CLIL AT THE TERTIARY LEVEL: PRODUCING CONTENT AND LANGUAGE USING A TASK-BASED APPROACH

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1. INTRODUCTION

Teaching in an ESP environment has become a very common procedure in Italian tertiary education due to its underlying characteristic, i.e. catering to the needs of the learners (Hutchinson and Waters 1987: 3, 19). Such a context also provides very fertile ground for experimenting with numerous teaching methodologies. In recent years, language learning theory reflects a move towards a more integrative and holistic view of language use (see Schmitt and Celce-Murcia 2002: 12) while bearing in mind that knowledge construction is an interactive phenomenon.

In HE the majority of CLIL programmes tend to fall under Partial-type CLIL with a focus on language or language for specific purposes. Far too often the CLIL experience emphasizes receptive skills, passive assimilation of knowledge, with far less time being spent on active production on the part of the learners. In fact, in CLIL, language learning should be seen from its functional viewpoint, learning to use the language for personal and professional purposes. To become an expert and a professional means learning the kind of language and communication competence which is integral to the academic field and profession in question, as well as being able to demonstrate that competence in a confident and credible way in various contexts of language use and to various kinds of audiences (Räsänen and Klaassen 2006).

CLIL programmes have experienced rapid growth in the past decades, and today are widely implemented throughout Europe. However, what approach can we use to integrate content and language at the University level within an academic context? The multifaceted nature of CLIL allows for flexibility in experimenting with various

pedagogical approaches which aim at facilitating learning. According to Foster (1999: 69), "giving learners tasks to transact, rather than items to learn, provides an environment which best promotes the natural learning of languages". Nunan considers interaction, task continuity, real world focus, language and learning focus and task outcomes as important features (1989, 2005) in language learning theories. Skehan (in Bygate *et al*. 2001: 10) emphasizes whole task completion and outcomes, a relationship with real-world activities and giving priority to learners' own meanings.

We will describe the practical application of a task-based framework for Physics and Chemistry students within the relevant institutional context including student profiles and target language needs. In particular, we will outline the principles of a TB approach and how it can be implemented to enhance productive skills for both content and language.

2. SUBJECTS AND EDUCATIONAL SETTING

The approach herein described was implemented with Chemistry and Physics students enrolled in the final year of the first level degree, as evidenced in figure 1, a small but linguistically homogeneous group. They had all successfully completed a 5 credit General English module and had chosen, as an elective course, a second English module which was characterized as an ESP course and thus geared towards their respective degree major.

Group Profile	**Course type**
• Chemistry and Physics majors • 3rd yr , 1st level degree • 2nd trimester • Total no. of students: 14 • English competence on entry = CEF level Upper B1	• Prerequisite = General English 1st module (5 cr) • 2nd module = ESP elective course • 5 cr / 40 hrs. f2f • Final exam mandatory (written and oral) • Target objective = B2 (Low)

Figure 1. Learner profile and course description

As we can see in figure 2 below, we are dealing with a Partial CLIL-type programme that simultaneously focuses on language learning and domain-specific competencies without annulling the backbone of the original course, i.e. English for specific purposes.

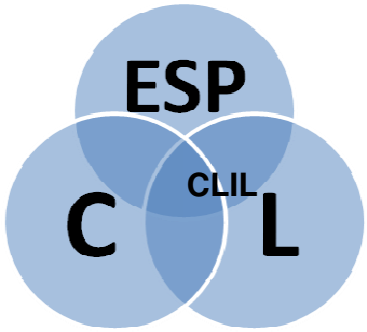

Figure 2. CLIL in ESP context

3. METHOD AND PROCEDURE

An informal student survey was conducted as is common practice with ESP courses (Hutchinson and Waters 1987: 12). The outcome revealed the following key comments from all of the students: (i) "not another grammar course??!!" (ii) "can't we put to use what we already know?". It was evident that the learners needed to be able to put knowledge into practice; in other words, they had to deploy the system without having to think about it. Students need to go through the process of automatization –on the way to achieving automaticity–, i.e. the process whereby individuals with time and practice move from the controlled processing of information held in short-term memory to the automatic processing of information held in long-term memory. But how was I going to achieve this? In designing the syllabus, learner needs were taken into consideration, thus the pedagogical approach used was based on a task carried out by students working in dyads.

3.1. Why a TBL approach?

TBL promotes the use of authentic topic material which is relevant to the learner's needs and encourages the development of skills necessary for the successful completion of real-life tasks. According to Foster (1999: 69), "giving learners tasks to transact, rather than items to learn, provides an environment which best promotes the natural learning of languages" (§ 1). Ellis (2003) says that "a task requires the participants to function primarily as 'language users' in the sense that they must employ the same kinds of communicative processes as those involved in real-world activities". Tasks should be "intellectually challenging enough to maintain students' interest, for that is what will sustain learners' efforts at task completion, [...] focus them on meaning and, as part of that process, engage them in confronting the task's linguistic demands" (Prabhu 1987). Tasks and patterns of interaction provide learners with the greatest amounts of comprehensible input which is based on the belief that opportunities for second language acquisition are maximised when learners are exposed to language which is just a little beyond their current level of competence. Richards and Rogers (2001: 223-234) believe that

> 1) tasks provide both input and output processing necessary for language acquisition,
> 2) task activity and achievement are motivational,
> 3) learning difficulty can be negotiated and fine-tuned for particular pedagogical purposes.

Skehan (1996: 20) defines tasks as activities which have meaning as the primary focus: "A task based approach sees the learning process as one of learning through doing - it is by primarily engaging in meaning that the learner's system is encouraged to develop". This resonates with CLIL theories. Ellis (2003: 9-10) outlines key features of a task stating that a task is a work plan which involves a primary focus on meaning and real-world processes of language use; a task involves any of the four language skills, engages cognitive processes, and has a clearly defined communicative outcome. On the whole, stimulating cognitive and meta-cognitive skills as well as attitudes has often been underestimated in both language research and language pedagogy (Ellis 2003: 7):

> Tasks (...) clearly do involve cognitive processes such as selecting, reasoning, classifying, sequencing information, and transforming information from one form of representation to another. One of the limitations of both SLA research and language pedagogy is that insufficient attention has been paid to the cognitive dimension of tasks.

3.2. Materials and Resources

To accomplish the task we opted for the use of Internet as a resource tool for accessing authentic material. Technically speaking this meant getting permission from the Physics department to use the computer room[1]. Once this was arranged, and each couple had the use of one computer, the following websites were suggested for consultation:

<**www.nasa.gov**>; <**www.cern.ch**>; <**www.physnews.com**>;
<**www.sciencedaily.com**>; <**www.world-science.net**>;
<**www.worldwidescience.org**>; <**www.newscientist.com**>

3.3. Components of a TBL Framework

Task is a central component of a 3-part framework as evidenced in figure 3.

[1] There were 12 computers in the room of which 10 fully functioning.

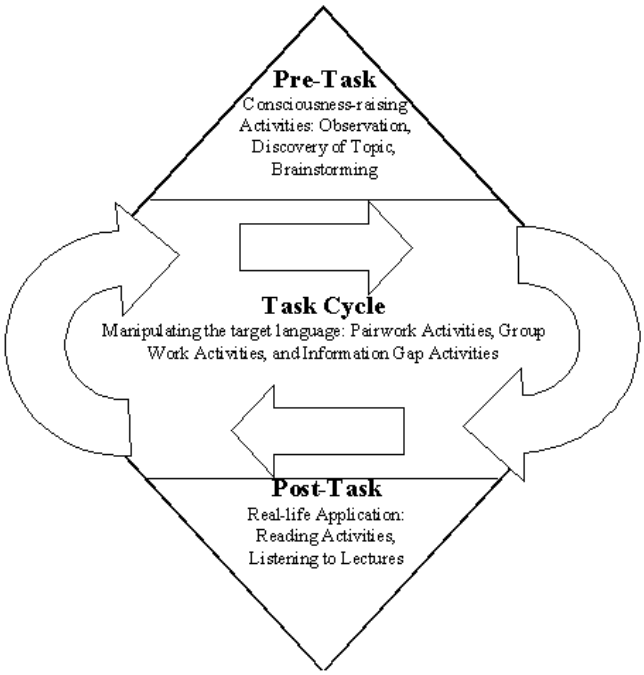

Figure 3: Task-based Learning Framework (adapted from J. Willis 1996)

a) Pre-task stage

The initial stage lasted 4 weeks for a total of 20 hours. It involved exposing the group to model articles (See Appendices A and B) which are "intended for a general, educated audience with interests in scientific research and development" (Filice 2002). This provides the students with an opportunity to recall things they know, a way to activate prior language knowledge but also content schemata. This is done through vocabulary building exercises, consolidating language skills, skimming and scanning, in-depth understanding of text through a variety of exercises. Pre-knowledge comprises both conceptual knowledge of the topic itself and knowledge of topic-related target language knowledge. This stage functions as a lead-in, a springboard to the actual task, with the aim of highlighting useful words, cohesive devices, phrases and structures (textual analyses). In other words, examining both content and form (for example, purpose of introductory and concluding paragraphs) helped lay the foundations for creating their own article. While this phase helped raise awareness of how language is used, it also familiarized students with topics relevant to their studies.

b) Task-cycle stage

The actual task assigned was the following:

You are a science journalist; write an article on a recent science event / development of interest to you that you would like to report on.

The second stage consisted in carrying out the actual pairwork activity. This involved putting in motion research skills, decision-making skills, negotiating skills which are all useful towards autonomous learning. The task itself involved searching for a topic of interest, making own choices, planning, doing, drafting, revising, editing, rewriting, peer negotiation and evaluation, conferencing that provides continuous feedback, discussion, and sharing. They put in practice typical skills and strategies that develop autonomous finding and understanding of information (reading strategies and processing strategies) which are preparatory for final comprehensible output. As students do the task in pairs, the teacher monitors from a distance, encouraging all attempts at communication, rather than focusing on corrections.

c) Post-task stage

In the final phase, each couple shared the final product (see Appendices C, D, E, F) with the class which gave them a sense of ownership[2]; they reported orally on how they did the task, what they decided or discovered while creating their article. Students examined, compared results and discussed specific features of the text they produced. The teacher acted as a chairperson, and commented on the content of the articles and the language structures used.

At this stage, reflection was encouraged on how the task was performed, a psychologically important function that clarifies further exploration and improvement of one's own knowledge. Time was provided to focus attention on both content and language. "Encouraging students to reflect on their performance in these ways may contribute to the development of the metacognitive strategies of planning, monitoring

[2] This sense of ownership was further reinforced by publishing these articles on a blog .

and evaluating, which are seen as important for language learning" (cf. O'Malley and Chamot 1990, *apud* Ellis 2006).

4. COMMENTS

4.1. Benefits

This experience was beneficial in many ways. It was obvious that students needed to assimilate information by themselves though some guidance from the instructor and fellow students was useful. By working in pairs students were engaged in a negotiative process, a highly socializing activity. This type of activity develops higher order cognitive skills –essentially they had to think in a more elaborate fashion–. Producing a final product, in this case a 'scientific' article, gives students a sense of accomplishment and boosts their self-confidence. It promotes lifelong learning by encouraging 'learning how to learn' techniques and also tends to match skills that learners will need once they finish their formal education. It easily lends itself to collaborative team work, thus favouring an "action-oriented approach". Overall, it turned out to be a challenging, rewarding and valuable experience for the students involved.

4.2. A note on the use of internet

The use of Internet as an added feature made accessing new information more motivating and fun which in turn activates learning. This real-time global media space plays an important part in students' everyday lives hence they can easily relate to it. However, the worldwide web can be overwhelmingly vast and confusing and students are tempted to use websites in their mother tongue; they are also tempted to cut and paste, so plagiarism may be a problem. Internet is above all a tool that supports learning, therefore it should be used wisely.

4.3 Overall suggestions on using tasks

A task-based approach does not work well with large classes because it becomes difficult for the teacher to monitor and to assess the learners. Also, the location of the course and the resources available are important factors that need to be taken into consideration since it is usually impossible for a large group to have the availability of enough computers with internet service. Moreover, students in general, are not used to this learning format and may need time to adjust. Finally, it is also very important to make instructions clear and provide sample material from the start so that students understand what is expected of them.

5. CONCLUSION

TBLT provides learners with natural exposure (input), chances to use language –without fear of making mistakes– to express their own meaning (output), to focus on improving their own language as they proceed from Task to Reporting stage, and to analyse and practice forms. Implementing a Task-based approach in a partial-CLIL environment is a valuable pedagogical tool that needs to be reconceptualized according to the curriculum framework –e.g. in this case ESP–, thus a profile of the groups, their concerns and interests need to be defined from the start.

Empowering learners in decision-making to accomplish an assignment requires activating Bloom's revised taxonomy of Higher Order Thinking skills –i.e. create, design, build, construct, plan, produce, devise–. Rather than passive content learning they had to produce, i.e. co-construct meaning by tapping into a cooperative experiential learning activity. CLIL favours Task-based activities and this experience highlights its potential in the field of Sciences. Allowing learners to produce language and content through motivating tasks has proved to be a gratifying experience as illustrated by the student-produced material (see Appendices C, D, E, F)[3].

[3] These represent some of the articles produced by the students in their original unedited versions, i.e. without undergoing any corrections on the part of the instructor.

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APPENDIX A: Sample material (pre-task stage)

UNIT 22

Waste water preserves food

WASTE water from olive oil production could be an abundant source of cheap natural preservatives for food and cosmetics, say researchers in Italy.

Each year, Italy's olive oil industry generates more than 800 000 tonnes of waste water. Olive mills use huge amounts of warm water to wash the olive paste. So all the water-soluble compounds in the paste that can't dissolve in the oil end up in the waste water.

Disposing of this water is expensive, however, because it is classified as industrial waste and cannot simply be poured down the drain. But Francesco Visioli of the Institute of Pharmacological Sciences in Milan has shown that the water is rich in potent natural antioxidants called phenolic compounds, which may prove to be a lucrative by-product if extracted.

Without some sort of preservative, fats in food and cosmetics become rancid when exposed to air. This is because unpaired electrons in highly reactive molecules called free radicals oxidise the fat to produce molecules that smell or taste bad. But phenolic compounds stop rampaging free radicals by pairing off their unpaired electrons.

In a future issue of the *Journal of Agricultural and Food Chemistry*, Visioli shows that olive waste water contains these powerful antioxidants. His results also suggest that large scale extraction could be practical. "We've done it on a lab-scale, but would like to move on to industrial scale," he says.

Jens Thomas

New Scientist - 21 August 1999

APPENDIX B: Sample material (pre-task stage)

A-3

No turning back

It's official—time is not symmetrical

Turning the tide: Fermilab near Chicago has filled in a gap in our understanding of time

THE dances of particles have revealed that time has a strange asymmetry.

For years physicists thought that if the flow of time was reversed, the laws of physics would remain exactly the same on the tiniest scale. If you videotaped two photons colliding to yield an electron and positron, then reversed the tape to watch a positron and electron colliding to yield two photons, this would also satisfy the laws of physics. You couldn't tell which tape was the original. This process was called "T symmetry".

In the same way, physicists thought that swapping all positive electrical charges with negative charges and vice versa (called C symmetry) and reflecting the Universe in a mirror (known as P symmetry) would leave the laws of physics unchanged.

However, in 1957 Tsung-Dao Lee and Chen Ning Yang won the Nobel prize for discovering that the decay of particles called kaons violates P symmetry. And in 1980, Val Fitch and James Cronin won the Nobel for showing that you can't switch the charges to compensate for the error in the mirror reflection. In other words, kaons violate CP symmetry.

Physicists expected to see T violation because they believe that though CP is not conserved, CPT is. So if you reverse time, swap charges, and mirror-image the Universe all at the same time, the laws of physics remain the same. If CP is violated in a decay, T must be violated to compensate. However, scientists had not observed this asymmetry directly.

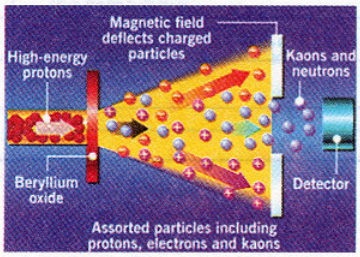
Now, an experiment at Fermilab near Chicago has recorded decays that show T symmetry violation. Scientists created a beam of kaons by firing protons at a target of beryllium oxide. The kaons can disintegrate into two pions, a positron and an electron. Scientists analysed the angles between the decay products, and mathematically divined that T asymmetry must be at work.

"It just confirms what you expect, but when you claim you understand something, it has lots of consequences that need to be tested," says Cronin, of the University of Chicago. "The work is absolutely beautiful."

An experiment at CERN, the European Laboratory for Particle Physics in Geneva, has also found evidence for T violation. It showed that kaons turn into antikaons less often than antikaons become kaons. A video running forwards would show antimatter slowly turning into matter, while the reverse shows matter turning into antimatter. This may explain why we see lots of matter in the Universe and little antimatter, even though the big bang probably made equal amounts of both.

Charles Seife, Washington DC

How to make a kaon beam



New Scientist - 31 October 1998 - www.newscientist.com

APPENDIX C: S1--final product

ANOMALOUS WAVE IN A LABORATORY

On February, 27, 2007, *Stromboli* erupted with a new lava flow. After a strong increase in its typical Strombolian activity(which has been on very high levels throughout the past 36 months), two effusive fissures appeared in the upper region of the *Sciara del Fuoco* beneath the summit craters. The new vents fed two lava flows, one of which has reached the sea.

Fear of a tsunami is always becoming more urgent in the archipelago of the Aeolian islands: in fact, if landslide took place, the nightmare of a seaquake could became real. *Alessandro Bonaccorso*, the director of INGV, says that there is only a landslide at the moment, but the surveillance is activated because the danger is imminent.

At the end of 2002 there was a violent eruption and immediately after, a part of Sciara del Fuoco collapsed and there was the formation of some landslides which flowed into the sea and caused a tsunami. According to this event and after the last eruptions, the researchers of the laboratory for the protection of the coast created the anomalous wave of Stromboli in a tank. In this way the researchers wanted to study the dynamics of the wave systems which originate in the sea when a landslide takes place.

The instruments used in the tank were about ten; in it Stromboli was reproduced in scale and to gauge the climb of the waves on the beach, the researchers used special probes; other probes were used to gauge the middle levels and the undulation caused by the landslides. The result of this experiment will contribute to create an alarm system for eventual seaquakes. With the last eruption the Civil Defence Unit is on the alert: even though *Guido Bertolasi* says that in the case there is another landslides it wouldn't be necessary to evacuate the island.

APPENDIX D: S2--final product

BIOMASS ENERGY IN CALABRIA

The unlimited sources of energy are called ***renewable energies***. The limited environmental impact is an important characteristic of renewable sources of energy, especially for air and sea pollution. These are divided into wave energy, solar energy, geothermic energy, wind energy and biomass energy.
The name biomass was invented about 1975 to describe natural materials used as energy sources. There are a wide variety of biomass energy resources derived from different biomass types: wood, crops, garbage, landfill gas and alcohol fuels.
Biomass can be converted into other forms of energy like methane gas, ethanol and biodiesel, also called transportation fuels. Ethanol can be produced from crops, like corn and sugar cane, whereas biodiesel can be produced from vegetable oils and animal fats.

The most important ***positive features*** of biomass energy are:
Transforming waste materials into energy;
Lower fuel cost;
Less demand on the earth's resources.
Whereas the most important ***negative features*** are:
Difficulty in collecting in sufficient quantities the waste materials;
Burning process releases greenhouse gasses that have high impact on air pollution and global warming;
Some waste materials are not available all year around.

In the province of Cosenza there is one of the 50 companies in Italy that produces biogas energy, the "Coretto". At the beginning this company dedicated time and resources in breeding of cattle and ovines. In the last two years it has turned its attention to the production of renewable energy, derived from manure. The process that transforms biomass into energy is completely automatic. In fact tubes connected to cowsheds bring manure into a big machine, the "DIGESTOR", which works as a "stomach". The anaerobic fermentation takes place in this machine. It takes three months to reach the production of methane, CO2 and other gasses. Methane passes through a motor that conduces it into an electric cabin. It is interesting to note that other types of organic wastes can be introduced in the "DIGESTOR". So an intelligent separate refuse collection of wet wastes, practiced in our homes, could feed this system of transformation and recycling.
Enel is the only buyer of green energy produced by Coretto company, which sells energy at a price that is higher than its cost price. In Italy green energy isn't exploited but a few administrators would like to start an experimentation for the habitants of the area next to the Coretto company. The separate refuse collection could reduce some rates, as ICI or waste costs, so the families could find a reason to practice the collection. In Europe Netherlands, Austria and Germany are the only nations that respect the Kyoto agreement which programs the use of renewable sources for bioenergy production. For example, in Germany, bioenergy has substituted nuclear energy by the installation of over 1000 biogas centers, in contrast to 50 centers in Italy.
For these reasons our country doesn't reach the standard objectives of the Kyoto agreement.
Nevertheless we can find a positive element in Calabria among negative elements.

P. F. & S. M.

APPENDIX E: S3--final product

ATOMS, MOLECULES AND… ART
Scientists invade Puglian archaelogical sites

The fields of Physics and chemistry can be used in conservation and restoration of heritage and cultural artefacts. On 23 September 2006 the team of "Diagnostica e restauro per i beni culturali" in the physics department at the university of Bari started a research project to analyse some finds coming from the archaeological site of Siponto and Castel del Monte.
The analysis and the conservation of artworks is now a scientific problem. The most important part of the work in the study of ancient manufactures or paintings or frescoes and so on is the accurate knowledge of the component materials. We can obtain this information using several devices deriving from chemistry and physics.
The study of an artwork is circumscribed to a tiny part of it, this is a device to protect the integrity of the artwork itself. This precaution is carried out taking a sample from the artwork and performing the analysis on this sample.
The analysis of the sample consists in three steps. In the first step, the sample is analysed by using an optical microscope to know its exact colour tonality; in the second step, the sample is studied with an electron microscopy, the device is called SEM (scanning electron microscopy). this technique exploits the atomic properties of matter. An electron analyser is used to observe the scattered electrons coming from an electron beam impacting on the sample. Studying the energy spectrum (that is, observing the energy distribution) of the scattered electrons, it is possible to deduce the atomic composition of the sample because the energy of the scattered electron depends on the type of hit atom.
The third step is the micro-Raman analysis of the sample. This technique consists in sending a monochromatic light beam through the sample and then analysing the light coming out of the sample. Because of a physical effect called raman effect it turns out that the light spectrum coming out of the sample isn't monochromatic any more but has some characteristic lines that are different from molecule to molecule. This way one can establish the different kinds of molecules composing the sample.
The data acquired from the three methods must be compared. Confronting the atomic composition of the sample with the molecular one, it is possible to derive the pigment type used in a painting or the material used to make a handwork.
In the analysis carried out in Puglia, one tassel from a mosaic in Castel del Monte and of some ceramic fragments found in the archaeological digging site of Siponto have been studied.
The results have shown that both the finds presented the same blue pigment.
This technique is very important in the study of heritage and cultural artefacts as it can be used to define the right material to employ in restorations; it can also be used to date the artefacts especially paintings and frescoes.

This diagnostical device is an example of the collaboration between two worlds that in the past were separate: the scientific world and the humanistic one. The main consequence of the introduction of this technique in the world of research was that many scientists began to study artistic subjects and many literary men were obliged to study sciences with a lot of advantages in both fields.

A. I. and M. P.

APPENDIX F: S4--final product

BEYOND THE KNOWLEDGE FRONTIER

New experiments at LHC could show the deep essence of the Universe

Probably, the year 2007 will be remembered among the most important historical dates of human knowledge. Infact, during this year, the great experimental device LHC, developed at CERN laboratories in Geneva, will start new experiments never realized before, which could give final answers to many questions regarding fundamental laws of our Universe. These experiments have the principal aim of discovering the Higgs boson. What exactly is the Higgs boson?

At the beginning of the previous century there was a scientific revolution that brought human knowledge to the quantum physics era. During the following decades, this new physics permitted to investigate deeply fundamental laws of the Universe and its ultimate building blocks. All experimental and theoretic results contributed to create a model, called Standard Model, that describes, with a single treatment, fundamental particles that constitute the Universe and their Electromagnetic, Weak and Strong interactions. One of the main features of Standard Model is the massless nature of particles, that is, all particles must have no mass. Observed particle mass is due to the interaction with another fundamental particle called Higgs boson. So Higgs boson is one of the fundamental building blocks of the Universe. The Universe exists in the way we know it thanks to Higgs boson.

LHC is the greatest and most powerful particle accelerator in the World. It is located at CERN laboratories, in Geneva, at a depth of 100 metres below the surface. LHC permits the collision of two proton beams at the very enormous energy of 14 TeV (one million greater of the energy that links two protons in atomic nuclei), thanks to very powerful magnets that work at a temperature of 2 Kelvin (around –271°C). These two beams will travel in a ring with a circumference of 27 Km. They will collide, with the rate of 800 million collisions per second, in four different points of the ring. For each collision point, four powerful (and huge) revelation systems (ATLAS, CMS, LHCb, ALICE, with the name of the experimental projects they refer to), with the purpose of discovering and revealing thousands and thousands of particles produced during collisions. Giant caves have been digged, underneath the city of Geneva, to host the revelators (the cave that gives hospitality to ATLAS has the dimension of a building of six floors). Every revelator will receive a flux of information comparable to the entire world telephonic traffic! Among these, only a Higgs boson per day will be produced! Over 150 research Institutes and Universities from many parts of the World are involved in LHC project, from the beginning of its realization.

Higgs boson revelation is only one of the experiments at LHC. Other experiments will try to go over the actual border of human knowledge, to discover a "new physics". LHC has the possibility to replicate the same conditions of the Universe, after a millionth of a millionth of a second from the Big Bang. This will permit to investigate for the first time ever several questions discussed only theoretically up until now, like supersimmetry, strings theory and extra dimensions, dark energy and dark matter essence, which constitute the unknown 95% of the mass of the Universe. What is the deep essence of the Universe? What are the fundamental building blocks of everything we can see around us? These are very important questions that have always regarded Human Beings and their evolution. Now, thanks to experiments at LHC, we could make another step, maybe an ultimate step, towards obtaining the answers.

G. I.