Autonomous Intelligent Systems as Creative Agents under the EU framework for Intellectual Property

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Recent advancement in technology in the domain of Autonomous Intelligent Systems (AIS) shall eventually lead to autonomous technology that can perceive, learn, decide and create without any human intervention. Already now there are robots that create better versions of robots and computer programmes that produce other computer programmes. Although the ability to create is a quality that has traditionally been considered a human capacity, the sudden increase in the level of complexity of such systems as well as their learning abilities, shall ultimately render human intervention in the process of creation redundant. This makes the need to address creative agents and the challenges they bring ever more evident. This contribution assesses the output of AIS as Creative Agents and its relation to the EU framework for Intellectual Property.

I. Introduction

Across policy domains, the current EU regulatory framework is more and more challenged by the impending arrival of robotics. These machines are becoming slowly but certainly part of our lives and cultural realization, certainly if the movie industry can be taken as an indicator. Several movies have appeared portraying artificial intelligence that can interact, feel, plan, flirt, create. In *Her (2013)*, which was nominated for an Oscar, the protagonist gets involved with his artificially intelligent operating system; in *Transcendence (2014)*, a human mind is transplanted into a computer resulting in an artificially intelligent system; in *Automata (2014)*, robots can improve their own systems, in *Chappie (2015)*, an artificially intelligent robot has a learning process resembling that of a child and is imprinted by his surroundings; in *Ex Machina (2015)*, the protagonist, Caleb, has to test an artificially intelligent system, AVA, that can joke, flirt and make drawings. It involves the well known Turing Test, designed by the grandfather of computer science Alan Turing that serves to answer the question 'can machines think?'[1], which is tested by determining whether an interrogator can distinguish between a human being and a machine on the basis of their typed answers to the interrogator's questions. Turing's 'imitation game' has become the accepted standard for testing of Artificial Intelligence.[2]

That Artificial Intelligence and robotics are much more than science fiction becomes apparent in the policy documents of the European Commission on sustainable innovation, where the Commission recognizes that Autonomous Intelligent Systems (hereinafter: AIS's) are the next step in the development of a sustainable information society.[3] The development of cognitive systems and robotics is mentioned as one of the most important challenges in Horizon 2020,[4] the in-

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1 Alan Turing, "Computing Machinery and Intelligence", 59 *Mind* (1950) 236, pp. 433-460.

2 James Boyle, "Endowed by their Creator? The Future of Constitutional Personhood", *The Future of the Constitution Series No. 10*, 9 March 2011 (hereinafter: Boyle 2011), at p. 10.

3 The Framework Programme for Research and Innovation', SEC(2011) 1427 & 1428 final, COM(2012) 808 final (Horizon 2020).

4 See the future annex 7 to the Decision, 'Work Programme 2013, Cooperation Theme 3, ICT[…]', ECC(2012), draft available via http://cordis.europa.eu/fp7/ict/programme/challenge2_en.html (hereinafter: Work Programme 2013).

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strument for the Innovation Union that aims to secure the EU's competitive position. The Commission will heavily fund the development of intelligent systems that operate in dynamic, every day surroundings and that reach high levels of autonomy and adaptation:

> *"(t)here is a strong focus on advanced robotic systems, given their potential to underpin the competitiveness of key manufacturing sectors in Europe and a wide range of innovative products and services across the economy (...), whereby the target is to produce 'systems that can operate autonomously in the real world through for example, scene and context understanding, anticipation and reaction/adaptation to changes, manipulation and navigation, as well as symbiotic human-machine relations."*[5]

Nowadays self-learning systems are indeed already gradually becoming part of our social reality. Google has introduced several apps that incorporate self-learning aspects.[6] During its most recent press conference on Google I/O it introduced a self-learning app – Google Photos – that can categorise and sort through its users' photos based on the people and objects photographed, which it learns to recognise. Leading AI scholar Geoff Hinton, announced that Google's computers will have developed "common sense" within a decade.[7] He is working on developing algorithms with the capacity for logic, natural conversation and even flirtation. According to Hinton, there is a plausible path from the current software to a more sophisticated version that would have something approaching human-like capacities for reasoning.

The focus of this contribution lies within the field of autonomous creation, it will illustrate the current state of affairs with several examples, showing the impressive advancement of technological innovation in this domain. Recent developments have actually led to machines that are capable of learning and creating. Creativity is a property that is traditionally reserved as a human value. The advancement in the level of complexity of AIS seems to be making human intervention in the process of creation more and more redundant. This contribution looks into the possible risks that are encountered within the EU framework on Intellectual Property, especially copyright law, that arise once not a human being but an AIS is the creator of artefacts.

As Asaro pointed out, the study of how the law might address such issues lays bare fundamental moral and social questions raised by AIS in robotics, for us to better understand them.[8] Studying questions on creative agents and copyright law will bring to the surface fundamental issues on the foundations of copyright, its fundamental notions and its object of protection. Would it be possible to protect the independent creations of AIS under the current Regulatory EU framework for Intellectual Property even when there is no human authorship? What is the fitness and adaptability of the current framework for these novel creations? Will these artefacts be protected against plagiarism?

In this contribution these questions will be addressed in a multi-dimensional manner. The second section will elaborate on Autonomous Intelligent Systems as Creative Agents and will show some recent developments leading to forms of creation by machines. In the third section the notion of creation as a human value will be explored within the EU Regulatory framework for Intellectual Property (IP) with it's largely harmonized body of Copyright Directives. The legal requirements for copyright protection will be addressed, with a focus on the necessity of human creativity. This legal perspective will then be outlined against some notions on creativity in philosophy and psychology.

Since similar questions on acceptance have arisen upon the introduction of earlier technological innovation within the Intellectual Property framework, this contribution also takes on a historical perspective in the fourth section. This is further discussed in the fifth section that sheds light on the foundations under copyright, as well as on the fundamental rights involved. Assessing all these above factors,

5 Work Programme 2013, at p. 33.

6 Jeroen Kraan:"Google datastofzuiger biedt steeds meer 'briljant griezelige' trucjes" Nu.nl, 29 May 2015, available on the Internet at <http://www.nu.nl/weekend/4057880/googles-datastofzuiger-biedt-steeds-meer-briljant-griezelige-trucjes.html> (last accessed on 14 December 2015).

7 Hannah Devlin, "Google a step closer to developing machines with human-like intelligence", The Guardian, 21 May 2015, available on the Internet at < http://www.theguardian.com/science/2015/may/21/google-a-step-closer-to-developing-machines-with-human-like-intelligence > (last accessed on 14 december 2015).

8 Peter Asaro, "A Body to Kick But Still No Soul to Damn: Legal Perspectives on Robotics", in: Patrick Lin, Keith Abney & George. Baker (eds), *Robot Ethics: The Ethical and Social Implications of Robotics*, (Cambridge: MIT Press, 2012) (hereinafter: Asaro 2012), p. 169.

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some preliminary conclusions can be drawn in the sixth and last section.

II. Autonomous Intelligent Systems as Creative Agents

In order to comprehend the legal issue in front of us, this section sets the stage by pointing out the current already advanced state of affairs of AIS as Creative Agents. It explains the notion of Autonomous Intelligent System and looks into its current abilities as creative agent, whereas also the promising expectations for the future are indicated.

1. Autonomous Intelligent Systems

The notion of Autonomous Intelligent Systems as addressed in this contribution consists of two elements. Firstly: *autonomy*, which is related to the level of control or involvement a human operator has in a system. Autonomy can be considered as the extreme on a spectrum on which the capacity to take decisions by the system is correlated to a proportional diminishing of human involvement.[9] The second element is *intelligence*, or the capacity to think. Intelligence can be described as 'the capacity to adjust one's own behaviour to make it fit new circumstances, which includes the capacity to learn, reason, solve problems, observe and understand language'.[10] Intelligent machines are capable of extracting information from every source, in order to make recommendations based on their own calculation, and to make their own decisions and implement them without being instructed to do so. Artificial Intelligence is currently already capable of carrying out the cognitive tasks that people do easily, like vision, natural language understanding and "real-world reasoning".[11] AIS are intelligent agents that perform these tasks and can interact with each other and with humans. They are capable of understanding such communication and can anticipate and decide based on their previous experience. In the creation of such systems, the software-design will often include 'neural networks'.

The design of these networks is based on the assumption that all human behavior can be explained in terms of parallel activation of – and interaction between – huge amounts of neurons, as takes place in the human brain. The functioning of the brain is simulated by model-neurons that are in connection with each other.[12] The systems learn to execute processes in a way resembling the first learning experiences of a child, through constant repetition and correction. The system functions independently from a database. Its knowledge is acquired through interaction with its surroundings and is represented by the connections between its neurons. Systems, programmed with relatively simple neural networks and equipped with some sensors, can learn how surroundings are composed, and which obstacles are positioned therein. Intelligent machines such as vacuum cleaners and lawn mowing robots are present not just in our every day lives, but can also play a large role in for instance the care of the elderly: a number of companies have explored the idea of humanoid robots as future home-helpers for elderly people. Robear,[13] for instance, is the kindly robot with the face of a bear that is programmed to help lift elderly from their wheelchair into their bed. The Instituto Italiano di Technologia have developed the iCub robot-toddler,[14] as part of the EU project RobotCub, which has subsequently been adopted by 20 other research facilities. iCub has a system that is modelled on the cognitive architecture of the human brain, so it can "think" and learn from the world around it, as an actual toddler would.

9 Natasha McCarthy, "Autonomous Systems: Social, Legal and Ethical Issues" (London: Royal Academy of Engineering 2009), at p. 2; David Calverley, "Imagining a non-biological machine as a legal person",22 *AI &Soc* (2008), at p. 532.

10 Colin Davies, "An evolutionary step in intellectual property rights – Artificial intelligence and intellectual property", 27 *Computer Law & Security Review* (2011), pp. 601 *et sqq.*, at p. 603; Jack Copeland, "What is artificial Intelligence?", May 2000, available on the Internet at <http://www.alanturing.net/turing_archive/pages/Reference%20Articles/What%20is%20AI.html> (last accessed on 14 October 2015). Also: Lawrence Solum, "Legal Personhood for Artificial Intelligences", 70 *North Carolina Law* Review (1992), pp. 1234-1238.

11 Ernest Davies, "The Singularity and the State of the Art in Artificial Intelligence", *Magazine Ubiquity* October 2014, available on the Internet at <https://www.cs.nyu.edu/davise/papers/singularity.pdf> (hereinafter: Davies 2014), p. 1 (last accessed on 14 December 2015).

12 Ray Kurzweil, "The Singularity is Near. When Humans Transcend Biology", New York: Viking 2005 (hereinafter: Kurzweil 2005), p. 35, pp. 127-166.

13 Trevor Mogg "Meet Robear, the Japanese Robot Nurse With the Face of a Bear", 26 February 2015, available on the Internet at: <http://www.digitaltrends.com/cool-tech/riken-robear/#/2> (last accessed on 14 December 2015).

14 Oliver Wainwright "The iCubs are coming! How robots could teach our kids and do our dirty work", The Guardian, 20 May 2015, available on the Internet at: <http://www.theguardian.com/artanddesign/2015/may/20/icub-robots-teach-kids-work-dance-swear-snog> (last accessed on 14 December 2015); see also: <http://www.icub.org/> for more information.

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2. Creative Agents

Since AIS are starting to display more complicated behavior, they are able to produce output that could be perceived as creative. One may for instance wonder whether the iCub might start developing creative capacities. The human maker of an AIS will be able to comprehend the structure of its software and learning algorithms, but he will not be able to direct or predict the reactions and creations of the system. Such machine creativity can exist, of course, only under the scientific assumption that human creation is the result of the interaction between the neurons in our brain.

There are several Creative Agents, each with different levels of sophistication, already at work or being further developed. A recent example is a project from the University of Tokyo. In 2015, two scientists from this University published a paper in which they introduce an algorithm that can reconstruct – or create – an image based on a "Bag-of-Visual-Words", a technique whereby images are dissected into groups of pixels that are given a visual word. [15] Google uses this technique to sort through images. The two scientists turned this process around, constructing images from different words. The algorithm managed to reconstruct images, but was also able to create entirely new images.[16]

One of the most compelling and creative agents at this moment is the program *The Painting Fool,*[17] developed by Simon Colton. The program was developed to challenge our perception of creativity as a human quality.[18] "The goal is to see whether software can be accepted as creative in its own right."[19] During its exhibitions called "You Can't Know my Mind"[20] in 2013 and 2014 the program painted portraits of the guests. The portraits were influenced by the 'mood' the program was in, which in turn was influenced by newspaper articles it had read that day. If the newspaper articles were generally positive, the atmosphere of the painting would be positive (more vibrant colours); if the newspaper articles were negative, the painting would be gloomy. On some occasions, the program was in such a bad mood, it actually refused to paint. The program sets itself a goal at the start, and attempts to achieve that with the painting styles it has. After completing the painting, it self-assesses to see whether it has achieved the goal it set itself. This self-assessment software is called 'Darci'. Based on a database of images labelled by humans, it understands what types of adjectives a new image conveys. It is a neural network model that tries to learn a map from the images to the adjectives, so that it can predict in the future, using new images, whether that image was gloomy or happy. If *The Painting Fool*, using Darci, establishes that it has failed to reach the goal it set itself, it becomes unhappy and will try to redo it and will learn in the future which style is better for a certain look, much like a learning artist.

3. A promising future

The current AIS, however sophisticated and unpredictable their output may sometimes be, in themselves do not yet constitute fully autonomous, general-purpose artificial intelligent Creative Agents since these systems still lack important capabilities such as planning and taking initiatives. Yet, they do not stand alone, and they herald the coming of the 'singularity', the technological lift-off point, in which a combination of scientific and technical breakthroughs will lead to an explosion of self-improving artificial intelligence,[21] representing the nearly vertical phase of exponential growth that occurs when the rate is so extreme that technology seems to be expanding at infinite speed.[22] Along those lines, the development of systems and machines that will be capable of autonomous creation seems to be inevitable.

15 Hiroharu Kato and Tatsuya Harada, "Image Reconstrution from Bag-of-Visual-Words", available on the Internet at <http://arxiv.org/pdf/1505.05190v1.pdf> (hereinafter Kato and Harada 2015) (last accessed on 14 December 2015).

16 *Ibid*, at p. 11.

17 See: <http://www.thepaintingfool.com> (last accessed on 14 December 2015).

18 Simon Colton, '"Creativity Versus the Perception of Creativity in Computational Systems", March 2008, available on the Internet at: <http://www.thepaintingfool.com/papers/colton_aaai08symp.pdf> (hereinafter Colton 2008), (last accessed on 13 October 2015).

19 Kadim Shubber, "Artificial artists: when computers become creative", Wired 7 August 2013, available on the Internet at: <http://www.wired.co.uk/news/archive/2013-08/07/can-computers-be-creative/viewgallery/306906> (last accessed on 14 December 2015).

20 See <http://www.thepaintingfool.com/galleries/you_cant_know_my_mind/> for examples of its work (last accessed on 14 December 2015).

21 Boyle 2011, *supra* note 2, at p. 3.

22 Kurzweil 2005, *supra* note 12, at p. 35. See also p. 35-38, where he lists the technological developments having taken place in 2005 (!) leading him to assume that the singularity is impending.

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III. Copyright and Creativity

Since this contribution aims at analysing the fitness and adaptability of the EU Intellectual Property framework for the protection of autonomous creation, this section outlines the current legal framework regarding copyright protection of works. Copyright is, given its objects of protection, the Intellectual Property regime that is most likely to be suitable for the protection of autonomous creation, more than trade mark or patent law. More specifically, in this section the requirements that need to be met for copyright protection will be addressed.

Most EU copyright laws do not pose any explicit requirements with regard to the quality or the form of the object of their protection, the way in which it was conceived or the entity that created it. Nevertheless, some notions about copyright are generally accepted; for instance a horse or an elephant cannot produce a copyright protected work. These are essential requirements that are not codified in law, but either were developed by the courts or are implicit in the system. It will be shown that there is what can be called an anthropocentric requirement in copyright law.[23]

The main focus will be on the European Court of Justice (CJEU), given the high level of harmonization in this field. Still, as each national court gives its own interpretation to European case law, national concepts of 'work' will deviate. Therefore, some attention is given to national law.

1. Author's own Intellectual Creation

The copyright law concept of what is to be considered a copyrightable 'work' has recently been thoroughly harmonized on a European level. Although various Copyright Directives state no minimum requirements for copyright protection, nevertheless, it was the Court of Justice that established in the *Infopaq*-case that a work must be *the author's own intellectual creation* to qualify for copyright protection.[24] This implicates that it cannot have been copied from earlier works, and that the author was able to make subjective choices during its creation, thus imprinting the work with his '*personal* touch'.[25] The CJEU established furthermore that a work that is solely dictated by its technical function, meaning that it had only been created to achieve a certain technical effect, cannot be copyright protected. The Court states in this respect:

> '*Where the expression of [...] components [of a work] is dictated by their technical function, the criterion of originality is not met, since the different methods of implementing an idea are so limited that the idea and the expression become indissociable.*'[26]

All these criteria indicate, at least implicitly, that some form of *human* authorship is required; before a work can be protected it should be an author's own intellectual creation,[27] whilst including subjective choices during its creation, thus imprinting the work with his 'personal touch'.

The Dutch Supreme Court even explicitly ruled that some form of human involvement is required before a creation can be considered protectable by copyright law. Most recently in the *Endstra Tapes*-case – which did not concern autonomous creation but the protectability of the transcripts of taped conversations – The Dutch Supreme Court ruled that in order to meet the requirements of own personal original character and personal touch of the maker, both human creation and human creative choices are necessary.[28]

In the absence of any specific requirement in European or national law indicating otherwise, no copyright protection is available for those artifacts that are generated by autonomous intelligent systems without a (human) personal touch. Especially in the UK, this does not remain without effect. In harmonizing copyright's object of protection, the CJEU has

23 It was Dutch legal scholar Grosheide that first referred to the requirement of human input as the anthropocentric approach to copyright law: Frederik.Willem Grosheide, *Auteursrecht op maat (diss.)*, (Deventer: Wolters Kluwer, 1986), at p. 219.

24 Case C-5/08, Danske Dagblades Forening [2009] ECR I-06569, at para. 35; Case C-393/09, Bezpecnostní softwarová asociace [2010] ECR 2010 I-13971, para. 45; Case C-403/08 and C-429/08, FA Premier League/Karen Murphy [2011] ECR 2011 I-09083, at para. 97; Case C-145/10, Eva-Maria Painer/Standard Verlags [2011] at para. 94; Case C-604/10, Football Dataco/Yahoo [2012] ECLI:EU:C:2012:115, at para. 38.

25 Case C-145/10, Eva-Maria Painer/Standard Verlags [2011] at para. 92, and Case C-604/10 Football Dataco/Yahoo [2012] at para. 38, both *supra* note 24.

26 Case C-393/09, Bezpecnostní softwarová asociace, *supra* note 24, para 49. See also Case C-403/08 and C-429/08, FA Premier League/Karen Murphy, *supra* note 24, para. 98.

27 See footnote 23.

28 Dutch Supreme Court 30 May 2008, LJN BC2153 (ECLI:NL:HR:2008:BC2153), Endstra Tapes.

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lifted the lower threshold for protection as it traditionally existed in the United Kingdom; a work was protected under the laws of the UK if it was *not copied*. At the end of the 20st century, this traditionally low threshold for copyright protection in the UK, allowing the protection of machine creation, has even resulted in the introduction of a tailor made provision to allocate ownership of creation without human creative intervention in the British Copyright, Designs and Patents Act 1988 (hereinafter: CDPA 1988). In the specific provision on machine creations, protection is arranged for works that are generated by a computer under such circumstances that no human author can be found. The right holder is considered to be the (legal) person who has made the financial investment in the computer and the computer program that has resulted in the production of the work:

> *'In the case of a literary, dramatic, musical or artistic work which is computer-generated, the author shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken.'* [29]

Up until now, this tailor made provision within the CDPA 1988 mainly found application with regard to (autonomously produced) satellite photography for which no human author can be appointed. This is a unique provision within Europe. Given the recent harmonization of the object of protection through the case law of the CJEU, it looks as if this form of protection for machine created works will stay unparalleled, at least in the near future. The CJEU demands the author's own intellectual creation that requires subjective choices and the imprint of the work with a 'personal touch', making attribution of possibly non-existing rights redundant.

2. Creativity as a Human Capacity

As the above shows, and as will also be discussed in more detail in the following, the presumption underlying main stream European copyright law is that creativity is a human characteristic. Not only assessing the level of creativity by looking at the work produced, copyright law also assesses the creator's role in the work of art; *was it the author's own intellectual creation; were subjective choices made and is there a personal touch in the work*? Following this, when the one that is the creator of the work is incapable of *human* creativity, it is most probably not capable of creating copyrightable works. The question is however, whether this legal concept of creativity and creation will be too narrow to be future proof. To find answers to these questions, some psychological and philosophical theories on creativity are considered.

In psychology, there is virtually universal agreement on what is creativity.[30] In particular, creativity is said to be the generation of ideas that fulfil the two following conditions: 1) creativity must be original, in the sense that it is novel, surprising and unexpected. Originality is a necessary but not sufficient criterion for creativity, for creativity must also be 2) adaptive. Someone who decides to make a zeppelin out of concrete can undoubtedly claim originality, but his strange idea cannot fly.[31] Given the general definition of creativity as 'adaptive originality', it is hard to measure creativity as a psychological notion empirically. This is even more difficult because creativity is generally considered to manifest itself in three ways: creativity can be seen as a mental process that yields adaptive and original ideas, it can be seen as a type of 'person' who exhibits creativity, and third, creativity can be analysed in terms of the concrete products that result from the workings of the creative process. If the emphasis is on the process that yields creative ideas, then this can be researched by looking at individual differences in access to these processes. Crucial in this assessment is the number of different ways in which a subject can propose a solution to a problem.[32] If the creative person is central, then the assumption is that this creative individual is different in various personal characteristics; her or his personality possesses characteristics that would most favour the production of numerous and diverse ideas, characteristics that are not present in 'common' people.[33] Finally, one might argue that the ultimate criterion of whether someone can be considered cre-

29 Copyright, Designs and Patents Act 1988, Chapter 48, § 9.3.

30 Dean Simonton, "Scientific talent, training and performance: intellect, personality and genetic endowment", 12 *Review of General Psychology* (2008), p. 28-46.

31 Dean Simonton, "Creativity", in: Shane Lopez and Charles Snyder (eds), *The Oxford Handbook of Positive Psychology*, (Oxford: OUP, 2009), p. 2.

32 Joy Guilford, *The nature of human intelligence*, (New York: McGraw-Hill, 1967); Sarnoff Mednick, "The associative basis of the creative process", 69 *Psychological Review* (1962), at pp. 220-232.

33 Gregory Feist, "A meta-analysis of personality in scientific and artistic creativity", 2 *Personality and Social Psychology Review* (1998), at pp. 290-309.

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ative is whether or not that individual has successfully generated a product that meets both requirements of creative behaviour: originality and adaptiveness.[34]

In philosophy there is broad consensus that creativity is the capacity to produce things that are original and valuable and surprising.[35] Still, certainly not all kinds of actions count as creative: a tree distributes its branches to best make use of light and the resulting canopy "represents the solution of a vital problem and what we experience as beauty of the tree. The tree seems to be acting creatively."[36] But of course, that is not creativity at all, for the tree lacks intention, desires, beliefs; so it cannot be acting creatively, for creativity is not a property of things or plants.[37] The kinds of actions that are creative are the ones that exhibit at least a relevant purpose (in not being purely accidental), some degree of understanding (not using purely mechanical search procedures), a degree of judgement (in how to apply a rule, if a rule is involved), and an evaluative ability directed to the task at hand.

These definitions are closely connected to the mind-body problem in philosophy. The definition described places emphasis on intention, understanding, and rationality as prerequisites for creativity. The mind-body problem, famously addressed by Descartes,[38] poses the question whether our consciousness and our brain should be considered one entity, or whether the matter should be separated from the mind. Descartes argued that there are two kinds of foundation, mental and body. The mental cannot exist outside of the body, and the body cannot think.[39] As indicated, machine creation implies another, monistic, view of the mind body problem. Several philosophical perspectives were developed that reject the dualistic view of the mind-body dichotomy. The fact that it needs an empirically identifiable meeting point between the non-physical mind and its physical extension has proven problematic to dualism. Many modern philosophers of mind maintain that the mind is not something separate from the body.[40] This monistic approach has been taken up in computer science and neurosciences.[41]

In the monistic view of the mind-body problem all behaviour is considered to be a property of brain activity, including creativity. This is also echoed in psychological theory of creativity. The emphasis is more on the result of the creative process, in the different solutions reached, or even purely in the material result of a creative process. The conscious personal touch behind the creation is left out of the equation, thus providing a much more level playing field for computer generated creative artefacts. For, if courts no longer assess the author, but rather the work he created, regardless of the process by which he came by it, the result of machine creativity could be compared to the result of human creativity objectively, without "prejudice". Many computer scientists also advocate this approach, among them the creator of the program The painting Fool mentioned before.[42]

IV. Historical Perspective on Machine Creation

From the philosophical and psychological approach we now turn to the history of law to find answers to the questions raised by machine creation. Each time new products or new methods of exploitation are introduced, the question arises whether the existing IP framework could and, moreover, should provide pro-

34 Shelley Carson, Jordan Peterson and Daniel Higgins, "Reliability, validity, and factor structure of the Creative Achievement Questionaire", 17 *Creativity Research Journal* (2005), at pp. 37-50; Ruth Richards, Dennis Kinney, Maria Benet and Ann Merzel, "Assessing everyday creativity: Characteristics of the Lifetime Creativity Scales and validation with three large samples", 54 *Journal of Personality and Social Psychology* (1988), at pp. 476-485.

35 Berys Gaut, "The Philosophy of Creativity'", 5/12 *Philosophy Compass* (2010), p. 1039.

36 Rudolf Arnheim, "What it means to be creative,"41.1 *British Journal of Aesthetics* (2001), p. 24.

37 Peter Carruthers, *The Architecture of the Mind,* (Oxford: Oxford University Press, 2006).

38 René Descartes, (1641) "Meditations on First Philosophy, in: The Philosophical Writings of René Descartes vol. 2", trans. by John Cottingham, Robert Stoothoff and Dugald Murdoch (Cambridge: Cambridge University Press, 1984), at pp. 1-62.

39 A contemporary defender of this proposition is David Chalmers, who, although he acknowledges that mental states are caused by physical systems, still believes mental states are ontologically distinct from, and not reducible to physical systems, David Chalmers, "Consciousness and its Place in Nature", in: Stephen Stich & Ted Warfield (eds), *Blackwell Guide to Philosophy of Mind* (Malden: Blackwell Publishing, 2003).

40 Bryan S. Turner, *The Body and Society: Explorations in Social Theory* (Los Angeles: Sage Publications, 2008),at p. 78.

41 Kim Jaegwan, "Emergent properties" in Ted Honerich: "Problems in Philosophy of Mind", Oxford companion of Mind (Oxford: Oxford University Press, 1995), at p. 2.

42 Graeme Ritchie, "Some Empirical Criteria for Attributing Creativity to a Computer Program", 17 *Minds & Machines* (2007), at pp. 67-99.

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tection. The current state of the law seems to leave us empty handed with regard to creations of AIS. History can shed some light on the question whether this is likely to be the persistent end result, or whether we can expect law to bend its ways to accommodate the products of this new autonomous technology. The lessons that can be learned from history shall be looked into by pointing to some legal reactions to similar previous technological developments.

This section shows that especially the requirement of human involvement for copyright protection of works has been a disruptive issue for the progressive development of copyright. When newly emerged machines or devices contributed to the creation of artefacts of art, science or literature in some way or another, this gave rise to reflections on the copyright law requirement of human presence in the creation process.

1. Photographs as Creations of the *Camera Obscura*

Objections based on the lack of human creativity have been voiced more than a century ago, when the question of copyright protection for photographic works was considered, at that time a completely novel phenomenon. Early photography gave rise to discussions as to whether there is enough room for human creative input in the partially mechanical creation process of the capturing of light through *camera obscura's* lens.[43] In several countries, copyright protection was not available for photographically produced works, because there were serious doubts about the presence of the human creator in the production process and therefore about the lack of originality of a photograph.

In the first case concerning photography in the United States on the multiplication of a portrait of Oscar Wilde by the lithographical company Burrow-Giles (1884),[44] the defendant argued that a photographically produced portrait cannot be eligible for copyright protection because the picture should be considered a copy of real life without any relevant additional human creative input. After moving along the entire judicial course of proceedings unsuccessfully, plaintiff found the Supreme Court at its side, taking a modern view on copyright. It considered that the common law approach disregards the method of production – be it mechanical or not – in the application of copyright law.[45] With its famous Oscar Wilde decision, acknowledging the creative effort going into taking the photograph, the Supreme Court paved the way for the copyright protection for mechanically produced creations. In those days, on the continent of Europe arguments against copyright protection of (partially) mechanical produced photographs were dominant. The photographer was considered a mechanic, whose job is to merely reproduce the reality before his lens. Even the inventor of photography, Daguerre himself defined his invention as a chemical procedure which allowed nature to reproduce itself. Apparently Daguerre also was of the opinion that the photographer was not contributing human creativity. It was for this absence of human creativity that Germany withheld full copyright protection for photographs until 1965. It was Germany, too, that was behind the rejection of the inclusion of photographic works in the list of copyright protected works in the international copyright treaty, the Berne Convention[46]. According to the German legislature, a photograph was a mere mechanical reproduction of reality, leaving no room for human creative choices.[47]

2. Early Computer-assisted Creation

When computers were introduced into society on a larger scale in the 70's and 80's of the 20th century, some were also used to assist with the creation of works of literature, science and art. The concept of human authorship was again put to discussion. If photographs upon their introduction were considered the result of a mechanical process, computer-assisted works were even more so. Even though these works were still quite rare, the topic gave rise to fierce discussions, both on the Continent of Europe as well as in the United States. The protection of the artefacts that were created with the mere assistance of a

43 Madeleine De Cock Buning, *Auteursrecht en informatietechnologie* (Amsterdam: Cramwinckel, 1998), at pp. 67-100.

44 *Burrow-Giles Lithographic Co./Sarony*, Supreme Court 1884, III US 53, 4 S Ct. 279.

45 *Ibid.*

46 Berne Convention for the protection of Literary and Artistic works, as amended on 1979, WIPO, TRT/BERNE/00.1.

47 Werner Hoenisch, *Fotografisches Urheberrecht und Urhebervertragsrecht* (Zeulenroda in Thüringen: Sporn, 1934), p. 28, as quoted in De Cock Buning 1998, *supra* note 43, at p. 80.

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computer, was generally considered outside the scope of copyright law. It was considered undesirable to grant copyright protection to these works whose creation could not directly be traced back to a human creator. For the US this can be illustrated with a citation from the case *Apple vs. Franklin*:

> "If the concept of "language" means anything, it means an ability to create human interaction. It is the fixed expression of this that the copyright law protects, and only this. To go beyond the bounds of this protection would be ultimately to provide copyright protection to the programs created by a computer to run other computers. With that, we step into the world of Gulliver where horses are human because they speak the language that sounds remarkably like the one humans use."[48]

Gulliver's world gave rise to intensive and moreover rather premature speculation. Technology allowed only for computer-*assisted* works, whilst autonomous creation was only science fiction those days. Also, US academia stuck to the need of both human authorship and ownership but concluded that, in the unlikely circumstance that a computer produced a work that was eligible for copyright protection, the right holder should be either the programmer of the software or a legal entity consisting of the owner of the software and the owner of the computer, or the user of the programme. Some did even state that the computer itself should be considered co-author.[49]

In Germany the first computer-assisted artefacts gave rise to an even more critical debate. Several German scholars stated that copyright protection could only be granted given a certain level of human involvement, and even if that involvement was present, some believed the standard of originality to be met before protection could be grated to be of such a level and degree that copyright protection for computer-assisted works would probably be denied.[50] The originality requirement of *persönliche geistige Schöpfung,* as defined by German Courts[51] even long before the CJEU harmonization in its *Infopaq*-decision, was on its way.[52]

Recognizing the role of the computer as a mere assistant, the UK on the other hand did accept the idea of copyright protection of works created with computers, as becomes apparent from the following statement by the Whitford committee charged with designing the new Copyright and Designs Act:

> "*Copyright works may be, and indeed are, produced with the aid of computers. Examples of this occur in the case of computer-aided design, program compilation and the composition of abstract music. The question which arises is who, or what, is the author of the work produced? Is it the programmer or the owner or the operator of the computer? Or the computer itself possibly?*"[53]

Although the copyright protection of such works was generally accepted, there was some discussion on who the right holder should be. As indicated sub III.1, it was the British Parliament that decided that - having satellite photography in mind - should such works have no human author, the right owner shall be taken to be the person by whom the arrangements necessary for the creation of the work are undertaken.[54]

In those days, the international legislatures also gave thought to the matter. The commission charged with debating copyright protection of computer-assisted works under the Berne Convention concluded to grant copyright to the author who had used the computer as a tool.[55] A second commission discussed the possibility of copyright protection for automatically produced music. Twice draft articles were suggested inspired by the British example, and twice it was concluded that further studies would be necessary before the BC could be adapted to accommodate such works. On the European level, the Commission's original proposal for the Software Directive[56] con-

48 Apple Computer, Inc. v. Franklin Computer Corp. 714 F.2d 1240 (3d Cir. 1983), as quoted in Madeleine e Cock Buning 1998, *supra* note 43, at p. 183.

49 Timothy. Butler, "Can a Computer be an Author? Copyright Aspects of Artificial Intelligence", 4 *Comm/Ent* (1982), at pp. 707-747; Dan Rosen, "A Common Law for the Ages of Intellectual Property", 38 *U. Miami Law Review* (1984), at pp. 769-828; Pamela Samuelson, "Allocating Ownership Rights in Computer-Generated Works", *University of Pittsburg Law review* (1986), at pp. 1185-1225.

50 Rau, G., *Antikunst und Urheberrecht, Überlegungen zum urheberrechtlichen Werkbegriff* (Berlin: Schweitzer, 1978), p. 63.

51 E.g. Case *Inkassoprogramm*, BGH, 9 May 1985, I ZR 52/83.

52 Case C-5/08, Infopaq, *supra* note 25 , at para. 35.

53 Report of the Committee to consider the Law on Copyright and Designs 1977, HMSO (Cmnd 6732), p. 132, as quoted in De Cock Buning 1998, *supra* note 43, p. 197.

54 Copyright, Designs and Patents Act 1988, art. 9.3.

55 Working Group on Copyright Problems Arising from the Use of Computers, Geneva 1979, Copyright Quartely Review 1979/3, p. 9.

56 Proposal for a Council Directive on the legal protection of computer programs, COM (88) 816 final.

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tained a provision granting copyright protection to computer-generated software, but the provision requires that:

> "*Although (...) the human input as regards the creation of machine-generated Programs may be relatively modest, and will be increasingly modest in the future [...] nevertheless, a human 'author' in the widest sense is always present, and must have the right to claim authorship in the program.*"[57]

The (legal) person responsible for the generation of the work would be right holder according to this draft.[58] However, these provisions did not make it to the final Directive, because the European Commission decided that technology was still too underdeveloped.[59]

3. Back to the Future

As becomes apparent from the above, even when actual autonomous creation was still far away, it has inspired strong debates about the requirement of human creatorship in copyright law. It was shown that the requirement of human involvement for copyright protection of works has been a divisive issue for copyright before. The analogue example of photography shows that the reactions of legislatures and academia are at first reluctant; then, as the exploitation of the new technology increases, becomes more accepting.

History shows us that in the end, when the use of the new technology is widespread, the protection of such works is normalised. Photography has emancipated to a full work of authorship. The legal framework is adapted to accommodate the corresponding need for protection. The same is true for e.g. software, semiconductors (computer chips) and databases that became economically very relevant a few decades ago and were accommodated accordingly. The European framework now includes Semiconductor-[60], Software[61]-, and Database[62] Directives, which all have been enacted as a response to the emergence of new technological innovations.

V. Legal Traditions and Fundamental Rights

In order to comprehend the perceived differences in approach towards machine creation, this section illuminates the civil and common law traditions in copyright, thereby shedding light on the underlying premises and making the ground fertile for possible solutions. This section will further address the fundamental rights aspects that are obviously involved in the domain of intellectual property and freedom of information and that need to be taken into account under all circumstances and in every solution.

1. Foundations of Copyright

As we have seen, the anthropocentric tendency is more dominant in European continental copyright law than in the civil law tradition. Continental copyright law displayed a conservative approach with regard to both photographic works and computer-assisted works. Protection is considered undesirable when human intervention is not immediately clear. A strong emphasis is traditionally put on the human maker. This can partially be explained by the foundation under continental copyright; the fairness of compensation and acknowledgement of the author as the almost divine creator of works of art, science and literature. Most relevant is therefore the author's personal touch. It is this tradition that also formed the basis of the Berne Convention initiated by a group of European authors led by Victor Hugo as early as 1886.[63] This largely explains the dominance of the anthropocentric view on copyright and makes protection of works that show no, or hardly any, human influence generally impossible.[64]

57 Ibid., Art. 1 (4).

58 Ibid., Art. 2 (5): In respect of programs which are generated by the use of a computer program, the natural or legal person who causes the generation of the subsequent program shall be entitled to exercise all rights in respect of the program, unless otherwise provided by the contract.

59 Directive on the legal protection of computer programs, May 14, 1991, Pb EG 1991 L 122; R. J. Hart, *Computer-generated Works in the UK, EC Directive & the Proposed Protocol to the Berne Convention* (Tokyo: Softic 1991), p. 9.

60 Council Directive 87/54/EEC on the legal protection of topographies of semiconductor products, OJ 1987 L 24/36.

61 Council Directive 91/250/EEC on the legal protection of computer programs, OJ 1991 L 122/42.

62 Directive 96/9/EC of the European Parliament and the Council on the legal protection of databases, OJ 1996 L 77/20.

63 Samuel Ricketson and Jane Ginsberg, International Copyright and Neighbouring rights; the Berne Convention and Beyond (Oxford: Oxford University Press, 2006), Part I.

64 Frederik Grosheide, *Auteursrecht op maat* (Deventer: Kluwer, 1986), at p. 291.

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The US remained outside the Berne Convention for more than 100 years. The Anglo-American copyright law traditionally has a more pragmatic approach with regard to authorship, since it is vested in the US Constitution as an incentive for creation and innovation.[65] Copyright law is considered an exception to free competition and seeks to stimulate the production of valuable products. It puts less emphasis on the protection of the creator/author and more on the furthering of production of works that have value for society. As a result, in the United States – like in the United Kingdom – the resistance against protection of (partial) machine creation is traditionally less fierce.

It is, however, the continental approach that is dominant in the case law of the CJEU as was demonstrated in its *Infopaq*-case, in which it established the concept of 'author's own intellectual creation' (see section 3.1) as a criterion for protection. Given the standard of harmonization of European copyright law, this is and will be the leading approach towards copyright in all Member States of the European Union, including the UK, leaving little or no room for the protection of the output of AIS as Creative Agents.

2. Balancing Fundamental Rights

Let us now look into the partially connected issue of fundamental rights. Intellectual property rights, including copyright, have officially been considered fundamental rights since the coming into force of the European Charter of Fundamental rights (hereinafter: EChFR). It states in its 17th article that intellectual property shall be protected in those countries where the Charter applies.[6667] The provisions of the EChFR apply to every issue covered by primary or secondary Union law, be it at the Union level or the Member State level.[68] This means that whenever national legislation falls within the scope of Union law, the Member State must apply and adhere to the Charter. Since the national Intellectual Property law regimes have largely been harmonised by European Directives, the provisions of the Charter must be complied with in Intellectual Property law cases. Most exemplary is the *Promusicae*-case in which the CJEU demonstrates that it considers intellectual property as a fundamental right to be weighed against other fundamental rights[69] such as the freedom of information as laid down in article 11 of the EChFR and article 10 of the European Convention of Human Rights (ECHR). The CJEU as well as the European Court of Human Rights (ECtHR) have established this clearly in their case law.[70]

What does this all imply for the protection of artefacts created by AIS? Let us look at the different scenarios. Should such an artefact not be protected by copyright law, or any other intellectual property law, it will generally fall within the public domain and will be free to use by anyone. Since the fundamental right of intellectual property falls outside the equation here, the freedom of information as vested in article 10 ECHR and article 11 of the EChHR will automatically prevail giving consumer the right to re-use the artefacts in all ways they find appropriate. This could be the final state of affairs; autonomous creation for the benefit of all.

The circumstances may change however, should augmented economic relevance of these creations in due time offer an incentive to bring AIS creations within the domain of Intellectual Property. Two possible options are conceivable for such an inclusion. The first option is that the CJEU lowers the threshold of protection towards the common law level, thus shifting its paradigm and letting go of the anthropocentric requirement towards a more economic and incentive oriented copyright as we know it in the US. The second and more likely option is the introduc-

65 Article I, Section 8, Clause 8 of the United States Constitution, known as the Copyright Clause, empowers the United States Congress: To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.

66 Charter of Fundamental Rights of the European Union (EChFR), 2000/C, 364/01, available on the Internet at: <http://www.europarl.europa.eu/charter/pdf/text_en.pdf> (last accessed on 13 October-2015).

67 Ansgar Ohly, "European Fundamental Rights and Intellectual Property", in: Justine Pila & Angsar Ohly (eds), *The Europeanization of Intellectual Property Law: Towards a European Legal Methodology*, (Oxford: Oxford University Press 2013) (hereinafter: Ohly 2013), p. 151.

68 EChFR, Article 51. (2000/C 364/01) See also Case C-279/09, DEB Deutsche Energiehandels- und Beratungsgesellschaft [2010] ECR 2010 I-13849; and Cases C-483/09 and C-1/10, Gueye and Sanchez [2011] ECR 2011 I-08263, both discussed in A. Pahladsingh & H.J.Th.M. van Roosmalen, 'Het Handvest van de grondrechten van de Europese Unie twee jaar juridisch bindend: rechtspraak in beweging?", *NtEr* February 2012, no. 2, pp. 56-65; Ohly 2013, *supra* note 67, at p. 153.

69 Case C-275/06, Promusicae [2008] ECR 2008 I-00271.

70 Case C-70/10, Scarlett Sabam [2011] ECR 2011 I-11959; Case C-314/12, UPC Telekabel Wien [2014] ECLI:EU:C:2014:192; ECtHR, Ashby Donald/France, case 36769/08 [2013]

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tion of a *sui generis* right for the protection of computer-generated works outside the copyright framework, as we have seen with the introduction of, for instance, the Chips Directive and the Database Directive.[71] The latter option would have the advantage that it would leave room for the attribution of rights that is most suitable. The beneficiary could for instance be the legal entity that made the investment in the system, such as is the case with Databases,[72] or the legal entity to be established to represent the acts in law of the AIS.[73]

For either option, it is upon the CJEU to decide whether the output of AIS can be considered to be an Intellectual Property right as defined in the EChFR. One should realize that the acceptance of Creative Agents as holders of fundamental rights is a smaller step to take than one might think. After all, ownership of rights of Intellectual Property is not exclusively granted to natural persons; right ownership can very well rest with collectives as legal entities;[74] and the anthropocentric requirement only plays a role in deciding whether a work is eligible for copyright protection, not in the attribution of rights. Should the CJEU decide that AIS output can be considered Intellectual Property of the (legal entity of) AIS within the framework of the EChFR, the CJEU will be required to equally balance the right of intellectual property and the freedom of information. Should it, on the other hand, decide that the output of the AIS falls outside the scope of intellectual Property as defined in EChFR, courts will still need to investigate whether the enforcement of the right can be considered to fall inside the scope of article 10 ECHR, leaving room for the fair balancing of public and private considerations.[75]

VI. Conclusions

Advancing technology in the field of Autonomous Intelligent Systems (AIS) is more and more leading to computer programs and systems that are capable of learning and creating. The question that was posed in this contribution was whether it would be possible to protect the independent creations of AIS as Creative Agents under the current Regulatory EU framework for Intellectual Property.

We have seen that this has proven to be more than a substantial challenge. Already the protection for works as produced by *The Painting Fool* - where indeed still some form of human authorship can be acknowledged in its programmer - seems questionable since the Court of Justice has recently decided that a work must be *the author's own intellectual creation* to qualify for copyright protection within the EU.[76] This implicates that the author was able to make subjective choices during the creation of the work, thus imprinting the work with his '*personal* touch'.[77] As was demonstrated, this is the result of the highly dominant anthropocentric requirement implicitly present in European continental copyright law. Historically this has more than once led to the rejection of the protection of works that were created with *the aid of* a machine, as we saw with the introduction of photography, and the first discussion on copyright protection for computer-assisted works. Partially due to a lack of understanding of the technology used for the creation of works, the anthropocentric requirement was staged to impede protection, especially in the continental copyright law tradition that emphasises the rights of the author as a human maker.

In this age, however, we seem to be heading towards truly autonomous creations. This raises fun-

71 Directive 96/9/EC on the legal protection of databases, *supra* note 63; Council Directive 87/54/EEC on the legal protection of topographies of semiconductor products, *supra* note 60.

72 Directive 96/9/EC, *supra* note 62, article 4.

73 See on the topic e.g. Calverley, "Imagining a non-biological machine as a legal person", *supra* note 10, p. 525; Lawrence Solum, "Legal Personhood for Artificial Intelligence", *Illinois Public Law and Theory Research Papers No. 09-13*, at p. 1238.

74 European Parliament and Council Directive 2009/24/EC on the legal protection of computer programs, OJ 2009 L 111/16, Article 2.

75 Article 10 – Freedom of expression 1. Everyone has the right to freedom of expression. This right shall include freedom to hold opinions and to receive and impart information and ideas without interference by public authority and regardless of frontiers. This article shall not prevent States from requiring the licensing of broadcasting, television or cinema enterprises. 2. The exercise of these freedoms, since it carries with it duties and responsibilities, may be subject to such formalities, conditions, restrictions or penalties as are prescribed by law and are necessary in a democratic society, in the interests of national security, territorial integrity or public safety, for the prevention of disorder or crime, for the protection of health or morals, for the protection of the reputation or rights of others, for preventing the disclosure of information received in confidence, or for maintaining the authority and impartiality of the judiciary.

76 Case C-5/08, Infopaq/Danske Dagblades Forening [2009], at para. 35; Case, C-393/09, Bezpecnostní softwarová asociace [2010], para. 45; Case C-403/08 and C-429/08, FA Premier League/Karen Murphy [2011], at para. 97; Case C-145/10 Eva-Maria Painer/Standard Verlags [2011] at para. 94; Case C-604/10 Football Dataco/Yahoo [2012], at para. 38, all *supra* note 24.

77 Case C-145/10, Eva-Maria Painer/Standard Verlags [2011] at para. 92, and Case, C-604/10 Football Dataco/Yahoo! [2012], at para. 38, both *supra* note 24.

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damental questions on the protectability of these works. Without taking action autonomous creation will fall inside the public domain. Without any form of intellectual property protection these works can be used, reproduced, changed and distributed to the benefit of all. One can argue in favour of this option where AIS creation is a positive consequence of Artificial Intelligence to the benefit of society as a whole. This can be justified in the light of the foundations of both civil and common law copyright traditions. AIS seem to need neither incentive to create nor a fair compensation as human authors do. However, the private economic interest of, for instance, the producers of AIS might favour some form of protection.

We can, as a second option, start looking beyond the limitations of the concept of the *author's own intellectual creation* that was adopted by the CJEU and instead determine whether the level of creativity displayed in a work approaches the required standards, regardless of the origin of that creativity. This seems also in conformity with the criteria of creativity found in both philosophy and psychology. This would certainly demand a paradigm shift in CJEU case law. However, history also teaches us that the introduction of new informational technologies is usually accommodated within the copyright framework one way or the other. This is especially true if these technologies represent substantial economic value, as is illustrated at the end of the 20th century by the inclusion of computer software within the copyright framework. [78]

The third and most likely option, is the introduction of *sui generis* regulation for AIS artifacts. It would be to left to the European legislators to draft appropriate provisions for a separate regime of Intellectual Property protection in Europe, leaving room for the attribution of rights that is most suitable, as we have seen with the Database- and Semiconductor Directives.[79]

Which option will eventually be realized cannot be predicted entirely at this stage, but it shall in any case be the innovation in Autonomous Intelligent Systems that will be the key. Only if the technology is developed successfully will it be susceptible to some form of IP protection.[80] Based on the recent case law, we can at the same time rest assured that, both with regard to the protection within the copyright framework or through a *sui generis* regime, the CJEU will have to consider the freedom of information in all of its judgements, thus leaving room for the fair balancing of public and private considerations.[81]

78 Directive 2009/24/EC, *supra* note 74.

79 Directive 96/9/EC, *supra* note 63 ; Directive 87/54/EEC, *supra* note 60.

80 With regard to the question of who should then be the right holder of such future works, Asaro argued that if they can be liable for the acts of the computer, perhaps producers should also be the ones to benefit from the acts of the computer: Asaro 2012, *supra* note 8, at p. 169.

81 C-70/10, Scarlett Sabam [2011]; C-314/12, UPC Telekabel Wien [2014]; ECtHR Ashby Donald/France case 36769/08 [2013], all *supra* note 24.

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