Beyond the bench by Aix Marseille Team (2015)

1. Chewing gum

Chewing gum was born in South America, then called the "Treasure of Mexico". In 1869 Antonio Lopez de Santa Anna, a Mexican general, was driven from his country by the revolution. He arrived in New York with his "Treasure of Mexico": 250 kg of dried sap sapotier into a rubber substitute. It loads Thomas Adams negotiating the chicle which finally proves unsuitable. However Adams keeps the stock and sells it in pharmacy at a lower cost with paraffin. This is the beginning of success.

Other pioneers trying to improve the Mexican product:

- William J. WHIT added glucose syrup in its "Yucatan chewing gum".

- William Semple of Ohio dentist, obtained the first patent for the invention of modern chewing gum, dissolving * naphtha and alcohol, then adding a small dose of licorice, to give it a taste pleasant.

- William Wrigley Jr., meanwhile, is in charge of launching the product on the entire American continent, thanks to large advertising campaigns in the late nineteenth century.

Chewing gum was popularized in Europe by the Americans at the end of the Second World War. Indeed, the armed forces of the United States provided to their soldiers chewing gum since World War II. They considered that the chewing gum was helping fight stress and thus be more concentrated.

2. The use of chewing gum

According to the site http://www.planetoscope.com/Commerce/1146-consommation-de-chewing-gum-dans-le-monde.html, global consumption of chewing gum is 0.49 kg per person year, or about 100 kilos of new chewing gum chewed every second! In one year, world consumption of chewing gum would amount to nearly 3 million tonnes. This consumption

varies widely among age groups and countries: the French are the second consumers of chewing gum in the world behind the Americans. Our poll conducted through the collaboration of many teams has allowed us to have a glimpse of this consumption. We were able to learn that about 50% of the respondents consume at least one chewing gum per week. No brand seems to stand out for their preference. We wanted to know why people consume chewing gum nowadays. The answer was clear: more than half of consumers of chewing gum do to have fresh breath and about a quarter pleasure.

We also wanted to know whether or not people were throwing their chewing gum on the floor. To our surprise more than ¾ responded never throwing chewing gum. So if you have already taken a chewing gum on the ground, know that you are one-quarter of the world population causing gum-related pollution problems developed in the next section.

It is interesting to note that over 70% of those who admitted throwing their chewing gum on the ground do not know the biodegradation time of chewing gum and over ¾ know no technique to take off chewing gum from sidewalks. Moreover, only 5% of them know that the chewing gum contains approximately 100 chemical compounds. It therefore appears that there is a big lack in information about the leading chewing gum maybe people lay the ground especially if they are unaware of the environmental impacts associated with the degradation of chewing gum, we'll cover in the next section.

3. Environmental problems related to chewing gum recycling

The environmental problems caused by chewings gums was our principal motivation to start this project. For that reason we decided to build further our research around the subject.

3.1 Wildlife problems

The very first evidence we had in our possession, was the problems related to birds. Indeed, as part of the "Conférence des Parties de la Convention cadre des Nations Unies » which acts for climate change, the region Provence-Alpes Côtes d'Azur has organized the MEDCOP21 (a discussion forum of the non-trading Mediterranean corporation for climate)the 4th and 5th of

june 2015 in Marseille. To members of our team (Yoann and Daniel) were there to meet associations and companies and discuss with them around the environmental problems.

They presented them our project and a member of an association named “les petits débrouillard”

Told them that chewing gum were harmful for birds because they could mistake them with bread crumbs, swallow them and die. We decided to look closer at this problem and made futher research. First of all we contacted the League of Protection PACA to get their professional opinion, but they didn’t answer our questions. After some research on Internet, it seems that this information is corrupt, and rumors of such problems spread around the social network Facebook. It’s trough this publication, which was translated in other languages in order to be understood by a majority :

Source : http://briseur-de-mythes.blogspot.fr/

However, this assertion has been a subject of discussion in the american tv show « lie or legit » broadcasted on CBS 21, which is also available on youtube: https://www.youtube.com/watch?v=ZSPl1fFeuqo .

In this show you can see two experts in avian zoology claim to have never take notice of such problems. It seems that birds can actually make the difference between bread crumbs and chewing gum. One of the experts say that it was possible that small objects could block respiratory tracts of birds and choke to death. In their case it’s not the components but mostly the size of food which cause death

That's why the presenter concludes with "legit" to the question. However, one expert says, despite the low probability, that it's impossible to assert the inexistence of this phenomenon.

Finally, we also found a video of a bird where one of his wings was glued by a chewing gum, disabling it to take off and live normally. The video is accessible here. At the end, the environmental problem in relation with chewing gums thrown away in nature is not a problem we consider as major as it seems to be rare and not proven.

3.2 Problems water streams

Afterwards we took a look at problems that chewing gums could cause to water streams. In the short film « the dark side of the chew » realized by Andrew Nisker (CANADA), talks a lot about these problems. In this short film we realize that chewing is the second world's most abundant waste next to the first, cigarette stubs. In order to take them off the streets, municipalities or cleaning companies use high pressure cleaning devices which unstick even residues of tar, chewing gums and other oil products which are flown away to the pipeline network and end up in river streams

Chewing gum seems to have a huge impact on the aquatic environment.

3.3 Urban problems

For us the most obvious environmental stake is the urban environment, besides it was when marion walked on a freshly thrown away chewing that she got the idea trying to handle this problem. I think that the whole team didn't realize the importance of this problem, but after she told us her idea, we took more time to look at our sidewalks and the report was distressing:

There was not even a single sidewalk not glued by chewing gums and it seems that we don't see them anymore. It was interesting to see the reactions of our family and friends since we told them about our project.

Some of them told us that since they heard about Chew fight, they realized that chewing gum pollution is a major problem around us and that they didn't necessarily look closer before. Do the same next time you'll go out! Watch your sidewalks! I bet you'll see hundreds of chewing gums you didn't see before!

Marseille has the reputation to be a very dirty and polluted city, so we wanted to know if this problem was either a local problem or if it was the same in other cities. To do so, we had the chance to interview Madame Dubal Josée, executive assistant of Onet Cleaning and services, which is also one of our sponsors. Onet is the leader in france for cleaning services. They own more than 10% of the French market.

She strengthened our idea, chewing gum is a very problematic concern encountered daily by their cleaning agents in charge of public places. She explained that most of chewing gums are thrown into public places like train stations, sidewalks and subway stations. They rarely find such problems in office corridors, personal offices or generally open workspaces. There's a real underlying problem which is a lack of public spirit. Indeed, it seems to be no problem for someone to throw away their chewing gum in open shared public spaces with a big amount of people. On the other hand, when the environment is more private they don't seem to have such behaviors. So, the open space isn't defined as a shared space anymore, rather as pathway where their private rules don't seem to enforce.

Nevertheless, throwing away a chewing gum on public spaces is considered, here in france, as a break of law, which is liable to 150€ fine according to article 131-13 of the penal code.

In addition to that, according to article L.541-1 of the environmental code, it's the mayor's duty to watch over the public health in the entire city and handle the elimination by the producer or owner of the waste.

That's the why the french communities set up a bylaw for the rejction of chewing gum on public places which are not strictly applied. In 2007, the city Besançon launched an anti-chewing gum operation by placing special signs where people can stick theyre chewed gums. This operation was taken over by Roanne, another city in the Loire in 2013. (http://france3-regions.francetvinfo.fr/franche-comte/doubs/grand-besancon/totems-chewing-gums-apres-besancon-roanne-s-y-colle-263687.html) and even the city Amiens which cost about 150 000 Euros instead of 240 000 Euros which would have been the cost for cleaning.

However, it seems that those operations didn't encounter much success. In Paris « we don't initiate further operations because others didn't succeed » said Mao Peinou, deputy mayor of Paris in charge for cleanliness and management of waste. « We'd need a hot water pressure pulse and even then we have to scratch them off ».

All this represents and huge cost in energy and water and takes about 30 minutes to clean 50cm2 and even after cleaning the stains remain (a clean stain …) http://www.20minutes.fr/planete/1531907-20150203-chewing-gum-laisse-trace-trottoirs-monde.

So, this problem is a general problem for each city in france. The abortion of these operations in Paris, the « romantic »capital is probably the most pity. However, it isn't specific to France, because even in Singapour, chewing gum is bannished there, they control the import and export of chewing gum. The only exception is therapeutic chewing gums. In England, more precise, in london, the cleaning of chewing gum costs more than 13 Million euros, and takes 3 month to clean the entire Oxford Street. http://www.20minutes.fr/planete/1531907-20150203-chewing-gum-laisse-trace-trottoirs-monde More then 55 % of the people which were interviewed estimated the cleaning less expensive. It's a world wide phenemenon which causes many problems to communities in terms of urban esthetic and the economy.

4. Existing solutions and the one proposed by our team

There are different technics to scratch of chewing gum off the streets. Miss Dubal showed us those who are used nowadays. The most classic technic is the most simple one, it's scratching them off with a tool of a razor blade. Another alternative is with crygenics, but it's too expensive and inefficient on some layers. The company Onet uses a system which is a high pressure generator which diffuses a beet sugar extract with the action of a brush this device is distributed by ECOGUM®

(www.ecogum.net)

The effects are mechanic, chemic and thermic. This method can be used on every surface. However it works with only one chewing gum at a time, and is expensive. Indeed the device costs avout 5000 Euros and every recharge costs 200 Euros and works about 8h. Considering that it takes 6 seconds per chewing gum, it also creates an additional labor cost because this method is very focalized. The high pressure cleaning is used by other companies but the water consumption is very expensive and not very efficient, creating more pollution than initialy.

So the treatement of vast surfaces like train stations, the ECOGUMr solution is not viable.

Today the only efficient method is a chemical method used by most of the companies, which uses a very agressive acid. The ground is then cleaned up by a automated cleaning device. One of the acid is called SOCOSTRIP T4210P and is commercialized by the company Socomre http://www.socomore.fr/socostrip-t4210p/pr11.html.

Miss. Dubal told us that biological solutions are appreciated by customers because of they're eco-friendly image.

Chew fight is a biological solution based on production of enzymes, collected from genetically modified bacterias.

Those GMO's are often on the focus of critics and detractors, sometimes very harsh. In which way our solution could be accepted by the population ?

5. Public view of our GMO

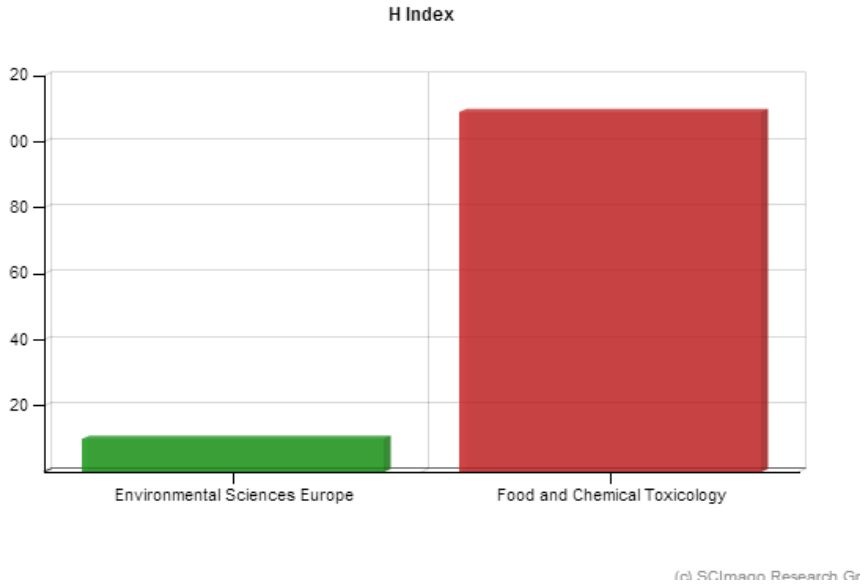
Mr. Robaglia, professor in Sciences of Aix-Marseille Université kindly answered to our questions about the subject. For him, the french community isn't in favor for GMOs. It's also interessting to compare the evolution of the reflection about this subject between two similar societies like North America and Europe, where ideas aren't at the same stage. This topic, which was first of all, a scientific debate became a public debate. This debate has also a politc side where « left » governments are allied with « green party » and on the other hand the pro-GMO's. Mr. Robaglia said there was a big evolution of this topic from the public position. He seemed delight to see the apparition of debates and their diffusion. He said that there was a difference of the possibility of communication between the scientific community and non-

governmental anti-GMO organisations. During the debate between A. Kahn (president of the GMO reflection commission) and JM. Pelt broadcasted on french tv channels, there appeared a gap of communicational possibilities.

The scientific speech is based on the measure and restraint. Indeed, a « serious » scientist can never maintain that GMO's are harmless animals, vegetables, health, the environment etc. He can however claim that the risk is very low while adding that the zero risk doen't exist. On the other hand, it is easy for his detractor to use this weakness(and ask for more and more tests to (move away the danger of use of the GMO's. It's not possible to prove the non-existence of a fact for a scientist. This basic principle of the science is a real problem in the debate. Furthermore, during these debates, the scientific community is not represented by people whose communication is their real job.

Mr Robaglia so regrets that the scientists aren't more familiar to communicate their results with the public. The detractors of OGM's also use scientific publications to transmit their message. Professor Seralini indeed published in 2012 an article in the famous « Food and Chemical Toxicology » Magazine questioning the use of the GMO's. This article was relayed by many big scale medias and raised confusion on behalf of the scientific community. Indeed, the experiments hadn't been realized in adequate conditions and the statistical results were not reliable. That is why the newspaper retracted the article : http://www.sciencedirect.com/science/article/pii/S0278691512005637.

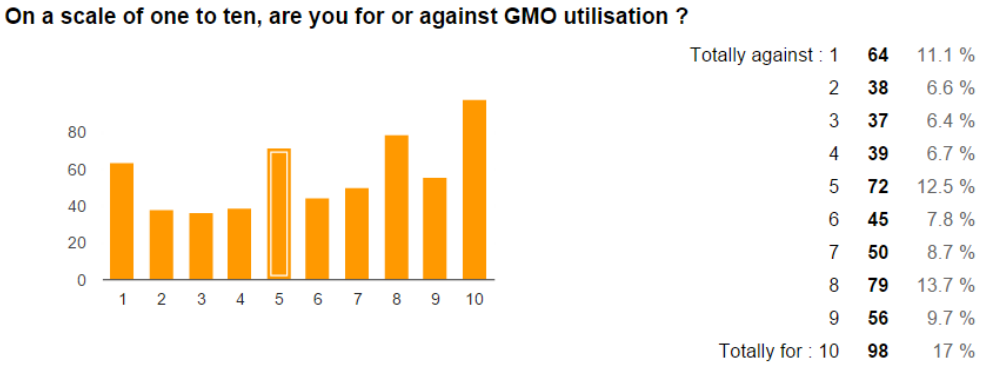
However, this article has been published again in June 2014 by a non recognized scientific journal, « environmental sciences Europe »



Comparison of the H index of two newspaper. Obtained on http://www.scimagojr.com

So, the anti-GMO detractors can use these scientific articles to support their words. He becomes then very difficult for a non-familiar person to differentiate good articles of others, which discredits the arguments of the researchers. Chew Fight and the principle of the synthetic biology rests on the use of GMO, thus we wanted to know the position of the population towards this question.

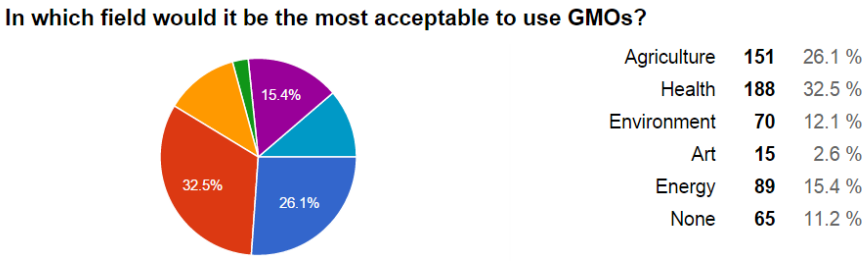
It appears that respondents are fairly divided on the issue:



An interesting thing to notice is that among the 30.8 % who are quite against the use of GMOs (notes 1 to 4), more than half of them have not been able to give an exact definition or approaching that of a GMO. This reinforces the idea that there is a great lack of communication on the subject. Without even knowing what a GMO, more than 15 % of the population feels they are opposed to their use. In comparison, the share of people who

responded rather positively (score of 6 to 10), 17% were unable to give an exact definition or approaching that of a GMO.

According Mr.De La Roche Saint André, opinions about GMOs can hardly be dissociated from their application. The use of GMOs for medical purposes is much more accepted by the general population its use for agricultural purposes in France at least. The results of our investigation have indeed supported the fact that the field of health would be the most acceptable for the use of GMOs. In second place comes agriculture and the field of energy complete the podium.

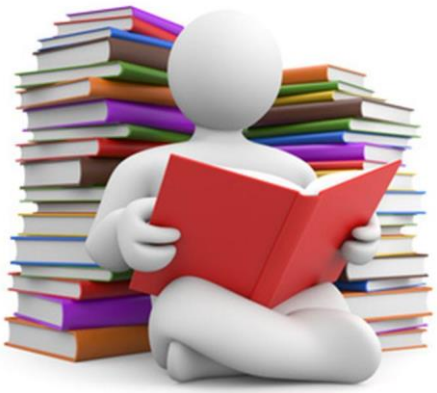


The first large-scale production for medical purposes was the production of insulin in E. coli. Soon, morphine should be produced by a yeast strain , an organization increasingly studied for its production capacity. He told us also that the issue of GMOs cannot be addressed without a comprehensive consideration of the economic, geographic, political, environmental and societal situation.

PART 2 : PATENTS

1. Laws

a. Patents history



Historically, the first appearance of the idea of patent is a venitian law from March, 19 1974. It gave the exclusive right of exploitation to the person that revealed an invention, and this for a 10 year duration. This law was completely ignored in the rest of the world. New laws appeared in the following centuries in France and in the UK for example. These rights appeared quickly as privileges given to the upper class, allowing an increase of profit for the Treasure. In Great Britain,the same rights were given under the form or "open letter" or *litterae patentes*, which gave birth to the current "patents".

Only the kings had the decisionnary power, which led to some abuses such as those from Elizabeth I and Jacques I, who would deliver *litterae patentes* not only for inventions but also for some everyday life products. In order to prevent this, the English Parliament voted in 1623 the Statute of monopolies which is the first modern law on patents. Thus, the *litterae patentes* could be delivered for inventions not existing in England at the moment and the one who would obtain it would get a 14 years monopole. In France, the privilege regime lasted until the Revolution, and it is only in 1791 that a law gave the inventor a property right on the inventions considered as new in France for a 15 years period of time. In the US inventions started to be protected by an act from 1790.

In 1984, the European council decide to put the accent on biotechnology ans wishes to improve the legislative and regulatory framework. In order to do this, a system of intllectual property right common to all the member countries was considered. The first proposal was an update on the Convention on European patent delivery, in order to include the possibilities brought by biotechnologies. This process was finally very complex, partly because there was

existing divergences between national laws from different EU countries. A directive is finally written in 1988. A first lecture is made by the parliament at the end of year 1992, following which 46 amendments are proposed. Most of them try to introduce an ethical dimension to the law text. The text is finally adopted on July 6, 1998

b. La directive 98/44/CE

A communiqué explained later that the directive contained either national right elements or preexisting elements from the law. Only rare new elements were added.

Effective on July 30, 1998, the directive has to be transposed by member states into their own right until July 30, 2000. In 2005, only 8 member states out of 15 had made this transposition and the Netherlands (backed up by Italy and Norway) even contested the directive. In order to satisfy more countries, the directive countains several parts underlining the ethical dimension and preventing the following elements from being patented:

2. Intellectual property rights

a. International frame

The trips, Trade related aspects of intellectual property rights, rule the international frame. They were signed in April 1994 and their aim is to put the national legislations on intellectual property in a common frame. They are rights given to private persons developing new technologies. Theg give them the control on the innovation they have produced. It includes patent, trademark or copyright.

The article 27-1 deals with the living and the article 27-3 (b) defines the possibilities of exclusion of patentability. This includes of course the living, which is a technological field.

b. European frame

Completing the directive 98/44, there are two texts about the living: the Strasbourg convention and the CBE.

The Strasbourg convention was signed in 1963 and aims to unify some elements on innovation patents rights. This convention protects the microbiological processes and their derived products. It shares the criteria of patentability and non patentability with the ????. It does not include the protection on vegetal species, animal breeds, or essential biological processes leading to the obtention of vegetals or animals.

The CBE was signed in Munich in 1973 and was effective in 1977. It underlines the fundamental difference between invention and discovery. It is signed by more than 100 countries.

c. National frame

In terms of national right, the article 611-17 of the Intellectual property Code is applied. It uses the same criterias of patentability and non patentability stated before. This national right is however bypassed, given the content of the directive 98/44.

3. Patents

a. What patents do

A patent is a juridical term that gives its owner the right to prevent others from creating, using, selling, offering for sale or from importing an invention without his approval. These rights are given for a limited period of time (in Europe, 20 years starting from the patent deposit) and on a limited geographical area (generally the territory of the state in/for which the patent has been created). It gives a temporary exploitation monopole for the patent owner.

There are two reasons for which a patent can be cancelled :

- If the annual payment for the patent has not been paid
- If there is a wrong exploitation of the patent

The patent has a very precise economic aim : the exploitation of the invention. The patent owner has to either exploit the invention himself or to allow the exploitation through a license (most of the time against money). If the patent is not exploited, the authorities can impose the license.

If the selling of the good is successful, the patent owner can pay back the costs related to the development of the invention, and also generate a return on investment. Therefore, it is a consequent financial motivation to give the monopole of exploitation to the patent owner. The economic value of the patents is real and they are parts of the companies economic strategy for the markets' approach. The actual patent deposit and even the hope for patent deposit is a real call for funding. It represents, for some companies, a fully finished product that allows the the creation of capital by selling exploitation rights. On the world scale, the competition between the countries to set the most attractive conditions possible for the research companies is fierce. The more the country has dynamism and economic power, the bigger the companies' economic interest is big.

Moreover, given the patents' rights, the applicant has to integrally divulgate its will in the patent application, application published 18 months later. The patents give access to information about recent innovations, which represent a consequent data base with public access. It stimulates new technologic advances. The EPO (European Patent Office) data base is one of the biggest in the world and contains more than 80 million documents which can be consulted freely in 28 languages.

b. What patents do not do

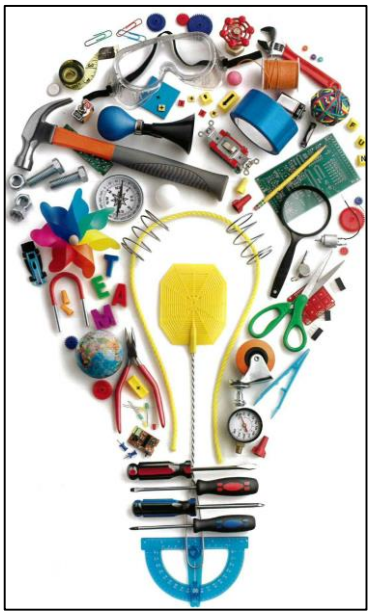
A delivered patent does not allow its owner to use or to set up an innovation, it only gives him the right to prevent anyone from using this invention. It is possible that the patent owner should also obtain the authorization to apply and to sell the product. For a medicine for example, a patent does not allow the placing on the market of the molecule. As for GM crops, they have to be authorised by the competent authorities before being the object of field trials. The patents rights cannot be substituted to national, European and international laws, that are all susceptible to impose restrictions and interdictions regarding the use of given technologies.

c. When is a biotechnology patentable ?

The EPO, being an executive organism of the European Organisation of Patents, examines the European patent applications and choose to allow or reject the patent asked on the basis of European law on patents.

Conditions for obtaining the patent are strict on the form and the substance.

d. Content requirements



Three criteria have to be filled to patent an invention : the newness, the inventive step, and the industrial application. The rights for intellectual property are given only if the applicant provides means to the technic and to the industry that did not exist before.

The idea of newness has been included in the law of the January, 2nd, 1966 is very strict. Every invention having received any advertisement before it was patented cannot be patented. Even if the patent application is submished, no advertisement is allowed before the study of the file. It is what we call the existence of an anteriority. This notion does not exist in the US where the rule "grace period" is applied. This rule allows the inventor to test, to use and to sell his invention for a one year period starting from the day of the patent application deposit. During this period, the inventor can test the commercial viability of his invention, but he can also evaluate whether his invention is really worth to be patent protected. Thus, a product can already be in the public domain but the inventor presents a new way of obtaining it, which is patentable. And reversely, a patent can be attributed for a new application of an existing mean.

In order to have newness, it is needed to have inventiveness. This criterion is evaluated thrugh a "problem-solution" approach. They evaluate the state of the closest technic to the invention, then the technical problem that is being solved by the invention is identify. Then, they check if the invention would have been obvious for a person skilled in the field, regarding the state of the technic and the problem. In the US, this last evaluation is called criterion of "no-evidence" has to be shown that a person skilled in the field would not have easily achieved this innovation.

The industrial application is the last criterion (regarding content) for a patent obtention. The invention is subject to industrial application if its object can be produced or used in any kind of industry. In the US, this criterion is called "utility" and correspond to the fact that an invention is useful and could lead to a useful application.

Finally, the invention has to be made public in order to patent it.

e. Form requirements

The patent application has to contain three elements : a title, a description, and the claims.

The title has to contain a short and concise description of the innovation. It allows to classify the invention in the catalogues, which makes the coming consultation easier. A wrong title can be an important prejudice to the applicant.

The description is the capital piece of the file since it allows the invention to be publicly known. It should allow any technician or any skilled person in the field to reproduce the innovation.

The claims deal with the fields of applications on which the inventor wishes to benefit from a monopole.

As we saw previously, there are several strict conditions of patentability, the laws are different from one government to another, and the patents can deal with every technological field. Which naturally includes the living organisms. It led to the creation of the term "Patents on Life", which is widely used even though it does not really give information. Thus, we decided to study the beginning and the evolution of the patents on living organisms. Then thanks to the interviews and the answers collected through a survey sent to all the attending teams, we studied the ethical, economic and social stake of the intellectual monopole on living.

4. « Patenting the living organisms »

a. Interdiction of patenting the living organisms doesn't come from a text law

Even though there is an interdiction of patenting all living organisms, there is now actual legal text to claim that. Indeed, as we already reported «Patents may be granted for any inventions, in any field of technology, if they are new, inventiv and leading to an industrial application.

A few decades ago, the belief in developped countries was that inanimates things and living organisms were two separate things. Inanimates things could be tampered with by men, whereas

living organisms were considered sacred, « as part of the sacred nature of the human being ». Due to that fact, there has been very few patents have been granted for living organisms until very recently, with a few exception, noticeably the patent by Louis Pasteur for a grem-free yeast in 1873. This patent did concern a living organism, but microorganisms were considered

inferior enough to human beings that these ethical questions were not an issue, thus demonstrating perfecty how humans were considered superior to all other species. This idea changed along with new scientifiq discovery.

The exclusion of the living organisms of the patent system was also due to the fact that the technology at this time didn't allow the creation of new living things. The USA were the first to question these ethical principles for plants, then the EU followed.

b. Unated states questionning

The questionning of these ethical principles were made by the USA by a vote (Plant Patent Act) in 1930, for ornemental plants, were a distinction was made between the natural living or inanimated organisms, and things made by man. Humans were considered apart from nature, and all things other than man could be exploited, thus demonstrating once again how humans considered themselves superior to all other species.

In 1970, the Plant Variety Protection Act was voted, in order to protect phytogenetical research. It applied from seed to multiplicative organs of more than 350 plant species. These two text laws make the USA very special because the obtention of certificates for plants, transgenic or not can be mixed up, thus causing many lawsuits in 1985 by some american's company.

In 1960, the EU went along the same path by creating the Union for the protection of plant obtention (U.P.O.V)

c. L'organisation de l'Europe : Protection des obtentions végétales

The UPOV has been created in oredr for plant and animal varieties to have appropriate rights. However, the system was only fully developed for the plants, ignoring the animals. Thus, all new plant species are eligible for protection of intellectual property system. This was set up in 1961 with the adoption of the International Convention for the protection of plant varieties or "UPOV Convention", which is applied since 1968. According to this text, plant and animal species can not be patented. Plants are protected by a plant variety certificate (COV) for a 20 years period for annual species and 25 years for perennial species. This certificate gives the owner of a variety (also called the breeder) the exclusive right to reproduce, multiply,

package, sell, import and export. The breeder can not , however, oppose the use of his variety in specific cases

- In a private setting or for non-commercial purposes

- Experimentally

- For seed production called of "farm" (this case depends of the country)

- For the creation of new varieties

This last exception is really important, it is called " breeder's exception". It allows free access to the protected variety and allows its use in order to create new ones. The COV protects the specific combination of genes in the plant but not the genes themselves. Thus, they can be used at leisure to create new combinations and new varietal creations. This system does not stop research, seeing as any genetic progress protected by COV can be used to enable the invention of new plants. The French are very attached to this system and really defend it against the Americans .

The convention has changed several times: in 1972, 1978 and 1991. The 1991 amendment has introduced the criterion of essential derivation and extension of genera and species to be protected. This criterion allows the breeder to extend the initial coverage of a varietie to varietes which are derived from the original one. This helps prevent a particular breeder of selling a variety derived from another and so to steel the work of the original breeder. The main criticism of this criterion is that it's considerably close to the COV of the patent,seeing as a breeder can no longer market a variety derived from another without the agreement of the breeder of the first variety from which is derived the second one. In addition, a breeder can market its variety derived from another if there is a large genetic distance between the two varieties. This limits the possibilities for creating small breeders.

d. Le mouvement croissant de brevetabilité du vivant

A process…

- Strasbourg Convention - Patentability of processes of microorganisms (viruses, cells ..) . At the time it was about fermentation processes that have evolved much later, following the technical innovations of genetic engineering. The techniques have changed in nature, the

resulting product is not only what is produced by microorganisms but also the microorganism itself. The problem of ownership of the microorganism was quickly raised. Between this agreement and the French 1978 law on patents, developments led to the fact that microorganisms have become patentable. Animals and plants are still excluded from patentability.

- The decision " Chakrabarty " - Patentability of bacteria capable of degrading hydrocarbons recognized by the US Supreme Court. Initially, the Patent Office and the United States Trademark Office (USPTO) had rejected this application because of the naturalness of the product . Then the US Supreme Court reversed that decision by stating that all things created by man was patentable. This decision, noticeable at the time, led to a significant acceleration in the number of patent application on the biological material .

- An oyster is found patentable by the US Patent Office

- A cancerous transgenic mouse mother to daughter (" Mycmouse ") is patented by the US Patent Office, then in 1992 by the European Patent Office .

- It is during this period, that begins the preparation of what became Directive 98/44 / EC which we spoke of earlier.

... Which led to ADPIC

... Driven by two motors

- The WTO (World Trade Organization) wants to extend the liberalization of commercial trade between nations to intangible goods, and requires that nations develop intellectual property legislation . These are the ADPIC agreements that secure the harmonization of national legislation . They especially state that patents can be obtained in all areas (including the living organisms course)., which uses the same logic as the Directive 98/44 / EC.

Large firms have actively contributed to the development of biotechnology and research on the genome in particular.

e. <u>More about “Patents on living being”</u>

The saying " Patents on the living organisms " is a relatively popular phrase made to be understood by the most peole , particularly those untrained in sciences. However, given the responses gathered through our questionnaire, we observed that the definitions given to this expression were very disparate . Of course, this saying has been used by the media in order to write negative articles and criticize this legislative procedure that is increasing. But what is the real meaning of these words ?

As we have seen in the preceding paragraphs, the patentability of living organisms depends of the organism. In general, these are combinations of genes that can be protected (thanks to the COV for plants for example) but that's not all. Directive 98/44 / EC states that "all of production of plants or animals which are essentially biological if they consist entirely of natural phenomena such as crossing or selection" are excluded from patentability. However, the events of 25 March 2015 demonstrate that Article 4-1 is not respected. Indeed, the OEB granted patents to tomatoes and broccoli varieties selected conventionally, involving no ârticular invention. So, is it enough to discover a link between genetic sequence existing naturally in a living organism, and a special feature of this organism in order to become the owner of all living organisms expressing that character? This is what is left to believe by the OEB.

The increasing use of patents in the living organisms' world, along with the increasing reach of the patents granted raise many questions and generate some ethical concerns , economic, scientific and social . Of course, we will also evoke the positive aspects.