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Robot creativity: an incentive-based neighbouring rights approach

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Table of Contents

Introduction

Human creativity requirement

Identifying human creativity in robot works

Desirability of protection in the light of copyright's rationales

Competing interests and legal obligations

Conclusion

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****E.I.P.R. 797 Abstract***

Today, texts, paintings and songs need no longer be the result of human creativity. Advanced artificial intelligence (AI) systems are capable of generating creations that can hardly be distinguished from those of authors of flesh and blood. This development raises the question whether AI-generated works could be eligible for copyright protection. In the following analysis, we explore this question. After a discussion of the traditional copyright requirement of human creativity, the rationales underlying copyright protection—in particular the utilitarian incentive theory—will serve as a compass to decide on the grant of exclusive rights and delineate the scope of protection. In addition, the analysis will address the question who the owner of protected AI creations should be. Finally, the discussion of pros and cons of protection will be placed in the broader context of competing policy

goals and legal obligations, such as the prospect of enriching the public domain, the need to prevent interferences with human creativity and the question of liability for AI creations that infringe the rights of third parties.

Introduction

"A home transformed by the lightning
the balanced alcoves smother
this insatiable earth of a planet, Earth.
They attacked it with mechanical horns
because they love you, love, in fire and wind.
You say, what is the time waiting for in its spring?
I tell you it is waiting for your branch that flows,
because you are a sweet-smelling diamond
architecture
that does not know why it grows."¹

As the meaning of "art" is subjective in nature, one might consider the above poem to be abundantly vague, while another may find it truly inspiring. Nevertheless, when realising that this poem stems from a robot, most people are likely surprised. It was not a human poet or literary artist, but an artificial intelligence (AI) that created this text independently. The poem was actually published in a literary journal under the assumption that it was written by a human being.² It can serve as an example of how advanced the technology of creative AI has become and how difficult it can be to distinguish robot creations from those of human beings.³

For a long time, mankind assumed that only humans were capable of creating literary and artistic works. With developments in the field of AI giving birth to a new kind of algorithmic creator in the realm of cultural creativity, this assumption no longer seems valid.⁴ Today, robots are capable of mimicking works of art, such as literature, music and paintings.⁵ The technology enabling their creative functions is becoming more and more advanced.⁶ Instead of relying on human instructions, contemporary AI systems have become increasingly independent by **E.I.P.R. 798* mimicking human traits, such as reason, creativity and learning.⁷ AI authors are thus capable of cultural creation, more or less on their own, allowing for broad-scale production of cultural objects which eye and ear often fail to distinguish from human creations.⁸

While the capabilities of creative robots—in the sense of efficient and independent broad-scale creation—are promising, the current copyright framework in the United States (US) and the European Union (EU) have not yet addressed this development adequately.⁹ Both systems lack specific regulation regarding the copyright eligibility of robot-generated works. Moreover, both copyright systems seem to consider human authorship a prerequisite for copyright protection.¹⁰ In US copyright law, for subject-matter to be eligible for copyright protection, it must constitute a work created by a human being.¹¹ Similarly, the Court of Justice of the European Union (CJEU) has determined that for creations to be eligible for copyright protection, they must be the result of an author's own intellectual creation.¹²

The human authorship requirement raises questions with regard to robot creations. Especially when robots start operating more independently, making their choices less predictable and foreseeable to either their users or programmers, human involvement in the process of creation becomes more difficult to identify.¹³ If, for that reason, robot creations are deemed ineligible for copyright protection, they automatically enter the public domain where everybody can use, enjoy and exploit them freely. In fact, the following analysis shows that a large category of robot-generated works is ineligible for copyright protection. By separating different types of algorithms and analysing their functioning, it makes a clear distinction between works that will, and works that will not meet copyright's originality test.

While the debate up until now has mostly concerned the doctrinal question whether robot-generated works *could* be copyrightable, our article analyses whether robot-generated works *should* be copyrightable. In doing so, we find that the incentive theory should serve as the sole compass for addressing the issue of robot-generated works.¹⁴ We recognise that providing an incentive for the user of a creative robot may stimulate the creation and dissemination of robot-generated works. In the absence of any incentive to invest in robot training and share the results of the robot's work, literary and artistic productions

of AI systems may remain underdeveloped. They may also be withheld from the public.¹⁵ With its long term of protection and robust exclusive rights, however, copyright law does not seem to provide the most suitable legal framework for addressing this dilemma. The law of neighbouring rights, by contrast, offers room for more elastic solutions owing to its flexible and customisable protection framework. Such a framework makes it possible to ensure that the creation and dissemination of robot-generated works are rewarded and stimulated. At the same time, however, it is necessary to consider potential competing policy goals, such as the enrichment of the public domain, the objective to prevent interferences with human creativity and the need to regulate the risk of infringements of third-party content. Concluding remarks complete the analysis.

Human creativity requirement

United States

Section 102 of the US Copyright Act provides that copyright is present

"in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device". **E.I.P.R. 799*

As such, the two requirements that play a role in determining what constitutes a copyrightable work are "originality" and the act of fixation "in any tangible medium".¹⁶ With regard to works generated by or with the help of a computer, the act of fixation does not pose problems. Robots are able to write on paper, paint on canvas and create audio files of music. More interesting issues arise from the originality requirement. As the US Copyright Act does not define "originality" more precisely, the conceptual contours of this requirement must be deduced from the Supreme Court's case law.¹⁷ On the one hand, originality implies that a work is independent in the sense that it has not been copied from another work: it stands on its own.¹⁸ Robots go beyond mere copying. They are able to create on the basis of one's style or even create in their own style.¹⁹ In both scenarios, the created work may or may not be inspired by pre-existing works, but the resulting creation is independent in the sense that it deviates enough from the source material to be considered novel. Sufficient independence from pre-existing works, however, is not the only prerequisite that has to be met in order for a work to qualify as original. The originality test also implies a "creativity" requirement.²⁰ The US Supreme Court has extensively elaborated on the meaning and scope of the creativity requirement in its case law.

Feist Publications Inc v Rural Telephone Service Co. is one of the leading cases concerning the creativity requirement in US copyright law. The case concerned copyright protection for a telephone directory. After Rural had refused to grant a licence, Feist had copied information from Rural's telephone directory to include it in its own. Rural sued Feist for copyright infringement. The tension in this case concerned two established propositions: the first being that facts, such as one's personal information, are ineligible for copyright; the second that one has put effort into gathering this information, organising it and writing it down, thus creating a new useful object (the "sweat of the brow doctrine").²¹ Prior to the *Feist* judgment, some US courts had embraced the sweat of the brow doctrine. Instead of focusing on creativity, this approach brings the amount of labour into focus that has been invested in a work.²² The US Supreme Court, however, rejected the doctrine in *Feist* by holding that for a work to be original in the sense of the US Constitution, it should not only be created independently by an author in the sense that it has not been copied from another work, but also *at least possess a minimal degree of creativity*.²³

The first question that arises from this creativity requirement with regard to robot works is to whom or what it actually applies. Should it be understood in the sense that the work itself needs to reflect sufficient creativity or does it refer to the process leading to the work? Must the process of making the work be creative? As already indicated above, the appearance of a robot-generated work—the final result—is often indistinguishable from that of a human creation. Creativity of the work itself may therefore be easier to establish. With regard to the process of creation, more delicate questions arise. The choices underlying a robot-generated work may stem from the robot programmer, the robot user or the robot algorithm itself. In *Feist*, the US Supreme Court gave quite a clear answer:

"Factual compilations, on the other hand, may possess the requisite originality. The compilation author typically chooses which facts to include, in what order to place them, and how to arrange the collected data so that they may be used effectively by readers. These choices as to selection and arrangement, so long as they are made independently by the compiler and entail a minimal degree of creativity, are sufficiently original that Congress may protect such compilations through the copyright law."²⁴

Hence it seems that the process of creation is decisive. Linking the creativity requirement to acts in the process of creation, such as "choice", "compilation" and "arrangement", the court implies that not only the final result but also the author himself must be creative.²⁵ This leads to the question whether a robot operating on the basis of machine instructions can be deemed creative *in the sense of the law*. Or is creativeness an ability that is exclusive to the human mind? Another remark in the *Feist* judgment points in this direction. The court stated that a **E.I.P.R. 800* work could only be original "when founded in the creative powers of the mind".²⁶ This case law and related discussions in literature²⁷ suggest that the US creativity requirement requires human origin indeed.

In *Burrow-Giles Lithographic Co v Sarony*, the famous photographer Sarony had filed a copyright infringement suit because Burrow-Giles had sold unauthorised lithographs of his portrait photograph of Oscar Wilde. Before assessing potential infringement, the US Supreme Court had to answer the central question whether copyright could rest on a photograph. The court answered this question in the affirmative. Photographs could attract copyright protection "so far as they are representatives of original intellectual conceptions of the author".²⁸ In the words of the court

"whether a photograph is a mere mechanical reproduction or an original work of art is a question to be determined by proof of the facts of originality, of intellectual production, and of thought and conception on the part of the author ...".²⁹

A mere mechanic mode of creation is therefore not enough. The creation must give expression to an idea of the human behind the machine. Denying copyright in a photograph made by a monkey in *Naruto v Slater*, the US Court of Appeals for the Ninth Circuit confirmed that

"[t]he terms 'children', 'grandchildren', 'legitimate', 'widow', and 'widower' [in the Copyright Act] all imply humanity and necessarily exclude animals that do not marry and do not have heirs entitled to property by law".³⁰

Slater had stationed a camera in the jungle, after which a Macaque monkey had seized the opportunity to take a self-portrait. Owing to the lack of human decision-making, however, the "monkey selfie" could not attract copyright protection, even though it resembled a photograph taken by a human. The judgment confirms that the final result is not decisive.³¹ The focus is on human involvement in the process of creation.³² Not surprisingly, s.306 of the Compendium of US Copyright Office Practices stipulates that

"because copyright law is limited to 'original intellectual conceptions of the author', the Office will refuse to register a claim if it determines that a human being did not create the work".³³

Arriving at this exclusion of mere mechanic creations from copyright, the US Copyright Office, obviously, has interpreted the requirements of *Feist* ("founded in the creative powers of the mind") and *Burrow-Giles* ("original intellectual conceptions of the author") as a human authorship requirement.³⁴ However, this does not mean that the US Copyright Office refuses to register robot works altogether. Section 313.2 of the Compendium clarifies that the scope of the aforementioned practical rule is limited to "works produced by a machine or a mere mechanical process that operates randomly or automatically without any creative input or intervention from a human author".³⁵ A robot's creation may therefore be registered, if sufficient traces of human creativeness can be identified in the process of its creation. This US practice seems in line with the findings in the Final Report of the National Commission on New Technology Uses of Copyrighted Works (CONTU). In 1978, this National Commission, formed by Congress and the US President, had already released a report that assessed the role of copyright in relation to computer programs. The CONTU report stated that copyright eligibility depended on the presence of minimal human creative effort at the time of producing the work.³⁶ Although it is more than 40 years old, it still seems to have an authoritative character.

In sum, the analysis of the US legal framework shows that for a robot-generated work to enjoy copyright protection, at least some sort of human creativity is required during the process leading to its creation.³⁷ It may be easy to meet this human input requirement in a situation where the robot is used merely as a tool. The identification of traces of humanity, however, becomes more difficult when the robot starts to create autonomously, taking steps that no longer follow directly from the underlying programming. **E.I.P.R. 801*³⁸

European Union

In the EU, the [Software Directive](#) and the [Database Directive](#) stipulate that for attracting copyright, computer programs and databases must be "original in the sense that they are an author's own intellectual creation".³⁹ Universalising this requirement, the CJEU extended this criterion to all work categories in *Infopaq*.⁴⁰ Hence, the court established an originality test that points in the direction of human creativity by requiring "an author's own intellectual creation".⁴¹ In *Infopaq*, this question had arisen from the practice of scanning publications of Danish newspapers, converting them into searchable text files, and offering media monitoring services that provided users with text fragments of 11 words which the search system detracted from protected press articles. Answering the question whether 11 words could enjoy copyright protection, the CJEU also clarified that it was

"only through the choice, sequence and combination of those words that the author may express his creativity in an original manner and achieve a result which is an intellectual creation"⁴²

Defining a work as the result of expressing creativity, the court detached the inquiry into originality from the final result—the work itself—and focused on the process of creation instead. A line with the above-described developments in US copyright law can easily be drawn. In *Painer*—a case concerning copyright protection for a portrait photograph taken at school—the CJEU added that an intellectual creation was an author's own if it reflected the author's personality.⁴³ That was the case if the author expressed his creative abilities in the production of the work by making "free and creative choices".⁴⁴ Making these choices, the author could stamp the work with his "personal touch".⁴⁵ Again, the author occupies centre stage. Although a human authorship requirement is not explicitly mentioned, the court's reference to a reflection of the author's personality indicates quite clearly that some kind of human involvement in the creation process is indispensable.⁴⁶ Given the important role of the natural bond between author and creation in Europe's civil law copyright tradition,⁴⁷ this conclusion seems inescapable.

It is worth mentioning that, prior to *Infopaq*, the Supreme Court of the Netherlands had explicitly held that, for a work to enjoy copyright protection, it had to be the result of human authorship. In *Zonen Endstra*, the court noted that for a work to receive the requisite imprint of the author's personality, it had to be the result of human creation and creativity—a product of the human spirit.⁴⁸ Although the CJEU's case law has not yet been as clear-cut as this Dutch decision in *Zonen Endstra*, the explicit formulation of such a prerequisite in the Netherlands is fully in line with the continental-European *droit d'auteur* tradition. As mentioned above, the bond between a human author and its creation plays a central role in continental-European civil law systems.⁴⁹

In the light of the continental-European focus on the materialisation of an author's personality, the examination of case law and literature statements,⁵⁰ it seems safe to assume that EU copyright law requires at least some human involvement in the process of creation for a work to be copyrightable. Otherwise, the stamp of the author's personality is missing. As mentioned in the US context, the focus on human input during the process of creation precludes the recognition of copyright on the sole ground that the final result—a robot-generated work—can hardly be distinguished from literary and artistic productions of authors of flesh and blood. The final result may often resemble a human creation. The process leading to its creation, however, may differ substantially. The moment the robot starts to take steps independently of human instructions, the requisite bond with human personality may be lost and the resulting work may no longer be eligible for copyright protection. ***E.I.P.R. 802**

Identifying human creativity in robot works

The preceding analysis of US and EU originality standards shows that for a robot-generated work to enjoy copyright protection, human creativity needs to be identified in the process of creation.⁵¹ Therefore, it is necessary to analyse to what extent the robot's operational process leaves room for creative human input. In this assessment, the underlying algorithm—the set of coding instructions defining the robot's operational process—constitutes a key factor. A sufficient nexus between the programmer's general coding instructions and/or the specific instructions given by an individual robot user on the one hand, and the steps taken to establish the work at issue on the other hand, may justify the assumption of adequate human intervention. Hence, it is important to determine which type of algorithm steers the process of creation, as the algorithm's functioning plays a decisive role in evaluating the degree of human creativity that contributes to the robot's creation process.

Room for creative user input

Literary and artistic works in the classic sense, such as literature, paintings and music, may be created using computers and specific software. Creations resulting from the use of Microsoft Word for poetry, Fruity Loops for melodies and Photoshop for artworks have in common that the computer and the used software only operate as assistants, tools, for fixating an idea of the human mind. Evidently, such computer-aided processes of creation leave ample room for free and creative human choices. They do not pose obstacles to the assumption of copyright eligibility. As the computer is merely used as a tool, the creativity invested in the act of creation still originates very clearly from the human author operating that tool.⁵²

The same may be said about works generated by robots as long as the robot user has enough influence on the production process to add sufficient (human) creativity.⁵³ For example, when a robot makes a painting, the robot user may still be creative by making choices and arrangements with regard to design parameters, such as colours, shapes, lines and canvas type. The resulting painting may thus reflect a sufficient degree of human creativity (stemming from the robot user) to pass the originality tests laid down in *Feist* and *Burrow-Giles* (US), or *Infopaq* and *Painer* (EU).

A more problematic scenario arises when the creative control of a human user is more limited. If, in the painting scenario, the role of the user is confined to pressing the button to start the process of creation, the design choices leading to the painting stem from the robot itself or the programmer of the underlying algorithm. The robot user no longer has creative freedom to define the form of the robot's output. The painting no longer expresses free and creative choices of the robot user. As we have learned from *Burrow-Giles* (US) and *Painer* (EU), pressing a button to create a photograph only results in copyright eligibility if the photograph is an intellectual creation of the author because it expresses free and creative human choices (*Painer*) or gives expression to ideas of the human mind (*Burrow-Giles*). Hence, merely pushing a robot's button to start a machine-driven process leading to a painting, does not bestow copyright protection upon the robot user—even if the final result successfully mimics typical features of human creativity.

Room for creative robot programmer input

When the creativity involved in the creation process does not originate with the user, we are still left with the programmer who may have impregnated the creation process with human creativity when developing the algorithm and code steering the robot.⁵⁴ In this regard, the first type of algorithm that is relevant to the present inquiry is the "step-by-step algorithm". The operational process of a robot operating on the basis of a step-by-step algorithm follows from an "if-then" decision model, whereby the robot draws conclusions by applying rules of supposition.⁵⁵ In such a scenario, the algorithm created by the programmer—functions as an instruction manual (or a set of rules) that directly dictates the robot's creation process. If the programmer tells the robot to do "A" then "B", the robot slavishly carries out the will of its programmer. It may thus be possible to trace back the creative choices in a work generated by a robot with a step-by-step algorithm to the human coding decisions which the programmer made. A user pushing the button to start the robot's creation process merely activates the programmer's "will", as laid down in the instructions defining the robot's functioning. Everything the robot does is determined by the inference engine made up of if-then rules that were created by the programmer. If, in this scenario, the created painting can be qualified as a manifestation of the robot programmer's creative choices and, in particular, if the programmer can foresee and predict what the created work will comprehend, the creativity reflected by the final result can be attributed to the programmer.⁵⁶ Accordingly, the painting can be deemed the programmer's own intellectual creation (*Infopaq*) and represent his original intellectual conceptions (*Burrow-Giles* / *Infopaq*). Works resulting from a step-by-step algorithm may thus enjoy copyright protection—a copyright owned by the programmer. *E.I.P.R. 803

The programmer may also define rules in a robot's programming that place constraints on the robot's functioning.⁵⁷ With algorithms in this category, so-called "rule-based algorithms", the programmer does not tell the robot exactly what to do, but instead sets boundaries to the robot's ambit of operation. Instead of directing the robot to do "A", then "B", rule-based constraint programming means that the programmer provides rules such as that "A" should always be bigger than "B", "X" must never equal "Y", and so on. In this scenario, the boundaries are set, but the robot is not told *specifically* what to do. Hence, it becomes more difficult to identify human creativity in the creation process. The robot operates *on its own* within the space provided by the programmer. In the case of rule-based algorithms, the creativity that can be traced back to the programmer seems significantly reduced in comparison with step-by-step algorithms. The programmer has provided the robot with instructions through the inference engine. However, these instructions do not directly steer and define the creation of the work. The robot, when activated,

starts to create within the delineated field of operation. However, it seems much less plausible that the programmer dictated—let alone could foresee—the concrete form and features of the resulting work.

Nonetheless, it may be argued that programmer creativity was involved in limiting the robot's operational field and that the free and creative selection of the borders of this field are sufficient to award copyright. However, this argument seems only valid if the boundary lines are drawn so precisely that the programmer still has sufficient control over the creation process to keep the robot within her original intellectual conceptions (*Burrow-Giles*) and add her personal touch (*Painer*). If, by contrast, the limits set by the programmer merely resemble general limits that impact human creativity as well, such as rules regarding grammar and orthography, or traditional form conventions of a classical symphony,⁵⁸ it may be said that the programmer de facto leaves the choice of the work's concrete form to the machine. Despite certain limits, a robot with a rule-based algorithm may thus ultimately carry out the creative process on its own. Robot creations with features that can no longer be traced back to a human programmer, are unlikely to pass the human creativity requirement. As they are no longer founded in the creative powers of a human mind (*Feist*) and do not reflect the programmer's own intellectual creation (*Infopaq*), works generated by robots that operate on the basis of loosely defined rule-based constraints are ineligible for copyright protection. They leave the programmer empty-handed.

Finally, robots operating on the basis of "machine learning" algorithms⁵⁹ pose the biggest hurdles to proving sufficient human creativity.⁶⁰ On the basis of input data (in the context of robot creativity often consisting of human works serving as templates), the robot is able to recognise patterns and similarities. Following this deductive method, a robot is able to learn how to create a novel work on its own, either mimicking the style of analysed works or generating a previously unknown style variation. Thus, a machine learning algorithm enables a robot to *learn* how to create *on its own*.⁶¹

Regarding the robot's functioning, the role of the programmer is limited to defining the robot's goal, providing the robot with training data and reviewing the robot's generated outcome.⁶² In doing so, the programmer will certainly invest creativity. Without the programmer's efforts, there would be no algorithm, and without the algorithm, there would be no work. However, the creative contributions of the programmer relate to the creation of the robot's learning process, instead of controlling the creation process of the work itself. Deriving connections and similarities from the data it processes, the robot is able to learn through trial and error. As several programmers have recognised, this mode of operation allows the robot to make choices that are often surprising—in the sense that the programmer could not have predicted them and could not explain them on the basis of his thorough understanding of the underlying algorithm.⁶³ Hence, it is no longer possible to allocate the design choices leading to the work to the programmer.⁶⁴

Arguably, the robot's learning process in the machine learning scenario even resembles the learning cycle of a human. When an artist of flesh and blood creates a painting of a duck, she does so by digging into her cognitive memory. Applying the knowledge that she has gathered through perception and transforming her lifetime experience of duck observation into a drawing, the artist is able to create a work of art. Based on this comparison, it may be said that in the case of machine learning, the role of a programmer is in essence the same as that of an art teacher. If the artist, as a student, was assigned the task of painting ducks after the art teacher provided her with pre-existing pictures of ducks, the student may create a duck painting on the basis of what she has learned from the teacher. Nonetheless, the creative components defining the painting—e.g. the shape of the duck's beak, *E.I.P.R. 804 the colour of its feathers and the form of its flippers—result from the choices made by the student herself. Moreover, the art teacher could not predict beforehand what the student's creation would look like. The elements that may justify copyright protection are the artist's, not the art teacher's. By analogy, the machine-learning robot—as a student—makes the decisive choices and not the programmer. The programmer only has the role of the teacher who cannot claim authorship simply because she prepared the student for the creative task. Works created by robots with machine learning algorithms, thus, are unlikely to reflect enough programmer creativity to meet the originality test and allow the programmer to invoke copyright protection.⁶⁵

Desirability of protection in the light of copyright's rationales

The foregoing analysis shows that, *de lege lata*, copyright protection is unlikely to be available in the case of robots with rule-based or machine learning algorithms. Against this background, the question arises whether, *de lege ferenda*, it makes sense to reconfigure the originality test and pave the way for the grant of copyright despite the described lack of human creativity. As this question concerns the normative level of policy-making, it is advisable to return to the rationales justifying copyright

protection. If these rationales offer sufficient support for the grant of copyright not only in the case of human creativity but also in the case of robot creativity, they can serve as a basis for extending copyright protection to robot-generated works. If not, they confirm the appropriateness of the described status quo.

Adopting a natural law approach to copyright, it can be posited that the author has a right to claim protection over his work owing to the simple fact that he—as *auctor intellectualis*—brought something into existence with his labour in the abundant universe of cultural expressions. As the work is regarded as a manifestation of the author's personality, the author acquires a property right in his work by virtue of the mere act of creation—the act of mingling his personal creativity with the raw material of pre-existing sources of inspiration in the cultural landscape.⁶⁶ Strictly speaking, this means that an author's rights are a natural result of creative labour. They are not created by law, but have always existed in the legal consciousness of man.⁶⁷ This has the corollary that nothing is left to the law, apart from formally recognising what is already inherent in the "very nature of things".⁶⁸ Natural law theory thus invokes feelings of fairness and justice. The underlying thought is that the author should be rewarded and acknowledged.⁶⁹ Copyright follows from creative labour and preserves the natural bond between an author and his creation. Central to this theory are not the interests of the community, but the interests of the author as a creating individual.⁷⁰ This author-centrism of natural law theory calls on the legislator to safeguard rights broad enough to concede to authors the opportunity to benefit from the use of their self-expression, and to bar factors that might stymie their exploitation.⁷¹

Evidently, however, this natural law theory has little to offer in respect of works generated by a robot with a rule-based or machine learning algorithm. As discussed in the preceding section, the copyright dilemma arising from this mode of creation is the absence of identifiable human creativity shaping the process of creation. Hence, there is no natural bond between a human author and the work that could justify the recognition of copyright protection in the light of natural law theory. As explained, there is no direct bond between the creative efforts of the programmer and the works that the robot generates in the rule-based or machine learning scenario.⁷² In contrast to authors of flesh and blood, robots simply follow machine instructions: they mimic creativity without making any creative effort. Even if one was willing to accept robots as legal persons capable of holding copyright, the basic theoretical preconditions for awarding copyright under natural law theory are missing. Therefore, a discussion of the desirability of copyright protection in light of this theory seems pointless.⁷³ By definition, it must lead to the rejection of copyright without entering into a meaningful debate of pros and cons.

Economic incentive theory, by contrast, offers a theoretical framework for assessing the benefit and detriment of copyright to robot works.⁷⁴ The basic **E.I.P.R. 805* principle underlying economic incentive theory is the thought of maximising utility for society as a whole.⁷⁵ Copyright serves as a means to reach this end. Providing authors with a financial reward—in the form of exploitation rights with market value—the law seeks to encourage the promotion of scientific and literary development.⁷⁶ Exclusive rights to reproduce and distribute literary and artistic works offer authors a monopoly position during the limited term of protection, allowing them to recoup the investment of time and money during the process of creating the work. The incentive following from this amortisation scheme is intended to stimulate the creation and dissemination of cultural expressions.⁷⁷ The focus, however, is not on the individual author, but on the community. Copyright is a prerogative granted to enhance the overall welfare of society by ensuring a sufficient supply of knowledge and information.⁷⁸ This theoretical basis only justifies rights strong enough to induce the desired production of intellectual works. In contrast to natural law theory, the exclusive rights of authors deserve individual positive legal enactment from the perspective of economic incentive theory.⁷⁹ Those forms of use that need not be reserved for the right holder to provide the necessary incentive remain free. Otherwise, rights would be awarded that are unnecessary to achieve the societal goals of the system.⁸⁰ Hence, copyright protection is justified insofar as it is necessary to provide the incentive needed to encourage the creation and dissemination of creative expression. Copyright is not a natural right, but an enacted right, that is aligned with the interests of the public.⁸¹ Under economic incentive theory, the effectiveness of copyright protection can be measured in terms of societal benefits, including the enhancement of a participatory culture.⁸²

Before embracing economic incentive theory as a reference point for assessing the desirability of copyright to robot works, however, a final word on the relevance of this theory in both traditions of copyright law seems advisable. It is often assumed that a distinction in justifying theory can be made between the continental-European civil law tradition and the Anglo-American common law tradition. The assumption is that in civil law systems, the right of the author (*droit d'auteur*) rests on natural law theory, whereas economic incentive theory occupies centre stage in common law countries. In literature, however, it has been shown that it is wrong to paint a black and white picture. In fact, both theories—natural law and economic incentive—

influenced the evolution of copyright protection standards on both sides of the Atlantic.⁸³ Recital 4 of the EU Information Society Directive 2001/29 reads as follows:

"A harmonised legal framework on copyright and related rights, through increased legal certainty and while providing for a high level of protection of intellectual property, will foster substantial investment in creativity and innovation, including network infrastructure, and lead in turn to growth and increased competitiveness of European industry, both in area of content provision and information technology and more generally across a wide range of industrial and cultural sectors. This will safeguard employment and encourage new job creation."

Instead of focusing on the individual interests of the author in line with natural law theory and the civil law tradition of continental-European Member States, this core consideration underlying EU copyright law recalls the economic incentive rationale by emphasising overall benefits for society. Against this background, it does not seem inconsistent to apply incentive theory as a guideline for addressing the issue of copyright for robot-generated works in the US and the EU.

In the light of economic incentive theory, copyright protection for robot works is desirable only if, on balance, society benefits from the grant of exclusive rights. The benefits accruing from copyright as a bait to spur investment in robot works must outweigh the costs of creating monopoly positions. More concretely, the grant of protection must be likely to promote the progress in the field of literature and art to such an extent that the protection scenario seems preferable over the status quo which leaves works evolving from rule-based and machine learning algorithms unprotected. To assess the potential stimulating effect of copyright, it is necessary to consider the interests of potential copyright owners: the robot programmer, the robot user and, potentially, even the robot itself. Is it desirable from an economic incentive perspective to award any of these candidates copyright? *E.I.P.R. 806

Copyright for the robot itself

As the robot generates the work independently in a rule-based or machine learning scenario,⁸⁴ a first—at least theoretical—option is the recognition of the robot itself as holder of copyright. This option remains a mere theoretical option as long as robots do not possess legal personhood and, accordingly, are incapable of owning, transferring, licensing and enforcing rights. Even if robots were to have legal personhood, however, their lack of conscience and self-determination would still cause copyright to be meaningless as an incentive scheme. Unless this is woven into the fabric of the robot programming, robots are not aware of any incentive and not susceptible to the stimulus that may arise from copyright protection in the case of human authors.⁸⁵

Moreover, it can hardly be said that robots invest time and money in the creation of a work that they would like to amortise. Once activated, they mechanically produce works regardless of the prospect of any return on investment. One of the central guidelines following from the economic incentive theory is that no more incentive should be provided than necessary. As the robot does not make any investment that could be amortised via copyright protection, an incentive is not required. Conferring copyright upon the robot would only create unjustifiable barriers to the dissemination and enjoyment of its creations. As copyright does not influence robot productivity, it would mean that the grant of protection has no function at all at the cost of others being unable to freely access robot-generated works. Hence, copyright for the robot itself is not warranted from an economic incentive perspective. It even appears as the worst solution from this perspective.⁸⁶

Copyright for the programmer

AI is regarded as one of the most promising contemporary tools for innovation.⁸⁷ The advancement of AI research and development requires the investment of significant financial resources and man hours.⁸⁸ Arguably, the extended amortisation period following from the grant of copyright protection can play an important role in this context. It allows AI entrepreneurs to recover investments that may remain impossible in the absence of the prospect of amortisation. Hence, the grant of copyright to robot-generated works may render investment attractive. Providing copyright as a bait for substantial investment may stimulate innovation in the field of creative AI which, in turn, could promote robot-generated contributions to the literary and artistic domain.

One of the reasons why the programmer deserves to be considered in this regard is that, as explained above, he has significantly contributed to the production of the rule-based or machine learning algorithm which enables the robot to produce works. He is "the author of the author". Without his algorithm, the works would never have come to light.⁸⁹ Especially if the output generated

by the robot is of high quality, this may be due to the ingenuity which the programmer applied to establish a particularly potent rule-based or machine learning framework for the robot.

However, it is doubtful whether this investment would really remain absent when copyright to robot-generated works is not bestowed upon the programmer. Copyright given to robot works is not the sole incentive scheme in this area. Even though software patents remain a contested and challenging branch of patent protection,⁹⁰ the technical implementation of a rule-based or machine learning algorithm in a creative robot may be eligible for patent protection.⁹¹ In addition, copyright law offers a reliable *E.I.P.R. 807 alternative incentive scheme. It protects a computer program's source and object code as a literary work.⁹² Hence, the denial of copyright to robot-generated works does not leave the programmer empty-handed. He can apply an amalgam of copyright and patent protection to recoup investments through profits that he derives from the sale and licensing/leasing of the algorithm and/or source and object code underlying the creative robot functionality.⁹³

In this context, it must also be considered that copyright for the programmer may render creative robot systems less attractive for users. If the programmer is granted all the rights to works that the robot makes, what interest would a user have in purchasing such a robot? The programmer could transfer copyright or grant an umbrella licence beforehand. But this enhances the complexity of robot sales and may increase the price of the creative machine to such an extent that the grant of copyright can no longer be justified under economic incentive theory. A comparison with the purchase of a photo camera illustrates this point. The person who uses the camera makes the photographs, while the operating software enables her to do so. The software was created by the programmer and may enjoy patent and copyright protection. The programmer of the software, however, is not entitled to copyright in the photographs made with the camera. Otherwise, users may have little interest in a camera that imposes the legal obligation of rights clearance whenever a photograph is copied and shared. Similarly, widespread monopolisation of copyright to robot-generated works in the hands of programmers may cause costs for society (in terms of restrictions on free use and dissemination) which the additional incentive arising from the grant of copyright (on top of existing patent and copyright protection for the robot software) does not outweigh. The bundling of copyright to robot works in the hands of programmers is thus unlikely to make sense in the light of economic incentive theory.⁹⁴ It will most probably do more harm than good when considering that this copyright would only supplement existing patent and copyright incentive schemes for software production and dissemination.

Copyright for the user

As explained, an incentive for the development of creative robots is already present in the form of copyright and patent protection for the algorithm and programming code. An incentive for the creation and dissemination of the robot's works, however, is sought in vain. From an economic incentive point of view, the user is the candidate that deserves considerable attention in this regard. Ultimately, the robot programmer is not the one who activates the robot and initiates the process of work production. That would only be the case if the programmer were to keep the robot to himself, not selling it or licensing it for use. If, in such a scenario, the programmer finally activates the robot and gives green light for the creation process, however, the programmer himself no longer confines his activities to the programming function. By contrast, he combines this function with the role of a user who exercises control over the robot's production phase and the dissemination of resulting works.⁹⁵ Even in this scenario, the focus therefore shifts from the act of programming to the act of using/instructing the robot.

As it is the user who operates the robot, he decides when a work is brought *into existence*. Moreover, he decides whether the work is brought *into public circulation*. Providing the user with the incentive of copyright protection may thus stimulate the creation and dissemination of robot-generated works which, in turn, may allow society to benefit from new literary and artistic productions, thus achieving the primary goal of incentive theory.⁹⁶ Not surprisingly, existing copyright provisions in countries belonging to the Anglo-American common law tradition, such as the United Kingdom, New Zealand and Ireland, offer starting points for conferring copyright upon the user who undertakes "the arrangements necessary for the creation of the [computer-generated] work...".⁹⁷ Arguably, a robot user may fulfil this requirement when embarking on instructing and guiding actions, such as activating the robot and directing its operational process.⁹⁸

In the case of a robot user, it is also possible to identify costs—both time and money—which the user may want to recoup. It is conceivable that a robot system, while *E.I.P.R. 808 providing the functional basis for the act of making a work, still requires training activities and data input. A robot user may thus have to spend considerable time with the robot in order to develop and fine-tune its creative functions. He may also have to buy source material that provides sufficient templates for the robot to mimic a specific concept or style. Moreover, a user must buy, lease or license the program steering the process of

creation. Depending on the refinement of the robot system, this may involve significant costs. Hence, it may be said that the user must make investments which copyright law could foster by providing the prospect of a long amortisation period. In the absence of copyright, the only remaining interest will often be the play with the robot. A user may enjoy placing the robot's paintings on the walls of his home, playing its music in his living room or reading one of the robot's many poems or science fiction novels in his bed. This private use scenario, however, has the drawback that the user may also decide not to share the work with a larger public. If the dissemination of the work is unlikely to generate any income, less users will make the effort of uploading robot-generated works to online platforms or developing other modes of communication to the public. Therefore, the private use scenario is unsatisfactory from the perspective of the incentive theory, which seeks to spur not only the creation of works but also their dissemination.

Assigning copyright to the user of a creative robot may also provide indirect incentives for programmers. If robot users can benefit from copyright royalties accruing from the exploitation of AI-generated works, they may be willing to pay more for the robot system. After all, the prospect of an additional source of income enhances the commercial attractiveness of creative robots. This will cause the demand for creative robots to rise, enabling programmers to increase the price of creative robots which, in turn, will provide an additional incentive for them to invest in creative AI. The willingness of robot users to pay higher prices may also encourage programmers to make progress with regard to the quality of creative robots. A user who is considering to purchase a creative robot for the purpose of making money with robot-generated works will most probably be more demanding than a user who simply looks for a new toy for private curiosity and entertainment. The profit-oriented user will look for a robot that creates efficiently and in high quality. Hence, the grant of copyright to this type of users may support the evolution of a market for high-end robot artists and, at the same time, spur investment in the technology necessary for these premium machines.

In the light of these considerations, it seems most convincing to confer copyright upon the user of a creative robot. Providing the user with copyright appears as the best solution from the perspective of economic incentive theory. If the user cannot enjoy copyright to the creations of her robot, she may lose interest in plumbing the full potential of the robot and bringing robot works to the market for the public to enjoy. Hence, society may be deprived of contributions to the cultural landscape due to the lack of copyright protection.

Appropriate scope of protection

The identification of a reason to support the purchase, training and dissemination activities of a robot user, however, does not entail that the current proportions of copyright protection must automatically be deemed appropriate. As already pointed out, economic incentive theory only supports copyright protection to the extent to which monopoly rights are necessary to promote the desired creation and dissemination of literary and artistic works. As the robot user does not add her own creativity to the final creation process (but only prepares and initiates the robot's production mechanism), one can legitimately question the appropriateness of copyright's long term of protection⁹⁹ and the broad scope of exclusive rights that can be invoked to prevent others from using and enjoying robot-generated works.¹⁰⁰ As elaborated above, the issue of robot-generated works does not call for a reward for human creative effort. The natural law argument justifying far-reaching exclusive rights is not applicable. Instead, the possibility of recouping investment is central to the inquiry in line with economic incentive theory. Considering the spectrum of contributions of the user—ranging from the willingness to run financial investment risks to organisational efforts supporting the creation and dissemination of robot works—a parallel with the holders of neighbouring rights can easily be drawn.¹⁰¹ Phonogram and film producers, for instance, receive a neighbouring right for the financial and organisational responsibilities flowing from their entrepreneurial involvement.¹⁰²

A neighbouring rights approach makes it possible to avoid overprotection and potential negative effects that may result from broad exclusive rights and a long duration of protection. As the CJEU pointed out in *Marco Del Corso*, the phonogram producer rights laid down in **E.I.P.R. 809 art.8(2) of Directive 92/100/EEC* are not intended to allow the right holder to place constraints on the dissemination of protected sound recordings. By contrast, the right to equitable remuneration for the broadcasting of recorded music is of a "compensatory nature."¹⁰³ The focus is not on prohibition but on the payment of a fair royalty that may be collected by central rights management organisations. At the international level, art.15(1) of the WIPO Performances and Phonograms Treaty offers room for this solution in the field of phonogram producer rights. The application of the same recipe to robot-generated works would generate a revenue stream while, at the same time, preventing the robot user from posing excessive obstacles to the enjoyment and use of the work by asking prohibitively high licence fees. In other words, the right to prevent use could be downgraded to a mere right to the payment of equitable remuneration. In the light of incentive theory, this approach makes sense. Incentive theorists often emphasise that copyright entails the risk of pricing monopolies.¹⁰⁴ As they

do not want copyright protection to go beyond what is necessary for providing the required incentive to create and disseminate new cultural works, their ultimate goal is to strike a balance between protection (to ensure that one may recover investment costs) and freedom (to ensure that others can enjoy and build upon those works at acceptable costs). Evidently, the equitable remuneration option known from the phonogram producer right offers much more flexibility in this respect than the standard protection formula that has evolved in copyright law.

As to the length of the term of protection, the example of a new neighbouring right for press publishers in the EU shows that neighbouring rights may be granted for a substantially shorter period than copyright. [Article 15\(4\) of the new Directive on Copyright in the Digital Single Market](#) stipulates that the new press publisher's right (covering the reproduction and making available to the public of extracts taken from press articles) expires after a protection period of two years.¹⁰⁵ This neighbouring rights solution for press publishers could serve as a model for EU and US policy-makers seeking to introduce tailor-made protection standards in the field of robot-generated works instead of simply extending the reach of copyright protection with its fixed catalogue of minimum rights and a long term of protection. With limiting measures, such as a shorter term of protection and a mere right to equitable remuneration, lawmakers can avoid overly broad protection. They can confine the scope and length of protection to what is necessary to afford robot users the opportunity to recoup their investment. Providing adequate (but no unnecessary) incentives, they can encourage humans to develop the full potential of creative robots without constraining the dissemination and enjoyment of robot-generated works.

Competing interests and legal obligations

An analysis of robot creativity in the light of the economic incentive theory yields the insight that the grant of a tailor-made neighbouring right can be appropriate to stimulate the full development of the creative abilities of AI systems and encourage the dissemination of resulting literary and artistic productions. However, it must not be overlooked that the foregoing analysis focused exclusively on utilitarian incentive theory. Accordingly, the resulting policy recommendation—a neighbouring right for robot users—also rests exclusively on incentive considerations. For a final decision on the grant of protection, however, it is necessary to weigh benefits that could accrue from incentives for the development and dissemination of robot creativity against potential detriments, such as missed opportunities for public domain enrichment and a corrosive effect on human creativity. In addition, it is important to consider liability questions that would arise from the grant of a neighbouring right.

Public domain enrichment

As explained, the grant of protection to offer users an incentive for investment in robot-generated works, inevitably, reduces the availability of robot creations for cultural follow-on innovation. The grant of protection leads to a scenario that is more restrictive than unbridled freedom for enjoying and remixing robot-generated works. In comparison with absolute freedom of use, the allocation of neighbouring rights to the robot user makes it more difficult to use AI productions as source material and building blocks for new human and robot creations. From an economic perspective, the grant of incentives for robot users implies disincentives for the creation and dissemination of derivative works. The protection of robot works places burdens on transformative expression that depends on the reuse and remix of pre-existing robot-generated works.¹⁰⁶ The use of existing cultural expressions as a basis for new creations, however, is a recurring theme in the history of literature and art. It is an essential trait of literary and artistic productions. As Jessica Litman pointed out,

"the very act of authorship in any medium is more akin to translation and recombination than it is to creating Aphrodite from the foam of the sea. Composers recombine sounds they have heard before; playwrights base their characters on bits and **E.I.P.R. 810* pieces drawn from real human beings and other playwrights' characters; novelists draw their plots from lives and other plots within their experience; software writers use the logic they find in other software; lawyers transform old arguments to fit new facts; cinematographers, actors, choreographers, architects, and sculptors all engage in the process of adapting, transforming, and recombining what is already 'out there' in some other form. This is not parasitism: it is the essence of authorship."¹⁰⁷

When the productive reuse of robot-generated works requires the payment of a substantial amount of equitable remuneration or involves high transaction costs for obtaining a licence, it may discourage cultural follow-on innovation. High costs resulting from the creation of monopolies in favour of robot users will thus impede access to building blocks of new cultural expression.¹⁰⁸ Therefore, the described benefits accruing from the grant of protection—an incentive for the full development and dissemination of robot works—must be weighed against potential detriments, such as an impediment of creative remix and reuse of AI-generated creations, including their use as training material for other robots.¹⁰⁹ These detrimental effects must not be

overlooked when devising a tailor-made neighbouring rights solution. They may even culminate in arguments for leaving robot-generated works in the public domain altogether—unencumbered by any form of copyright or neighbouring rights protection.¹¹⁰

Impact on human creativity

A further policy issue comes to the fore when considering potential competition and substitution effects between robot-generated works and literary and artistic works made by humans. In the debate about progress in the literary and artistic field, Barton Beebe has argued that the time has come to abandon the "standard accumulationist account".¹¹¹ According to Beebe, the traditional mantra—the more literary and artistic works, the better for society¹¹²—has become doubtful. Instead of focusing on the increased production of literary and artistic works which the grant of copyright may make possible because it provides a monetary incentive, the central question should be whether the grant of protection enhances the room for "artistic practice" that fosters the development of creative talent in society.¹¹³

This critique raises the question whether the incentive theory must be nuanced when it is applied to robot creations. Even if conferring a neighbouring right on robot users stimulates the development of creative AI systems and the dissemination of resulting literary and artistic productions, this does not automatically imply that the grant of protection is the best solution from a societal perspective. Insofar as the stimulation of robot creativity and the dissemination of robot-generated works reduces the market for human creations and the room for human creativity,¹¹⁴ it could still be preferable to refrain from measures to support robot creativity. If the availability of robot creations kills demand for human creations, the opportunities for artistic practice—in the sense of human artistic endeavours—are not enhanced. In other words: potential benefits that may accrue from incentives for robot creativity must be weighed against potential detriments to traditional human creativity. Before granting a neighbouring right in robot creations, further research seems indispensable to clarify repercussions and potential corrosive effects on human creativity.

Liability for infringing robot creations

Finally, the decision on the grant of protection should not be taken without considering the issue of liability for the contents of robot creations. In copyright law, the author attaches her name to the work. As explained above, the work is seen as a manifestation of the author's personality in continental-European copyright theory. For this reason, a steadfast bond unites the author with her work and protection follows directly from the act of creation.¹¹⁵ The requirement of work modifications being "prejudicial to [the author's] honor or reputation" in art.6bis(1) of the **E.I.P.R. 811* Berne Convention reflects this aspect of responsibility: the author vouches for the contents of the work with her good name and reputation. As a corollary, the author must have the right to take measures against modifications of the work that could damage her name and reputation (which is inseparable from the work). The author's moral right to object to any distortion, mutilation, modification or other derogatory action¹¹⁶ is thus not only a right. It also attests to an inherent obligation: the responsibility—and accompanying liability—for the content of the work.¹¹⁷

If, however, the creative process leading to a work is left to a robot, the question arises whether this traditional liability for the contents of the work vanishes as well.¹¹⁸ In other words: can the robot user escape liability for infringing AI creations by leaving the decisions determining the concrete appearance of the work to a machine? Daniel Gervais has stated that a right to robot creations, inescapably, entails responsibility for the contents of robot-generated works. In his opinion, the acquisition of a right implies liability for potential infringement:

"Yet, if programmers, owners, and users of AI machines claim rights in the productions made by those machines, those programmers, owners and users must accept responsibility for those productions, whether they amount to copyright infringement, libel or any other source of liability. It does not matter whether it is likely that any liability might arise; what matters is answering this question: what if there was; would the owner or user be liable? This is a central normative point, anchored in copyright history: No copyright should be granted to an author who is not also responsible for the work's meaning and content, whether it be libel or copyright infringement."¹¹⁹

Evidently, the liability risk arising from this connection between the right to a work and liability for its content can render a neighbouring right to robot creations unattractive. Robot users may eschew a form of protection that brings liability for potential

infringements of third-party rights in its wake. Liability for the contents of robot creations may thus have the result that the grant of protection no longer appears desirable. The liability risk may thwart the attainment of the described goals of granting protection as an incentive for robot users.¹²⁰

Conclusion

Human creativity is a prerequisite for copyright protection on both sides of the Atlantic. In the case of works generated by robots with a step-by-step algorithm, human creativity can easily be identified because the human programmer's creative choices in coding the algorithm directly determine the creative actions taken by the robot. Rule-based and machine learning robot systems, however, raise more delicate issues. As human creativity no longer steers the creation process, the works created by robots operating on this basis are unlikely to enjoy copyright protection. Hence, the question arises whether it is desirable to change copyright originality standards and extend protection to robot creations in this category despite the lack of human creativity.

In this regard, an analysis on the basis of economic incentive theory indicates that it could make sense to offer protection for robot users. The robot user plays a central role in training the robot, activating the production process, and disseminating resulting robot-generated works. Seeking to maximise benefits for society, the user, thus, appears as the best candidate to ensure the creation and dissemination of fresh cultural material.

However, we have also seen that the grant of copyright protection has its price. Considering the long term of copyright and the breadth of exclusive rights, copyright can easily become too heavy a burden for creators of derivative works wishing to enjoy and remix robot-generated works. While copyright may offer a strong incentive for the creation and dissemination of robot works, it will at the same time discourage the use of robot-generated works as source material and building blocks for new human and robot creations. To avoid this corrosive effect, it is advisable to adopt a neighbouring rights approach instead. In contrast to copyright law, neighbouring rights law leaves much more room for tailor-made solutions. It allows the introduction of a period of protection that is long enough to enable the user of a creative robot to recoup his investment, but still short enough to prevent unnecessary obstacles to transformative remix activities that support cultural follow-on innovation. Moreover, the neighbouring rights approach allows the confinement of protection to a mere right to equitable remuneration.

Considering these recommendations, however, it must not be overlooked that the foregoing analysis focused on the utilitarian incentive theory. A broader assessment frame may yield the insight that, on balance, the described benefits for society — flowing from enhanced investment in the full development and dissemination of robot works — are unlikely to outweigh potential detriments, such as the curtailment of absolute freedom to remix and reuse AI-generated works that would follow from the status of public domain material, and increasing competition and substitution effects between robot and human creations that may reduce investment in human creativity and darken the income horizon of human creators. Moreover, **E.I.P.R. 812* it is important to factor legal obligations into the equation that may arise from the grant of protection. If the grant of neighbouring rights in robot creations implies liability for potential infringements of third-party rights, robot users may find the acquisition of rights no longer attractive. The risk of liability for infringement may thwart the attainment of the goals of incentive theory. Instead of seeing the grant of protection as a stimulus for stronger efforts to develop the full potential of creative AI machines, robot users may eschew the right holder status to escape liability for potential infringements.

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Footnotes

1 See https://motherboard.vice.com/en_us/article/vvbxxd/the-poem-that-passed-the-turing-test [Accessed 6 October 2020].

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- See https://motherboard.vice.com/en_us/article/vvbxxd/the-poem-that-passed-the-turing-test [Accessed 6 October 2020].
- See A. Elgammal, B. Liu, M. Elhoseiny, M. Mazzone, "CAN: Creative Adversarial Networks Generating 'Art' by Learning About Styles and Deviating from Style Norms" (June 2017): https://www.researchgate.net/publication/317823071_CAN_Creative_Adversarial_Networks_Generating_Art_by_Learning_About_Styles_and_Deviating_from_Style_Norms (2020), p.17 [Accessed 6 October 2020] (Elgammal and his fellow researchers carried out an experiment to determine whether humans were capable of distinguishing computer-generated art from human art by its appearance. 75% of the research subjects assumed that the computer-generated paintings were created by a human artist).
- See, for example, S. Yanisky and S. Moorhead, "Generating Rembrandt: Artificial Intelligence, Copyright and Accountability in the 3A Era" [2017] Michigan State Law Review 659, 662; A. Bridy, "The Evolution of Authorship: Work Made by Code" (2016) 39 Columbia Law Journal & Arts 395, 397; W.T. Ralston, "Copyright in Computer-Composed Music: HAL Meets Handel" (2005) 52 J. Copyright Society U.S.A. 281, 283.
- D. Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105, forthcoming; Vanderbilt Research Paper No.19-35, pp.2–4; J.C. Ginsburg and L.A. Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 395–396; M.-C. Janssens and F. Gotzen, "Kunstmatige Kunst. Bedenkingen bij de toepassing van het auteursrecht op Artificiële Intelligentie" (2018/19) 3 Auteurs en Media 323, 325–327; Ralston, "Copyright in Computer-Composed Music" (2005) 52 J. Copyright Society U.S.A. 281 (on computer-generated music); Yanisky and Moorhead, "Generating Rembrandt" [2017] Michigan State Law Review 659 (over computer-gegenereerde schilderijen); R.C. Denicola, "Ex Machina: Copyright Protection for Computer-Generated Works" (2016) 69 Rutgers University Law Review 251 (on computer-generated literature).
- Yanisky and Moorhead, "Generating Rembrandt" [2017] Michigan State Law Review 659, 672–676 (discussing the evolution of AI); A. Bridy, "Coding Creativity: Copyright and the Artificially Intelligent Author" (2012) 5 Stanford Technology Law Review 1, 3 (arguing that the state of the art continues to advance in AI), see also: M. Boden, "Computer Models of Creativity" (2009) 30 AI Magazine 23; and Bridy, "Coding Creativity: Copyright and the Artificially Intelligent Author" (2012) 5 Stanford Technology Law Review 1, 1 (for a discussion on whether a computer can "be" creative).
- J.-M. Deltorn, "Disentangling deep learning and copyright" [2018] Tijdschrift voor auteurs-, media- en informatierecht 172, 173–174); R. Pearlman, "Recognizing Artificial Intelligence as Authors and Investors under U.S. Intellectual Property Law" (2018) 24 Richmond Journal of Law and Technology 1, 4; Yanisky and Moorhead, "Generating Rembrandt" [2017] Michigan State Law Review 659, 670.
- Elgammal et al, "CAN: Creative Adversarial Networks Generating 'Art' by Learning About Styles and Deviating from Style Norms" (June 2017), p.17, https://www.researchgate.net/publication/317823071_CAN_Creative_Adversarial_Networks_Generating_Art_by_Learning_About_Styles_and_Deviating_from_Style_Norms (2020) [Accessed 6 October 2020]. (Elgammal and his fellow researchers carried out an experiment to determine whether humans were capable of distinguishing computer-generated art from human art by its appearance. 75% of the research subjects assumed that the computer-generated paintings were created by a human artist.)
- Notably, the European Parliament warned the European Commission, in its 2017 resolution, that because humankind stands on the threshold of an era when ever more sophisticated robots, bots, androids and other manifestations of artificial intelligence (AI) seem to be poised to unleash a new industrial revolution, which is likely to leave no stratum of society untouched, it is vitally important for the legislature to consider its legal and ethical implications and effects, without stifling innovation (European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics, pp.1–2).
- For a broader discussion of the requirement of human creativity across seven jurisdictions, see J.C. Ginsburg, "The Concept of Authorship in Comparative Copyright Law" (2002–03) 52 De Paul Law Review 1063, 1066.
- Copyright prerequisites laid down in *US Supreme Court 27 March 1991, Feist Publ'ns, Inc v Rural Tel. Serv. Co.*, 499 U.S. 340; and *US Supreme Court 17 March 1884, Burrow-Giles Litographic v Sarony*, 111 U.S. 53 seem to imply that human creativity is necessary in the process of creation (see second section of this article for analysis). From a practical point of view, the Copyright Office requires human authorship for copyright registration (Compendium of US Copyright Office Practices art.306).

- 12 *Infopaq International v Danske Dagblades Forening (C-5/08) EU:C:2009:465*; [2012 Bus. L.R. 102 at [37]. See also European Parliament Draft Report of 31 May 2016 with recommendations to the Commission on Civil Law Rules on Robotics, p.8 (in which the European Parliament calls on the Commission to elaborate on the criteria for "own intellectual creation" for copyrightable works produced by computers or robots).
- 13 See, for example, S.J. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach (Upper Saddle River, NJ: Pearson Education, 2010)*, p.9 (arguing that a robot's ability to learn may extend the reach of its designer into unknown environments); Yanisky and Moorhead, "Generating Rembrandt" [2017] Michigan State Law Review 659, 670 (arguing that AI systems are creative and unpredictable).
- 14 Nevertheless, see C.J. Craig and I.R. Kerr, "The Death of the AI Author", *Osgoode Legal Studies Research Paper (March 2019)*, SSRN, p.7, <https://ssrn.com/abstract=3374951> [Accessed 7 October 2020]; the authors argue that the issue of copyright protection for robot-generated works should not only be addressed by moving past bare doctrinal considerations of originality, but also by moving past utilitarian considerations).
- 15 Admittedly, the widespread availability of AI creations may have an adverse, disruptive effect on the creation and dissemination of traditional works made by humans. cf. R. Chavannes, "De bescherming van deep learning-systemen door het intellectuele eigendomsrecht" [2019] *Tijdschrift voor auteurs-, media- en informatierecht* 179, 181–182; Gervais, "The Machine as Author" (2020) 105 *Iowa Law Review* 105 (forthcoming). This problem, however, raises questions of redistributing royalties flowing from the exploitation of robot-generated works. It does not necessarily militate against the grant of protection.
- 16 *Feist Publ'ns Inc v Rural Tel. Serv. Co.*, 499 U.S. 340, 355.
- 17 See, for example, *Feist Publ'ns, Inc v Rural Tel. Serv. Co.*, 499 U.S. 340; and *Burrow-Giles Litographic v Sarony*, 111 U.S. 53.
- 18 *Feist Publ'ns, Inc v Rural Tel. Serv. Co.*, 499 U.S. 340, 345.
- 19 In the field of computer-generated art, the Next Rembrandt project could serve as an example of a creative robot that created a completely new painting in the style of Rembrandt. See Yanisky and Moorhead, "Generating Rembrandt" [2017] Michigan State Law Review 659, 663. Elgammal produced a neural network named CAN that can serve as an example of a robot that is able to deviate from style. See Elgammal et al, "CAN: Creative Adversarial Networks Generating 'Art' by Learning About Styles and Deviating from Style Norms" (June 2017), pp.20–21, https://www.researchgate.net/publication/317823071_CAN_Creative_Adversarial_Networks_Generating_Art_by_Learning_About_Styles_and_Deviating [Accessed 6 October 2020].
- 20 *US Supreme Court 27 March 1991, Feist Publ'ns, Inc v Rural Tel. Serv. Co.*, 499 U.S. 340, 345.
- 21 *US Supreme Court 27 March 1991, Feist Publ'ns, Inc v Rural Tel. Serv. Co.*, 499 U.S. 340, 348–354.
- 22 H. Saksena, "Doctrine of Sweat of the Brow" (3 May 2009), SSRN, pp.5–6, <https://ssrn.com/abstract=1398303> [Accessed 7 October 2020]; C.J. Craig, "The Evolution of Originality in Canadian Copyright Law: Authorship, Reward and the Public Interest" (2005) 2 *University of Ottawa Law & Technology Journal* 425, 444–445; J.C. Ginsburg, "The Concept of Authorship in Comparative Copyright Law" (2003) 52 *DePaul Law Review* 1063, 1080.
- 23 *US Supreme Court 27 March 1991, Feist Publ'ns Inc v Rural Tel. Serv. Co.*, 499 U.S. 340, 358.
- 24 *US Supreme Court 27 March 1991, Feist Publ'ns, Inc v Rural Tel. Serv. Co.*, 499 U.S. 340, 348.
- 25 See *US Supreme Court 17 March 1884, Burrow-Giles Litographic v Sarony*, 111 U.S. 53 (in which the court discusses whether there is enough room for human creative input when capturing a photograph).
- 26 *US Supreme Court 27 March 1991 (Feist Publ'ns, Inc v Rural Tel. Serv. Co.)*, 499 U.S. 340, 346.
- 27 See for example: Pearlman, "Recognizing Artificial Intelligence as Authors and Investors under U.S. Intellectual Property Law" (2018) 24 *Richmond Journal of Law and Technology* 1, 15; Denicola, "Ex Machina: Copyright Protection for Computer-Generated Works" (2016) 69 *Rutgers University Law Review* 251, 265–266; Bridy, "The Evolution of Authorship: Work Made by Code" (2016) 39 *Columbia Law Journal & Arts* 395, 399.
- 28 *US Supreme Court 17 March 1884 (Burrow-Giles Litographic v Sarony)*, 111 U.S. 53, 58.
- 29 *US Supreme Court 17 March 1884 (Burrow-Giles Litographic v Sarony)*, 111 U.S. 53, Syllabus.
- 30 *US Court of Appeals for the Ninth Circuit, 23 April 2018 (Naruto v Slater)*, No.16-15469, p.17.
- 31 cf. Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 *Berkeley Technology Law Journal* 343, 362–365.
- 32 In this sense also Gervais, "The Machine as Author" (2020) 105 *Iowa Law Review* 105, forthcoming.
- 33 Compendium of US Copyright Office Practices art.306.

- 34 For instance, see Pearlman, "Recognizing Artificial Intelligence as Authors and Investors under U.S. Intellectual Property Law" (2018) 24 *Richmond Journal of Law and Technology* 1, 15; Denicola, "Ex Machina: Copyright Protection for Computer-Generated Works" (2016) 69 *Rutgers University Law Review* 251, 265–266; Bridy, "Authors and Machines" (2019) 34 *Berkeley Technology Law Journal* 343, 399 (arguing that human creativity is essential for copyright protection under US law).
- 35 Compendium of US Copyright Office Practices, art.313.2.
- 36 National Commission on New Technological Uses of Copyrighted Works, Final Report of 31 July 1978, p.45.
- 37 Gervais, "The Machine as Author" (2020) 105 *Iowa Law Review* 105, forthcoming; Pearlman, "Recognizing Artificial Intelligence as Authors and Investors under U.S. Intellectual Property Law" (2018) 24 *Richmond Journal of Law and Technology* 1, 15; Denicola, "Ex Machina: Copyright Protection for Computer-Generated Works" (2016) 69 *Rutgers University Law Review* 251, 265; Bridy, "Authors and Machines" (2019) 34 *Berkeley Technology Law Journal* 343; Ralston, "Copyright in Computer-Composed Music" (2005) 52 *J. Copyright Society U.S.A.* 281, 298 (arguing that human creativity is essential for copyright protection under US law).
- 38 Gervais, "The Machine as Author" (2020) 105 *Iowa Law Review* 105, forthcoming.
- 39 Directive 2009/24 (Software Directive) art.1(3); Directive 96/9 (Database Directive) art.3. See also Directive 2006/116 (Term Directive) art.6.
- 40 *Infopaq International v Danske Dagblades Forening (C-5/08) EU:C:2009:465*; [2012] *Bus. L.R.* 102 at [37].
- 41 *Infopaq (C-5/08) EU:C:2009:465* at [37]. See also European Parliament, 27 January 2017, Report with recommendations to the Commission on Civil Law Rules on Robotics, Document 2015/2103(INL), p.8, https://www.europarl.europa.eu/doceo/document/A-8-2017-0005_EN.html [Accessed 7 October 2020] (where the European Parliament asks the European Commission to clarify the criterium of "own intellectual creation" with regard to works made by computers or robots).
- 42 *Infopaq (C-5/08) EU:C:2009:465* at [45].
- 43 *Eva Maria Painer v Standard Verlags (C-145/10) EU:C:2011:798* at [88].
- 44 *Painer (C-145/10) EU:C:2011:798* at [89].
- 45 *Painer (C-145/10) EU:C:2011:798* at [92].
- 46 Gotzen and Janssens, "Kunstmatige Kunst: Bedenkingen bij de toepassing van het auteursrecht op Artificiële Intelligentie" (2018/19) 3 *Auteurs en Media* 323, 332; M. De Cock Buning, "Autonomous Intelligent Systems as Creative Agents under the EU Framework for Intellectual Property" (2016) 7 *European Journal of Risk Regulation* 310, 314 (discussing that the court's reasoning in *Infopaq* and *Painer* implies a human creativity requirement). See also *F.W. Grosheide, Auteursrecht op maat (Deventer: Wolters Kluwer, 1986), p.219* (Grosheide, according to De Cock Buning, was the first Dutch legal scholar who referred to the requirement of human input as the anthropocentric approach to copyright law); A. Ramalho, "Will Robots Rule the Artistic World? A Proposed Model for the Legal Status of Creation by AIs" (2017) 21 *Journal of Internet Law* 12, 21 (stating that when there is no human author, a work cannot be original, and without originality, a work cannot be protected by copyright).
- 47 With regard to the long tradition of this assumption of personal attachment to the work, see *E. Ulmer, Urheber- und Verlagsrecht (Berlin/Heidelberg/New York: Springer 1980), pp.110–111*; *H. Desbois, Le droit d'auteur en France (1978), p.538*.
- 48 *Supreme Court of the Netherlands (Hoge Raad), 30 May 2008, NL:HR:2008:BC2153 (Zonen Endstra)* para.4.4 and 4.5.1.
- 49 M.R.F. Senftleben, "Bridging the Differences between Copyright's Legal Traditions: The Emerging EC Fair Use Doctrine" (2010) 57 *Journal of the Copyright Society of the U.S.A* 521, 524.
- 50 See, for example: De Cock Buning, "Autonomous Intelligent Systems as Creative Agents under the EU Framework for Intellectual Property" (2016) 7 *European Journal of Risk Regulation* 310, 314 (discussing that the court's reasoning in *Infopaq* and *Painer* implies a human creativity requirement). See also: *Grosheide, Auteursrecht op maat (1986), p.219* (Grosheide, according to De Cock Buning, was the first Dutch legal scholar who referred to the requirement of human input as the anthropocentric approach to copyright law); Ramalho, "Will Robots Rule the Artistic World?" (2017) 21 *Journal of Internet Law* 12, 18 (stating that when there is no human author, a work cannot be original, and without originality, a work cannot be protected by copyright).

- 51 cf. Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 359–361. The same conclusion follows from an analysis based on the historical evolution of modern copyright law. See Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105, forthcoming.
- 52 cf. Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 405–407.
- 53 Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105, forthcoming; Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 404–405.
- 54 cf. Ginsburg & Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 408–413.
- 55 S. Mukundan et al, "A Practical Introduction to Rule-Based Expert Systems" (January 2007), pp.21–25, <https://www.researchgate.net/publication/265038834> [Accessed 7 October 2020].
- 56 Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 424–426.
- 57 M.A. Boden and E.A. Edmonds, "What is Generative Art?" (2009) 20 Digital Creativity 21, 24; M. Boden, "Authenticity and Computer Art" (2007) 18 Digital Creativity 3.
- 58 Bridy, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 397 (discussing the rule-bound nature of human creativity).
- 59 In this category, a distinction can be drawn between "machine-learning" and "deep-learning" algorithms. See Deltorn, "Disentangling deep learning and copyright" [2018] Tijdschrift voor auteurs-, media- en informatierecht 172, 173–174; Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105, forthcoming; Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 401–402.
- 60 cf. Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105, forthcoming.
- 61 Russell and Norvig, *Artificial Intelligence* (2010), pp.693–717.
- 62 European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics, p.2 (arguing that machine learning offers enormous economic and innovative benefits for society, while also raising challenges to ensure understandability in decision-making processes).
- 63 For instance, see Yanisky and Moorhead, "Generating Rembrandt" [2017] Michigan State Law Review 659, 701; Pearlman, "Recognizing Artificial Intelligence as Authors and Investors under U.S. Intellectual Property Law" (2018) 24 Richmond Journal of Law and Technology 1, 28.
- 64 Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105, forthcoming.
- 65 Gotzen and Janssens, "Kunstmatige Kunst" (2018/19) 3 Auteurs en Media 323, 332. See also the discussion of "authorless works" by Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 433–437 and 446.
- 66 See the invocation of Locke's labour theory: Locke (1698), book II chapter 5 §27, which is discussed by L.L. Weinreb, "Copyright for Functional Expression" (1998) 111 Harvard Law Review 1150; W.J. Gordon, "A Property Right in Self-Expression: Equality and Individualism in the Natural Law of Intellectual Property" (1993) 102 Yale Law Journal 1553; A. Strowel, *Droit d'auteur et Copyright* (Brussels: Bruylant, 1993), pp.183–184; F.I. Michelman, "Property, Utility, and Fairness: Comments on the Ethical Foundations of 'Just Compensation' Law" (1967) 80 Harvard Law Review 1165, 1204).
- 67 Grosheide, *Auteursrecht op maat* (1986), p.124.
- 68 Desbois, *Le droit d'auteur en France* (1978), p.538; Ulmer, *Urheber- und Verlagsrecht* (1980), pp.105–106.
- 69 De Cock Buning, "Autonomous Intelligent Systems as Creative Agents under the EU Framework for Intellectual Property" (2016) 7 European Journal of Risk Regulation 310, 319; Grosheide, *Auteursrecht op maat* (1986), p.130.
- 70 B. Edelman, "The Law's Eye: Nature and Copyright" in B. Sherman and A. Strowel, *Of Authors and Origins* (Oxford: Clarendon Press 1994), p.79 at pp.82–87; P.E. Geller, "Must Copyright Be For Ever Caught Between Marketplace and Authorship Norms?" in *Of Authors and Origins*, (1994), p.159 at pp.169–170; A. Strowel, "Droit d'auteur and Copyright: Between History and Nature" in *Of Authors and Origins* (1994), p.235 at pp.236–237.
- 71 A. Förster, *Fair Use* (Tübingen: Mohr Siebeck, 2008), pp.182–184; Grosheide, *Auteursrecht op maat* (1986), p.2; Geller, "Must Copyright Be For Ever Caught Between Marketplace and Authorship Norms?" in *Of Authors and Origins* (1994), p.170; Sherman and Strowel, *Of Authors and Origins* (1994), pp.249–250.

- 72 Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 447.
 73 For a concurring opinion, see B.E. Boyden, "Emergent Works" (2016) 39 Columbia Journal of Law & Arts 377, 391; Yanisky and Moorhead, "Generating Rembrandt" [2017] Michigan State Law Review 659, 706–707.
- 74 In the words of M.E. Kaminski, "Authorship, Disrupted: AI Authors in Copyright and First Amendment Law" (2017) 51 UC Davis Law Review 589, 599: "we change the nature of the conversation from being about rewarding humans for creative endeavors to calibrating policy to a level that benefits society as a whole, including the human audiences of algorithmically authored works." cf. Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 447–448.
- 75 *Grosheide, Auteursrecht op maat* (1986), p.18.
 76 T.L. Butler, "Can a Computer be an Author: Copyright Aspects of Artificial Intelligence" (1982) 4 Hastings Communications and Entertainment Law Journal 707, 735.
 77 cf. *E.W. Ploman and L. Hamilton, Copyright: Intellectual Property in the Information Age* (London: Routledge & Kegan Paul, 1980), p.26.
- 78 In this vein, the US Supreme Court, for instance, referred to copyright as an "engine of free expression" in *Harper & Row v Nation Enterprises*, 471 U.S. 539 (1985), at III B.
 79 cf. *Sherman and Strowel, Of Authors and Origins* (1994), pp.241–249; S.P. Calandrillo, "An Economic Analysis of Property Rights in Information: Justifications and Problems of Exclusive Rights, Incentives to Generate Information, and the Alternative of a Government-Run Reward System" (1998) 9 Fordham Intellectual Property Media and Entertainment Law Journal 301, 310.
 80 cf. *Geller, "Must Copyright Be for Ever Caught Between Marketplace and Authorship Norms?" in Of Authors and Origins* (1994), p.170; *Sherman and Strowel, Of Authors and Origins* (1994), pp.250–251.
 81 *Grosheide, Auteursrecht op maat* (1986), p.134.
- 82 N.W. Netanel, "Copyright and a Democratic Civil Society" (1996) 106 Yale Law Journal 283, 288, who argues that copyright's primary goal is not allocative efficiency, but to bolster the discursive foundations of a robustly participatory culture and democratic civil society.
 83 *J.C. Ginsburg, "A Tale of Two Copyrights: Literary Property in Revolutionary France and America" in Of Authors and Origins* (1994), p.131.
- 84 As to the question whether the robot can be deemed creative in this context, see Boden, "Authenticity and Computer Art" (2007) 18 Digital Creativity 3; Boden, "Computer Models of Creativity" (2009) 30 AI Magazine 23; Bridy, "Computer Models of Creativity" (2009) 30 AI Magazine 1; Bridy, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 395.
- 85 Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105, forthcoming; A.J. Wu, "From Video Games to Artificial Intelligence: Assigning Copyright Ownership to Works Generated by Increasingly Sophisticated Computer Programs" (1997) 25 AIPLA Quarterly Journal 131, 156. As to the validity of the incentive argument in the case of authors of flesh and blood, see *M.R.F. Senfileben, "Copyright, Creators and Society's Need for Autonomous Art—The Blessing and Curse of Monetary Incentives" in R. Gibling and K. Weatherall (eds), What if We Could Reimagine Copyright?* (Canberra: ANU Press, 2017), p.25 at pp.28–32.
- 86 For instance, see P. Samuelson, "Allocating Ownership Rights in Computer Generated Works" (1985) 47 University of Pittsburgh Law Review 1185, 1199; Butler, Butler, "Can a Computer be an Author: Copyright Aspects of Artificial Intelligence" (1982) 4 Hastings Communications and Entertainment Law Journal 707, 740, n.171; Yanisky and Moorhead, "Generating Rembrandt" [2017] Michigan State Law Review 659, supra note 4, 701; R.D. Clifford, "Intellectual Property in the Era of the Creative Computer Program—Will the True Creator Please Stand Up" (1997) Tulane Law Review 71, 1675 (1701) (agreeing that it makes no sense to allocate copyright ownership to the AI machine itself).
- 87 K. Hristov, "Artificial Intelligence and the Copyright Dilemma" (2017) 57 IDEA: The IP Law Review 431, 433; De Cock Buning, "Autonomous Intelligent Systems as Creative Agents under the EU Framework for Intellectual Property" (2016) 7 European Journal of Risk Regulation 310 (arguing that the European Commission recognises AI as the next step in the development of a sustainable information society). See also: European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics, p.2.
- 88 Samuelson, "Allocating Ownership Rights in Computer Generated Works" (1985) 47 University of Pittsburgh Law Review 1185, 1205.
 89 Bridy, "Computer Models of Creativity" (2009) 30 AI Magazine 1, 21.

- 90 cf. P. Samuelson, "Staking the Boundaries of Software Copyrights in the Shadow of Patents" (2019) 71 Florida Law Review 243, 29–301; Y. Li, "The Current Dilemma and Future of Software Patenting" (2019) 50 International Review of Intellectual Property and Competition Law 823; T.G. Dane, "Part I: Are the Federal Circuit's Recent Section 101 Decisions a 'Specific Improvement' in Patent Eligibility Law?" (2018) 35 Computer and Internet Lawyer 1; T.G. Dane, "Part II: Are the Federal Circuit's Recent Section 101 Decisions a 'Specific Improvement' in Patent Eligibility Law?" (2018) 35 Computer and Internet Lawyer 5; S. Sterckx and J. Cockbain, "The Patentability of Computer Programs in Europe: An Improved Interpretation of Articles 52(2) and (3) of the European Patent Convention" (2010) 13 Journal of World Intellectual Property 366, 366–402; R.M. Ballardini, "Software Patents in Europe: the Technical Requirement Dilemma" (2008) 3 Journal of Intellectual Property Law and Practice 563; M. Leistner, "Computerimplementierte Erfindungen im System des 'Geistigen Eigentums'" in: O. Depenheuer and K.N. Peifer (eds), *Geistiges Eigentum: Schutzrecht oder Ausbeutungstitel (Berlin/Heidelberg: Springer, 2008)*, p.187 at p.188; G. Ghidini and E. Arezzo, "Patent and Copyright Paradigms vis-à-vis Derivative Innovation: The Case of Computer Programs" (2005) 36 International Review of Intellectual Property and Competition Law 159, 166; R.M. Hilty and C. Geiger, "Patenting Software? A Judicial and Socio-Economic Analysis" (2005) 36 International Review of Intellectual Property and Competition Law 615; D.L. Burk and M.A. Lemley, "Designing Optimal Software Patents" in: R.W. Hahn (ed.), *Intellectual Property Rights in Frontier Industries: Software and Biotechnology (Washington, D.C.: AEI Press, 2005)* p.81; J. Weyand and H. Haase, "Patenting Computer Programs: New Challenges" (2005) 36 International Review of Intellectual Property and Competition Law 647; J.E. Cohen and M.A. Lemley, "Patent Scope and Innovation in the Software Industry" (2001) 89 California Law Review 1, 41–42; C. Caron, "Réflexions sur la coexistence du droit d'auteur et du droit des brevets sur un même logiciel" (2000) 184 Revue internationale du droit d'auteur 3.
- 91 Deltorn, "Disentangling deep learning and copyright" [2018] Tijdschrift voor auteurs-, media- en informatierecht 172, 177–178.
- 92 TRIPS art.10(1); WIPO Copyright Treaty art.4. cf. A. Dietz, "Copyright Protection for Computer Programs: Trojan Horse or Stimulus for the Future Copyright System" (1985) 110 Archiv für Urheber-, Film- und Theaterrecht 57.
- 93 Gotzen and Janssens, "Kunstmatige Kunst" (2018/19) 3 Auteurs en Media 323, 335; Deltorn, "Disentangling deep learning and copyright" [2018] Tijdschrift voor auteurs-, media- en informatierecht 172, 174–178; Samuelson, "Staking the Boundaries of Software Copyrights in the Shadow of Patents" (2019) 71 Florida Law Review 243; Y. Li, "The Current Dilemma and Future of Software Patenting" (2019) 50 International Review of Intellectual Property and Competition Law 823, 1208. However, see also Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 448, who emphasise that copyright protection for the code and patent protection for algorithms may be insufficient because these forms of protection do not cover the final result: the AI-generated work as such. Nonetheless, they conclude that, for the time being, there is not enough evidence of a lack of protection to support the development of a specific sui generis instrument of protection.
- 94 See for a contrasting opinion: Hristov, "Artificial Intelligence and the Copyright Dilemma" (2017) 57 IDEA: The IP Law Review 431, 445.
- 95 From an economic incentive perspective, this combination of tasks may be inefficient, as the programmer is unlikely to have the best expertise regarding art markets and channels of distribution.
- 96 See, for example: Samuelson, "Allocating Ownership Rights in Computer Generated Works" (1985) 47 University of Pittsburgh Law Review 1185, 1227–1228; J. McCutcheon, "The Vanishing Author in Computer-generated Works" (2013) 36 Melbourne University Law Review 915, 960; Denicola, "Ex Machina: Copyright Protection for Computer-Generated Works" (2016) 69 Rutgers University Law Review 251, 286–287 (who argue that copyrights should be attributed to the user). For the opposite view, see Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105, forthcoming, p.14 (who sees no convincing evidence that protection is necessary to stimulate the dissemination of robot works); Ralston, "Copyright in Computer-Composed Music" (2005) 52 J. Copyright Society U.S.A. 281, 307 (who argues that awarding copyright to a user who does no more than double-click a computer screen icon seems at odds with the underlying policy for copyright as an incentive for creation).
- 97 See ss.9(3) and 178 of the UK Copyright, Designs and Patents Act 1988. cf. A. Guadamuz, "Do Androids Dream of Electric Copyright? Comparative Analysis of Originality in Artificial Intelligence Generated Works" (2017) 2 Intellectual Property Quarterly 169, 175; Bridy, "Computer Models of Creativity" (2009) 30 AI Magazine 1, 26.

- 98 Ginsburg and Budiardjo, "Authors and Machines" (2019) 34 Berkeley Technology Law Journal 343, 430–432.
- 99 BC art.7(1). As to the extension of this international minimum term, see *US Supreme Court 15 January 2003 (Eldred/Ashcroft)*, 537 U.S. 186, 202.
- 100 Nonetheless, several scholars have argued that copyright could provide the desirable form of protection for machine-authored works. See, for example: Samuelson, "Allocating Ownership Rights in Computer Generated Works" (1985) 47 University of Pittsburgh Law Review 1185, 1227–1228; McCutcheon, "The Vanishing Author in Computer-generated Works" (2013) 36 Melbourne University Law Review 915, 960; Denicola, "Ex Machina: Copyright Protection for Computer-Generated Works" (2016) 69 Rutgers University Law Review 251, 286–287 (who argue that copyrights should be attributed to the user).
- 101 cf. De Cock Buning, "Autonomous Intelligent Systems as Creative Agents under the EU Framework for Intellectual Property" (2016) 7 European Journal of Risk Regulation 310, 322 (arguing that a sui generis right may provide a more suitable solution). See also: Gotzen and Janssens, "Kunstmatige Kunst" (2018/19) 3 Auteurs en Media 323, 333 (mentioning a neighbouring rights approach as a protection alternative); Ramalho, "Will Robots Rule the Artistic World?" (2017) 21 Journal of Internet Law 12, 20–22 (stating that it would be best to leave robot-generated works in the public domain or create a "disseminator's right" that is limited in scope to ensure that robot-generated works are brought into public circulation, while at the same time avoiding privatisation).
- 102 As to the rationales underlying the grant of phonogram producer rights, see *Pelham (C-476/17) EU:C:2019:624* at [29]–[31]; *SCF/Marco del Corso (C-135/10) EU:C:2012:140* at [75]. cf. D.J.G. Visser, "Openbaar maken met ketchup" [2013] Tijdschrift voor auteurs-, media- en informatierecht 41, 46.
- 103 *SCF/Marco del Corso (C-135/10) EU:C:2012:140* at [75].
- 104 Netanel, "Copyright and a Democratic Civil Society" (1996) 106 Yale Law Journal 283, 309.
- 105 [Directive 2019/790 on Copyright and Related Rights in the Digital Single Market and Amending Directives 96/9 and 2001/29 \[2019\] OJ L130/92](#). cf. M.M.M. van Eechoud, "Artikel 15 DSM-richtlijn: bescherming van perspublicaties met betrekking tot onlinegebruik (persuitgeversrecht)" [2019] Tijdschrift voor auteurs-, media- en informatierecht 197, 199; M.R.F. Senfileben, M. Kerk, M. Buiten and K. Heine, "New Rights or New Business Models? An Inquiry Into the Future of Publishing in the Digital Era" (2017) 48 International Review of Intellectual Property and Competition Law 538, 55556).
- 106 M.R.F. Senfileben, "Quotations; Parody and Fair Use" in: P.B. Hugenholtz, A.A. Quaadvlieg, D.J.G. Visser (eds), *A Century of Dutch Copyright Law—Auteurswet 1912–2012 (Amstelveen: deLex, 2012)*, p.359 at p.389.
- 107 J. Litman, "The Public Domain" (1990) 39 Emory Law Journal 965, 966–967. For a more detailed discussion of the dialogic process underlying acts of creation, see S. Dusollier, "Realigning Economic Rights with Exploitation of Works: The Control of Authors over the Circulation of Works in the Public Sphere" in P.B. Hugenholtz (ed.), *Copyright Reconstructed — Rethinking Copyright's Economic Rights in a Time of Highly Dynamic Technological and Economic Change (Alphen aan den Rijn: Kluwer Law International 2018)*, p.163 at pp.180–183; C.J. Craig, *Copyright, Communication and Culture — Towards a Relational Theory of Copyright Law (Cheltenham: Edward Elgar, 2011)*, pp.52–56; J.E. Cohen, "Copyright, Commodification, and Culture: Locating the Public Domain" in L.M.C.R. Guibault/ and P.B. Hugenholtz (eds), *The Future of the Public Domain — Identifying the Commons in Information Law (The Hague/London/New York: Kluwer Law International 2006)*, p.121 at pp.144–152.
- 108 Netanel, "Copyright and a Democratic Civil Society" (1996) 106 Yale Law Journal 283, 293.
- 109 As to the debate on text-and-data mining for the purpose of robot training, see T. Margoni, "Text and Data Mining in Intellectual Property Law: Towards an Autonomous Classification of Computational Legal Methods" in: I. Calboli and L. Montagnani (eds.) *Handbook of Intellectual Property Research (Oxford: Oxford University Press 2020 (forthcoming))*; T. Margoni, "Artificial Intelligence, Machine Learning and EU Copyright Law: Who Owns AI?" (2019) 27 AIDA: Annali italiani del diritto d'autore, della cultura e dello spettacolo 281; P.B. Hugenholtz, "Artikelen 3 en 4 DSM-richtlijn: tekst- en datamining" [2019] Tijdschrift voor auteurs-, media- en informatierecht 167, 167–168.
- 110 cf. Gotzen and Janssens, "Kunstmatige Kunst" (2018/19) 3 Auteurs en Media 323, 333–334; R. Yu, "The Machine Author: What Level of Copyright Protection is Appropriate for Fully Independent Computer-generated Works?" (2017) 165 University of Pennsylvania Law Review 1245, 1245–1246 (who argues that no copyright protection for computer-generated works provides the desirable solution from a public policy standpoint); Boyden, Boyden, "Emergent Works" (2016) 39 Columbia Journal of Law & Arts 377, 391 (arguing that no one needs to be incentivised to produce the output of computer-generated

- works); M. Perry and T. Margoni, "From Music Tracks to Google Maps: Who Owns Computer-generated Works" (2010) 26 Computer Law and Security Review 621 (proposing that works created in the absence of human intervention should belong to the public domain).
- 111 B. Beebe, "Bleistein, the Problem of Aesthetic Progress, and the Making of American Copyright Law" (2017) 117 Columbia Law Review 319, 345–346, 373–374 and 384–385.
- 112 Beebe, "Bleistein, the Problem of Aesthetic Progress, and the Making of American Copyright Law" (2017) 117 Columbia Law Review 319, 345–346.
- 113 Beebe, "Bleistein, the Problem of Aesthetic Progress, and the Making of American Copyright Law" (2017) 117 Columbia Law Review 319, 346–347.
- 114 cf. Chavannes, "De bescherming van deep learning-systemen door het intellectuele eigendomsrecht" [2019] Tijdschrift voor auteurs-, media- en informatierecht 179, 181–182; Gervais, "The Machine as Author" (2020) 105 Iowa Law Review 105 (forthcoming), 181182; Gervais, supra note 5, 14–15.
- 115 Ulmer, supra note 47, 110–111; Desbois, supra note 47, 538.
- 116 Berne Convention art.6 bis(1).
- 117 Gervais, supra note 5, 36–37, emphasises a "linkage between right and responsibility."
- 118 See Gotzen & Janssens, supra note 5, 338 (pointing out that the liability question cannot simply be discarded by arguing that the AI system operated in an automated, independent way).
- 119 Gervais, supra note 5, 38.
- 120 For a broader discussion of liability regimes that may be appropriate in respect of robot creations, including product liability and risk control, see Gotzen & Janssens, supra note 5, 339–341.