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THE *XYLELLA FASTIDIOSA* CASE: A WAY FOR THINKING ON RESEARCH DAMAGE IN THE ITALIAN LEGAL SYSTEM (**)

Abstract: The aim of this paper is analyse the state of art of research damage on the Italian legal system and actual developing of liability connected with the research activity. In order to do this, we will take into consideration what is happening in Italy concerning the research on Xylella fastidiosa. This is related to scientific progress which opened new fields and horizons to science, but often it carries fears and anxiety in the public opinion. Scientific development is essential for human progress and for a sustainable human impact on the world. A society which does not keep on studies and experiments is destined to stagnation and decline, because without technological progress it can not be able to faces future challenges. Nevertheless, scientific research has the potential of being dangerous as demonstrated by many studies and events. In this scenery civil liability on the one hand could become the instrument to guarantee damaged subjects and on the other hand is the way to allow a healthy development of scientific research, because every human activity can be dangerous, but the fear of the unknown effects can not stop scientific progress, therefore the judicial system must to provide the appropriate rules to protect damaged subjects by the results of the research activities without block it. From this point of view this gap could be highly fixed by civil liability.

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Introduction.

The elements of this research would like to offer an interpretation from a juridical point of view about what happen in scientific research field in connection with the civil liability. The aim of this paper is to build an autonomous specific case of liability connected with art. 2043 c.c. In order to do this the starting point is represented by the analysis of a specific case related to what is happening in Italy about the research on Xylella fastidiosa.

In the first paragraph is studied the relation between science and rights, with the focus on scientific uncertainty, new and converging technologies, while in the second paragraph the attention is focused on research types and is given the definition of research damage.

Starting from this point in the third paragraph it is explained the necessity of research damage as an autonomous specific case in connection with the Italian non contractual liability rules. This is useful to understand the Xylella fastidiosa case explained in the fourth paragraph, while in the fifth paragraph the conclusions of the previous paragraph are related to other fundamental researches. In order to give a complete picture of the situation, in the sixth paragraph is briefly faced the question related to the pro-action principle and the precautionary principle among which the questions related to the scientific research are involved in.

1. — *Scientific uncertainty, new and converging technology: an unregulated field.*

The issue related to the link between law and new technology became essential since 1890 with the Brandeis and Warren's article concerning the right of privacy[1]. Since that period, scientific development was followed by a corresponding evolution of the law, with the aim to regulate scientific activities. This regulation is necessary because scientific progress has a quickly development bringing with it different kind of risks, included the

[1] S. Warren, L. Brandeis, *The right to privacy*, in *Harvard Law Review*, IV, 5, Harvard, 1890.

possibility of provoking damage, as affirmed by Charles Perrow[2] who sustained that such accidents are inevitable in complex systems, despite efforts to avoid the issues, but the absence of certainty could increase the risk. Uncertainty, in effect, concerns most aspects of life, but it is especially linked with scientific research. Thereby the risk is originated by some aspects not completely unknown but still uncertain related to the answers for a determinate question[3].

Scientific uncertainty usually identifies risks originated by some innovative human activities, and concerns various areas of interest relating to «complexity of knowledge, lack or shortage data, unpredictability of the results, stochastic nature of the hypothesis for much naturalistic sector»[4] according to the idea of a non deterministic science. All these activities can be included in the technological unknown field. Nanotechnology, biotechnology, information and communication technology, neuroscience, robotics are only examples of some fields developed last decades who are involved in scientific uncertainty and technological unknown that have had the greatest progress both qualitatively and quantitatively.

Since 2002 National Science Foundation's[5] Roco Report highlighted how, within the next twenty years, our comprehension would be increased and the sensorial and physical ability of human beings would be changed, augmenting the interactions between mind and instruments, and between individual and group. This means that a regulation is necessary, as proved by the European Union's orientation, which created the European Group on Ethics in science and New technologies, made by the European Commission with the task of analyse this kind of questions in order to give advices to the

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[2] C. Perrow, *Normal Accidents: Living with High-Risk Technologies*, New York, 1984.

[3] R. Costi, *Ignoto tecnologico e rischio di impresa*, in Aa.Vv., *Il rischio da ignoto tecnologico*, Milano, 2002, p. 49.

[4] Italian National Committee of Bioethics, *Il principio di precauzione, profili bioetici, filosofici, giuridici*, Roma, 2004, p. 11.

[5] M. Roco, W. Bainbridge, *Converging Technologies for Improving Human Performance*, Dordrecht, 2002. The U.S. National Science Foundation and Department of Commerce commissioned the report.

Commission itself [6]. The EGE in his last Executive Summary and Recommendations of Opinion [7] «recommends that the EU institutions in conjunction with member states endeavour to reach common understandings and definitions on key terms» because this bring concrete regulatory implications supporting lawmakers when classify and regulate new technologies.

The implications about definitions are very important, because we need to to emphasize that from a juridical point of view we do not have a definition for new technologies even if, in different cases, some Internationals Courts or some legislators considered this aspect. Also the European Court of Human Rights faced the question in different cases [8] but never gave a definition. The same problem exists in the European Charter of Fundamental Rights, whose preamble recognises the presence of such problems [9] and the Charter regulates some fields concerning new technologies, but without a parameter helpful to determine what are such new technologies and which are the application field of that regulation.

Beyond new technology concept there is an additional idea both in scientific and juridical field represented by "Converging technology". The European Commission in 2004 established a workgroup to study the potential and the risks of this technologies, that represents situations in which different scientific areas interacts to facilitating a common development, with the task to elaborate a document in order to help the Commission and member States to understand potential, risk and opportunities of these kind of technologies.

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[6] The EGE was set up in 1991, following a communication from the EU Commission to the European Parliament and Council titled «Promoting the competitive environment for industrial activities based on biotechnology within the Community». The Commission emphasized the need for ethical discussions on the development of biotechnology, thus the need for an ethics body was felt, *http://erawatch.jrc.ec.europa.eu*.

[7] European Group on Ethics in science and New technologies, Opinion on the ethical implications of new health technologies and citizen participation, 2015, *https://ec.europa.eu/research/ege/pdf/opinion-29_ege_executive-summary-recommendations.pdf#view=fitc&pagemode=none*.

[8] *S. and Marper v. United Kingdom*, Grand Chamber, 4 December 2008.

[9] European Charter of Fundamental Rights «it is necessary to strengthen the protection of fundamental rights in the light of changes in society, social progress and scientific and technological developments».

The document elaborated by this workgroup[10] does not have a juridical value, but it is useful to understand what Converging technologies are. At present the document define these technologies as «enabling technologies and knowledge systems that enable each other in the pursuit of a common goal»[11]. The document, in its conclusion, sets sixteen recommendations but does not faces the juridical aspect, leaving an important gap.

The absence of a specific legal definitions related to these aspects brings with him various problems, because in spite of the pervasive importance of new technologies and converging technologies, the applicable law does not permit an adequate definition of these fields and it may not be able to protect enough the fundamental rights in contrast with these ones. According to this, the absence of a regulation could create an unresolved contrast among different constitutionally guaranteed rights such as heath right, research right, property right and many others.

2. — *Fundamental research and research damage.*

In the next step we have to defining the area of this study. First of all, scientific research follows a clear structural process defined scientific method. The scientific method is the set of factors necessary for investigating an event, acquiring new knowledge, or to correct and integrate existent knowledge. The communication from the Commission on the Precautionary principle mentions five characteristics of the scientific method: the variable chosen, the measurements made, the samples drawn, the models used and the causal relationship employed[12]. Therefore, scientific research and scientific method are indissolubly bonded.

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[10] CORDIS - The opportunities and challenges of converging technologies, *http://cordis.europa.eu/news/rcn/24628_en.html*, 2004, last access January 2016.

[11] CORDIS - The opportunities and challenges of converging technologies, *http://cordis.europa.eu/news/rcn/24628_en.html*, 2004, last access January 2016.

[12] Communication from the Commission on the Precautionary principle, *http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52000DC0001&from=EN*, last access January 2016.

Scientific research belongs either to natural sciences than humanistic sciences, but it is not a single field and can be divided in different phases, as explained in EU Commission communication 2006/C 323/01 , and more recently in the Commission Regulation (EU) No 651/2014, in which the Commission gave definition for aid for research and development and innovation[13] at art. 2.83 et seq. in which are identified the following categories: fundamental research, which is related to experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any direct practical application or use in view. Industrial research, which is related to the planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of components of complex systems, which is necessary for the industrial research, notably for generic technology validation, to the exclusion of prototypes as covered by point. Experimental development, which is referred to the acquiring, combining, shaping and using of existing scientific, technological, business and other relevant knowledge and skills for the purpose of producing plans and arrangements or designs for new, altered or improved products, processes or services. These may also include, for example, other activities aiming at the conceptual definition, planning and documentation of new products, processes and services. The activities may comprise producing drafts, drawings, plans and other documentation, provided that they are not intended for commercial use[14].

This is an important statement because allow us to distinguish two steps, the first one which includes the fundamental research and the second one which includes all the other following steps. Indeed, these ones are oriented to the creation of projects and prototypes and every kinds of damage could be reconnected with the product liability.

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[13] Commission Regulation (EU) No 651/2014 of 17 June 2014.

[14] European Commission, Community framework for state aid for research and development and innovation 2006/C 323/1, art. 2.2 and Commission Regulation (EU) No 651/2014, art. 2.83 et seq.

The definition of fundamental research considers «experimental or theoretical works undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any direct practical application or use in view»[15], structured it in three phases. In the first one scientists develop hypotheses and ideas, in the second one these ideas are studied and at a later stage actualized in a theory, that is tested in the third one. As example of this kind of research it is useful to consider the aspect of the medical research, related not only to human illness but also to plant health, which is a priority for the European Union[16].

After this exposition it is possible to delimitate the area useful to understand which of these fields could cause a "research damage", that is the damage provoked by a scientific experiment or scientific research.

First of all, it is important to delimit the area of research damage. The first and the second phases previously explained, are not able to cause direct damage to goods or people because they are only theoretical, whereas the third phase in which all these theories are tested could be dangerous, because it may involve material or procedures able to interact with people and goods. From a juridical point of view This phase can not belong to the product damage field, because the Council Directive 85/374/EEC, which establish that when a defective product causes damage to a consumer the producer may be accountable for the damage, decree that «product means all movables, with the exception of primary agricultural products and game, even though incorporated into another movable or into an immovable. Primary agricultural products mean the products of the soil, of stock-farming and of fisheries, excluding products which have undergone initial processing. Product includes electricity»[17]. In this way we can't consider the results of a theoretical experiment as a product, and this is confirmed by the

[15] European Commission, Community framework for state aid for research and development and innovation 2006/C 323/1, art. 2.2 (e) and Commission Regulation (EU) No 651/2014, art. 2.84.

[16] Risks to plant health: European Union priorities for tackling emerging plant pests and diseases: EASAC policy Report 24, February 2014.

[17] Council Directive 85/374/EEC, art. 2.

sentence «which have undergone initial processing», because in that step the theory do not have reached the initial processing phase yet.

According to this, there is a gap between the protection guaranteed by the product liability legislation and the moment when effectively the damage could be caused. If this gap in the past was less important and wide in comparison with the present, nowadays the situation has changed. The development of the scientific research, the converging technologies and the scientific uncertainty make necessary to fill this gap. But the product liability is not useful to fill the gap because all the scientific advancement do not belong to the product field. For this reason, it is possible to hypothesize a different branch able to include all the different situations involving eventually damages caused by the scientific research.

3. — *Research damage as an autonomous specific case.*

Even if the research damage could not belong to the product liability it could be connected with civil liability, and specifically, in the Italian judicial system, under the provision of art. 2043 of the Civil Code. This article entitled «Compensation for unlawful acts», reads: «Qualunque fatto doloso o colposo, che cagiona ad altri un danno ingiusto, obbliga colui che ha commesso il fatto a risarcire il danno»[18]. From a juridical point of view fundamental elements are individuated in the intentional or negligent act, the unjustified injury, the guilt and the causal connection. Therefore, the question is focused on these elements connected with the research damage.

From a comparative point of view it is interesting to highlight how also the French Civil Code provide a similar provision at the article 1382: «Tout fait quelconque de l'homme, qui cause à autrui un dommage, oblige celui par la faute duquel il est arrivé à le réparer»[19].

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[18] Italian Civil Code, art. 2043: Any intentional or negligent act that causes an unjustified injury to another obliges the person who has committed the act to pay damages.

[19] French Civil Code, art, 1382: Any act of man, which causes damage to another obliges the person by whose fault it happened to repair it.

Before to proceed to the analyses of connections, the main question concerns the necessity to understand if potential dangers related to scientific uncertainty or converging technology are able to provoke material damages, and if these damages can be included in a specific kind of liability. Related to this in the website of the European Research Council, it is explained that «research at and beyond the frontiers of understanding is an intrinsically risky venture, progressing in new and the most exiting research areas and is characterised by the absence of disciplinary boundaries»[20]. According to this, this study have to investigate the phase in which science and technology may have this risky characteristics and become able to damage people or goods.

To find this characteristics it is important to delineate a timeframe in which focusing the research. Approximately it is possible defining this lapse of time since first years of nineteen century. In this period, in fact, science has had a remarkable development and has acquired the same profile that is possible to find nowadays. Limiting our research to this temporal line allow us to find a great number of cases useful for our purpose. It was possible to find more than two hundred cases related to our research[21], in which only those that occurred in the last forty years have had a juridical consequence . The largest number of research damages occurred in laboratory, but we have to exclude scholastic laboratories because in this cases we do not have a research damage, in fact there was not conducting any research in these cases but only scientific demonstrations. All other cases could be inserted in different groups: the first group is composed by researchers damaged by researches, the second one is composed by employees non researchers damaged by researchers, the third is composed by third parties damaged by researchers and the fourth is related to the environmental damage caused by researchers.

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[20] *Https://erc.europa.eu/glossary/term/267*, last access January 2016.

[21] The high number of cases were found thanks to the statistic work done by the Laboratory Safety Institute and thanks to the report in different law journal and particularly *Diritto penale e processo*, *Corriere merito*, *Social science research network*, *Rivista italiana di diritto e procedura penale*, *Danno e responsabilità*, *Quaderni della rivista trimestrale di diritto e procedura civile*, *Acedemia.edu*. Moreover some newspaper simplified the research.

The Lab Safety Institute elaborated a list of deadly accidents occurred in laboratories[22]. That list complemented with other accidents and juridical cases is useful to support our thesis. For example, it is possible to mention some cases. In the first group, which concerns damage toward researchers, it is suitable to cite Marie Skłodowska, known as Marie Curie, who died in 1934 in France, due to an aplastic anaemia contracted because of an exposure to radiation, her field of research. At that time, it was not known the radio's radiation effect, so there was no juridical action. One other case is about the dead of a researcher of Stanford Research Institute and the injury of other two during an experiment related to cold fusion in 1992 in the United States of America, due to an explosion.

For the second group, connected to damages at employees in research centres, it is possible to mention Clarence Madison Dally, a worker in the Edison Lab, who was the first man to die due an x-ray exposition in 1904 in the United States of America, during the development of the fluoroscope[23]. One other case concern the recourse promoted by some French atomic tests veterans about the charge of «collective negligence, involuntary homicide and more» filed on November 2003[24]. No one court has scheduled that lawsuit yet.

The third and more interesting group is related to injuries caused to third parties, as occurred to Janet Parker, a photographer exposed to a deadly smallpox virus at Birmingham University Medical School. Due to this exposition miss Parker died in 1978. The Health and Safety Executive[25] observed a security breach and, subsequently to an appeal advertised by

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[22] The lab safety memorial wall, Laboratory Safety Institute (LSI) An International Educational Centre for Safety in Science and Science Education, *http://www.labsafetyinstitute.org/MemorialWall.html*, Natick (MA), 2014, last access September 2015.

[23] Due to this fact Thomas Alva Edison interrupted the studies concerning radio.

[24] The scientist magazine, *http://www.the-scientist.com/?articles.view/articleNo/23196/title/French-atomic-lawsuit/*, Clare Kittredge, 3 December 2004, last access August 2015.

[25] A non-departmental public body of the United Kingdom responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare, and for research into occupational risks in England, Wales and Scotland.

Trade Union Association of Scientific, Technical and Managerial Staff, Janet's husband was refunded for suffered damage. This case is very interesting also because, *mutatis mutandis*, it is quite similar to the problem related to Xylella fastidiosa in Puglia. The second case concerns an accident happened at Cryo Cell, a steam cell bank located in Florida, where in 2003 cryogenic containers were subjected to an accident able to endanger the cells storage. In this case the damage could have been related to a goods owned by people but linked to a fundamental right such as health.

For the fourth group it is sufficient to mention the environmental damage caused by INFN Gran Sasso laboratory in Italy due to an accidental leak of oil pseudocumene boxerino in a phreatic aquifer. Because of this the President of L'Aquila district threatened a civil lawsuit, but at the end there was not any trial.

These examples are only a little part of the damages occurring every year in research field and show the existence of an elevated number of hypothesis related to research damage, caused by negligence, lack of skill, malpractice, damage unpredictable or misfortune. Some of these cases may be connect with scientific uncertainty because at the time in which the research was underway they were technological unknown. Furthermore, data collected explain how the research damage is not delimited to one or few countries, but there are damages in different part of the world both in developing countries and in developed countries, irrespective of scientific level. It is possible to note that the scientific development increased the damage frequency and this is supported by the data shows in the LSI Memorial wall[26]. The study of the frontier of science became pervasive and this development, connected with the spread of the knowledge, in same cases can cause damages with juridical relevance.

These data prove the theory concerning the potential damage that could be provoked by research. Now it is necessary to understand if it is possible to apply civil liability elements to the research damage. The first element concerns the act, a non-standard legal provision, in Italy, that includes every

[26] *Http://www.labsafetyinstitute.org/MemorialWall.html*, last access September 2015.

single act. It is really important to maintain the legal provision in a non-standard area, differently by common law or German provision, because in this way every single act attributable to the research damage could be cover by the rule. This is fundamental because research involving scientific uncertainty, new and converging technology is unpredictable and the aim of this work is to guarantee a legal cover to people, goods or the environment anyway damaged by the research.

The second element concerns the unjustified injury, related to the comparison of opposed interests. A damage is unjustified when it is *non iure*, in other words it is a damage caused by a misconduct unjustified by the juridical system, and *contra ius*, therefore harmful for an interest judged by the system deserving of protection. Concerning the *contra ius* area, if the research damage involves an interest deserving protection it may belong to the provision. Concerning the *non iure* element, the situation needs more evaluation.

The problem concerns if the research area may belong to the unjustified injury or, if the scientists' behaviour during their scientific work is always licit, to the civil liability for lawful act. The solution to this question could be find applying to the research damage civil liability in every case in which the behaviour is *non iure* and *contra ius* and by the application of the civil liability for lawful act, which could be applied reasonably by analogy as decided by Italian Constitutional Court[27], when the behaviour is not *non iure*.

The third element is represented by the guilt. Nowadays the guilt related to civil liability concerns principally intentional and unintentional acts, but some specific case considers other kind of guilt, as strict liability. Intentional act does not create any problem to be used in research damage category. Unintentional act could be performed with different behaviours, by negligence, imprudence or malpractice[28], damage unpredictable, misfortune or caused by non-compliance of the law. Therefore, the potential

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[27] Italian Constitutional Court, judgement June the 22th 1990, n. 307, and, judgement April the 26th 2012, n. 107.

[28] Italian Penal Code, art. 43.

damage provoked by research may belong to each of these cases because any scientists could perform a damaging act without necessary caution, prudence or practice or respecting the law. Strict liability concerns a kind of liability related to an unpredictable damage, but in the Italian judicial system it is limited to some specific case. Nevertheless, this kind of liability could better fit to our purpose, because the behaviours related to frontier research could be dangerous also if there is no negligence, imprudence, malpractice, damage unpredictable or non-compliance of the law. In these cases the only element useful to evaluate the presence of the liability is the casual connection.

This one represent the last element that is the mainly complicated aspect for many reasons. First of all, the concept of casual connection, borrowed from the Italian penal code, in the civil field has a different meaning compared to the one postulate by the penal law[29]. Endorsing this idea, the main problem is represented by the lack of scientific certainty, in fact the end of deterministic science produced a gap due to the impossibility to determine for certain when a specific act produces a determined consequence. This gap is wider in new and converging technology fields, in fact, especially in this field, often the consequences of the research are not clear and in others cases the research involve dangerous activities and there are specific protocols in order to avoiding damages to goods or people.

4. — *An illustrative case: Xylella fastidiosa.*

The Italian jurisprudence faced the proposed questions in different situations concerning the link between science and right as showed in L'Aquila earthquake trial[30]. At the same time other European Courts faced

[29] Corte di Cassazione, judgement 16th October 2007, n. 21619 e Corte di Cassazione, judgement 11th January 2008, n. 581.

[30] L'Aquila Court, judgement October the 22th 2012, n. 380, L'Aquila Court of Appeal, judgment 10th November 2014, n. 3317.

additional questions like the action against CERN's LHC[31] activation[32].

In the time during this paper has been written there is a lawsuit concerning the question of xylella fastidiosa, in which «nine scientists are being investigated for a possible role in enabling an outbreak of a disease that is ravaging olive groves in Puglia, Italy» [33]. The outbreak is caused by the bacterium Xylella fastidiosa, a bacteria endemic in parts of the Americas, like Costa Rica, Brazil and California, but it had not been seen in Europe until 2013, when it was identified in southern Italy.

Under European Union rules, Italy carried out a scientifically based containment plan to stop the disease that involves destroying healthy trees to create buffer zones, but farmers and environmental activists protested against its implementation. Individual court rulings have found in their favour, stopping tree felling and the spraying of insecticide on their land.

On December the European Commission opened an infringement procedure over Italy's failure to carry out containment measures quickly enough.

Prosecutors had confiscated computers and documents from scientific institutes they say that the deadly Xylella strain may have been imported for a training workshop at the Mediterranean Agronomic Institute of Bari in 2010, and may have escaped into the environment from field experiments.

Most scientists who have examined the issue consider it likely that the disease arrived with ornamental plants imported from Costa Rica, which harbour the same strain of Xylella.

This is the situation related to Xylella lawsuit at December 2015 and, even if it is related to a penal case, is will be useful for our purpose allowing

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[31] The Large Hadron Collider is the world's largest and most powerful particle accelerator. It first started up on 10 September 2008, and consists of a 27 kilometre ring of superconducting magnets with a number of accelerating structures to boost the energy of the particles along the way.

[32] Bundesverfassungsgericht (German Supreme Court), judgment February the 18th 2010 BvR 2502/08, Verwaltungsgericht Köln (Cologne Administrative Court), 13 K 5693/08.

[33] Nature.com, Allison Abbot, 21 December 2015, *http://www.nature.com/news/italian-scientists-under-investigation-after-olive-tree-deaths-1.19078*.

us to evaluate the impact of a research damage and the possible refund.

The prosecution hypothesize that the spread of the olive illness follows some conferences in which some Xylella's strains was carried from Holland to Puglia without the necessary supervision[34].

The lawsuit is currently underway but for our purpose it is sufficient considering the elements previously explained.

First of all it is possible to consider the research related to plant illness as basic research, like every medical research, even if it does not involve human health, as previously showed and confirmed by the European Academies Science Advisory Council[35]. In this way we can consider the research on Xylella basic research, fitting our purpose.

Secondly, following the hypothesize of the prosecution, some scientist and researcher did not use necessary precautions during the transport or the manipulation of the bacteria. In this case we can use the liability theory for this specific case. Concerning the first of four elements previously showed, the act, the legal provision includes every single act, which must to be intentional, but this is not the case, or, if unintentional, must have be done without the necessary caution, prudence or practice, or respecting the law, as explained in the third element. Concerning this element behaviours of the researchers could fit some of the requisites and specifically it might have happened with a lack of caution or without respecting the law. The other element is represented by the casual connection, that in our specific case, is related to the bacteria Xilella. In order to fit this element must to be proved that Xilella's strain which is spreading in Puglia is the same and has the same genetic characteristics of the one sent from Holland.

The last element we discuss, which is the second previously listed, is represented by the unjustified injury. Concerning the *contra ius* area, the damage created by the spread of Xylella involves an interest deserving protection, but the *non iure* element necessitates a deeper analysis.

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[34] Procura della Repubblica di Lecce, Preventive urgency sequestration decree, 18th December 2015.

[35] Risks to plant health: European Union priorities for tackling emerging plant pests and diseases: EASAC policy Report 24, February 2014.

The problem concerns if the scientists' behaviour during their scientific work with Xylella is licit. In Italy the older theory considered the injury unjustified only if it was related to absolute rights, but the evolution of the concrete case shows how, during last years, the interpretation of this field was less strict and has been considered inside the unjustified injury also other categories. This new point of view allows us to consider the damage to environment and to economy done by the spread of Xylella bacteria unjustified. Thereby all the four elements exist in our specific case and we can consider the spread of Xylella, if happened without necessary care and precautions and if there will be proved that the strains derived from the ones were used by the scientist, a direct damage of scientific research, and, for this reason, compensable, as happened for the smallpox spread who killed Janet Parker in 1978 [36].

All the light of the above, it is possible to apply existent liability rules, in particular related to art. 2043 of the Italian Civil Code, to some issues created by the researchers, but the protection guaranteed by this liability law could not fit to all the problem related to research liability, in particular in all that cases in which the *non iure* field is not easy to value or in that cases in which the casual connection is not easy to determine, due to the condition of scientific knowledge. Because of this, it is urgent that the legislator, both National and European, faces the question in order to prescribe an adequate normative systems ables to regulate fields that nowadays does not belong to liability area.

5. — *Liability and new technology.*

The question related to Xylella represents a useful starting point in order to build a research liability because involves a particular case of fundamental research which is very wide. Indeed, the hypothesis of research liability could be applied in various fields involving areas as space research, human

[36] *Http://research.omicsgroup.org/index.php/Janet_Parker*, last visit December 2015.

trial, neuroscience, genetic, biotechnology, nanotechnology, information technology, artificial intelligence development, illness research and much more. Considering the damaged part, it was showed that could be victims different subjects as researchers, employees and third parties, but the list of possible damaged includes also the environment and institutions or legal entities which are the owners of damageable goods.

Last years law researchers have considered nanotechnologies fields as a frontier for liability, but they considered it only in product damage field. In this cases someone shown that «non contractual liability is an extensive instrument that has been applied to new technologies»[37], like in mental health field, for example, where the current knowledge relating to the effects of nanomaterials which are able to cross previously impermeable barriers, have created anxieties and fears related to potential future harms due to nanomaterials exposure. Related to this topic it is possible to observe that different countries have chosen different law practices. For example it is possible to consider mental issues due to the anxiety generated by nanomaterials exposure. In France proofs of mental/psychiatric disorder are not required and the damage must be direct and certain to qualify for compensation. In Germany the mental illness must be foreseeable if consequent to an accident and the mental harm must surpass the normal reactions of pain, mourning and sorrow, so anxiety or fear may be considered as an actionable harm only if it is particularly acute. In England Courts decided that a mental/psychiatric illness must be certificated and foreseeable[38].

In spite of these different legislations there is no question about the importance of this topic. According to this, European Commission believed

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[37] C. Micallef-Borg, G. Van Calastre, *Non contractual liability as an instrument for regulating nano and new technology - A through review using national and european union tort law*, Leuven, 2011, p. 16.

[38] C. Micallef-Borg, G. Van Calastre, *Non contractual liability as an instrument for regulating nano and new technology - A through review using national and european union tort law*, Leuven, 2011, p. 16.

necessary to create a regulation for nanotechnologies field[39] considering the importance and the economic investment[40]. Thereby the Commission assigned to the Scientific Committee on Emerging and Newly Identified Health Risks the assignment to study the implications of nanotechnology.

All these analysis consider the problem in the product damage field, but the existence of a potential damage in fundamental research field may allow us to consider an extension of the existing protection to this new area. Nanotechnology, and all other potentially dangerous new and converging technologies, are not hazardous only for the customers but they can be so also for researchers, employees, for the environment and other subjects even before the commercialisation, as previously proved. According to this it could be suitable to extend the protection of the law also in these cases, waiting for a complete regulation of this field by legislators, both European and National. Moreover this may be useful to balance the precautionary principle and the pro action principle without blocking scientific progress.

6. — *The connection between research damage and precautionary principle.*

The importance of scientific research in mass production led governments of different countries to consider the introduction of a principle able to avoid damages connected to technological unknowns. The range of these legislations increased in comparison to their starting point also as consequences of events which shocked the public opinion, like mad cow disease.

Despite the high number of these legislations, there is no single definition of the Precautionary Principle. The most important reference is the Rio Declaration signed in 1992 in which is set that «in order to protect the environment, the precautionary approach shall be widely applied by

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[39] European Commission, research & innovation, *http://ec.europa.eu/research/industrial_technologies/policy_en.html*, last Access August 2015.

[40] Only in the USA in 2005 was about 982 million dollar and the global market for nanomaterials was estimated about 20 billion euro.

States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation»[41]. Without an in-depth-analysis it is important to explain that this principle, which was initially thought only to protect the environment, nowadays spreads his application also in other fields, like health protection, and is able to block any action that is believed too dangerous. In this way the principle is not only able to affect the industrial production, and consequently the product liability, but also the scientific research, as highlighted by European Commission which suggested that «recourse to the precautionary principle presupposes that potentially dangerous effects deriving from a phenomenon, product or process have been identified, and [at the same time] that scientific evaluation does not allow the risk to be determined with sufficient certainty»[42].

This principle in Europe led to stopping some researches, like GMO research[43] even if also the European Commission consider the GMO not dangerous[44], while in other non-European countries the same researches, and the commercialization too, proceed. Indeed, on the one hand scientific research in these fields does not develop within the European Union and on the other hand this situation it is able to create some issues between European Union countries and third parties countries. But the dark side of this principle is represented by the possibility for the research to be blocked any time in which it is possible to identify the presence of a risk for health or environment, but at the same time the existence of this risk is not scientifically proved, because the precautionary principle is based on the absence of data which guarantee the presence of the danger, whereas scientific method

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[41] Rio Declaration of Environment and Development, Principle 15, 1992.

[42] Communication from the Commission on the precautionary principle, 2000, p. 5.

[43] Consiglio di Stato, Sez. III, sentenza 6 febbraio 2015, n. 605, TAR Lazio, sentenza 23 aprile 2014, n. 4410.

[44] Philippe Busquin, European Commissioner for Research between 1999 and 2004 affirmed, after a 15 years research involving more than 400 European research institute, that GMO plant are safer than the traditional ones because more controlled.

needs proves able to confirm the existence of the risk[45]. This could bring to an interruption of the research and a paralysis of the innovation.

In this situation the conflict between the application of the precautionary principle, with the idea of protection behind it, and the freedom of the scientific research could be insoluble with all the problems that this lack of solution can bring with him.

For this reason it is time to think to a different way to resolve this kind of problems. In the paper «Four tests for liability in torts» Guido Calabresi and Alvin Klevorick affirmed that «one of the reasons for the current unhappy state of tort law generally – and of products liability law especially – is that the courts have apparently had an unusual degree of difficulty in explaining the basis of liability. Product defect has never provided an illuminating starting point for analysis, and when it is defined to include design defects, it helps even less. Taken literally, product defect would seem to imply liability for any and all injuries that are causally linked to the product»[46]. In this paper it was suggested to use negligence and strict liability rules to creating a system based to an ex-post test. This "third way" was never considered properly, but it could be useful to have a different point of view even if it was thought for product liability.

Calabresi and Klevorick were the first who faced the problem considering the necessity of a solution. The same necessity exists nowadays in order to guarantee the freedom of research on the one hand and the others fundamental rights on the other hand.

In this context a liability designed for research's damage could be the right way to permit to balance opposed rights maintaining the possibility for governments to using the precautionary principle, but at the same time containing the application of this principle in order to use it only in that situation in which the damage could really be non-refundable or too dangerous and allowing researchers to keep on study in all the other cases.

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[45] I. Lincesso, *Nanotecnologie e principio di precauzione*, in *Danno e responsabilità*, 2010, p. 1095.

[46] G. Calabresi, A. Klevorick, *Four Tests for Liability in Torts*, Faculty Scolarship Series, Yale, 1985, paper 3744.

7. — *Conclusions.*

Nowadays the potential damage that could be provoked by scientific research is not only a theoretical cogitation, but it is absolutely actual as proved by the case of Xylella. Nevertheless it is not only impossible imagine a world without scientific progress, but it is also deeply wrong. In order to face everyday challenges and improve the human impact on the world and the environment, also to guarantee an appropriate lifestyle for future generations, scientific research must go on and develop. The interaction among research and other fundamental rights is deep and the task of the law is to face issues deriving by this connection. Indeed, on one hand the research freedom is important and can not be stopped but on the other hand it is necessary to guarantee an appropriate protection to all other fundamental rights damaged by the research.

It was showed how it was applied the precautionary principle in order to block all the actions, not only involving scientific research, potentially dangerous.

The issues arising from the first approach show that probably this is not the right way to solve the problem. The block of the research, commercial problems, inadequate protection of some rights, uncertainty of law which depends by the governments application of precautionary principle instead to assigning it to a judge[47], decisions made without a scientific method and the existence of different criticism about the principle are only few of problems, affecting this approach.

This means that it is necessary to go beyond the extended use of this principle restricting it only to some situations.

This restriction leads the necessity of a different solution, solution that could be represented by the research liability. For some cases, as the Xilella one, it is possible to use existent rules of civil liability, but in these cases it is possible to prove the existence negligence, lack of skill, malpractice, damage unpredictable or misfortune and the casual connection. In other cases the main problem is represented by the uncertainty of science. About

[47] Italian Health Minister, Decree 22 January 2015, which extend the decree 12 July 2013.

this it is possible to agree with the statement which affirm that «uncertainty avoidance concerns the extent to which members of a country feel threatened by uncertain or unknown situations. It can be argued that strict liability provides a reduction in uncertainty, firstly because of the hard-and-fast rule character of strict liability. This provides more legal certainty about the outcome of a case than fault liability. Secondly, strict liability ensures that compensation is relatively easy to obtain in case a risk materialises. Fault liability traditionally requires balancing the interests of claimant and defendant. The outcome of this balancing act very much depends on the circumstances of the case. Uncertainty-avoiding cultures shun ambiguous situations and fault liability is ambiguity par excellence»[48].

So civil liability, connected with art. 2043 of the Italian Civil Code, could works, but it is mandatory to provide to the juridical system a specific regulation concerning research damage. This because the issues related to the casual connection, but also with the justified or unjustified injury need a specific regulation, that could bring a strict liability regime as for some others specific case[49]. This could be the right solution, capable of solve the temporal question raised by Calabresi and Klevorik [50].

It could be argued that a liability with this strict rule could brings some researchers, in order to avoiding the compensation, to stop their researches. Actually this is only a hypothesis because researchers often work inside a research centre or a research company, and in such cases the law provides that compensation shall be borne by these latters[51].

In conclusion the aim represented by the protection of fundamental rights and by the guarantee of freedom of research could be reached by an appropriate scheme of liability, concerning researcher liability.

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[48] C. Van Dam, *Who is Afraid of Diversity? Cultural Diversity, European Co-operation, and European Tort Law*, in *King's law Journal*, London, 2009, p. 298.

[49] E.G. art. 48, 51, 53 Italian Civil Code.

[50] G. Calabresi, A. Klevorick, *Four Tests for Liability in Torts*, Faculty Scholarship Series, Yale, 1985, paper 3744.

[51] Italian Civil Code, art. 2049, as interpreted by the Italian Corte di Cassazione, sentence 22th October 2004, n. 20588.