (no introduction needed), which affably welcomed quite a peculiar *Comic&Science* delegation: a minivan fully packed of cartoonists which sparkled several projects.
Like *Oramai* by cartoonist Tuono Pettinato (2014; the same year he was awarded the "Premio Gran Guinigi", Italy's main recognition in the comics field), a story about time's paradoxes and ultimate nature, stemmed from discussions around today's theoretical physics more abstract and philosophical aspects.
We also had the pleasure to see a reader "crossing the line" becoming a valued addition to our roster: Francesco Artibani made the history of Disney comics in the last 25 years and his name is well recognized wherever Disney comics are printed. He's also a *C&S* fan and helped in taking aboard Silver (Guido Silvestri's *nom de plume*; see Fig. 2), one of the living "gods of Italian comics". So we had the additional pleasure to discover how Silver is a passionate fan, devouring popular science book after popular science book. His main concern was – and still his – how in recent years the "social" dimension of communication is giving "hoax" a new

meaning, making “fake news” and “information disorder” key-words when crucial topics like vaccines and GMOs are concerned.

Figure 2: Silver's trademark character “Lupo Alberto”, as a testimonial for what drives science and knowledge: passion and curiosity (from “Materia oscura”; Comics&Science 001/2016, April 2016).

Having Italian CNR – Consiglio Nazionale delle Ricerche (“National Research Council of Italy”) as a publisher might come in handy, especially if you are Director one of its historical institutes (IAC – Istituto per le Applicazioni del Calcolo, “Institute for Applied Computing”), which is what Roberto happens to be. CNR promotes and carries out research projects in 27 main research areas, with almost 100 institutes operating as part of each one of them. *Nature* magazine recognized the Council as one of the top 10 innovation centers in the world, so it's no surprise when something happening inside its revered halls gets some attention.

It's what happened with the Pisa-based CNR-IIT – Istituto di Informatica e Telematica (“Information tecnology and data communication Institute”), a name which in Italy spells “In-ter-net”: CNR-IIT is the Italian arm of ICANN, operating the DNS – Domain Name System when the “.it” domain names are concerned, and it was CNR-IIT to bring the Internet to Italy back in 1986-1987, making the first connection possible.

So, in 2016-2017 it was CNR-IIT's choice to have special, exclusive *C&S* productions as part of the many events celebrating the 30th anniversary of the Italian

Internet, starting with an “Internet Issue” featuring – again – the comic genius of Leo Ortolani, teaming up with Federico Bertolucci, an Italian superstar in his own field, with five nominations to the Eisner Awards (the “Nobel Prize of cartoonists”) under his belt and, in 2019, the Italian “Romics d'oro”, awarded each year in Rome.
It was the beginning of a long continuing streak of *C&S*-inspired productions: two more comic books, a card game and a series of educational comics and illustrations in digital form followed, while a videogame is entering its beta testing phase at the time of writing.

A very typical feature of scientific research, as opposite to the prevailing competition in other sectors, is its openness to collaboration and partnerships. So, joining forces with “sister” institutions has always been the rule for CNR and *C&S* since the start. Institutions like Universitites, research centers or the Pisa-based “Museo degli Strumenti per il Calcolo”, a very peculiar museum built around the mission of bringing computer science and its “key players” – computers – at a general public level, beyond the skin-deep, if not shallow “pseudo-konowledge” coming from being passive users of modern technology.
It all started from the question “How is it possible for machines to do calculations?”. A very simple but far from trivial one, like its many possible answers. Some of them are even surrounded by modern myths, if not legends, which is what comics writer Alfredo Castelli thrives on. Castelli is one of the venerable fathers of contemporary Italian comics and jumped aboard the *C&S* boat with *Il segreto di Babbage* (“Babbage's secret”), joined by the rising star of young artist Gabriele Peddes.
Then it came the aforementioned *Archimede Infinito 2.0* by Giuseppe Palumbo (see Fig. 3), recounting one of the most incredible, far-out, 100%-true stories ever to be told, a milestone event in science, history and archeology. An epic ride across centuries, from III Century B.C. to 1998 when, during one of the harshest auctions ever, a still-today unknown US millionaire won over the greek Government for the possession of the invaluable Archimedes' “Codex C”, and to an accelerator in Harvard, where high-energy X-ray fluorecence techniques were developed in order to

recover the secrets still encoded in the parchment. While we can't be but partial, we found this issue a very well done – if not spectacular – embodiement of the "*C&S* principles".

Figure 3: A Comics&Science issue devoted to Giuseppe Palumbo re-telling the story of Achimedes' "Codex C" (from "Archimede Infinito 2.0"; Comics&Science 002/2017, October 2017).

It's 2018 when *Educazione subatomica* ("Subatomic Education") hits the stands. Zerocalcare (Michele Rech) is possibly the only cartoonist attaining an actual "stardom status" in Italy, a sought-after public figure, looked at for opinions and viewpoints about controversial political and social issues. Following his own curiosity over the misteries of quantum physics, he spent a day at the premises of the ELETTRA and FERMI accelerators, in the Trieste area (Northeastern Italy), which are among the most powerful tools at our disposal when it comes to investigate matter at the micro- and nano-scale. Totally captured by the environment and by "the Sspirit of Research" (see Fig. 4), Zerocalcare delivered a compelling and deeply

personal account of what reasearch is for hard-working active researchers, and how they should be – and often are not – considered and perceived by the general public taking advantage of their discoveries. A heartfelt and inspired report mixing the highest *C&S* standard and the trademark Zerocalcare style *together*, with humor, brilliant jokes and darker musings about how blind humans can be.

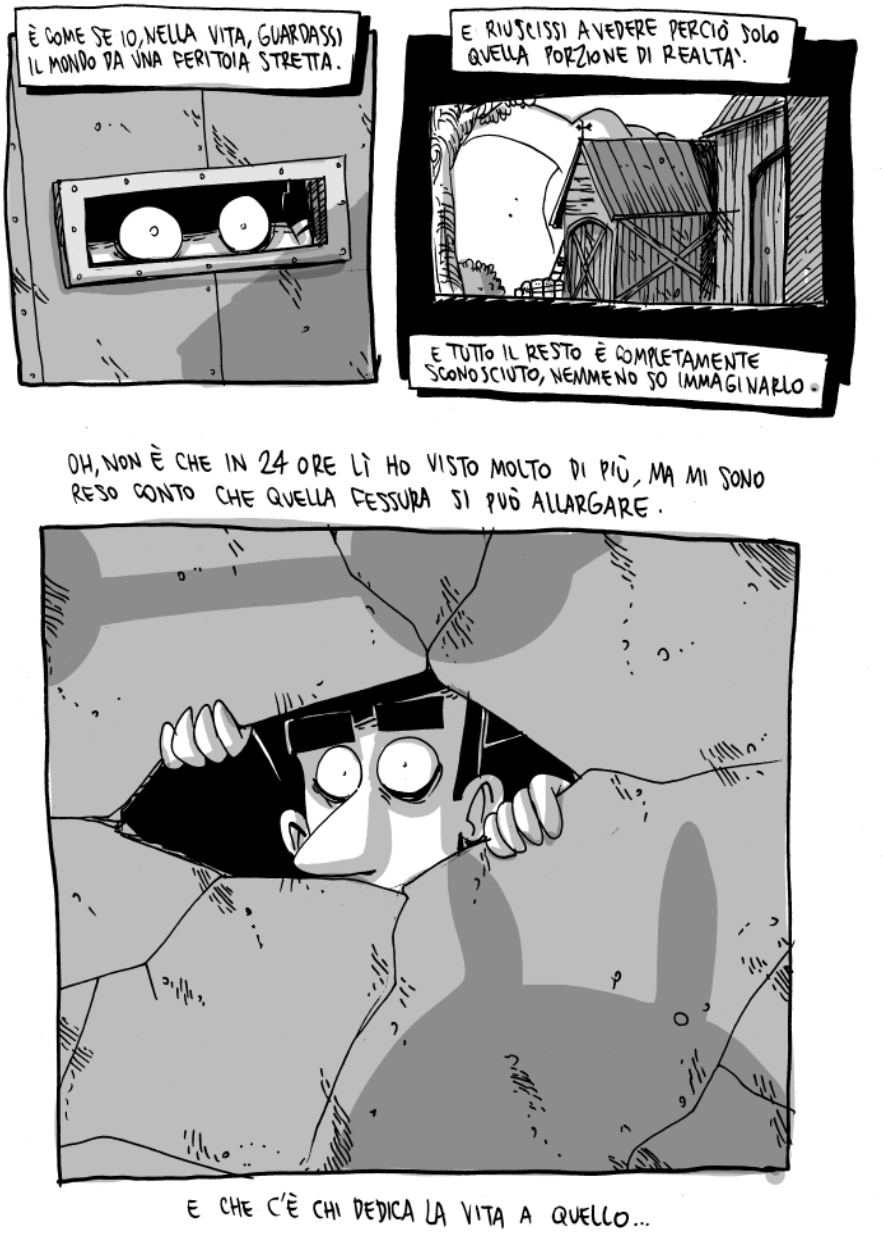

Figure 4: Zerocalcare's moving rendition of the Spirit of Research (from "Educazione subatomica"; Comics&Science 002/2018, October 2018).

We said "no literal or educational approach to Science".

Licia Troisi is a writer of fantasy novels selling million copies worldwide. She's also

got a PhD in astrophysics and that's where her brilliant "fantasy metaphor" for a star's life-cycle comes from (and if you're wondering what a "fantasy metaphor" actually is you'll have to read it): *La fanciulla e il drago* ("The Dragon and the Maiden") does not call for any specific scientific knowledge, only the will of plunging into the spectacular images summoned by Licia Troisi and visually rendered by the extremely talented Carmine Di Giandomenico (a comics superstar on his own, working for global powerhorses like Marvel and DC comics), artist Alessandro Micelli and the out-of-scale coloring by Leo Colapietro (see Fig. 5).

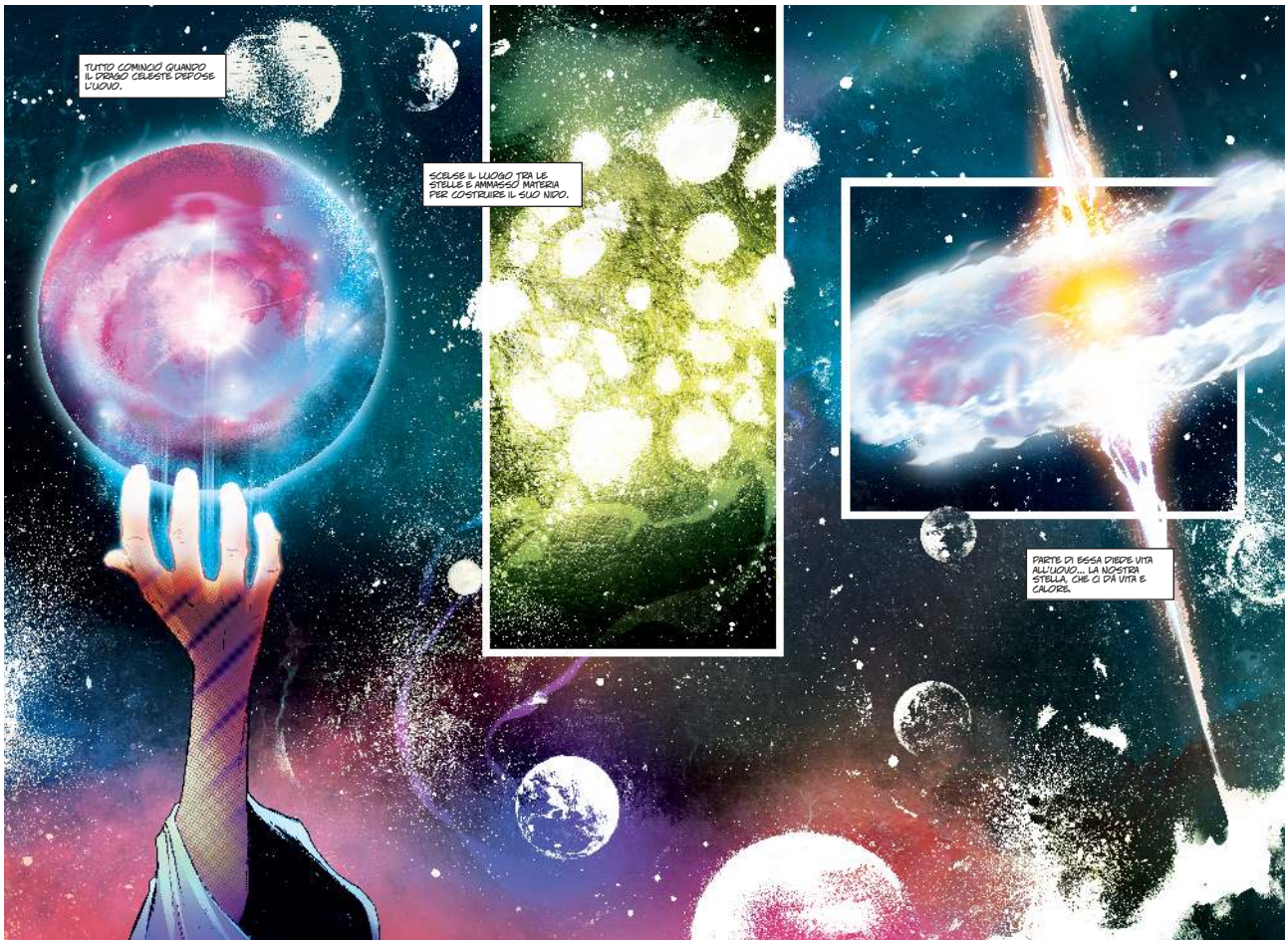

Figure 5: A spectacular two-pager from Licia Troisi's story: layouts by Carmine Di Giandomenico, art by Alessandro Micelli, colours by Leo Colapietro (from "La fanciulla e il drago"; Comics&Science 001/2019, April 2019).

In 2019 the Periodic Table of Elements turned 150 and *C&S* celebrated the anniversary joining forces (remember? Openness and collaboration) with CNR-ICCOM – Istituto di Chimica dei Composti Organo-metallici ("Chemical Institute for Organ-metallic Compounds") and the Società Italiana di Chimica ("Italian Society

for Chemistry"). The outcome was a story by writer Giovanni Eccher and artist Sergio Ponchione, where very peculiar young people are supposed to learn how to use their very peculiar abilities by enrolling in a very peculiar school. Which might be ringing some bell to comics fans (see Fig. 6).

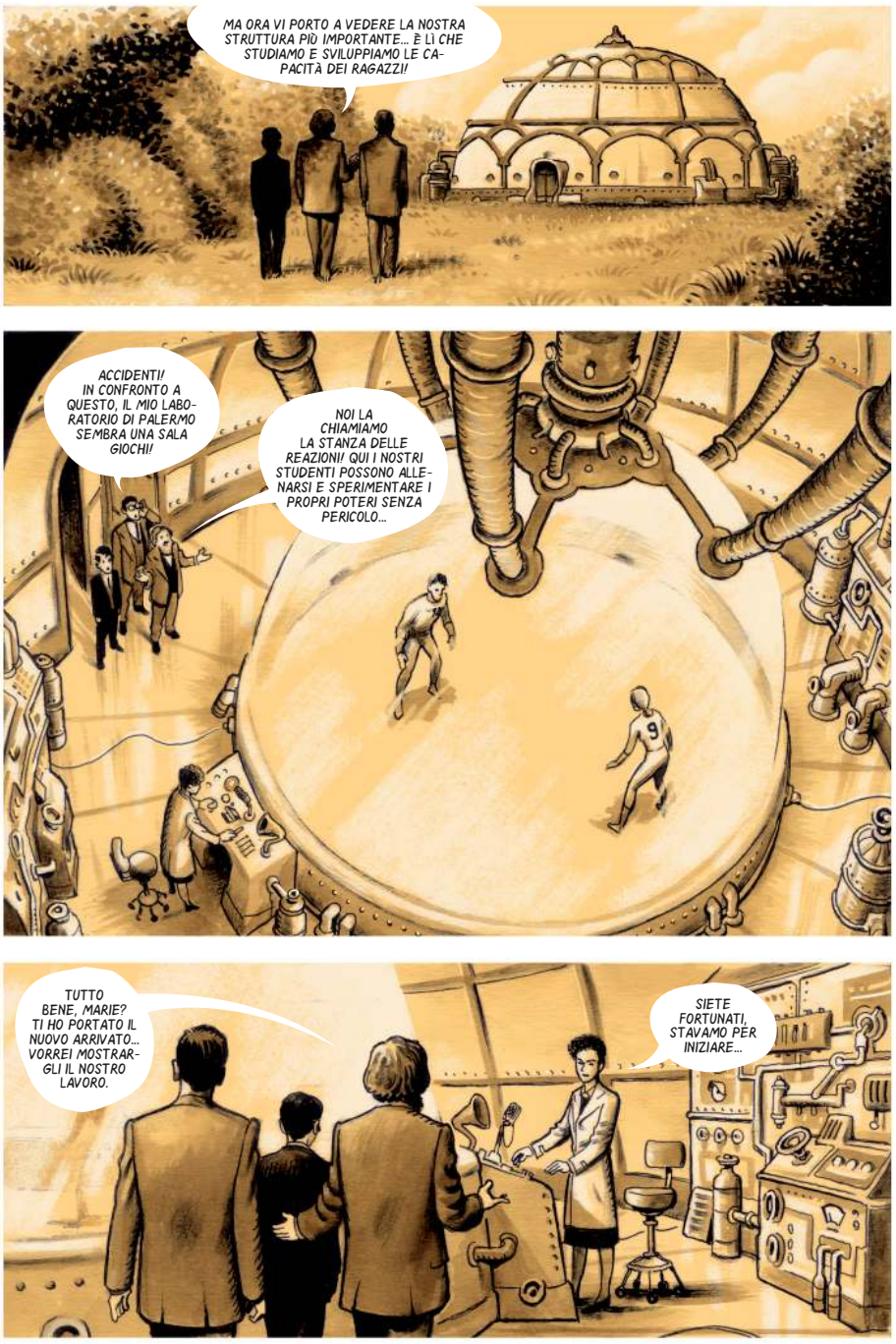

Figure 6: The "Reaction chamber" devised by Giovanni Eccher and Sergio Ponchione for "gifted elements" (from "L'Accademia del Professor M per elementi dotati"; Comics&Science 002/2019, October 2019).

One shouldn't look for any thin blue line connecting these *C&S* dots: each and every one of these works of art springs from talented and creative cartoonists, who couldn't differ more one from another, getting in touch and mingling with reasearchers who, in turn, are actively working in any possible venue of contemporary Science.
What makes *C&S* an actual, coherent line of books, is its approach to any given topic: 20 to 24 pages of pure and simple comics, followed by roughly the same amount of editorials, articles and pieces covering that topic. A very simple, down-to-earth answer to the "popularization paradox": the more scientific content is simplified for the sake of comprehension, the more it becomes something else, and we fail to communicate.
It must not be necessarily so.
With this in mind, we recently produced very different projects.

To start with, we tried our hand at Artificial Intelligence, a fascinating and crucial issue, already permeating every aspect of moderne Science. Blossomed as a distinct discipline from Alan Turing's researches during the Fifties, AI has progressed by bumps and jumps, with years of stagnation often following (and followed by) important breakthroughs. All the while movies and Science Fiction have been giving voice to great hopes and not lesser fears, with fascinating tales not always so far from reality.
Today's AI is part of our everyday lives: we find it in cell phones, computers, biomedical imaging's analysis and in natural language recognition. Something almost unthinkable until not so many years ago. What happened? How did we get where we stand now? And most of all: what looms at the horizon? Again, AI's path is paved with fears and hopes: complex and crucial themes for science and society at large. Strictly cooperating with AIxIA – Associazione Italiana per l'Intelligenza Artificiale ("Italian Association for Artificial Intelligence") we targeted these topics with the help of Diego Cajelli and Andrea Scoppetta. Cajelli is and experienced comics writer, routinely handling important Italian comics properties like most Bonelli characters

Figure 7: Diego Cajelli (story) and Andrea Scoppetta (art) and their difficult child (from "N3well"; Comics&Science 001/2020, April 2020).

(Bonelli is by far Italy's leading comics publisher) and the iconic “Diabolik” series. He also teaches “Crossmedial Storytelling” at the Sacro Cuore University in Milan. Scoppetta is a cartoonist, illustrator and animator who contributed to world-renowed productions by Disney/Pixar and Dreamworks. *N3well's visit* is their *C&S* take on AI and the very classic, evergreen theme of the “thinking machine” (see Fig. 7 and Fig. 8): N3well is a robot and much, much more, as readers will discover following *him* looking for *his* origins. Something normal for human beings and downright surprising for an artifical mind. With a heartfelt tip of the hat to Isaac Asimov's centenary.

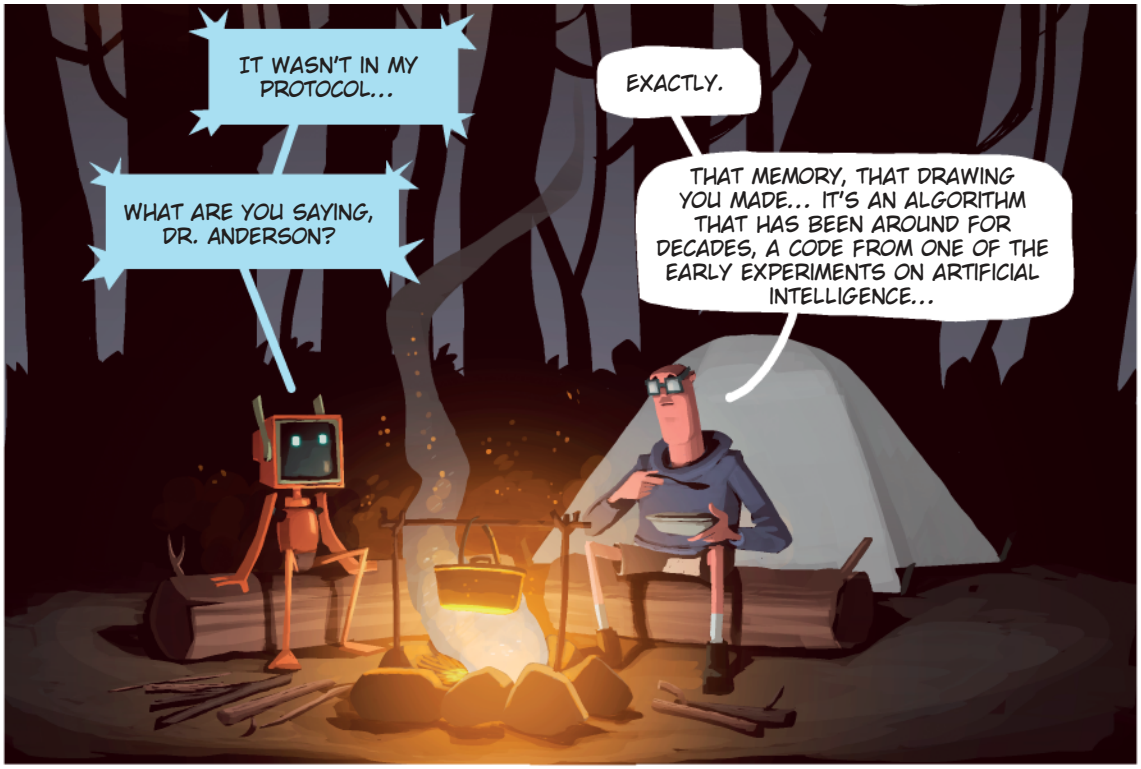

Figure 8: How N3well became all too human (ibid.).

From today to a remote past as a way to “Imagine Math”: Leonardo “Pisano” (“from Pisa”), better known under his *Filius Bonaccii*, or Fibonacci, family name, was allegedly born in 1170. In 2020, 850 years after, *C&S* joined the town of Pisa and honorable institutions like the local University, “Scuola Normale Superiore” and – again – “Museo degli strumenti per il calcolo”, in a series of events celebrating the anniversary. Fibonacci's *Liber Abbaci* (1208) brought the indo-arabic positional notation for numbers to Europe, a durable legacy which still today – every day – tells how much Mathematics, technology and Science as a whole owe him. First of all, his

book was intended to be of help for merchants and businessmen, illustrating practical problems and how to solve them using the “new numbers” and the “new ways” of handling them (which today we call algorithms). So, illustrator and cartoonist Claudia Flandoli concocted *Il libro di Leonardo* (“Leonardo's Book”; see Fig. 9), a brilliant rendition of Leonardo's early years as a young man returning to his native town, telling his friend Sara – and all of Western World and us with her – how everybody's lives are going to be changed forever by what he learned from “the arabic scholars”.

Figure 9: How young Fibonacci became acquainted with rabbits, as told by Claudia Flandoli (from “Il libro di Leonardo”; Comics&Science 002/2020, October 2020).

One specific *C&S* aspect might turn out to be even more relevant than its comic books' success. We call it “fertility”. Since its inception, *C&S* inspired – we like to say “catalysed” – many other different, often fully spontaneous and independent projects in its own vein. As an example, we recall here only four of them.

- “Archimedia”: a two-page short story in comics form for *Archimede*, a historical italian journal devoted to Mathematics and mainly aimed to teachers.
- Two series of book mass-marketed through the national network of newsstands: *I manga delle Scienze* (“Science Manga”) and *I grandi della Scienza a fumetti* (“Great Scientist in comics”).
- The series of Disney tales “Topolino Comic & Science” (almost a namesake), which Roberto Natalini, Alberto Saracco, world-renowned theoretical physicist Carlo

Rovelli, Fields medalist Alessio Figalli and other researchers (all die-hard Disney fans) personally contributed to, both as advisors and writers, suggesting themes and topics.

These positive feedbacks has been very encouraging, taking us – almost by the hand, in a way – to a single story we were eager to tell, after years of it lingering in our minds and conversations: the life and works of Italian mathematician and physicist Vito Volterra.One of the founding fathers of Functional Analysis, Volterra pioneered more than one crucial field of research, from Integral and Integro-Differetial Equation to Bio-Mathematics (population dynamics, predator-prey models), bringing his new, visionary approach to both fundamental and applied scientific research, which – way back in 1923 – led him to found what today is CNR – Consiglio Nazionale delle Ricerche, a model *ante literram* for many European research institutions and agencies to come.
He was also passionately politically engaged, "Senatore del Regno per meriti scientifici" (Senator of the then-Kingdom of Italy for scientific distinction) from the age of 40, strenously opposing the rising fascist regime, which succeded in marginalizing and then expelling him from his academic positions, upon his refusal of taking a "solemn fidelity oath" (1931).
In a joint venture with Italian major publisher Feltrinelli Editore, *C&S* editorial board edited and produced a graphic novel, a biographical comic in book form telling the story and the political hardships of this illustrious XX Century Italian mathematician.
Cartoonists Alessandro Bilotta (writer) and Dario Grillotti (artist), both acclaimed professionals in their own field, joined forces giving birth to a compelling tale of knowledge, Science and civil passion as ways to improve our lives, making them better and worth living.

It's quite obvious how the main reason for *C&S* to work out so well is that something was "in the air", in some sense, while kind of an astonishment for the unreasonable effectiveness of the very basic idea of using comics in order to boost interest for

science, still stands.

What we see, from this viewpoint, is that comics, like mathematics, are not simply a language – a "structured" way to tell or explain things in a very specific way – but a way to look at the world, telling its stories with a concise, terse approach.

Archimedes used to carve his diagrams in sand and – we like to think – would suscribe to that.

Figure 10: (from "Archimede Infinito" a short story by Giuseppe Palumbo ; Archimede 1/2016, March 2016).