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PATENT PROTECTION FOR PLANTS: A COMPARISON OF AMERICAN AND EUROPEAN APPROACHES

GEERTRUI VAN OVERWALLE *

* Senior researcher at the Centre for Intellectual Property Rights (CIR) of the Catholic University of Leuven (K.U. Leuven), Belgium; Visiting Professor at the Catholic University of Brussel (K.U. Brussels), Belgium.

I. Introduction

From the initial establishment of patent acts in the United States and in Europe, experts have questioned whether or not plants can enjoy patent protection. For various reasons, it has generally been felt that the patent system was an inappropriate method of protecting new plants. Consequently, special plant-tailored protection systems were created. With the enactment of these plant protection systems, the debate on patent protection for plants under the general patent act (called the "Utility Patent Act" or "UPA" in the United States) seemed to end, until the call for patent protection for plants was raised again at the end of the 1970s. In the United States, the renewed debate was settled once and for all in 1985 in favor of UPA patent protection for plants. In Europe, the debate temporarily ceased in 1983, but resumed in 1995, when the Technical Boards of Appeal of the European Patent Office ("EPO") decided to stop granting patents for plants. The Directive 98/44/EC of the European Parliament and of the Council of July 6, 1998 on the Legal Protection of Biotechnological inventions did not, for various reasons, put an end to this revived debate. This article argues that the ongoing uncertainty and ambiguity as to plant patentability in Europe can only be settled by parting from a semantic approach - i.e., by no longer arguing about the exact meaning and scope of the phrase "plant variety" in Article 53(b) of the European Patent Convention ("EPC") - and by looking instead to intrinsic arguments to justify the patentability of plants.

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To this end, I evaluate the objections which have been raised over the past one hundred years to deny plants patent protection in the light of recent technological developments, to see if and to what extent these objections still apply to plants obtained by modern transformation techniques. I conclude by suggesting that these various historical patentability objections are no longer valid with regard to plant biotechnological inventions, and that a number of patent-law objections also no longer apply to plants obtained by conventional breeding. Finally, in the interest of realigning itself with current U.S. patent policy, the European Patent Office should follow this analysis and take appropriate steps to abolish Article 53(b) of the EPC.

II. The First-Generation Patent Acts

Starting around the middle of the 19th century, national patent acts were established in continental Europe. When defining patentable subject matter, some patent acts (such as the Belgian Patent Act of 1854 n1 and the German Patent Act of 1877 n2) stated in general terms that

[*145] exclusive patent rights were granted for "inventions," whereas other patent acts (such as the Dutch Patent Act of 1910 n3 and the French Patent Act of 1844 n4) specified that patent protection would be offered only to "certain categories of inventions."

Regarding general patentability requirements, several national patent acts stipulated that inventions be novel n5 and industrially applicable. n6 The first-generation patent acts did not explicitly require

[*146] originality (in Belgium, "non-evidence;" in Germany, Erfindungsh he), but following jurisprudential n7 and legal doctrine, n8 originality was considered to be inherent to the concept of invention. n9 Additionally, most patent acts required a patent application to include a clear and sufficient description, n10 fulfilling the requirement of adequate disclosure.

The first U.S. patent statute was enacted in 1790. n11 Three years later, Congress replaced that initial patent act. n12 In 1836, Congress revised the patent laws, n13 and in 1870, Congress replaced the 1836 revision with a new codification. n14 However, despite the later revisions and replacements, the 1790 and 1793 patent statutes and court decisions interpreting them introduced the fundamental concepts that remain features of current U.S. patent law.

In defining patentable subject matter, the 1790 Patent Act authorized patents for "any useful art, manufacture, engine, machine, or device, or any improvement therein not before known or used," n15 provided the invention was "sufficiently useful and important." n16 The 1793 Patent Act omitted the importance determination and authorized patents for "any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement [thereon], not known or used before the application." n17 By requiring that an

[*147] invention fall within one of the express categories of patentable subject matter, the 1793 Patent Act introduced the famous four-category approach, which is still in force today.

Furthermore, the general patentability requirements of the 1790 Patent Act introduced the criteria of novelty n18 and utility. n19 The non- obviousness requirement was established by case law in the mid-19th century. n20

As for adequate disclosure, the original Patent Act of 1790 required the inventor to file, at the time of the patent grant,

a specification . . . containing a description . . . of the thing . . . by him . . . invented . . . which specification shall be so particular . . . as not only to distinguish the invention . . . from other things before known and used, but also to enable a workman or other person skilled in the art of manufacture, whereof it is a branch, or wherewith it may be nearest connected, to make, construct, or use the same, to the end that the public may have the full benefit thereof, after the expiration of the patent term, n21

thus clearly introducing the description and enablement requirements. Later, "[t]he 1793 Patent Act altered the language of the 1790 Patent Act . . . and added the requirement that 'in the case of any machine, [the inventor] shall fully explain the principle, and the several modes in which he has contemplated the application of that principle or character, by which it may be distinguished from other inventions.' n22 Furthermore, "[t]he referent became 'any person skilled in the art or science,' omitting 'workman,' and the disclosure had to enable such person to 'make, compound, and use.'" n23 Finally, "[t]he Patent Act of 1870 changed the

[*148] 'mode' provision as to machines from 'several modes' to 'best mode,'" n24 thus introducing the best-mode requirement.

III. The First-Generation Objections

Since the enactment of the first-generation patent acts, critics have questioned whether plant inventions merit patent protection. Close reading of the academic writers and the courts' decisions in the United States and in Europe (with special emphasis on Belgium, Germany and the Netherlands) shows that between 1790 and 1970, several arguments were raised to deny plants patent protection.

The largest category of objections focused on non-compliance with the legal requirements of patentability: invention conception, novelty, inventive step (Europe) or non-obviousness (United States), industrial applicability (Europe) or utility (United States) and adequate disclosure. n25 Simultaneously, there were a number of other arguments against patenting plants, focusing on economic and evidential objections. n26

A. Product of Nature

The first objection raised by the legal doctrine was that breeders' products, even those artificially bred, were not the result of a creative process and hence were not inventions as such. In other words, breeders'

[*149] products were products of nature and were non-inventions or, as the Germans put it, Nicht-Erfindungen. n27

The product-of-nature objection had several followers in Europe. In Belgium, commentators argued that mineral products (such as marble and ivory), plant products (such as fruits, flowers or vegetables) and animal products were not patentable because these products occurred in nature. n28 In Germany, the product-of- nature (Naturstoff) objection had only a few followers who opposed patent protection for culture methods, breeding methods and breeders' products, basing their objection on the fact that these inventions were largely the result of nature's "work" with minor human intervention. n29

The product-of-nature objection also arose in the United States. For a long period, the U.S. Patent and Trademark Office ("USPTO") particularly denied patents to plants because of the product-of-nature doctrine. The doctrine was explicitly stated in Ex parte Latimer, n30 and followed by the Supreme Court in American Fruit Growers v. Brogdex Co. n31 and Funk Bros. Seed Co. v. Kalo Inoculant Co. n32 The Supreme

[*150] Court failed to see plants as manufactures in the sense of the general patent law, but rather, considered plants to be products of nature and hence not patentable. This line of reasoning recurs in legal doctrine, arguing that patent protection for plant life would be "the granting of patents for the use of natural powers and would undoubtedly be of little or no help in promoting progress." n33

B. Living Organism

Another objection to plant patenting contended that patent law is tailored to inanimate techniques, while the subjects of plant inventions are living organisms. Thus, according to this objection, breeders' products should not be excluded because they lack a creative step, but because of the special nature of the inventive subject, a position which reflects an inveterate distrust of techniques affecting living nature.

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Although continental legislators clearly had in mind only inventions in the field of inanimate techniques (in Germany, tote Technik) when drafting the first- generation patent acts, the majority of the Belgian, n34 German n35 and Dutch legal doctrine n36 dismissed the objection that inventions relating to living material are not patentable.

In the United States, the living-organism objection remained relatively dormant until 1973, when the USPTO Board of Appeals invalidated a patent covering a living organism n37 by strictly construing 35 U.S.C.

101. n38 The Board held patentable only those subject matter categories specifically enumerated in the statute, deciding that living organisms did not fall within the scope of any of the categories listed. n39 The Board's decision in this case was ultimately reversed by the Court of Customs and Patent Appeals ("CCPA"). n40

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C. Lack of Novelty

Another objection that was put forth against patent protection for plants was that breeders' products could not comply with the requirement of novelty.

This objection was raised in Germany n41 and in the Netherlands n42 by some commentators, but most saw no fundamental conflict between breeders' products and the patentability requirement of absolute novelty. n43 Likewise, the novelty objection was rarely raised against the patenting of breeders' products in the United States.

D. Non-Inventiveness/Obviousness

A fourth objection raised against plant patents was that plant varieties bred by traditional methods were not beyond the grasp of the ordinary artisan. In other words, such breeding did not involve an inventive step (Europe), nor was it obvious to one with ordinary skill in the art (United States).

Although the obviousness objection seldom prevented the patenting of plants in the United States, some German n44 and Dutch n45 legal

[*153] writers took the view that breeding methods lacked an inventive step. However, while admitting that the inventive step in the field of plant breeding was not evident, n46 other authors argued that it was not insuperable n47 for there was always the possibility that the application of a known process would result in a new goal or in a new special effect. n48

E. Lack of Industrial Applicability/Utility

A major objection to plant patents was that breeders' products lacked industrial applicability (Europe) or utility (United States).

This objection was at the core of a heated dispute surrounding the scope of the term "industry" in Article 1 of the Belgian Patent Act. The majority in Belgium contended that the term "industry" in Article 1 was not clear. Agricultural inventions should not be subject to a per se exclusion from patent protection, under this argument, because some agricultural products, such as fertilizers and agricultural machines, were clearly definable, manufactured for industry, and deserving of patent protection, while agricultural activities or processes such as fertilization methods, fertilizer preparation, or sowing techniques were not patentable because of the lack of an industrial character. Logically, then, breeders' inventions, products, and methods could not be the subject of the concept of "industry" in Article 1. n49

Lack of industrial applicability was also discussed in the Dutch legal doctrine on the patentability of plant inventions. The main

[*154] objection raised was that such inventions were unpatentable because they did not fall within the definition of the term "industry" in Article 3 of the 1910 Dutch Patent Act. n50 This objection was, however, criticized by a number of authors who argued that although the wording of the Dutch Patent Act was not very clear on this point, the preparatory works of the act showed that it was not the intention of the legislature at the time to exclude agricultural inventions from patent protection. n51

In contrast, the lack-of-industrial-applicability (gewerbliche Verwertbarkeit) objection never entered the German doctrine, n52 and the non-utility objection rarely barred patenting of plant inventions under the general patent act in the United States.

F. Impossibility of Description

As a logistical issue, the legal doctrine argued that patent protection for plants was impossible, because neither a new plant nor its breeding process could be described clearly and sufficiently.

Although old Belgian doctrine paid much attention to the description requirement and focused on the possible consequences of insufficient description, the question of whether the description requirement is achievable or applies to the same extent to plants as it does to non-living subject matter is absent from the legal discussion. n53

[*155] The description requirement arises in more recent literature, which argues that morphological characteristics and features such as resistance to pests and diseases can be described, but characteristics such as the taste of a fruit, the smell of a flower, the baking power of a cereal or the brewing power of barley cannot. n54

Similarly, various Dutch commentators have argued that patent protection should be denied to plants because their organic nature presented insoluble problems in satisfying the statutory requirement of description. n55 Yet German doctrine has seldom raised the impossibility-of-description (Beschreibung) objection. n56

In the United States, a primary obstacle to plant patent protection was that plants were considered unamenable to the

[*156] requirement of a written description. n57 Differentiation of new plants by written description has been viewed as almost impossible. This objection has been expressed by various American critics in language that is rich in imagery:

When the majority of pomologists frankly admit that they cannot begin to differentiate the existing varieties of apples, the utter impossibility of relying on verbal descriptions, or even on drawings or photographs, begins to be evident. n58

How will a plant breeder describe his new product? Botanists have a fairly good vocabulary for describing the shape of a fruit or a flower and can do fairly well with colors by reference to standard color charts. But the value of many flowers and fruits depends on odors and aromas, and there is no vocabulary whatever for the description of odors. n59

It is almost impossible to describe in words what a violet smells like, or a Jonathan apple tastes like. n60

Then, too, we shall have nice questions for the experts. "A better flavor" may be an adequate characteristic for a patent, but we wonder who can describe it? Pray tell me, what does an onion taste like? Please describe the odor of the rose which you purchased on the 15th day of June 1932. n61

G. Non-Reproducibility

The last objection raised against plant patent protection was the non-reproducibility impediment, which aroused emotions similar to those inspired by impossibility of description. Although the reproducibility requirement was not literally present in the first-generation national patent acts, n62 it stemmed from the industrial-applicability requirement in

[*157] Belgium and Germany n63 and the enabling-disclosure requirement in the United States. A method was not industrially applicable and hence not patentable when it could not be reproduced. Whatever the background or motives that led to the reproducibility requirement, its appropriateness has been unanimously accepted.

In Belgium, the old doctrine examined the basis and scope of the reproducibility requirement, but did not determine whether the requirement should be applied to plant inventions. More recent doctrine has raised the problem of the non-reproducibility of plant inventions. On one side, rigid interpretation of the reproducibility requirement expresses that the process of making which led to the first specimen of the new variety should be repeatable; since such a repetition was not possible in practice, plant patent protection should be excluded. n64 On the opposite side, a more flexible interpretation of the reproducibility requirement allows that it is sufficient for additional "copies" of the first specimen of the new variety to be obtained by another process, specifically the multiplication process of sexual or asexual reproduction; in most cases, this requirement can be met meaning that plant patent protection should not be denied on the basis of non-reproducibility. n65

The problem of reproducibility (Wiederholbarkeit) of biological inventions has also led to heated disputes in German doctrine and jurisprudence, and has rolled back and forth over the years like a Sisyphean rock (wie ein Sisyphos-Stein n66). The general requirement that

[*158] an invention should be reproducible derived from the German requirement of industrial utility; an unrepeatable process is not industrially applicable and hence not patentable, as it does not involve any Lehre zum technischen Handeln. n67 Supporters of a stricter application of the general reproducibility requirement for plant inventions n68 argued that from the executed crossings and selections, no Lehre, or learning, could be deduced. The majority of the German commentators, however, endorsed the flexible interpretation of the reproducibility requirement, arguing that it is unnecessary for the entire creative process to be reproduced. They maintained that the requirement was fulfilled when additional specimens from the first unique specimen could be obtained as a result of a reproduction process. n69

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The non-reproducibility objection was also raised in the Netherlands, n70 but did not receive much attention there.

In the United States, some commentators have argued that a description of the process of making is demanded by the general patentability requirement that a person skilled in the art should be able to carry out the patented invention. n71

IV. The Establishment of Plant-Tailored Protection Systems

As the patent system, for various reasons, was considered an inappropriate method of protecting new plants, special legal protection systems for plant breeding were created in the United States and Europe as of the 1930s.

A. The Enactment of the Plant Patent Act and the Plant Patent Variety Protection Act in the United States

In 1930, the United States took the initiative in patenting plants with the introduction of identical bills into the House and Senate, proposing to remove the product-of-nature objection n72 and to ease the

[*160] enablement requirement n73 with regard to plants. n74 This legislation, passed by Congress as the "Townsend-Purnell Plant Patent Act of 1930," n75 was signed into law on May 23, 1930 by President Hoover. n76 This Act, which came to be known as the Plant Patent Act ("PPA"), established statutory patent protection for asexually reproduced plants.

The patent protection for plants provided for in the PPA was extended to sexually reproduced plants in 1970 by the enactment of the Plant Variety Protection Act ("PVPA") n77 which was modeled on the UPOV Convention, discussed in the next section. With the enactment of the PPA and the PVPA, the debate on protection for plants under the general patent act temporarily came to an end in the United States.

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B. The Enactment of Plant Breeders' Rights Acts in Europe

In Europe, special plant protection provisions were established in several countries. The Netherlands enacted a plant variety protection act in 1942, n78 followed by Germany in 1953. n79

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New light was shed on the existing plant variety protection systems as a result of the establishment of the International Convention for the Protection of New Varieties of Plants of 1961. n80 The Convention, which was signed by several European countries, created a Union for the Protection of New Varieties of Plants, commonly known under its French abbreviation "UPOV" (Union pour la Protection des Obtentions Vegetales). The 1961 UPOV Convention called for the adaptation of existing breeders' rights regulations in the contracting states which already had plant breeders' rights protection systems. Thus, in Germany, the 1953 law was revoked and a new plant variety protection act was adopted in 1968. n81 In the Netherlands, a new breeders' rights law was enacted in 1967. n82 The UPOV Convention also introduced a system of plant breeders' rights for those contracting states which did

[*163] not yet have special legal provisions for plants, as was the case in Belgium, where a plant variety protection act was not put in place until 1975. n83

V. The Second-Generation Patent Acts and the Second-Generation Objection

A. The Establishment of the Second-Generation Patent Acts

In Europe, a regional patent treaty called the European Patent Convention ("EPC") came into being in 1973. n84 On the basis of a single application and examination procedure, one could protect an invention in up to nineteen European countries, all contracting states which had ratified the EPC.

With regard to the definition of patentable subject matter, the EPC stated in Article 52(1) that European patents shall be granted for any new inventions which are susceptible to industrial application that involve an inventive step. These requirements recognized provisions laid down in various first-generation national patent acts n85 and concepts previously introduced by case law and legal doctrine. n86 As to the patentability of plants, Article 53(b) of the EPC states that "European patents shall not be granted in respect of plant or animal varieties or

[*164] essentially biological processes for the production of plants or animals." The purpose of this exception was to exclude from patentability under the EPC subject matter that was also protectable under independent plant variety protection acts.

The enactment of the EPC led to the revocation of the first-generation patent acts in many continental countries. A new generation of national patent acts was born, n87 which is still in force today. National legislators voluntarily modeled their new national patent acts on the EPC to avoid differences n88 between their own national patent systems and the European regime. n89 In doing so, several countries in Europe, including Belgium, Germany and the Netherlands, adopted the general patentability clause of Article 52(1) n90 as well as the exclusionary provision of Article 53(b). n91

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In 1952, the U.S. Congress passed a new patent act, the "Utility Patent Act" or "UPA," n92 which is still in force today. n93 The 1952 UPA "rearranged existing statutory provisions and stated in statutory form

[*166] matters previously recognized only in court decisions and Patent Office practice." n94 As it did so, "Congress replaced 'art' with 'process' in the four-category definition" n95 of patentable subject matter, "but emphasized that '[t]he term "process" meant "process, art or method."'" n96 Most significantly, for the first time, Congress included a statutory provision of non- obviousness. n97 Unlike the EPC, the 1952 UPA did not explicitly exclude plants from patent protection.

B. The Resurgence of Demand for Patent Protection for Plants

Although the various national plant breeders' rights acts offered protection for plant varieties, and although plant varieties were explicitly excluded from patent protection, the call to include plants in the scope of patent law resumed in Europe at the end of the 1970s. n98 Patent protection for plants was considered desirable for several reasons. First, it was the only way to protect the method which had been used to develop a new plant, since the national plant variety protection acts did not offer protection for breeding methods. Second, patent protection offered perspectives for a wider protection: a greater number of acts constituted infringement and the patent system did not recognize the far-reaching breeders' n99 and farmers' exceptions n100 that occurred in the system of plant breeders' rights.

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In the United States, although patent protection for asexually reproduced plants was available under the PPA and breeders' rights protection for sexually reproduced crops was available under the PVPA, there was a growing sentiment for granting patent protection for plants within the framework of the UPA. n101 UPA patent protection for plants was considered desirable for several reasons. First, even with the PPA and the PVPA, some plants were still excluded from any form of protection. These unprotected plants include tuberpropagated plants (excluded from PPA protection) n102 and first-generation hybrids (excluded from PVPA protection). n103 Second, as was the case in Europe, patenting under the

[*168] UPA was the only way to protect the method which had been used to develop a new plant, since neither the PPA nor the PVPA offered protection for breeding methods. Third, UPA patent protection offered broader protection, in the sense that a number of acts in addition to vegetative production and sexual reproduction would constitute infringement.

C. The Second-Generation Objection: Preemption

In Europe, however, patent protection for plants was argued to be no longer available for those plants that enjoyed protection under national plant variety acts, because the enacted breeders' protection systems were the only protection possible for plants. Indeed, the 1961 UPOV Convention stipulated that each member state of the Union could recognize the right of the breeder by granting either a special title of protection or a patent. n104 Since Belgium, n105 Germany, n106 and the Netherlands explicitly opted to grant a separate title of protection, these countries excluded plants from patent protection.

In the United States, the preemption objection was first raised in 1984, when the U.S. Patent Office announced its intention to discontinue issuing UPA patents for those plants that enjoyed protection under the

[*169] PPA or the PVPA, relying on the theory that the two existing plant-specific acts were the exclusive forms of plant protection. n107

VI. The Semantic Approach

In Europe, the preemption objection and the exclusion of plant varieties from patent protection under Article 53(b) of the EPC was framed by the case law of the European Patent Office ("EPO"). Regarding plant varieties, it has been clear since 1983, according to EPO case law in general and the Ciba-Geigy n108 and Lubrizol [Hybrid Plants] n109

[*170] cases in particular, that the excluded area of subject matter was to be identical with the subject matter that is protectable under the UPOV and corresponding national plant breeders' rights laws. Article 53(b) of the EPC prohibited only the patenting of plants or their propagating material in the genetically fixed form of the plant variety, but did not prohibit patenting the plant per se - in other words, the exclusion did not apply to plants which did not meet the profile of a variety and belonged to a classification unit taxonomically higher than that of the variety. In concrete terms, and following EPO case law, patent protection was not possible at the time for the potato variety Charlotte, but protection was possible for the potato itself (Solanum tuberosum). n110

In 1995, EPO policy made a U-turn with the famous Plant Genetic Systems (PGS) decision, in which claims on plants per se were no longer considered acceptable, whereas plant cells were determined to be patentable. n111 The viewpoint which was announced in PGS was reaffirmed in Novartis. n112

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In the United States, the renewed debate was settled once and for all by the decision of the Supreme Court in Chakrabarty and the decision of the USPTO Board of Appeals and Interferences in In re Hibberd. n113

VII. The Intrinsic Approach: Refuting the First- and Second-Generation Objections

Whether plants are patentable is currently an ambiguous issue in Europe. There is the current viewpoint in EPO case law (and TRIPs n114),

[*172] in which plants are not considered patentable. However, there is also the recently adopted Biotechnology Directive of the European Parliament and of the Council, n115 in which plants are considered patentable. This Biotechnology Directive excludes from patentability "plant and animal varieties," n116 and "essentially biological procedures for the breeding of plants and animals," n117 but provides patent protection for inventions which concern plants or animals "if the application of the invention is not technically confined to a particular plant or animal variety," n118 or in other words, for the plant per se. Regarding the patentability of plants, the new proposal seems to align itself with old, pre-PGS, EPO case law.

In my opinion we can end the perpetual uncertainty and ambiguity concerning the patentability of plants only by abandoning the semantic approach and its fruitless debate over the precise meaning and scope of the terms "plant variety" and "plant." Instead we must look for other, more intrinsic arguments to justify the patentability or non-patentability of plants. To this end, I evaluated the first-generation objections in the light of recent technological developments, to determine if, and to what extent, these objections are currently valid relative to plants that are the result of modern genetic engineering.

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As outlined below, similar arguments have been made in the United States to refute the first-generation objections and to settle the dispute. However one must consider that in the United States the text-related discussion and the content- related argument are more intertwined than they are in Europe. For example, in Chakrabarty n119 the Supreme Court based its decision on the semantic scope of 35 U.S.C.

101, n120 and also ruled on the objections related to the invention concept. n121

A. Product of Nature

In Europe, the product-of-nature objection was strongly criticized by several preeminent authors. In Belgium for example, the theory was advanced that the criteria for patentability should not hinge on the (un)natural character of the product; n122 but rather, should focus on the degree of human intervention necessary to obtain such a product. n123 Following a similar rationale, legal writers in Germany argued that new plant varieties were not products of nature simply because they would never have come about without the intervention of a breeder. n124

The German Federal Supreme Court (Bundesgerichtshof or "BGH") rejected the product-of-nature argument with finality in the Rote Taube [Red Dove] case of March 27, 1969 n125 by explaining that a

[*174] technical invention can also exist in the systematic application in plants of biological forces of nature:

Als patentierbar kann werden angesehen eine gewerblich verwertbare neue fortschrittliche und erfinderische Lehre zum planmassigen Handel unter Einsatz beherrschbarer Naturkrafte zur Erreichung eines kausal ubersehbaren Erfolgs. n126

This systematic approach is even more apparent with new plant biotechnological techniques that make it possible for plants to be both modified faster and more goal-oriented.

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During the 1970s in the United States, there was a turnaround in the point of view of the U.S. courts regarding the product-of-nature doctrine. In 1970 the CCPA ignored the product-of-nature objection and held, in In re Bergstrom, n127 that the biological origin of purified natural products does not preclude their novelty, n128 and accepted, by implication, the proposition that such products could be understood as "manufacture" and rewarded with patent protection. n129 Although this line of reasoning was apparently abandoned in 1974 in In re Mancy, n130 the product-of-nature objection was rejected again in 1977 in Bergy I. n131 In that case the

[*176] CCPA dismissed, as "ill-considered" dictum, n132 the comments it made in Mancy that seemed to revive the product-of-nature objection, and the court explicitly accepted that a biologically pure strain of microorganisms is patentable. n133 An important basis for the court's decision was its understanding that the microorganisms at issue were "man-made and could be produced only under carefully controlled laboratory conditions." n134

The final breakthrough came in 1980 with Chakrabarty. n135 In its extensively reasoned opinion, the Supreme Court explained that both the language of 35 U.S.C.

101 - specifically the inclusion of "such expansive terms as 'manufacture' and 'composition of matter,' modified

[*177] by the comprehensive 'any'" n136 - and the relevant history support broad construction. n137 Both factors indicate that Congress plainly contemplated the notion that patent laws should be given wide scope and intended statutory subject matter to "include anything under the sun that is made by man." n138 According to the Supreme Court, Chakrabarty's microorganism was the result of human ingenuity and thus patentable:

His [Chakrabarty's] claim is not to a hitherto unknown natural phenomenon, but to a nonnaturally occurring manufacture or composition of matter - a product of human ingenuity "having a distinctive name, character [and] use." n139

By virtue of Rote Taube and Chakrabarty, the product-of-nature discussion was finally concluded by means of case law in both Europe and the United States.

B. Living Organism

In Europe, the majority of the Belgian, German and Dutch legal doctrines dismissed the objection that inventions relating to living material are not patentable. n140 The argument that patent law was tailored to inanimate techniques and that breeders' products as living material should therefore be excluded from patent protection was never introduced in those countries.

In the United States, the living-organism objection was raised by the USPTO Board of Appeals and Interferences in Bergy I, n141 and was initially rejected by the CCPA in that case. n142 The CCPA explained the illogic in arguing that the existence of life in a manufacture or composition of matter that takes the form of a biologically pure culture of a microorganism automatically removes that manufacture or composition of matter from the category of patentable subject matter. n143

[*178] Since the nature and commercial uses of biologically pure cultures of microorganisms "are much more akin to inanimate chemical compositions such as reactants, reagents, and catalysts than they are to horses and honeybees or raspberries and roses," n144 the microorganisms in Bergy I were categorized as "an industrial product used in an industrial process." n145

The Supreme Court, as well, rejected the living-organism objection, in Chakrabarty. n146 In its opinion, the Court held that neither the PPA nor the PVPA were introduced to limit the field of application of the UPA. n147 The Court explained that the purpose of these statutes was to remove several specific impediments to the protection of plants, n148 most notably the idea that all plants, simply by virtue of being plants, are products of nature that fall outside the scope of patentable subject matter. n149 The Court also explained that these statutes introduced a relaxation of the enabling requirements for plants. n150 The Court added that the relevant distinction was not between "living and inanimate things, but between products of nature, whether living or not, and human-made inventions" n151

Nonetheless, the question whether the Chakrabarty holding opened the UPA for plant patents retained some lingering doubt. This uncertainty was put to rest in 1985 by Ex parte Hibberd, n152 in which the

[*179] USPTO Board of Appeals and Interferences adopted the position that plants may be protected by the UPA. n153 This position was formally adopted by the USPTO in a Notice from the Commissioner of Patents issued in October, 1985. n154

The living-organism objection was thus finally eliminated - as was the product- of-nature objection - by a decision of the highest American court in 1980.

Even so, the living-organism objection retains some validity. One may concede that an important distinction between inventions relating to inanimate material and inventions relating to animate material lies in the fact that while realizations with living material can multiply by themselves, inventions that make use of inanimate material must be repeated one-by-one. Nonetheless, the reproductive characteristic of plants should not play a decisive role in the fundamental question of whether plants can constitute patentable subject matter, but should only be a consideration in the framework of determining the scope of protection. n155 Further research will establish the extent to which patent

[*180] protection for plants should be extended to progeny and whether progeny themselves should be the subject of patent protection. n156

C. Lack of Novelty

Although the non-novelty impediment was introduced for consideration in some European countries, notably in Germany and in the Netherlands, most legal writers saw the patentability requirement of absolute novelty as presenting no serious obstacle to the patentability of plants. n157

In the United States, the novelty objection was rarely raised. In fact, some legal writers stressed the unique qualities of the breeder:

The plant breeder is seldom regarded as an inventor although he is actually an innovator of the highest type . . . . The production of a new plant often requires more patience, skill, ingenuity, resourcefulness, knowledge, and observation than the making of a mechanical invention. n158

There is little case law that addresses, within the framework of UPA plant- patent applications, n159 the unique problems of traditionally

[*181] bred or of modernly engineered plants. n160 Therefore we can conclude that novelty requirement is not presently considered problematic.

D. Non-Inventiveness/Obviousness

In Europe, the inventive-step requirement was not seen as posing any fundamental problem with regard to plant patents. n161

In the United States, the non-obviousness objection has rarely been raised against patenting plants under the UPA. Moreover, there is little case law discussing the non-obviousness requirement with regard to genetically engineered plants for which UPA patent protection has been sought. n162

According to some authors, an explanation for this lack of case law may be that it is unclear whether courts that analyze the obviousness of a plant utility patent pay serious attention to this criterion or merely glance over it in a perfunctory way. n163 The typical obviousness rejection occurs when the patent examiner must analyze a novel characteristic such as added color or increased sugar content. One could argue that these characteristics would be obvious to a skilled breeder. On the other hand, one could also argue that even if the phenotype was obvious, the underpinning genetics were unknown and, therefore, that success could

[*182] not have been predicted. n164 Another factor that enters into the analysis of obviousness is whether there were failed attempts by others to achieve the claimed phenotype. n165

Regarding the non-novelty objection and the non-inventiveness objection, developments in the molecular science of plant biotechnology over the last several years make it possible to overcome the impediments of novelty and inventive step/non-obviousness in many cases. As the gene-transfer technique becomes increasingly established, it is possible that a specific gene transfer will have to be more difficult or uncommon to meet the requirement of inventive step/non-obviousness of patent law.

E. Lack of Industrial Applicability/Utility

In Belgium, critics of the lack-of-industrial-applicability objection argued that any invention which is of practical use to mankind is of an industrial character. n166 The controversy in Belgium ended with the adoption of the 1934 London Revision Act of the 1883 Paris Convention for the Protection of Industrial Property. n167 The Act concluded that the term "industry" should be broadly construed to include both manufactured and natural products such as flowers - the addition of

[*183] the word "flowers" being a result of a proposal from the Belgian delegation. n168

The controversy surrounding the patentability of agricultural inventions was partially settled in the Netherlands with a decision of the Dutch Supreme Court in 1957 that opted for an extensive interpretation of the term "industry." n169

This objection was finally eliminated when national legislators formally confirmed - in adapting their national legislation to the EPC n170 - that the term "industry" should be broadly construed to include agriculture, which rendered this impediment to the patentability of plants largely without foundation.

In Europe, the heavily criticized lack-of-industrial-applicability argument, which was rarely articulated in the United States, was settled by legislative action.

Current U.S. legal doctrine includes the theory that the utility requirement should not pose problems for plant patents because most plant varieties that are offered for patent protection are used for both ornamental purposes or consumption n171 and for agronomical and pharmaceutical goals. n172

F. Impossibility of Description

The impossibility-of-description objection was never regarded as a primary issue in Europe. Current legal doctrine considers it outdated. n173

[*184] In plant development, many added features are either biochemical characteristics or morphological characteristics that can be characterized biochemically. Some authors propose that the solution to the description problem is to require the deposit of plants and plant parts. However, the specifications for any such deposit requirement would have to be carefully considered. Regarding the application of the process, the various procedural steps of the majority of current plant biotechnological applications can be easily reported.

Although non-compliance with the description requirement was considered to be a significant obstacle to patenting plants in the legal doctrine in the United States during the 1930s, n174 this impediment was rarely presented in the 1970s, either administratively at the USPTO or judicially before the CCPA and the Supreme Court. However, the impossibility-of-description objection with regard to plants was brought to the fore in the United States in the 1980s, at a point when UPA patentability of plants had become a well-accepted practice. Critical attention was focused primarily how the description requirement was to be effectuated. This issue was settled in 1989 with the promulgation of rules by the USPTO. n175 Building on the explanation of these rules given by the Commissioner of the USPTO, n176 legal doctrine increasingly suggested that a deposit can be required for UPA plant inventions in those cases in which a verbal description alone would not sufficiently satisfy the

[*185] strict n177 disclosure requirement of 35 U.S.C. 112. n178 This reasoning has been followed by the USPTO. n179

As a result of scientific developments, the impossibility of description objection can be viewed as outdated. This point of view has been confirmed in European and U.S. legal doctrine.

G. Non-Reproducibility

In Europe the ongoing debate over reproducibility was tackled by the German Federal Supreme Court. In Rosenz chting [Rose Breeding], n180 the Court reasoned that the reproducibility requirement did not have to be strictly applied in cases of process protection for multiplication methods, and held that a repetition of the process of making was not necessary. n181

[*186] Seven years later, in Rote Taube, n182 the Court changed its policy, and held that a person skilled in the art must be able to repeat the process of making a new organism before patent protection should be granted. n183 The Court intended for this strict reproducibility requirement to apply to process protection both for the process of making a new organism (as in Rote Taube) and for multiplication methods from the new organism (as in B ckerhefe [Baker's Yeast] n184), as well as to product protection for the new organism (as in both Rote Taube and Backerhefe).

[*187]

Due to the persistent criticism in the doctrine and in practice that was stimulated by international harmonization movements, the Federal German Supreme Court altered its point of view and decided in Tollwutvirus [Rabies Virus] n185 that the strict reproducibility requirement would apply only to process protection for breeders' products, n186 affirming the position it had established in Rote Taube. The court decided as well that for product protection to be granted for a new organism, along with process protection for the multiplication method, a deposit of the new (micro) organism together with a description of the multiplication method, would suffice. n187 This represents a marked departure from the position taken by the Court in the B ckerhefe case.

Transferring the reasoning of the German Federal Supreme Court in its microorganism cases to the question of plant patents would suggest that product protection for plants is always possible, because this approach removes the most critical impediment to patenting plants: the repetition of the process of making. n188 Process protection for such products seems possible only if the process of making can be repeated, which is most common in the context of modern, genetic modification techniques that can be accurately described and repeated with few problems by persons skilled in the art. As a result, when a patent application for a plant invention contains product claims and process claims, the product claims are in principle always admissible if the

[*188] requirements of novelty, inventive step and industrial applicability are met, while process claims are only admissible if the process can also be repeated.

Can the process be repeated in a modern transformation experiment? Theoretically, the repetition of the process of making is possible in a plant biotechnological experiment. However, in practice this is not entirely feasible. The technical problems do not occur at the stage of the introduction of genetic information. The technology for making a DNA segment is manageable, and assuming that a description is available, a person skilled in the art should be able to copy the DNA segment to be inserted, on the basis of the description. The difficulties occur in the stage between the gene construct and the plant genome. The cause of these difficulties is that the DNA rapidly enters the nucleus of the plant cell and begins integrating at a random site resulting in the insertion of the new DNA segment at a different site in every cell transformed. The underlying implication of this difficulty is that a person skilled in the art who applies the method as specified, can still arrive at another transgene plant. To place this finding in perspective, it must be noted that although one can obtain a transgene plant that has different DNA, one usually arrives at a plant with the same performance.

In practice, the possibility of repeating the process of making is not very important. Product protection is most often claimed because it offers a wider scope of protection. However, if product claims are not possible, process claims are the next alternative, albeit an alternative that offers a reduced degree of patent protection.

In the United States, the non-reproducibility objection was considered in light of asexually reproduced plants by various legal writers in the 1930s. According to those authors, the description did not enable a person skilled in the art to repeat the invention. Rather, repetition of the process of making was completely superfluous because numerous copies could be created by means of vegetative propagation. According to Cook:

In most cases, there is no possibility of a plant breeder being able to describe the process of making a newform that can be relied upon to make the same form again. The breeder himself could probably not do this. It is not essential, because as long as a single plant of the new variety exists it can be multiplied almost indefinitely." n189

[*189]

Therefore the majority view theorized that the description served only to identify the patented plant for the purpose of infringement procedures. n190

In the 1970s, debate the non-reproducibility objection was rarely used to deny UPA protection to plants.

As a result of jurisprudential and scientific developments, the reproducibility debate was finally settled in Europe and in the United States.

H. Preemption

In the United States, the USPTO Board of Appeals and Interferences revoked the doctrine of preemption in 1985 in Hibberd n191 because it could locate no basis for any such restriction in the language of the PPA, the PVPA, or the UPA. n192 The Board disagreed with the contention that the scope of patentable subject matter under 35 U.S.C. 101 had been restricted by the passage of the PPA and the PVPA. n193 The Board also disagreed with the contention that these plant-specific acts represented the exclusive form of protection for plant life. n194 After the decision in Hibberd, Donald J. Quigg, U.S. Commissioner of Patents and Trademarks Designate, announced the policy that the USPTO would henceforth be "examining applications including claims to - e.g., plants per se, seeds, and plant parts." n195 The Commissioner further announced that "[t]o the extent that the claimed subject matter is directed to a 'nonnaturally occurring manufacture or composition of matter - a product of human ingenuity' such claims will not be rejected under 35 U.S.C. 101 as being directed to unpatentable subject matter." n196 Since

[*190] the introduction of this new policy, UPA patents for plants have been issued in large numbers. n197

In Europe, the preemption objection can be dismissed on the basis of the 1991 revision of the UPOV Convention, n198 which resulted in marked changes to the provisions of that treaty. In the 1991 UPOV Convention, Article 2 was replaced by new text that stipulates that each contracting party shall grant and protect breeders' rights. n199 In its current (1991) version, the UPOV Convention appears less explicit than the initial 1961 UPOV Convention with respect to the choice of protection systems for plant varieties. Legal doctrine has interpreted the new provision as a license for choice that enables national patent legislators and EPC member states to eliminate the exclusionary provisions for plant varieties from their patent acts. n200

[*191]

VIII. Conclusion

A. Rebuttal of the Objections in Europe

The foregoing analysis of first- and second-generation objections raised under European patent law to deny patent protection for plants leads to the conclusion that these objections are not valid for plant biotechnological inventions, or at the very least, must be carefully considered. Moreover, with regard to plants obtained by conventional breeding, this analysis shows that many patent law objections are not presently valid.

1. Plant Biotechnological Inventions

The conceptual and technical objections raised in Europe to deny patent protection to plants within the realm of plant biotechnological inventions may currently be regarded as outdated as a result of jurisprudential, legislative and scientific developments.

The jurisprudential evolution began in 1969 when the German Federal Supreme Court recognized, in Rote Taube, that there is no justification for the product-of- nature objection. Then, in 1987, the Court relaxed the reproducibility requirement in Tollwutvirus. Although these judgments are from the national court of a member state and are thus not binding upon the EPC legislative process, these opinions may well carry significant persuasive authority, given the high regard that has been accorded to these decisions by legal commentators.

The next development took place during the process of adapting national patent laws to the EPC, as national legislators confirmed that the term industry should be broadly construed. As a result, the lack-of- industrial-applicability objection has become largely fallen by the wayside.

Finally technical developments in plant breeding over the last decade, particularly in the area of plant biotechnology at the molecular level, make it possible in many cases to effectively conquer the objections of non-novelty, non- inventiveness and impossibility of description.

Consequently, the central thesis of this article is that plant biotechnological inventions are protectable by both product and process patents, and not only on the basis of a semantic or textual construction, but on the basis of intrinsic arguments as well.

[*192]

2. Breeders' Products

Several objections to the patentability of breeders' inventions including the product-of-nature objection and the lack-of-industrial- applicability objection are no longer valid. However, the absolute novelty requirement and the inventive step requirement of patent law will be difficult to satisfy using conventional breeding techniques.

With a more flexible interpretation of the reproducibility requirement, product patent protection for breeders' products is appropriate in those cases in which the novelty and the inventive step requirements can be satisfied, to the extent that the plant organism is available for multiplication by a deposit or in a comparable way. Process protection will not be available in the majority of conventional breeding cases, unless the breeding method is described in manner that allows step-by-step repetition, which is both difficult and nearly impossible. However, in those rare instances in which it is possible to repeat the process of making, or at such time as the reproducibility requirement is diminished by courts or legislatures, protection using process patents should no longer be denied, and the legal doctrine appears to be moving in this direction. Strict requirements within the framework of publicity theory in the area of practicability, including the reproducibility requirement, are no longer justified. This holds true under either the modern view that the reproducibility requirement constitutes a completion of the practicability requirement or the traditional view that reproducibility is an essential characteristic of the patentable invention.

3. All Plant Inventions

This conclusion leads directly to the thesis that patent law should provide patent protection for all plant inventions regardless of whether they are obtained by conventional breeding methods or by modern transformation techniques. This position could be effectuated by abolishing the exclusion for plant varieties found Article 53(b) of the EPC or, more radically, by completely rescinding Article 53(b).

Regarding the relationship between patent law and the protection of breeders' rights, this article does not advocate the elimination of breeders' rights protection systems. Instead, it advocates the coexistence of both protection systems, with the choice of which system to use left to the individual plant breeder. For modern biotechnological transformation methods that are new, non-obvious and repeatable and that can be carried out with a group of plants, protection can be sought under patent law. With methods of conventional breeding that lack

[*193] novelty and non-obviousness, protection can be sought under the law of breeders' rights. In this way, breeders' rights should continue to play an important role alongside patent law.

B. Rebuttal of the Objections in the United States

This article has also sought to determine whether conceptual and technical objections have been raised in the United States to deny patent protection to plants under the general patent acts. Indeed, in the United States, as in Europe, various objections, including the product-of-nature, the living-organism and the preemption objections were raised by litigants under the first-generation patent acts. All of these objections were ultimately eliminated by court decisions: the product-of-nature objection and the living-organism objection were cast away by the Supreme Court's 1980 Chakrabarty decision while the preemption objection was done in by the Board of Patent Appeals and Interferences in its 1985 Hibberd decision.

C. The European and U.S. Rebuttals in Comparison

A comparison between the European and U.S. contexts shows that there are striking similarities and differences between the European and U.S. approaches to the establishment of protection for plants under the general patent acts. Initially, under the first-generation patent acts, the European and U.S. frameworks ran parallel. The language of the first-generation patent acts was equally unclear in both the United States and Europe with respect to the patentability of plants. Equally similar were the first-generation objections raised to deny patent protection to plants in Europe and in the United States. Subsequently, the perception that general patent law was inappropriate for the protection of plants resulted in the establishment of plant-tailored protection systems in both Europe and the United States.

The divergence between European and American approaches occurred with the enactment of the second-generation patent acts. The EPC and its member states adopted an explicit exclusionary provision regarding plant varieties, while the 1952 U.S. Patent Act contained no similar clause - but neither did U.S. patent law contain a provision that explicitly allowed the patentability of plants.

This chasm between European and American patent law - created along with the inception of the EPC - was quickly bridged. General discontent over inadequate plant protection systems and the confusion regarding the status of the law led to a resurgence of demand

[*194] for plant protection under general patent acts in both Europe and the United States. The simultaneous renewal of the plant patentability debate in Europe and the United States resulted in an acceptance of the patentability of plants. However, there was a significant distinction between the arguments that prevailed in these two patentability debates. The U.S. Supreme Court decided to extend patent law to include plants by giving an extensive interpretation to the terms "manufacture" and "composition of matter" in 35 U.S.C.

101. This may be understood as an extensive interpretation of a "requirement" provision. Following a different approach, the European Technical Boards of Appeal decided to extend patent law to plants by giving a restrictive interpretation to the term "plant variety" in Article 53(b) of the EPC. This may be understood as a restrictive interpretation of an exclusionary provision.

The gap between European and U.S. plant-patent policies reopened in 1995 when the EPO decided, in PGS, to cease granting patent claims on plants per se, and this gap remains open as result of the affirmation of the PGS decision in Novartis. As a result, the question whether plants may be protected under the general patent act must now be answered differently in the United States than in Europe. In the United States, the debate has been settled - the courts filled the legal vacuum created under the pre-1952 patent acts (and prolonged by the 1952 Patent Act) in favor of UPA patent protection for plants. In Europe the discussion is probably not over, and the picture is still obscure. On the one hand there is the current EPO case law, according to which neither plants nor plant varieties are patentable, while on the other hand there is the Biotechnology Directive of the European Parliament and of the Council which allows patents for plants, but denies patents for plant varieties. Regrettably, the Directive maintains the confusion-causing semantic distinction between "plant" and "plant variety." To provide the clarity that is needed, the EPO should comply with the outcome of the intrinsic rebuttal, accept that patent protection for plants can be justified from a legal point of view, and rescind Article 53(b) of the EPC. By taking these steps, the EPC could finally pave the way for plants to be covered by patents, and Europe could realign itself again with the United States in the area of patent protection for plants.

n1 Octrooiwet van 24 mei 1854 [Patent Act of May 24, 1854], Belgisch Staatsblad [Belgian Law Gazette, hereinafter BS], May 25, 1854, reprinted in Tweetalige We-Weitboek Intellectuele Rechten [Bilingual Codes Story - Code on Intellectual Property Rights] III.B.1 (Georges Van Hecke, et al. eds). This act stipulated that for all discovery or improvement, subject to exploitation in industry or trade, exclusive and temporary rights were granted bearing the name of patent, improvement patent or import patent. In the words of the statute: Voor alle ontdekking of alle verbetering, die als voorwerp van nijverheid of handel voor exploitatie vatbaar is, worden er uitsluitende en tijdelijke rechten verleend, onder den naam van octrooi, verbeteringsoctrooi of invoeroctrooi. Il sera accorde des droits exclusifs et temporaires, sous le nom de brevet d'invention, de perfectionnement ou d'importation, pour toute decouverte ou tout perfectionnement

susceptible d' tre exploite comme object d'industrie ou de commerce. Id. Although the 1854 Patent Act created some ambiguity by using the words "invention" and "discovery" with no apparent difference in meaning, legal doctrine emphasized that this was a mistake of the Belgian legislature and that only inventions, not discoveries, were meant to be patentable. See Geertrui Van Overwalle, Octrooieerbaarheid van Plantenbiotechnologische Uitvindingen. Een Rechtsvergelijkend Onderzoek naar een Rechtvaardiging van een Uitbreiding van het Octrooirecht tot Planten (with an extensive English summary) [Patentability Of Plant Biotechnolo gical Inventions: A Comparative Study Towards a Justification of Extending Patent Law to Plants] 287-88 (1996) and the references given there.

n2 Patentgesetz, v. 25.5.1877 (RGBl. S.501). This act stipulated in Article 1(1) that patents were granted for inventions which were industrially applicable, but in (2) it explicitly excluded some objects, such as chemical substances, food products, stimulants and drugs. Id. (" 1. (1) Patente werden erteilt f r neue Erfindungen, die eine gewerbliche Verwertung gestatten, (2) Ausgenommen sind: 1. . . . 2. Erfindungen von Nahrungs-, Genuss- und Arzneimitteln, sowie von Stoffen die auf chemischem Weg hergestellt werden, soweit die Erfindungen nicht ein bestimmtes Verfahren zur Herstellung der Gegenst nde betreffen."). La ter legislative modifications and reforms did not alter this provision substantially.

n3 Wet van 7 november 1910 tot regeling van het octrooirecht voor uitvindingen [Act Nov. 7, 1910, for the Statutory Regulation of the Patent Law for Inventions], Rijksoctrooiwet [National Patent Act of] 1910, Stb. 313 (1910), reprinted in Rijksoctrooiwet (Edition 73-I) 508 (Schuurman & Jordan, eds., 1992). This act stipulated in Article 1 that exclusive rights of patent were granted to those who invented a new product, a new method or an improvement of a product or a method. Id. ("Onder den naam van octrooi worden aan hem, die een nieuw voortbrengsel, eene nieuwe werkwijze, of eene nieuwe verbetering van een voortbrengsel of van een werkwijze heeft uitgevonden, op zijne aanvrage uitsluitende rechten toegekend.").

n4 Loi du 5 juillet 1844 sur les brevets d'invention [Act of July 5, 1844, on Patents], published in Auguste Anoul, Brevets d' *Invention. Commentaire de la loi du 24 Mai 1854*, suivi d'un resume des principales legislations etrang res [Patents. Annotations to the Act of May 24, 1854, Followed by the Text of the Most Important Foreign Legislation] 105 (1854); and Th. Tilliere, Traite theorique et pratique des brevets d'invention, de perfectionnement et de la contrefa on industrielle [Theoretical and Practical Treatise on Patents and on Industrial Counterfeit] 102 (1854). This act refers to certain categories of inventions. Id. (Art 1: "Toute nouvelle decouverte ou invention dans tous les genres d'industrie conf re a son auteur, sous les conditions et pour le temps ci-apr s determines, le droit exclusif d'exploiter a son profit ladite decouverte ou invention"; Art. 2: "Seront considerees comme inventions ou decouvertes nouvelles: l'invention de nouveaux produits industriels; l'invention de nouveaux moyens ou l'application nouvelle de moyens connus, pour l'obtention d'un resultat ou d'un produit industriel.").

n5 Cf. Belgian Patent Act of 1854, supra note 1, art. 24; German Patent Act of 1877, supra note 2, art. 1(1); Dutch Patent Act of 1910, supra note 3, art. 1; French Patent Act of 1844, supra note 4, art. 1 & art. 2.

n6 Cf. Belgian Patent Act of 1854, supra note 1, art. 1; German Patent Act of 1877, supra note 2, art. 1(1); French Patent Act of 1844, supra note 4, art. 1. Article 3 of the 1910 Dutch Patent Act, supra note 3, stipulated that an invention is only patentable, when the patent leads to a "result" (een uitkomst) in the field of "industry" (nijverheid). Id. ("Eene uitvinding is slechts vatbaar voor octrooi, wanneer zij strekt tot verkrijging van eenige uitkomst op het gebied van de nijverheid.").

n7 For Belgium, see, e.g., the following decisions: Court of Brussels, May 5, 1950, 44 Revue de Droit Intellectuel - l'Ingenieur Conseil [Journal for Intellectual Property Rights (Belgium), hereinafter Ing. Cons.] 202 (1954); Court of Brussels, May 31, 1960, Pasicrisie [Collection of Case Law], 1961, II, 204; Supreme Court (Hof van Cassatie), Sept. 13, 1968, Pasicrisie, 1969, I, 47; Supreme Court (Hof van Cassatie), Jan. 7, 1972, Pasicrisie, 1972, I, 443.

n8 For Belgium, see *Van Overwalle, supra* note 1, at 301-02. For Germany, see *Van Overwalle, supra* note 1, at 330.

n9 European continental legislators included a statutory provision on originality (inventive step) in the second-generation patent acts of the 1970s, see infra Part V.

n10 Cf. Belgian Patent Act of 1854, supra note 1, art. 17, para. 2 ("De aanvraag omvat een duidelijke en voldoende beschrijving, alsook de tekeningen die nodig zijn voor een goed begrip van de beschrijving."); Dutch Patent Act of 1910, supra note 3, art. 20 ("De aanvrage om octrooi moet vergezeld zijn van een beschrijving van de uitvinding.").

n11 U.S. Patent Act of 1790, ch. 7, 1 Stat. 109 (1848).

n12 U.S. Patent Act of 1793, ch. 11, 1 Stat. 318 (1848).

n13 U.S. Patent Act of 1836, ch. 357, 5 Stat. 117 (1846).

n14 U.S. Patent Act of 1870, ch. 230, 16 Stat. 198 (1871).

n15 U.S. Patent Act of 1790, ch. 7, 1, 1 Stat. 109, 110.

n16 Id.

n17 U.S. Patent Act of 1793, ch. 11, 1, 1 Stat. 318, 319. The term "art" is essentially a synonym for "process" or "method." See 1 Donald S. Chisum, Chisum on Patents, OV-3 (rel. no. 46, May 1993); see also 1 id., 1.03[1], at 1- 59 (rel. no. 54, June 1995).

n18 See generally 1 Chisum, supra note 17, ch. 3, for a discussion of novelty.

n19 See generally 1 Chisum, supra note 17, ch. 4, for a discussion of utility.

n20 1 Chisum, supra note 17, at OV-6 (rel. no. 46, May 1993), OV-9 (rel. no. 46, May 1993). See also 2 id., 5.02, at 5-12 (rel. no. 51, Aug. 1994). Congress included a statutory provision on non-obviousness in the 1952 Patent Act. 1 id. at OV-12 (rel. no. 46, May 1993); 2 id., 5.02, at 5-13 (rel. no. 51, Aug. 1994). See also infra, Part V.A.

n21 3 Chisum, supra note 17, 7.02[1], at 7-5 (rel. no. 52, Nov. 1994) (quoting U.S. Patent Act of 1790, ch. 7, 2, 1 Stat. at 110).

n22 Id., 7.02[2], at 7-5 (quoting U.S. Patent Act of 1793, ch. 11, 3, 1 Stat. at 321-22.

n23 Id., 7.02[2], at 7-5 n.1.

n24 Id., 7.02[3], at 7-7 (rel. no. 52, Nov. 1994) (quoting U.S. Patent Act of 1870, ch. 230, 26, 16 Stat. at 201).

n25 On the categorization of the objections, see *Van Overwalle, supra* note 1, at 285-87.

n26 See generally *Van Overwalle, supra* note 1, at 306-08 (discussing Belgium), 334-37 (discussing Germany), 374-77 (discussing the Netherlands), 592-93 (discussing the United States). Objections on ethical, societal, ecological and safety grounds were not raised under the first-generation patent acts at all; these objections have only been raised the past twenty-five years. *Van Overwalle, supra* note 1, at 403-07 (discussing Europe), 593-95 (discussing the United States.) The present article only offers an analysis of objections of strict (i.e. technical) patent-law nature. Impediments with regard to the economic and evidential dimension have been excluded here and the same applies to the ethical, societal, ecological and safety aspects of patenting plants. The latter exceeds the framework of the present article. Cf. Mario Frazosi, Patentable Inventions: Technical and Social Phases, 19 Eur. Intell. Prop. Rev. [hereinafter EIPR] 251 (1997) (drawing the distinction between technical and social objections to the patenting of plants).

n27 Dixit Rainer Moufang, Kommentierung des Europ ischen Patent bereinkommen. Artikel 53: Ausnahmen von der Patentierbarkeit [Comments/Annotations on the European Patent Convention, Article 53: Exclusions from Patentability] 15 (Europ isches Patent bereinkommen. M nchner Gemeinschaftskommentar [European Patent Convention, Munich Annotations], 1991).

n28 Georges Vander Haeghen, Brevets d'invention, Marques et Mod ls [Patents, Trade Marks and Models] para. 69, at 57 (1928); Georges Vander Haeghen, Brevets d'invention [Patents], in Le Droit Intellectuel [Intellectual Property Rights] I, paras. [105-10 at 77-78 (1936). See also Pieter A. Verhulst, Kweekersrecht [Plant Breeders' Rights] 119 (1947).

n29 Oscar Gissel, Patentf higkeit landwirtschaftlicher Kulturverfahren [Patentability of Agricultural Culture Methods], Recht des Reichsn hrstandes - Zeitschrift f r Bauern- und Bodenrecht [Journal for Farmers and Soil Law] 441; Oscar Gissel, Patentf higkeit von Pflanzenz chtungsverfahren und Pflanzenz chtungen [Patentability of Breeding Methods and Breeders' Products], Recht des Reichsn hrstandes - Zeitschrift f r Bauern- und Bodenrecht [Journal for Farmers and Soil Law] 473 (1941).

n30 *1889 Dec. Comm'r Pat. 123.* See also Allen Bloom, Designer Genes and Patent Law: A Good Fit, *26 N.Y.L. Sch. L. Rev. 1041 (1981);* James Carroll, Bergy, Flook, and Microorganisms as Patentable Products, *29 Cath. U. L. Rev. 485 (1980);* 1 Iver P. Cooper, Biotechnology and the Law, 2.10, at 2-31 (1982); Harold C. Thorne, Relation of Patent Law to Natural Products, *6 J. Pat. Off. Soc'y 23 (1923).*

n31 *283 U.S. 1, 8 U.S.P.Q. (BNA) 131 (1931).* See also Robert S. Allyn, The First Plant Patents: A Discussion of the New Law and Patent Office Practice 11, 28 (1934); Bloom, supra note 30, at 1044-45; 1 Chisum, supra note 17, 1.02[3], at 1- 14 (rel. no. 14, Mar. 1985); Robert C. Cook, The First Plant Patent, *14 J. Pat. Off. Soc'y 398, 401 (1932);* Iver P. Cooper, The Patent System and the "New Biology," 8 Rutgers Computer & Tech. L.J. 1, 18 (1980); 1 Cooper, supra note 30, 3.05, at 3-24 (rel. no. 3, Oct. 1988); Eric W.

Guttag, The Patentability of Microorganisms: Statutory Subject Matter and Other Living Things, 11 Intell. Prop. L. Rev. 17, 26-28 (1979); Stanley D. Schlosser, Legal Protection for Biotechnology in the United States of America, in Vth International Colloquium on the Protection of Plant Breeders' Rights. The Protection of Biotechnological Inventions in the Field of New Plant Varieties. Legal Problems and Practical Solutions. September 10 and 11, 1987, Washington DC, USA 7, 21 (CIOPORA 1988); Harold C. Wegner, Patent Protection for Novel Microorganisms Useful for the Preparation of Known Products, 5 Int'l Rev. Indus. Prop. & Copyright L. [hereinafter IIC] 285, 289-90 (1974).

n32 *333 U.S. 127, 76 U.S.P.Q. (BNA) 280 (1948).* See also Bloom, supra note 30, at 1045-46; Dan L. Burk, Biotechnology and Patent Law: Fitting Innovation to the Procrustean Bed, 17 Rutgers Computer & Tech. L.J. 1, 26-27 (1991); Bradford Chaucer, Life, the Patent Office and Everything: Patentability of Lifeforms Created Through Bioengineering Techniques, *9 U. Bridgeport L. Rev. 413, 427-28 (1988);* 1 Chisum, supra note 17, 1.02[7][b], at 1-36 (rel. no. 14, Mar. 1985); Cooper, supra note 31, at 18-19; 1 Cooper, supra note 30, 3.01, at 3-3 (1982), 3.05, at 3-27 (1982); Donald G. Daus et al., Microbiological Plant Patents, 10 IDEA 87, 93-94 (1966); Arthur P. Gershman & Joseph Scafetta, Jr., Patents on Microorganisms, 21 IDEA 1, 3-4 (1979); Guttag, supra note 31, at 28-29; William D. Noonan, Patentability of Microorganisms: Legal Control of Life, 47 U. Mo. Kan. City L. Rev. 130, 134 (1978); Schlosser, supra note 31, at 21; Wegner, supra note 31, at 285, 288; Harold C. Wegner, Patenting Nature's Secrets - Microorganisms, 7 IIC 235, 240-41 (1976); Harold C. Wegner, Patent Law in Biotechnology, Chemicals & Pharmaceuticals, 284, at 391 (2d ed. 1992); A similar debate went on in the Netherlands, see J.D. Tak, Microbiologische vondsten en octrooibescherming [Microbiological Discoveries and Patent Protection], 28 Bijblad bij De Industri le Eigendom 139 (1960); P.C. Henriquez, Stofconclusies voor natuurprodukten [Chemical Substance Claims for Products of Nature], 37 BIE 88 (1969).

n33 Thorne, supra note 30, at 28.

n34 See Vander Haeghen, supra note 28, at 78; Marie-Ther se Motte, Annotation under Court Dendermonde, May 2, 1958, Journal des Tribunaux [Journal of the Courts] 173, 174 (1959); Maurice De Brabanter, Brevetabilite des inventions microbiologiques [Patentability of Microbiological Inventions], 62 Ing. Cons. 45, 46 (1972). Cf. Frank Gotzen, Intellectuele eigendom en nieuwe technologie n. Bescherming van computerprograma's. Biologische uitvindingen. Kwekersrechten. [Intellectual Property and New Technologies. Protection of Computer Programs. Biological Inventions. Plant Breeders' Rights.], 47 Rechtskundig Weekblad [Juridical Journal (Belgium)] 2375, 2394 (1983-84); C. De Keersmaeker & S. Le Clercq, Biotechnologie, in Technologische innovatie en overdracht van technologie. Een nleiding tot juridische, fiscale, financi le, boekhoudkundige en managementaspecten [Technological Innovation and Transfer of Technology. An Introduction to Legal, Fiscal, Financial, Accounting, and Managerial Aspects] 179, 191 (Eric Bodson ed., 1985).

n35 See Julius Ephraim, Zum Begriff der gewerblichen Verwertbarkeit [The Concept of Industrial Applicability], 24 Gewerblicher Rechtsschutz und Urheberrecht [Industrial Legal Protection and Copyright (Germany), hereinafter GRUR] 34, 34-37 (1919); Hans Schade, Patentierung von Pflanzenz chtungen [Patentability of Breeders' Products], 55

GRUR 312, 317-18 (1950); Werner Marx, Zur Patentierung von Pflanzenz chtungen [Toward the Patentability of Breeders' Products], 57 GRUR 456, 457 (1952).

n36 See Verhulst, supra note 28, at 103-04.

n37 See *In re Bergy, 563 F.2d 1031, 1033, 195 U.S.P.Q. (BNA) 344, 346 (C.C.P.A. 1977)* (reversing the USPTO Board of Appeals) (Bergy I).

n38 *35 U.S.C. 101* (1994) is the 1952 equivalent of the 1793 patentability provision. See also infra Part V.A.

n39 *Bergy I, 563 F.2d at 1033, 195 U.S.P.Q. at 347.*

n40 *Id. at 1032, 195 U.S.P.Q. at 345.*

n41 See Marx, supra note 35, at 458.

n42 See Jan Van Harreveld, Bescherming van den kweekerseigendom [Protection of Breeders' Property] 54 (1934).

n43 For Germany, see Franz Herzfeld-Wuesthoff, Geheimhaltung neuer Pflanzenz chtungen, die patentiert werden sollen [Secrecy of New Breeders' Products, Which Will be Patented], 5 Der Z chter [The Breeder (Germany)] 48 (1933); Paul- Ernst B chting, Sortenschutz und Patent [Variety Protection and Patents] 86 (1962). For the Netherlands, see Verhulst, supra note 28, at 85. To compare with current Belgian doctrine, see A.C. Delcorde, La protection des inventions [The Protection of Inventions] 14 (Le Droit de la Concurrence [Competition Law], Vol. 2**, Aime De Caluwe, series ed., 1985); Thomas Braun & Bernard Van Reepinghen, Chronique de Jurisprudence. Droits Intellectuels [Chronicle of Case Law. Intellectual Property Protection.], (1975-1979), 98 Journal des Tribunaux [Journal of the Courts] 397, 399 (1980); Bernard Van Reepinghen & Maurice De Brabanter, Les Brevets d'invention [Patents] 17 (1987).

n44 See Marx, supra note 35, at 458; Schade, supra note 35, at 322; Willi Schickedanz, Zum Problem der Erfindungsh he bei Erfindungen die auf Entdeckungen beruhen [The Problem of Inventive Step with Inventions which Depend on Discoveries], 77 GRUR 161-65 (1972); Helmut Schippel, Zur Patentierung landwirtschaftlicher Kulturverfahren [The Patentability of Agricultural Culture Methods], 7 Gewerblicher Rechtsschutz und Urheberrecht - Internationaler Teil [Industrial Legal Protection and Copyright - International Volume (Germany), hereinafter GRUR Int.] 333-39 (1958).

n45 See *Van Harreveld, supra* note 42, at 48-50.

n46 Gerhard Geisler, Untersuchungen ber die M glichkeiten zum Schutze der Erfolge der Pflanzenz chtung [Examination of the Possibilities for Protection of the Results of Plant Breeding] 81 (1952).

n47 For Germany, see B chting, supra note 43, at 71-72. For the Netherlands, see Verhulst, supra note 28, at 85.

n48 Cf. the so-called "Auswahl-Erfindungen." See Noel J. Byrne, Legal Protection for Plants, in Problemen van Octrooirecht [Problems of Patent Law] 477 (Paul Vancraesbeeck ed., 1994); Anne-Marie Flury-Jeker, La protection juridique des obtentions vegetales sous le regime de la convention de Paris du 2 decembre 1961 et de la loi federale du 20 mars 1975 [The legal Protection of Breeders' Products Under the

Regime of the Paris Convention of December 2, 1961, and the Federal Act of March 20, 1975] 62 (Collections de travaux publies par la faculte de droit et des scienses economiques de l'Universite de Neuch tel [Series Published by the Faculty of Law and the Faculty of Economics of the University of Neuch tel, Switzerland], Vol. 21, 1987).

n49 Tilliere, supra note 4, at 214-16; Edmond Picard & Xavier Olin, Traite des brevets d'invention et de la contrefa on industrielle [Treatise on Patents and Industrial Counterfeits] para. 121, at 186-87 (1866).

n50 W.H. Drucker, Handboek voor de studie van het Nederlandsche octrooirecht [Reference Book for the Study of the Netherlandish Patent Law] 122-23 (1924); *Van Harreveld, supra* note 42, at 47-48; L.J. Hijmans Van den Bergh, Kweekerseigendom, Nota aan de Nederlandse Algemene Keuringsdienst (N.A.K.) [Breeders' Property. Note to the Netherlandish General Inspection Service (N.A.K.)] 5, 12 (March 25, 1938).]

n51 W. Moorrees, De octrooiwet 1910 [The 1910 Patent Act] 39 (Het octrooirecht [Patent Law], Vol I, 1912); J.C.T. Resius, Uitvinding, uitvinder en octrooi [Inventions, Inventor and Patent] 133 (1913); J.K. Schellenbach, Zijn Agrarische werkwijzen octrooie erbaar? [Are Agrarian Methods Patentable?], 17 Nederlands Juristenblad [Netherlandish Legal Journal] 481, 493-99 (1942); Verhulst, supra note 28, at 80-81; C.M.R. Davidson, Annotation under Octrooiraad December 5, 1961, Gebied van de nijverheid [The Scope of the Term "Industry"] 30 BIE 99, 100 (1962).

n52 See Ephraim, supra note 35, at 34-35; Geisler, supra note 46, at 83; Franz Wuesthoff, Erschliessung des Patentrechts f r neue Gebiete (dargelegt am Beispiel der Pflanzenz chtungserfindungen) [The Opening Up of Patent Law for New Fields (for Example Plant Breeders' Inventions)], 58 GRUR 230, 231 (1953).

n53 See Louis Andre, Traite des brevets d'invention et de la contrefa on industrielle. commentaire compare de la legislation belge, de la legislation fran aise et de la convention internationale de 1883 [Treatise on Patents and Industrial Counterfeits. Comparative Analysis of the Belgian and the French Legislation and of the International Convention of 1883] para. 574, at 406 (1899); Thomas Braun & Paul Struye, Precis des brevets d'invention et de la contrefa on industrielle [Guide on Patents and Industrial Counterfeits] para. 12, at 12-14 (1935); Picard & Olin, supra note 49, para. 286, at 280-81; Vander Haeghen, supra note 28, paras. 437-42, at 313-16. Similarly, Leopold Remouchamps, Octrooien [Patents] paras. 132- 40, at 90-93 (1970). Cf. Swiss legal doctrine; see Bernard Frey- Godet, De la protection des nouveautes vegetales [Protection of Vegetable Novelties], La Propriete Industrielle [Industrial Property, hereinafter Prop. Ind.] 31, 32 (1923).

n54 Louis Van Eylen, Kwekersrecht in Belgi : Toepassing van het Internationaal Verdrag tot Bescherming van Kweekprodukten [Plant Breeders' Rights in Belgium: Application of the International Convention for the Protection of Breeders' Products] 4 (Diensten van de Eerste Minister - Openbaar Ambt - Algemene Directie voor Selectie en Vorming [Department of the Prime Minister - General Direction for Selection and Education] 1978); Comment, De la protection des nouveautes fruiti res et vegetales. Commentaire sur le rapport de L. Blanc [On the Protection of Fruit and Vegetable Novelties: Comments on the Report of L. Blanc], Prop. Ind. 192 (1911). Cf. Gotzen, supra note 34, at 2393.

n55 See Nanno H.H. Addens, Zaaizaad en pootgoed in de Nederlanse landbouw [Seeds in Netherlandish Farming] 196 (1952); B.K. Boom, De bescherming van de kwekers-eigendom [The Protection of Breeders' Property], De Boomkweekerij [Tree Cultivation (Netherlands)] 48, 149 (1946); J.C. Dorst, De betekenis van het Kwekersbesluit voor de plantenveredeling en de zaaizaadvoorziening [The Significance of the Breeders' Decree for Breeding and for the Seed Supply], Landbouwkundig Tijdschrift [Agricultural Journal (Netherlands)], 393, 396 (1948); *Van Harreveld, supra* note 42, at 56-58, 59; J.C. Van Leeuwen, Octrooi en Merk [Patent and Trademark] 13 (1949); J.C. Van Leeuwen, Intervention, Symposium betreffende gebieden waarover de bescherming door octrooien zich behoort uit te strekken [Intervention on the Symposium on Fields to which Patent Protection Should be Extended], 19 BIE 106, 106-07 (1951).

n56 Schade, supra note 35, at 317.

n57 Although these objections were raised as a criticism of the "examination by description" instruction which was introduced by the PPA, this criticism is still relevant in the debate over UPA patentability of plants.

n58 Robert C. Cook, Applying the Plant Patent Law, *13 J. Pat. Off. Soc'y 22, 24 (1931);* Cf. Robert C. Cook, The Administration of the Plant Patent Law From the Breeder's Point of View, *15 J. Pat. Off. Soc'y 275, 281 (1933).*

n59 Joseph Rossman, Plant Patents, *13 J. Pat. Off. Soc'y 7, 15 (1931).*

n60 Id.

n61 Robert S. Allyn, Plant Patent Queries, *15 J. Pat. Off. Soc'y 180, 185 (1933).*

n62 The enablement requirement was only officially introduced later. Cf. Dutch Patent Act of 1910, supra note 3, art. 22(B)(1) (introduced in 1963, Stb. 260, June 30, 1967) ("De beschrijving van de uitvinding moet duidelijk en volledig zijn; de aan het slot daarvan gegeven omschrijving moet nauwkeurig zijn. De beschrijving moet . . . overigens van zodanige aard zijn, dat de uitvinding daaruit door een deskundige kan worden begrepen en aan de hand van die beschrijving toegepast,"); Wet van 28 maart 1984 op de uitvindingsoctrooien [Act of Mar. 28 1984 on Invention Patents], BS, Mar. 9, 1985, art. 17, 1, reprinted in Tweetalige Wetboeken Story - Wetboek Intellectuele Rechten, supra note 1, VII.A.1, reprinted in English in WIPO Laws and Treaties, Industrial Property [hereinafter WIPO Laws] ("De uitvinding moet in de octrooiaanvrage zodanig duidelijk en volledig worden beschreven dat zij door een deskundige kan worden toegepast,").

n63 For the Belgian approach, see Picard & Olin, supra note 49, para. 221, at 247-48; Les Pandectes belges, T me quatorzi me, Verbo "Brevet d'Invention" [The Belgian Collection. Volume 14. Headword "Patent."], para. 236, col. no. 448 (1885). For the German approach see sources cited infra, note 67.

n64 Victor Renier, Nouveautes vegetales et droit d'inventeur [Vegetable Novelties and Inventors' Rights], Annales de Droit et de Sciences Politiques [Annals of Law and Political Science (Belgium)] 253, 267 (1960).

n65 Yves Hendrickx, La protection des obtentions vegetales [The Protection of Breeders' Products], 58 Ing. Cons. 101, 156 (1968). Similarly, Gotzen, supra note 34, at

2392; Delcorde, supra note 43, at 14; Van Reepinghen & De Brabanter, supra note 43, at 17.

n66 Dixit Rainer Moufang, Genetische Erfindungen im gewerblichen rechtsschutz [Genetic Inventions and Industrial Property Rights] 154 (Schriftenreihe zum Gewerblichen Rechtsschutz [Series for Industrial Property Rights], Friedrich- Karl Beier & Gerhard Schricker, series eds., 1988).

n67 See Georg Benkard, Patentgesetz [Patent Act] para. 27, at 152, paras. 41-50, at 157-64, paras. 54-73, at 166-77 (Beck'sches Kurz Kommentare [Beck's Commentaries] 9th ed. 1993); Ephraim, supra note 35, at 34; Franz Herzfeld-Wuesthoff, Gewerbliches Eigentum an neuen Pflanzensorten [Industrial Property Rights and New Plant Varieties], Der Z chter [The Breeder] 202, 207 (1932); Peter Lange, Die Natur des Z chterrechts (Sortenschutzrecht) in Abgrenzung zur patentf higen Erfindung [The Nature of Breeders' Rights in Relation to Patentable Inventions], 11 GRUR Int. 88, 90 (1985); R. Lindenmaier, Das Patentgesetz [The Patent Act] 33 (6th. ed. 1973); Moufang, supra note 66, at 146 and the references given there; Marx, supra note 35, at 458; Franz Wuesthoff & Freda Wuesthoff, Der Schutz von Pflanzenz chtungen [The Protection of Breeders' Products], 1 GRUR Int. 64, 65-66 (1952); Wuesthoff, supra note 52, at 231; Freda Wuesthoff, Patentschutz f r Pflanzen [Patent Protection for Plants], 62 GRUR 49, 52 (1957). For the Belgian approach, see Remouchamps, supra note 53, para. 208, at 117 ("regel van werkwijze").

n68 See K.A. Schmidt, Warum nicht Pflanzenz chtungspatente? [Why Not Breeders' Product Patents?], 57 GRUR 168-76 (1952); Geisler, supra note 46, at 82; G. Hesse, Rechtsschutz des Saat- und Pflantzgutes, insbesondere der Entwurf eines Saat- und Pflanzgutschutzgesetzes [Legal Protection of Seeds: The Draft of a Seed Protection Act] 644, 650 (1931).

n69 See Herzfeld-Wuesthoff, supra note 67, at 207; Schade, supra note 35, at 317; Ernst Kirchner, Zur Frage der Wiederholbarkeit bei Pflanzenz chtungserfindungen [On the Question of Reproducibility of Plant Breeders' Inventions], 56 GRUR 572-74 (1951); Ernst Kirchner, Wiederholbarkeit bei Pflanzenz chtungserfindungen [Reproducibility and Plant Breeders' Inventions], 57 GRUR 453-56 (1952); Marx, supra note 35, at 458; Wuesthoff & Wuesthoff, supra note 67, at 65-66; Wuesthoff, supra note 52, at 231; Freda Wuesthoff, supra note 67, at 50; Franz Wuesthoff, Sch pferische Fortentwicklung auf dem Gebiet der belebten Natur, eine neue Grundsatzfrage des gewerblichen Rechtsschutzes [Creative Development in the Field of Resuscitating Nature: A New Fundamental Question in Intellectual Property], 65 GRUR 517, 521-23 (1960); B chting, supra note 43, at 72-85; Franz Wuesthoff, Schutzrechte auf biologischem Gebiet [Protection Rights in the Field of Biology], in Feststrift f r Ph. M hring zum 65. Geburtstag 315, 319-20 (1965).

n70 See *Van Harreveld*, *supra* note 42, at 56-58. The non-reproducibility objection is still being put forward by the current Dutch doctrine. See Paul A.C.E. van der Kooij, Octrooirecht, kwekersrecht en biotechnologie [Patent Law, Plant Breeders' Rights, and Biotechnology] in CIER-Lezingen [CIER- Lectures] (1989-1990) 37, 37 (Molengraaff Instituut voor Privaatrecht - Centrum voor Intellectueel Eigendomsrecht [Molengraaff Institute for Private Law - Centre for Intellectual Property], Willem Grosheide ed., 1993);

K.A. Fikkert, Het kwekersrecht in Nederland [Plant Breeders' Rights in the Netherlands], Tijdschrift voor Agrarisch Recht [Journal for Agrarian Law (Belgium)] 1, 1 (1984); E.S. van de Graaf, De industri le eigendomsbescherming voor (moleculair-) genetische vindingen [Industrial Property Protection for (Molecular) Genetic Inventions], 1988 Biotechnologie in Nederland [Biotechnology in the Netherlands] 335, 335. These authors discuss this objection, but do not make a stand.

n71 This viewpoint was put forward for the first time in the framework of the PPA, where some commentators regarded it as a deficiency that no description of the method of making was required, even though the enablement requirement was also considered to be mandatory in the framework of the PPA. See Robert S. Allyn, More about Plant Patents, *15 J. Pat. Off. Soc'y 963, 966;* Allyn, supra note 31, at 18.

n72 See *In re Bergy, 596 F.2d 952, 982, 201 U.S.P.Q. (BNA) 352, 378 (C.C.P.A. 1979)* (Bergy II) ("The secondary purpose of the Plant Patent Act was to avoid the judicial interpretation which had been placed on then-existing patent laws that products of nature are not statutory subject matter."). See also *Diamond v. Chakrabarty, 447 U.S. 303, 206 U.S.P.Q. (BNA) 193 (1980)* in which the Supreme Court explained that: Prior to 1930, two factors were thought to remove plants from patent protection. The first was the belief that plants, even those artificially bred, were products of nature for purposes of the patent law. This position appears to have derived from the decision of the Patent Office in Ex parte Latimer . . . . In enacting the Plant Patent Act, Congress . . . explained at length its belief that the work of the plant breeder "in aid of nature" was patentable invention. *Id. at 311-12, 206 U.S.P.Q. at 198* (citations omitted). See also Chaucer, supra note 32, at 422; 1 Cooper, supra note 30, 2.10, at 2-8 (discussing the import of the Plant Patent Act); Carroll, supra note 30, at 491-92; Diane K. McDonald, Note, The Patentability of Living Organisms Under *35 U.S.C. 101:* In re Bergy, *58 Neb. L. Rev. 303, 323-24 (1978);* Joseph Drazek, Note, Ownership of Living Inventions - In re Bergy, *29 DePaul L. Rev. 215, 230 (1979).* Congress explained at length its belief that the work of the plant breeder "in aid of nature" was patentable invention.

n73 See *Bergy II, 596 F.2d at 952, 201 U.S.P.Q. at 352.* See also *Chakrabarty, 447 U.S. at 312, 206 U.S.P.Q. at 198* which teaches that: The second obstacle to patent protection for plants was the fact that plants were thought not amenable to the "written description" requirement of the patent law. Because new plants may differ from old only in color or perfume, differentiation by written description was often impossible. In enacting the Plant Patent Act, Congress . . . relaxed the written description requirement in favor of "a description . . . as complete as is reasonably possible. Id. (quoting *35 U.S.C. 162).* See also. Bloom, supra note 30, at 1052; Carroll, supra note 30, at 491-92; Iver P. Cooper, Do We Need a Special Patent for Biological Inventions?, 2 Bio/Tech. 192; 1 Cooper, supra note 30, 2.10, at 2-29 to 2- 30 (1982); McDonald, supra note 72, at 323-24; Drazek, supra note 72, at 230-31.

n74 Various bills had already been submitted before 1930 aiming to change the existing patent law, but those attempts had not been successful. See Reid G. Adler, Can Patents Coexist with Breeders' Rights? Developments in U.S. and International Biotechnology Law, 17 IIC 195, 197 (1986).

n75 Ch. 312, 46 Stat. 376 (1931), reprinted in Allyn, supra note 31, at 14 and Rossman, supra note 59, at 7-8.

n76 Allyn, supra note 31, at 13.

n77 Pub. L. No. 91-577, 1970 U.S.C.C.A.N. (84 Stat. 1542) 1793.

n78 Besluit van de Secretarissen-Generaal van de Departementen van Landbouw en Visscherij en van Justitie Betreffende de Rechtspositie van den Kweeker van Voortkweekingsmateriaal van Cultuurgewassen en het Verkeer met Zoodanig Materiaal of January 5, 1942 [Decree of the Secretaries- General of the Departments of Agriculture and Fishery Regarding the Legal Position of the Breeder of Propagating Material of Cultivated Crops and the Trade of Said Material], 2 Verordeningsblad voor het Bezette Nederlandsche Gebied [Law Gazette for the Occupied Territory of the Netherlands] (Jan. 10, 1942) 17. (This act is generally referred to as Kwekersbesluit 1941 [Plant Breeders' Rights Act of 1941]. See generally Addens, supra note 55, at 168-225; O. Banga, Bescherming van de kwekerseigendom [Protection for Plant Breeders' Rights], Mededelingen Directe van de Tuinbouw [Communications of the Board of Horticulture] 636-46 (1951); Dorst, supra note 55, at 395; Paul A.C.E. van der Kooij, Kwekersrecht in ontwikkeling [Plant Breeders' Rights in Development] 33-38 (1990); W. Van Dijk, Enkele begripsbepalingen uit het Kwekersbesluit 1941 [Some Definitions from the Plant Breeders' Rights Act of 1941], 12 BIE 20-22 (1944); *Van Overwalle, supra* note 1, at 241-47; Verhulst, supra note 28, at 136-278.

n79 Gesetz ber Sortenschutz und Saatgut von Kulturpflanzen (Saatgutgesetz 1953 [Seed Act of 1953]), v. 27.6.1953 (BGBl. I S.440), 58 GRUR 374 (1953). See generally B chting, supra note 43, at 23 (historical development), 35-66 (subject and scope of variety protection); W. B ttner, Die Saatgutordnung. Eine Einf hrung in das Saaten- und Sortenrecht [The Seed Regulation: An Introduction to the Seed and Variety Law] (1954); R.E. Greaber, Der Sortenschutz, ein neues Urheberrect [Variety Protection, a New Copyright], Neue Juristische Wochenschrift [New Legal Weekly] 1540-41 (1953); Hans Neumeier, Sortenschutz und/oder Patentschutz f ur Pflanzenz chtengen [Variety Protection and/or Patent Protection for Breeders' Products] 25-30 (Schriftenreihe zum gewerblichen Rechtsschutz [Series for Industrial Property Rights], Friedrich- Karl Beier & Gerhard Schricker, series eds., 1990); Carsten Puttfarken, Das Schutzrecht des deutschen Sorteninhabers bei zugelassenem Importsaatgut [The Protection Rights for German Variety Owners' Importation of Seeds] 66 GRUR 263 (1961); Schade, supra note 35, at 322; Bernd Schlick, Der Schutz f r neue Pflantzenz chtengen nin Deutschland und Vorschl ge f r seine Fortentwicklung [The Protection of New Plant Breeders' Products in Germany and Proposals for its Further Development] (1963); *Van Overwalle, supra* note 1, at 238-40; Franz Weusthoff et. al., Sortenschutzgesetz. Kommentar [Treatise on Variety Protection] 28-29 (1990). A bill calling for a plant breeders' rights act, Entwurf eines Saat- und Pflanzenschutzgesetz [Draft of a Seed and Plant Act], 38 GRUR 244 (1933), was introduced in 1930, but was never enacted into law. See Franz Herzfeld-Wuesthoff, Durchbrechung von Grundprinzipen des Warenzeichenrechts durch dans neue Pflanzenschutzgesetz [Breakthrough in Basic Principles of Competition Law by the New Plant Protection Act], 36 GRUR 300 (1931); R. Isay, Bericht ber den Entwurf eines Saat- und Pflanzengutgestzes [Report on the Draft for a Seed and Plant Act], 36 GRUR 905 (1931); Neumeier, supra, at 15-16, 24; *Van Overwalle, supra* note 1, at 237-38;

Wuesthoff, supra note 69, at 315; Franz Wuesthoff, Biologische Erfindungen im Wandel der Rechtspreschung [Biological Inventions in Changing Case Law], 82 GRUR 405 (1977); Wuesthoff et al., supra, at 28.

n80 International Convention for the Protection of New Varieties of Plants of Dec. 2, 1961, as revised at Geneva on Nov. 10, 1972 and on Oct. 23, 1978 [hereinafter UPOV Convention], in Records of the Geneva Diplomatic Conference on the Revision of the International Convention for the Protection of New Varieties of Plants 221 (UPOV Publication No. 337(E) 1981). See Geertrui Van Overwalle, Protecting Innovations in Plant Biotechnology: Patents or Plant Breeders' Rights?, Proceedings of the Sixth Forum for Applied Biotechnology, in 57 Mededelingen van de Faculteit Landbouwwetenschappen Universiteit Gent [Reports of the Faculty of Agriculture of the University of Gent - Belgium 1521, 1527-30 (1993); Geertrui Van Overwalle, The Legal Protection of Biotechnological Inventions in Europe and the United States. Current Framework and Future Developments 43-46 (1997); *Van Overwalle, supra* note 1, at 168-212.

n81 Gesetz ber den Schutz van Pflanzensorten [Decree on the Protection of Plant Varieties] (Sortenschutzgesetz [Variety Protection Act of] 1968), v. 20.5.1968 (BGBl. I S.429). See generally J. Hoffman & B. Peinemann, Das neue Sortehschutzrecht [The New Variety Protection Act], Der Betriebsberater, 1140 (1968); *Van Overwalle, supra* note 80, at 47; *Van Overwalle, supra* note 1, at 237-40.

n82 Wet houdende een nieuwe regeling van het kwekersrecht alsmede van het verkeer met teeltmateriaal van landbouw- en tuinbouwgewassen [Act Introducing a New Regulation of the Plant Breeders' Rights and of the Trade in Propagating Material of Agricultural and Horticultural Crops] (Zaaizaad- en Plantgoedwet [Seeds Act of] 1967), v. 6.10.1966 (Stb. S.455), reprinted in K.A. Fikkert, Zaaizaad- en Plantgoedwet [Seeds Act] (Edition 163-I) 259 (Schuurman & Jordans eds. 1985). See generally Charles Gielen, Kwekersrecht [Plant Breeders' Rights] 81 (Studiepockets Privaatrecht [Series on Private Law], Vol. 27, 1983); *van der Kooij, supra* note 78, at 395-96; *Van Overwalle, supra* note 80, at 47-48; *Van Overwalle, supra* note 1, at 249-52.

n83 Wet van 20 mei 1975 tot Bescherming van Kweekproducten [Act of May 20, 1975, on the Protection of Breeders' Products], BS, Sept. 5, 1975, reprinted in Tweetalige Wetboeken Story - Wetboek Intellectuele Rechten, supra note 1, VII.A.1, reprinted in English in WIPO Laws. See generally Guy Vrijdags, En nieuw industrieel eigendomsrecht in Belgi : het kwekersrecht [A New Industrial Property Right in Belgium: The Plant Breeders' Right], 41 Rechtskundig Weekblad [Legal Journal] 2113-51, 2177-99 (1977-78); *Van Overwalle, supra* note 80, at 46- 47; *Van Overwalle, supra* note 1, at 215-37.

n84 Convention on the Grant of European Patents, Oct. 5, 1973, *13 I.L.M. 276,* 1160 U.N.T.S. 231 [hereinafter "European Patent Convention" or "EPC"]. The texts of the EPC, the Implementing Regulations, the Protocol on Centralization, the Protocol on Recognition, the Protocol on Privileges and Immunities, and the Rules relating to Fees, in their versions as of June, 1997, appear in European Patent Convention (Munich, European Patent Office, 9th ed. 1997). As of April, 1998, the member states of the European Patent Organization ("EPO") were: Austria, Belgium, Cyprus, Denmark,

Finland, France, Germany, Greece, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, the Netherlands, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

n85 These provisions include novelty and industrial applicability, see supra Part II and the sources cited in notes 5 & 6.

n86 These concepts include inventive step, see supra Part II and the sources cited in notes 7 & 8.

n87 For Belgium see Wet van 28 maart 1984 op de uitvindingsoctrooien [Act of March 28, 1984, on Invention Patents], BS, Mar. 9, 1985, reprinted in Tweetalige Wetboeken Story - Wetboek Intellectuele Rechten, supra note 1, VII.A.1, reprinted in English in WIPO Laws. For Germany see Patentgesetz in der Fassung der Bekanntmachung vom 16. Dezember 1980 [Patent Act in the Version of the Proclamation of December 16, 1980] (Patentgesetz [Patent Act of] 1981), v. 16.12.1980 (BGBl. I S.1), reprinted in (1) Benkard, supra note 67, at 1, (2) Gewerblicher Rechtsschutz, Wettbewerbsrecht, Urheberrecht. Textausgabe mit Verweisungen [Industrial Property Protection and Copyright: Text Edition with Annotations] (Beck'sche Textausgaben [Beck's Text Editions] 1979), (3) Rainer Schulte, Patentgesez mit Europ ischen Patent bereinkommen [Patent Act and European Patent Convention] 60, 65-66 (Heymanns Taschenkommentare zum gewerblichen Rechtsschutz [Heymann's Annotations on Industrial Property Protection], 5th ed. 1994), reprinted in English in WIPO Laws. For the Netherlands see Rijkswet houdende regels met betrekking tot octrooien [Government Act Introducing Rules With Regard to Patents] (Rijksoctrooiwet [Patent Act of] 1995) v. 15.12.1994 (Stb. 51), reprinted in English in WIPO Laws. Originally, the EPC was implemented in Dutch patent law by the Act of December 13, 1978, which modified the 1910 Patent Act, but in 1994, the Dutch legislature decided finally to revoke the often amended 1910 Patent Act and to replace it with a completely new statute.

n88 Similarly Gotzen, supra note 34, at 2395; Moufang, supra note 27, paras. 1, 22, 57; Romauld Singer & Margarete Singer, Europ isches Patent bereinkommen [European Patent Convention] 114 (Heymanns Taschenkommentare zum Gewerblichen Rechtsschutz [Heymann's Annotations on Industrial Property] 1989).

n89 Apart from the application for a European patent at the European Patent Office (the so-called European route), it is still possible to obtain patent protection by separate application to each of the national patent offices within Europe, in which patent applications are screened according to the national patent acts (the so-called National route).

n90 Belgian Patent Act of 1984, supra note 87, art. 2 ("Onder de voorwaarden en binnen de grenzen van deze wet wordt onder de naam 'uitvindingsoctrooi', hierna octrooi genoemd, een uitsluitend en tijdelijk recht van exploitatie verleend voor iedere uitvinding die nieuw is, op uitvinderswerkzaamheid berust en vatbaar is voor toepassing op het gebied van de nijverheid"); German Patent Act of 1981, supra note 87, art. 1(1) ("Patente werden f r Erfindungen erteilt, die neu sind, auf einer erfinderischen T tigkeit beruhen und gewerblich anwendbar sind"); Dutch Patent Act of 1995, supra note 87, art. 2(1) ("Vatbaar voor octrooi zijn uitvindingen die nieuw zijn, op uitvinderswerkzaamheid berusten en toegepast kunnen worden op het gebied van de nijverheid").

n91 See Belgian Patent Act of 1984, supra note 87, art. 4, 1, reprinted in *Van Overwalle, supra* note 80, at 33, discussed in *Van Overwalle, supra* note 1, at 151-55; German Patent Act of 1981 (as amended in 1992), supra note 87, art. 2(2), reprinted in *Van Overwalle, supra* note 80, at 34, discussed in *Van Overwalle, supra* note 1, at 163-67; Dutch Patent Act of 1995, supra note 87, art. 3(b), reprinted in *Van Overwalle, supra* note 80, at 34-35, discussed in *Van Overwalle, supra* note 1, at 157-60. Compare the Belgian, German, and Dutch provisions with the Article 53(b) EPC equivalents in other EPC member states, e.g. French Patent Act of 1968, art. L. 611-17, reprinted in *Van Overwalle, supra* note 80, at 35 and Code de la Propriete Intellectualle [Code of Intellectual Property] 389 (Litec 1996), reprinted in English in WIPO Laws; UK Patent Act of 1977, art. 1(3), reprinted in *Van Overwalle, supra* note 80, at 35 and WIPO Laws, discussed in William Lesser, Anticipating UK Plant Variety Rights, 9 EIPR 172 (1987); Danish Patent Act [Patentlov] of Dec. 20, 1967, as last amended by Act No. 368 of June 7, 1989, art. 1(4)(2), reprinted in WIPO Laws, discussed in Hans C. Thomsen, Die Ausnahmen von der Patentierbarkeit nach Artikel 53 b EP und den entsprechenden Rechtsvorschriften der EP -Vertragsstaaten [The Exceptions from Patentability Under Article 53(b) EPC and the Parallel Provisions in EPC Member States], 47 GRUR Int. 212, 212 (1998); Swiss Patent Act, art. 1(a), AS 1977 2026, reprinted in English in WIPO Laws, discussed in Kathrin Klett, Die Ausnahmen von der Patentierung nach Art. 1a schweizerisches Patentgesetz [The Exclusions from Patentability under Art. 1 of the Swiss Patent Act], 47 GRUR Int. 215 (1998). The effect of the exclusionary provision of the EPC goes well beyond the EPC member states. The fact that non-members of the EPC, such as Russia and Norway, have adopted similar exclusionary provisions illustrates the far-reaching effect of the EPC. See, e.g., Patent Law of the Russian Federation of Sept. 23, 1992, Rossiiskaia Gazete [Russian Official Law Gazette], Oct. 14, 1992, reprinted in *Van Overwalle, supra* note 80, at 36, reprinted in English in WIPO Laws, discussed in Geertrui Van Overwalle, The Protection of Plants and Animals in the Russian Federation, in Intellectual Property in the Russian Federation: A System in Transition 99 (CIR-Reeks [Series of the Centre for Intellectual Property Rights - Leuven, Belgium], Vol. 8, MicElst & Katlign Malfliet, eds., 1994); Norwegian Patent Act [Lov om patenter] of Dec. 15, 1967, as amended by Act No. 35 of June 8, 1979, and Act No. 2 of Feb. 8, 1980, reprinted in *Van Overwalle, supra* note 80, at 36, reprinted in English in WIPO Laws.

n92 *35 U.S.C. 1*-376 (1994).

n93 1 Chisum, supra note 17, at OV-12 (rel. no. 46, May 1993).

n94 Id.

n95 1 id. at OV-3, n.4 (rel. no. 46, May 1993).

n96 Id. (quoting *35 U.S.C. 101).*

n97 1 id. at OV-12. See also 2 Chisum, supra note 17, 5.02, at 5-13 (rel. no. 51, Aug. 1994). With regard to the adequate disclosure requirement, 112 of the 1952 Patent Act "restated with some language changes the old disclosure requirement," 3 Chisum, supra note 17, 7.02[4], at 7-7 (rel. no. 52, Nov. 1994).

n98 See, e.g., Noel J. Byrne, Patents on Life, 1 EIPR 297 (1979); Noel J. Byrne, Patents for Plants, Seed and Tissue Cultures, 17 IIC, 324 (1985); Stephen Crespi, Biotechnology and Patents - Past and Future, 3 EIPR 134 (1981); Stephen Crespi, Patenting in Biological Sciences 211 (1982); Stephen Crespi, Biotechnology and Patents: Outstanding Issues, 5 EIPR 201 (1983); Joseph Straus, Patentschutz f r gentechnologische Pflanzenz chtungen? [Patent Protection for Genetic Breeders' Products?], 32 GRUR Int. 591 (1983); Volker Vossius, Patentf hige Erfindungen auf dem Gebiet der genetischen Manipulation [Patentable Inventions in the Field of Genetic Manipulation], 84 GRUR 579 (1979).

n99 Under the breeders' exemption, other breeders have the right to use a protected variety for commercial breeding.

n100 The farmers' exemption allows farmers to retain seed for planting.

n101 See, e.g., Kenneth E. Krosin, Are Plants Patentable under the Utility Patent Act?, 67 J. Pat. Trademark Off. Soc'y 220 (1985); Nancy J. Linck, Patentable Subject Matter Under Section 101 - Are Plants Included?, 67 J. Pat. Trademark Off. Soc'y 489 (1985). See also Sidney B. Williams, Intellectual Property Aspects of Plant Variety Genetic Engineering: View of an American Lawyer, in Genetic Engineering and Plant Breeding 23, (Records of a Symposium held on the Occasion of the Sixteenth Ordinary Session of the Council of the International Union for the Protection of New Varieties of Plants, Geneva, October 13, 1982 - UPOV 1983, Publication 340(E)).

n102 According to the Plant Patent Act: Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof, or who has invented or discovered and asexually reproduced any distinct and new variety of plant, other than a tuberpropagated plant, not known or used by others in this country, before his invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceedings, obtain a patent therefor. Ch. 312, 1, P 2, 46 Stat. 376, 376 (1931) (author's emphasis), reprinted in Allyn, supra note 31, at 14 and Rossman, supra note 59, at 7-8. For an explanation of the motivation for this exclusion, see S. Rep. 71-315 (1930), reprinted in 3 Anthony W. Deller, Deller's Walker on Patents 171, 176-77 (2d ed. 1964); 1 Chisum, supra note 17, 1.05[1][b], at 1-254 (rel. no. 18, May 1986); *Van Overwalle*, *supra* note 1, at 433, 508.

n103 According to the Plant Variety Protection Act, "(a) The breeder of any novel variety of sexually reproduced plant (other than fungi, bacteria, or first generation hybrids) who has so reproduced the variety, or his successor in interest, shall be entitled to plant variety protection thereof, subject to the conditions and requirements of this title." Pub. L. 91-577, 42, 84 Stat. 1542, 1547 (emphasis added). For an explanation of the motivation of this exclusion, see 1 Chisum, supra note 17, 1.05[2][a][i], at 1-277 n.14 (rel. no. 54, June 1995) ("First generation hybrids are ineligible because they are inherently genetically unstable and are incapable of reproducing themselves with uniform characteristics."); C.H. Neagley et al., Section 101 Plant Patents - Panacea or Pitfall?, in 1

APLA Selected Legal Papers A-1, A-11 (AIPA Plant Variety Protection Committee ed., 1994) ("Hybrid seeds were excluded based on the Congressional understanding that protection could be maintained by holding the parental pure lines as trade secrets."); *Van Overwalle, supra* note 1, at 433, 559.

n104 See UPOV Convention, supra note 80, art. 2(1); *Van Overwalle, supra* note 1, at 208-09.

n105 Gedrukte Stukken, Senaat, Buitengewone Zitting [Printed Documents, Senate, Extra-Ordinary Session] 1974, no. 352/1, 4.

n106 Cf. Straus, supra note 98; Joseph Straus, Zur Anwendbarkeit der Erfinderverordnung auf sortenschutzf hige Erfindungen freier Erfinder [Toward the Application of the Invention Decree on Plant Breeders' Inventions], 91 GRUR 767 (1986); Joseph Straus, Das Verh ltnis von Sortenschutz und Patentschutz f r biotechnologische Erfindungen in internationaler Sicht [The Relationship Between Variety Protection and Patent Protection for Biotechnological Inventions], 36 GRUR Int. 333 (1987); Joseph Straus, Patent Protection for New Varieties of Plants Produced by Genetic Engineering - Should "Double Protection" be Prohibited?, 15 IIC 426 (1984); Eckehart Von Pechmann, Zum Proble m des Schutzes Gentechnolgischer Erfindungen bei Pflanzen durch Sortenschutz und/oder Patente [The Problem of Protection of Genetic Plant Inventions: Plant Variety Protection and/or Patents], 90 GRUR 717, 725 (1985). For France, see Flury- Jeker, supra note 48, at 150-52; Jean M. Mousseron, Tra te des brevets [Treatise on Patents] 445-46 (1984).

n107 Rene Tegtmeyer, Assistant Commissioner for Patents, took this view in his speech at the annual meeting of the Industrial Biotechnology Association on Oct. 18, 1984: Plants, or parts of plants including cells, where the plant can be protected under the PPA or the PVPA, are regarded as not patentable under Section 101 of the general patent law. Congress carved these plants out for protection under special laws, the PPA and the PVPA. Linck, supra note 101, at 496 n.42. See also Adler, supra note 74, at 200; 1 Chisum, supra note 17, 1.05, at 1-248.5 n.8 (rel. no. 54, June 1995).

n108 Technical Board of Appeal 3.3.1., July 26, 1983 (T 49/83), Official Journal EPO 112 (1984), reprinted in English in 2M John P. Sinnott & William J. Cotreau, World Patent Law and Practice EPD-245 (1998). For discussions of this decision, see Bernard Bergmans, La protection des innovations biologiques. une etude de droit compare [The Protection of Biological Inventions: A Comparative Analysis] 116-17 (1991); Hans-Ranier Jaenichen, Die Patentierung von Biotechnologie-Erfindungen beim Europ ischen Patentamt. Eine bersicht ber ver ffentlichte und unver ffentlichte Entscheidungen der Beschwerdekammern des EPA [The Patenting of Biotechnological Inventions at the European Patent Office: An Overview of Published and Unpublished Decisions of the Technical Boards of Appeal of the European Patent Office], 41 GRUR Int. 327 (1992); Hans-Ranier Jaenichen, The European Patent Office's Case Law on the Patentability of Biotechnology Inventions 4-5 (2d ed. 1997); Moufang, supra note 60, at 106, 190-92; Walter Moser, Die Ausnahmen von der Patentierbarkeit nach Artikel 53 b) EP [The Patentability Exceptions Under Article 53(b) of the EPC] 47 GRUR Int. 209, 210 (1998); Neumeier, supra note 79, at 60-61; P. Paterson, The European Patent System 335-38 (1992); Andre Remond, Current Trends in Patenting Biotechnological Inventions before

the European Patent Office, 11 World Pat. Info. no. 2, 63-67 (1989); Ullrich Schatz, Zur Patentierbarkeit gentechnischer Erfindungen in der Praxis des Europ ischen Patentamts [Toward the Patentability of Genetic Inventions in the Practice of the European Patent Office], 46 GRUR Int. 588, 591-93 (1997); Joseph Straus, Der Schutz biologischer Erfindungen, insbesondere von Pflanzenz chtungen [The Protection of Biological Inventions, Particularly Plant Breeders' Products], in Gewerblicher Rechtsschutz und Urheberrecht in Deutschland. Festschrift zum hundertj hrigen Bestehen der Deutschen Vereinigung f r gewerblichen Rechtsschutz und Urheberrecht und ihrer Zeitschrift [Industrial Property and Copyright in Germany: Festschrift for the 100th Anniversary of the German Society for Industrial Legal Protection and Copyright and their Journal], Vol. I at 363, 408-09 (1991); Joseph Straus, Biotechnologische Erfindungen - Irh Schutz und seine Grenzen [Biotechnological Inventions - Their Protection and Their Borders], 41 GRUR Int. 252, 262-63 (1992); Rudolph Teschemacher, The Practice of the European Patent Office Regarding the Grant of Patents for Biotechnological Inventions, 19 IIC 18 (1988); Ullrich Schatz, Patentability of Genetic Engineering Inventions in European Patent Office Practice, 29 IIC 2, 8 (1998); *Geertrui Van Overwalle, supra* note 80, at 1521, 1531-32; *Van Overwalle, supra* note 1, at 127-29.

n109 Technical Board of Appeal 3.3.2., Nov. 10, 1988 (T 320/87), Official Journal EPO 71 (1990), abridged and translated in 21 IIC 361 (1990), reprinted in English in 2O Sinnott & Cotreau, supra note 108, at EPD-1912. See Jaenichen, supra note 108, at 5; Schulte, supra note 87, at 60, 65-66; *Van Overwalle, supra* note 80, at 1532-34; *Van Overwalle, supra* note 1, at 129- 34.

n110 For more details on the distinction between "plant" and "plant variety" from a taxonomical and legal point of view, see *Van Overwalle, supra* note 1, at 130-34; *Van Overwalle, supra* note 80, at 22-25; Compare *Imazio Nursery Inc. v. Dania Greenhouses, 69 F.3d 1560, 1570, 36 U.S.P.Q.2d (BNA) 1673, 1681 (Fed. Cir. 1995)* (reversing the trial court which found infringement of Imazio's plant patent based on "proof merely of asexual reproduction of a plant having the same essential characteristics as the patented plant," rather than on proof that the allegedly infringing plant was "an asexual reproduction of the plant claimed."). Imazio was heavily criticized by Vincent G. Gioia, Plant Patents - R.I.P., 79 J. Pat. Trademark Off. Soc'y 516 (1997).

n111 Technical Board of Appeal 3.3.4., Feb. 21, 1995 (T 356/93) (Appeal on the decision of the Opposition Division, Dec. 15, 1992), reprinted in English in 2P Sinnott & Cotreau, supra note 108, at 3745. For a comprehensive review of this decision, see Pierre Lan on, The Case Law of the EPO Boards of Appeal 1994 to 1996 - A Summary, 28 IIC 889, 891-93 (1997); Peter Lange, Patentierungsverbot f r Pflanzensorten: Zur Entscheidung der Technischen Beschwerdekammer 3.3.4 vom 21. Februar 1995 - T 356/93 [Patent Ban for Plant Varieties: The Decision of the Technical Board of Appeal 3.3.4 of February 21, 1995], 45 GRUR Int. 586 (1996); Margaret Llewelyn, Article 53 Revisited: Greenpeace v. Plant Genetic Systems NV, 17 EIPR 506 (1995); Schatz, supra note 108, at 591; Tim Roberts, Patenting Plants Around the World, 18 EIPR 531, 534-35 (1996); Andraes Schrell, Are Plants (Still) Patentable?, 18 EIPR 242 (1996); *Van Overwalle, supra* note 80, at 24-25; Moser, supra note 108, at 210; Schatz, supra note 108, at 9ff.

n112 Appeal on the decision of the Examining Division of the EPO to deny the patent application from Ciba- Geigy (now Novartis) regarding "anthi-pathogenically effective compositions comprising lytic peptides and hydrolytic enzymes," (T 1054/96). See generally Robin Nott, The Novartis Case in the EPO, 21 EIPR 33 (1999); Geertrui Van Overwalle, Patente f r Pflanzen nach der EG-Biotechnologierichtlinie vom 6.7.1998 [Patents for Plants Under the European Community Biotechnology Directive of July 6, 1998], Aagrarrecht [Journal for Agrarian Law (Germany)] (in press, 1999).

n113 See also infra Parts VII.A-B.

n114 Agreement on Trade-Related Aspects of Intellectual Property Rights, Including Trade in Counterfeit Goods ("TRIPs"), April 15, 1984. Reprinted in Selected Intellectual Property and Unfair Competition Statutes, Regulations and Treaties 847 (Roger E. Schecter ed., West, 1997). Article 27(3)(b) of the TRIPs Agreement allows member states to exclude from patentability "plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes," id., but requires that "[m]ember states shall provide for the protection of plants either by patents, or by an effective sui generis system or any combination thereof," id. In this provision, TRIPs seems to address the much-disputed EPC distinction between a plant or animal per se and a plant or animal variety, leaving the first category without legal protection. See Joseph Straus, Implications of the TRIPs Agreement in the Field of Patent Law, in From GATT to TRIPs: The Agreement on Trade-Related Aspects of Intellectual Property Rights 160 (IIC Studies in Industrial Property and Copyright Law, Friedrich-Karl Beier & Gerhard Schricker, series eds., 1996); Joseph Straus, V lkerrechtliche Vertr ge und Gemeinschaftschrect als Auslegungsfactoren des Europ ischen Patent bereinkommens. Dargestellt am Patentierungsausschluss von Pflanzensorten in Artikel 53 (b) [International Conventions and Community Law as Interpreting Factors of the European Patent Convention. And the Exclusion from Patentability of Plant Varieties in Article 53(b)] 47 GRUR Int. 1, 9-10 (1998); *Van Overwalle, supra* note 80, at 41- 42; Geertrui Van Overwalle, TRIPs en het octrooirecht [TRIPs and Patent Law], 2 Intellectuele Rechten - Droits Intellectuels [Intellectual Property] 222, 230-31 (1987).

n115 Council Directive 98/44, 1998 O.J. (L 213) 13. See generally Sven J.R. Bostyn, Octrooieren van klonen en Andere biologische merkwaardigheden [Patenting of Clones and other Biological Curiosities], 65 BIE 403 (1997); Nigel Jones, The New Draft Biotechnology Directive, 18 EIPR 363 (1996); Margaret Llewelyn, The Legal Protection of Biotechnological Inventions: An Alternative Approach, 19 EIPR 115 (1997); Robin Nott, The Biotech Directive: Does Europe Need a New Draft?, 17 EIPR 563 (1995); Robin Nott, "You Did It!": The European Biotechnology Directive at Last, 20 EIPR 347 (1998); Willy Rothley, Warum das Europ ische Parlament nochmals ber den Schutz biotechnologischer Erfindungen nachdenken sollte [Why the European Parliament Should Reflect on the Protection of Biotechnological Inventions Again], 44 GRUR Int. 481 (1995); Sigrid Sterckx, Some Ethically Problematic Aspects of the Proposal for a Directive on the Legal Protection of Biotechnological Inventions, 20 EIPR 123 (1998); Joseph Straus, Genplante. Rechtliche, ethische, wissenschafts- und entwicklungspolitische Fragen [Gene Patents: Legal, Ethical, and Political Questions] 29-40 (Bibliothek aur Zeitschrift f r Schweizerisches Recht [Library for the Journal of Swiss

Law, No. 24], B. Dutoit et al., series eds., 1997); Straus, supra note 112, 47 GRUR Int. at 8-9; *Van Overwalle, supra* note 112; *Van Overwalle, supra* note 80, at 38-41.

n116 Council Directive 98/44, art 4(1)(a), 1998 O.J. (L 213) at 18.

n117 Id., art. 4(1)(b), 1990 O.J. (L 213) at 18.

n118 Id., art. 4(2), 1990 O.J. (L 213) at 18.

n119 *Diamond v. Chakrabarty, 447 U.S. 303, 206 U.S.P.Q. (BNA) 193 (1980).*

n120 *Id. at 318, 206 U.S.P.Q. at 201.*

n121 *Id. at 310, 206 U.S.P.Q. at 197.*

n122 In French, the applicable concepts are "effort createur," "ingeniosite humaine," or "traitement elabore," while in German the concept is "Sch pferische Leistung."

n123 See R. Jaune, Protection des droits des createurs agricoles [Protection of the Rights of Agricultural Creators], Annales de Gembloux 146, 152 (1949); Renier, supra note 64, at 263-65; *De Brabanter, supra* note 34. Cf. Gotzen, supra note 34, at 2391; Delcorde, supra note 43, at 14; Van Reepinghen & De Brabanter, supra note 43, at 17; Albert Vaunois, La propriete intellectuelle et ses limites [Intellectual Property and its Limits], 38 Prop. Indus. 54, 54 (1922).

n124 Herzfeld-Wuesthoff, supra note 67, at 207-08; Wuesthoff, supra note 69, at 519; Wuesthoff, supra note 67, at 51, 53.

n125 BGHZ 52, 74, reprinted in 74 GRUR 672 (1969) (with an annotation by Heydt), abridged and translated in 1 IIC 136 (1970). See also Fritz Baumbach, Mikroorganismenschutz per se - eine Br cke zwischen Patentschutz und Sortenschutz? [Microorganism Protection Per Se - A Bridge Between Patent Protection and Plant Variety Protection?], 82 Mitteilungen der Deutschen Patentanw lte [Newsletter from the German Patent Attorneys, hereinafter Mitt.] 13-15 (1991); Friedrich-Karl Beier & Joseph Straus, Gentechnologie und gewerblicher Rechtsschutz [Gene Technology and Industrial Property Protection], in Festschrift 25 Jahre Bundespatentgericht [Festschrift on the 25th Anniversary of the Federal Patent Court] 133, 136-37 (1986); Benkard, supra note 67, at 222, 225; Holger Bunke, Zur Patentf higkeit von Naturstoffen [The Patentability of Products of Nature], 83 GRUR 132, 132-36 (1978); Hans G. Hesse, Zur Patentierbarkeit von Z chtungen [The Patentability of Plant Breeders' Products], 74 GRUR 644, 650 (1969); Rudolph Krasser, Zum Patentschutz chemischer und biologischer Erfindungen [Patent Protection for Chemical and Biological Inventions], 63 Naturwissenschaften 401, 403-04 (1976); Moufang, supra note 66, at 95-97; Rainer Moufang, Problems Related to the Protection of New Technologies: Biotechnological Inventions, in European Research Structures - Changes and Challenges. The Role and Function of Intellectual Property Rights 178, 180 (Max-Planck- Gesellschaft 1994); Schulte, supra note 87, at 60-61; Paul Tauchner, Schutzumfang von Naturstoffpatenten [Scope of Protection of Product of Nature Patents], 70 Mitt. 84 (1979); Rudolph Teschemacher, Patentability of Microorganisms per se, 13 IIC 27 (1982); Eckhart Von Pechmann, ber nationale und internationale Probleme des Schutzes mikrobiologischer Erfindungen [National and International Problems Relating to the Protection of Microbiological Inventions], 77 GRUR 51, 52 (1972); Von Pechmann, supra note 106, at 721; Volker Vossius, Der

Patentschutz von Mikroorganismen und Viren nach dem deutschen Patentgesetz und dem zuk nftigen europ ischen Patenterteilungsverfahren [Patent Protection for Microorganisms and Viruses Under the German Patent Act and the Future European Patent Convention], 78 GRUR 159, 162 (1973); Volker Vossius, Das Problem der Freigabe von hinterlegten Mikroorganismen [The Problem of the Release of Deposited Microorganisms], 80 GRUR 584 (1975); Volker Vossius, Patentf hige Erfindungen auf dem Gebiet der genetischen Manipulation [Patentable Inventions in the Field of Genetic Manipulation], 84 GRUR 579; Wuesthoff, supra note 79, at 407. This influential German decision was given consideration in the Belgian doctrine, see Gotzen, supra note 34, at 2392; Delcorde, supra note 43, at 34; Larissa Gruszow & Bernard Remiche, La Protection des Inventions [The protection of inventions] 204, 212 (Le droit de la Concurrence [Competition Law], Aime De Caluwe, series ed., 1978); Van Reepinghen & De Brabanter, supra note 43, at 62, and also received a great deal of attention in France, see Mousseron, supra note 106, at 174-75.

n126 74 GRUR 672, 673 (1969). The court's statement, translated into English, is: "Can be considered as patentable: an industrially applicable, new, advanced and innovative learning for systematic trade, which makes use of controllable forces of nature in order to reach a causally surveyable result."

n127 *427 F.2d 1394, 166 U.S.P.Q. (BNA) 256 (C.C.P.A. 1970).*

n128 *Id. at 1402, 166 U.S.P.Q. at 263.*

n129 See Robert A. Armitage, The Emerging US Patent Law for the Protection of Biotechnology Research Results, 11 EIPR 47 (1989); Burk, supra note 32, at 29; 1 Cooper, supra note 30, 3.04, at 3-20 (1982); Wegner, supra note 31, at 288; Wegner, supra note 32, at 240; Wegner, supra note 32, 284, at 208, 364, at 299. This judgment and the accompanying discussion were widely commented upon in Europe, particularly in Germany and in the Netherlands, see Henriquez, supra note 32; Jasper Utermann, Naturstoffe [Products of Nature], 81 GRUR 1 (1977).

n130 *In re Mancy, 499 F.2d 1289, 182 U.S.P.Q. (BNA) 303 (C.C.P.A. 1974).* See also Adler, supra note 74, at 199; Waddell A. Biggart, Biotechnology Developments in the United States, Address at the Conference on Protecting and Exploiting Biotechnological Inventions, IBC Technical Services, Brussels, Part II, at 5 (June 17-18, 1992); Hiram H. Bernstein, Note, Patenting the Microorganism: In re Bergy, the First Step up the Chain of Life, *2 Geo. Mason L. Rev. 265, 273 (1978);* Carroll, supra note 30, at 485, 491; 1 Chisum, supra note 17, 1.02[7], at 1-34 (rel. no. 14, Mar. 1984); 1 Cooper, supra note 30, 4.03[2], at 4-43 (rel. no. 10, Mar. 1995), 5B.08[4], at 5B-60 (rel no. 5, Apr. 1991); Guttag, supra note 31, at 34 (1979); Noonan, supra note 32, at 134-35; Gary S. Watson, Note, The Patentability of Living Organisms: Diamond v. Chakrabarty, *20 Am. Bus L.J. 93, 94 (1982);* Wegner, supra note 31, at 288; Thomas G. Wiseman, Biotechnology Patent Application Examination, in Trends in Biotechnology and Chemical Patent Practice 1989, at 31, 50-53 (PLI Pats. Copyrights, Trademarks & Lit. Prop. Practice Course Handbook Series No. 286, Nels T. Lippert ed., 1989).

n131 *In re Bergy, 563 F.2d 1031, 195 U.S.P.Q. (BNA) 344 (C.C.P.A. 1977).* This judgment inspired considerable commentary, see e.g. John W. Behringer, Germ Warfare in the Patent Courts?, *31 Hastings L.J. 883 (1980);* Bernstein, supra note 130, at 265ff.;

Bloom, supra note 30, at 1050; Carroll, supra note 30, at 496; Cooper, supra note 31, at 7; Donald G. Daus, Patents for Biotechnology, 26 IDEA 263, 272-77 (1986); McDonald, supra note 72, at 303; Drazek, supra note 72, at 215ff.; William F. Eberle, Bergy, Chakrabarty and Flook: Is a "Living" Article of Manufacture Patentable Subject Matter Under *35 U.S.C. 101?*, 11 Intell. Prop. L. Rev. 381 (1979); Gershman & Scafetta, supra note 32, at 1ff.; Guttag, supra note 31, at 35-40; Thomas D. Kiley, Common Sense and the Uncommon Bacterium - Is "Life" Patentable?, *60 J. Pat. Off. Soc'y 468 (1978);* Noonan, supra note 32. Bergy I also inspired commentary outside the United States, see, e.g., Moufang, supra note 66, at 120-24; Volker Vossius, Ein wichtiger Schritt zur Anerkennung der Patentf higkeit von Mikroorganismen in den U.S.A. [A Significant Step Toward the Recognition of the Patentability of Microorganisms in the U.S.A.], 29 GRUR Int. 16 (1980).

n132 *Bergy I, 563 F.2d at 1036, 195 U.S.P.Q. at 349.*

n133 *Id. at 1038, 195 U.S.P.Q. at 351.*

n134 *Id. at 1035, 195 U.S.P.Q. at 348.*

n135 *Diamond v. Chakrabarty, 447 U.S. 303, 206 U.S.P.Q. (BNA) 193 (1980).* The patent in Chakrabarty triggered numerous reactions, see, e.g., Behringer, supra note 131; John W. Behringer, Microorganism Patents, *63 J. Pat. Off. Soc'y 128 (1981);* John W. Behringer & Volker Vossius, Patentierbarkeit genetisch manipulierter Bakterien [Patentability of Genetically Manipulated Bacteria], Forum Mikrobiologie 194 (1981); Stephen A. Bent, Note, Living Matter Found to be Patentable: In re Chakrabarty, *11 Conn. L. Rev. 311 (1979);* Bloom, supra note 30, at 1042; James F. Brashear, Comment, Innocuous Inoculum or Perilous Parasite? Encouraging Genetic Research Through Patent Grants: A Call for Regulation and Debate, *18 San Diego L. Rev. 263 (1981);* Cooper, supra note 31, at 7; Daus, supra note 131, at 272-77; Drazek, supra note 72; Eberle, supra note 131; Gershman & Scafetta, supra note 32, at 11ff.; Karen Goodyear Krueger, Note, Building a Better Bacterium: Genetic Engineering and the Patent Law After Diamond v. Chakrabarty, *81 Colum. L. Rev. 159 (1981);* Guttag, supra note 31, at 40ff.; Peter B. Maggs, New Life for Patents: Chakrabarty and Rohm & Haas Co., 14 Intell. Prop. L. Rev. 285 (1982); Noonan, supra note 32, at 134; Harold C. Wegner, The Chakrabarty Decision: Patenting Products of Genetic Engineering, 2 EIPR 304 (1980). German doctrine devoted significant attention to this decision and compared it to the situation in Germany. See, e.g., Baumbach, supra note 125, at 13; Schulte, supra note 87 at 60-61; J.A. Goldstein, Der Schutz biotechnologischer Erfindungen in den Vereinigten Staaten - Gegenw rtige Praxis und zuk nftige Entwicklung [The Protection of Biotechnological Inventions in the United States: Current Practice and Future Developments], 36 GRUR Int. 310, 312-14 (1987); Rudolph Teschemacher, Die Patentf higkeit von Mikroorganismen nach deutschem und europ ischem Recht [The Patentability of Microorganisms Under German and European Law], 30 GRUR Int. 357 (1981); Moufang, supra note 66, at 120-24; Vossius, supra note 125; Vossius, supra note 131. This decision also received attention from Belgian commentators, see, e.g., Bergmans, supra note 108, at 117-18; Gotzen, supra note 34, at 2392; Van Reepinghen & De Brabanter, supra note 43, at 62.

n136 *Chakrabarty, 447 U.S. at 308, 206 U.S.P.Q. at 197.*

n137 Id.

n138 *Id. at 309, 206 U.S.P.Q. at 197* (citations omitted).

n139 *Id. at 309-10, 206 U.S.P.Q. at 197* (quoting *Hartranft v. Wiegmann, 121 U.S. 609, 615 (1887)).*

n140 See supra Part III.B.

n141 *In re Bergy, 563 F.2d 1031, 195 U.S.P.Q. (BNA) 344 (C.C.P.A. 1977)* (Bergy I). See also supra Part III.B.

n142 *Id. at 1033, 195 U.S.P.Q. at 346-47.*

n143 *Id. at 1038, 195 U.S.P.Q. at 350-51.*

n144 *Id., 195 U.S.P.Q. at 350.*

n145 Id.

n146 *Diamond v. Chakrabarty, 447 U.S. 303, 206 U.S.P.Q. (BNA) 193 (1980).*

n147 *Id. at 311, 206 U.S.P.Q. at 198.*

n148 *Id. at 312, 206 U.S.P.Q. at 198.*

n149 *Id. at 313, 206 U.S.P.Q. at 198.*

n150 *Id. at 312, 206 U.S.P.Q. at 198.*

n151 *Id. at 313, 206 U.S.P.Q. at 199.*

n152 *227 U.S.P.Q. (BNA) 443* (Bd. Pat. App. & Interf. 1985). See also Adler, supra note 74, at 201-15; Waddell A. Biggart, Protecting Exclusivity in Biotechnology Developments, in Treatise on Biotechnology Patent Practice 7 (Patent Resources Group Inc. 1989); John H. Barton, Patenting Life, 264 Sci. Am. 18, 20, 23 (1991); R.H. Benson, Biotechnology Patent Pitfalls, 4 Bio/Tech. 118, 120; Stephen A. Bent, Stan Allen's Invention - the World His Oyster?, J. Chartered Inst. Pat. Agents [UK, hereinafter CIPA] 30, 31 (1987); Stephen A. Bent, Patenting Genes that Encode Agriculturally Important Traits, in Intellectual Property Rights Associated with Plants 109 (ASA (American Society of Agronomy) Special Publication No. 52, Crop Science Society of America, 1989) [hereinafter IP Rights & Plants]; Biggart, supra note 130, part I, at 5-7; Noel J. Byrne, Patents for Plants, Seed and Tissue Cultures, 17 IIC 324, 324 (1986); 1 Chisum, supra note 17, 1.02[7][d][iii], at 1-50 (rel. no. 18, May 1986), 1.05[3], at 1-282.12 (rel. no. 54, May 1995); 1 Cooper, supra note 30, 6.01, at 6-8 (rel. no. 3, Oct. 1988); Stephen Crespi, Biotechnology and Intellectual Property, 9 Tibtech 151, 154 (1991); Anthony Diepenbrock, What Route - Patents, Plant Patents or Breeders' Rights?, in Vth International Colloquium on the Protection of Plant Breeders' Rights. The Protection of Biotechnological Inventions in the Field of New Plant Varieties. Legal Problems and Practical Solutions 211, 215, 221 (CIOPORA 1988); Goldstein, supra note 135, at 312-13; William Lesser, Patenting Seeds in the United States of America: What to Expect, 25 Indus. Prop. 360 (1986); Helen W. Nies, Patent Protection of Biotechnological Inventions - American Perspectives: Address at the Washington Meeting of European and American Judges on Problems of European and American Patent Law, 21 IIC 480, 485 (1990); Kevin W. O'Connor, Patenting Animals and Other Living Things, *65 S. Cal. L. Rev. 597,*

606 (1991); Nicholas J. Seay, Protecting the Seeds of Innovation: Patenting Plants, 16 AIPLA Q.J. 418 (1989); Roberts, supra note 111, at 532; Sidney B. Williams & Kenneth A. Weber, Intellectual Property Protection and Plants, in IP Rights & Plants, supra note 152, at 91, 97. For some comparative comments, see Van Reepinghen & De Brabanter, supra note 43, at 62.

n153 *Hibberd, 227 U.S.P.Q. at 444.*

n154 Patent Office Notice, Plant Life - Patentable Subject Matter (Oct. 8, 1985), published in 2 Cooper, supra note 31, App. H3, at App.H-6.

n155 Similarly, Verhulst, supra note 28, at 113, 115. Differently, Paul A.C.E. van der Kooij, Het voorstel voor een EG- verordening Inzake het Kwekersrecht [The Proposal for a European Community Council Regulation on Plant Variety Rights], 51 Agrarisch Recht [Journal for Agrarian Law (The Netherlands), hereinafter AR] 61 (1991), which addresses the question whether plant biotechnological inventions are patentable on in light of problems relating to the scope of protection.

n156 For a discussion of this issue from the standpoint of subject matter, see *van der Kooij, supra* note 78, at 395-96.

n157 See supra Part III.C.

n158 Rossman, supra note 59, at 10.

n159 There is, however, case law on the application of the novelty requirement within the framework of PPA patents. See, e.g., *Cole Nursery Co. v. Youdath Perennial Gardens Inc., 31 U.S.P.Q. (BNA) 94 (N.D. Ohio 1936); Ex parte Moore, 115 U.S.P.Q. (BNA) 145 (P.T.O. Bd. App. 1957);* see also Noel J. Byrne, Fifty Years of Botanical Plant Patents in the U.S.A., 3 EIPR 116, 118 (1981); 1 Chisum, supra note 17, 1.05[1], at 1-258 (rel. no. 18, May 1986); Harry C. Robb, Jr., Plant Patents, Encyclopaedia of Patent Practice 641, 648 (1964); Sidney B. Williams, Securing Protection for Plant Varieties in the USA, 3 EIPR 222, (1981). See, e.g., *Bourne v. Jones, 114 F. Supp. 413, 98 U.S.P.Q. (BNA) 206 (S.D. Fla 1951);* see also Byrne, supra, at 119; 1 Chisum, supra, 1.05[1], at 1-260 (rel. no. 18, May 1986); Robb, supra, at 648; Williams, supra, at 222. See, e.g., *Nicholas v. Bailey, 182 F. Supp. 509, 125 U.S.P.Q. (BNA) 157 (S.D. Fla. 1960);* see also Byrne, supra, at 119; 2 Cooper, supra note 30, 8.05, at 8-16 (rel. no. 11, Apr. 1996), 8-19 (rel. no. 11, Apr. 1996); Robb, supra, at 649; Williams, supra, at 222. See, e.g., *In re LeGrice, 301 F.2d. 929, 133 U.S.P.Q. (BNA) 365 (C.C.P.A. 1962);* see also Byrne, supra, at 118; 1 Chisum, supra, 1.05[1], at 1-264 (rel. no. 18, May 1986); 1 Cooper, supra, 4.05[1], at 4-58.24 (rel. no. 12, June 1997); 2 Cooper, supra, 8.05, at 8-15 (rel. no. 11, Apr. 1996); Donald G. Daus, Conditionally Available Cultures: An Appraisal of In re Argoudelis et. al., *54 J. Pat. Off. Soc'y 187, 197 (1972);* Robb, supra, at 648; Wegner, supra note 32, 129, at 86-87; Williams, supra, at 222. See generally *Van Overwalle, supra* note 1, at 517-25.

n160 Krosin, supra note 101, at 236-37. Cf. Richard H. Kjeldgaard & David R. Marsh, Recent Developments in the Patent Protection of Plant-based Technology in the United States, 19 EIPR 16, 17 (1997).

n161 See supra Part III.D.

n162 But see Kjeldgaard & Marsh, supra note 160, at 17 (reporting two cases involving obviousness in the context of UPA patents and the results of conventional plant breeding: *Ex parte C., 27 U.S.P.Q.2d (BNA) 1492,* (Bd. Pat. App. & Interf. 1992) and *In re Sigco Research, 48 F.3d 1238, 36 U.S.P.Q.2d (BNA) 1380 (Fed. Cir. 1995)).* Case law on the obviousness requirement within the framework of the PPA has also been rare, but see *Yoder Bros. Inc. v. California-Florida Plant Corp., 537 F.2d 1347, 193 U.S.P.Q. (BNA) 264 (5th Cir. 1976).* For information on the interpretation of the non-obviousness requirement by the Court of Appeals, see Noel J. Byrne, Plant Patent Trouble over Sunshine May Shoesmith, 7 CIPA 90, 93 (1978); Byrne, supra note 159, at 119; 1 Chisum, supra note 17, 1.05[1], at 1-265 (rel. no. 18, May 1986); 2 Cooper, supra note 30, 8.06, at 8-21 (rel. no. 11, Apr. 1996); Donald D. Jeffery, The Patentability and Infringement of Sport Varieties: Chaos or Clarity?, *59 J. Pat. Off. Soc'y 645, 648-49 (1977);* Lesser, supra note 152, at 363; Schlosser, supra note 31, at 18; Williams, supra note 159, at 222; Williams & Weber, supra note 152, at 93, 99. See generally *Van Overwalle, supra* note 1, at 525-29.

n163 Cf. Williams & Weber, supra note 152, at 99.

n164 Cf. the three-point test for non-obviousness set out in *Graham v. John Deere, 383 U.S. 1, 17-18, 148 U.S.P.Q. (BNA) 459, 467 (1965);* see also 2 Chisum, supra note 17, 5.02[5], at 5-48 (rel. no. 51, Aug. 1994).

n165 Id.

n166 Andre, supra note 53, para. 88; Jaune, supra note 123, at 148; Alfred Vander Haeghen, Inventions et cecouvertes en culture [Inventions and Discoveries in Cultivation], 40 Ing. Cons. 275 (1950); Alfred Vander Haeghen, Inventions et decouvertes en culture [Inventions and Discoveries in Cultivation], 41 Ing Cons. 224 (1951); Paul Van Reepinghen, La proctection legale des nouvelles varietes vegetales et florales [The Legal Protection of New Vegetable and Horticultural Varieties], 41 Ing. Cons. 83, 91-92 (1951).

n167 Wet van 2 juni 1939 tot goedkeuring van de internationale akten geteekend to Londen, op 2 juni 1934 betreffende den nijverheidseigendom, de internationale inschrijving der fabrieks- of handelsmerken en de internationale deponeering der nijverheidsteekeningen of modellen [Act of June 2, 1939, to Ratify the International Acts Signed in London on June 2, 1934, Concerning Industrial Property, International Registration of Trademarks, and the International Deposit of Industrial Designs and Models], BS, Dec. 9, 1939. See Verhulst, supra note 28, at 42. The Paris Convention was originally ratified in Belgium by Loi de 5 juillet 1884 qui approve la convention pour la protection de la propriete industrielle, conclue a Paris, le 20 mars 1883, entre la Belgique a plusiers pays etrangers [Act of July 5, 1884, to Ratify the Convention for the Protection of Industrial Property, Concluded in Paris, March 20, 1883, Between Belgium and Several Other Foreign Countries], BS, July 6, 1884.

n168 M. Laclavi re, Droits de l'obtenteur sur l'exploitation des varietes de plantes qu'il a creees [Rights of the Breeder in the Exploitation of Plant Varieties He Created], 41 Ing. Cons. 232, 235 (1951); *Van Reepinghen, supra* note 167, at 86. See also Jean M. Mousseron, Le droit du brevet d'invention [Patent Law] 96 (1961).

n169 *Sales Affiliates, Inc./P.G. van Kampen, HR, 28 July 1957, 32 NJ 475 (1958).*

n170 See supra Part V.A.

n171 Williams, supra note 101, at 25.

n172 See Waddell A. Biggart, United States Patent Application Disclosure and Preparation for Biotechnology-Related Inventions, in Treatise on Biotechnology Patent Practice 90 (Patent Resources Group Inc. 1989). See also Kjeldgaard & Marsh, supra note 160, at 16-17 (discussing the effect of the new USPTO Utility Examination Guideline, *60 Fed. Reg. 36,263 (1995)).*

n173 Similarly, Friedrick-Karl Beier, Gewerblicher Rechtsschutz f r moderne biotechnologische Verfahren und Produkte [Industrial Property Protection for Modern Biotechnological Methods and Products], 39 GRUR Int. 219, 220 (1990); Beier & Straus, supra note 125, at 151; Noel J. Byrne, Plant Breeders' Rights: A Benefit or Burden to the Community?, 4 EIPR 95, 98 (1982); Judith R. Curry, The Patentability of Genetically Engineered Plants and Animals in the U.S. and Europe 27 (1987); P. Mars, Intellectuele eigendom en biotechnologie [Intellectual Property and Biotechnology], in CIER-Lezingen [CIER Lectures] 1989-1990/1990-1991, 11, 15 (Molengraaff Instituut voor Privaatrecht-Centrum voor Intellectueel Eigendomsrecht [Molengraaff Institute for Private Law - Centre for Intellectual Property] 1991); Moufang, supra note 66, at 360-61; J.C.H. Perizonius, Bescherming van biotechnologie bij planten [Protection of Biotechnology with Plants], 58 BIE 283, 285 (1990); Charles J.J.C. Van Nispen, Octrooirecht en biotechnologie [Patent Law and Biotechnology], 50 AR 165, 168 (1990). The suggestion that the impossibility-of-description objection is outdated has also been made in the past. See, e.g., Siegfried Von der Trenck, Zum Patentschutz von Pflanzenz chtungen [Patent Protection for Breeders' Products], 44 GRUR 437, 442 (1939)); differently, Waddell A. Biggart, Patentability, Disclosure Requirements, Claiming and Infringement of Microorganism-Related Inventions, in The Law and Business of Genetically Engineered Organisms and Cells 120, 124 (Patent Resources Group Inc. 1981) (stating the the view that the necessity of a deposit might be superfluous in the light of recent developments in the field of chromosome mapping).

n174 See supra Part III.F.

n175 Deposit of Biological Materials, 37 C.F.R. 1.801-1.809 (1998), reprinted in 2 Cooper, supra note 30, App. A2, at App. A-4.1 and Wegner, supra note 32, 462, at 825.

n176 *USPTO Notice of Final Rule on the Deposit of Biological Materials for Patent Purposes, July 21 1989, 1106 Off. Gaz. Pat. Office 37* (Sept. 12, 1989), reprinted in 2 Cooper, supra note 30, App. A2(4), at App. A-14-55.

n177 Unlike the PPA and the PVPA, which require a description of the new variety that is as adequate as possible, and under which the exemption condition of *35 U.S.C. 162* (1994) applies, the UPA, and in particular, *35 U.S.C. 112*, demands full disclosure of both the new plant and the transformation method. See 1 Chisum, supra note 17, 1.05[3], at 1-283 (rel. no. 18, May 1986); Williams, supra note 159, at 229; Williams, supra note 101, at 33; Williams & Weber, supra note 152, at 98.

n178 Similarly Adler, supra note 74, at 215; 1 Chisum, supra note 17, 1.05[3], at 1-283, 1.05[4], at 1-284 (rel. no. 18, May 1986); 1 Cooper, supra note 30, 5.05[9], at 5-120

(rel. no. 6, July 1991); William King, Disclosure by Deposit and the Future for Fingerprinting, in Vth International Colloquium on the Protection of Plant Breeders' Rights. The Protection of Biotechnological Inventions in the Field of New Plant Varieties. Legal Problems and Practical Solutions 97, 100 (September 10-11, 1987, CIOPORA 1988); Krosin, supra note 101, at 224; Schlosser, supra note 31, at 29.

n179 See Charles E. Van Horn, Recent Rulemaking, in Trends in Biotechnology and Chemical Patent Practice 1989, at 161, (PLI Pats., Copyrights, Trademarks & Lit. Prop. Practice Course Handbook Series No. 286, Nels T. Lippert ed., 1989); Charles F. Warren, Issues and Challenges in the Administration of the Patent Law with regard to Plants by the Patent and Trademark Office, in IP Rights & Plants, supra note 152, at 145, 152. In *Ex parte C., 27 U.S.P.Q.2d (BNA) 1492, 1495* (Bd. Pat. App. & Interf. 1992), the USPTO stated that the deposit of seeds at an official depository may fulfill the enablement and best-mode requirements of a UPA plant patent.

n180 67 GRUR 577 (1962). See Lindenmaier, supra note 67, at 21; Moufang, supra note 66, at 86-87; Schulte, supra note 87, at 61; Eckhart Von Pechmann, Sind Vermehrungsanspr che bei biologischen Erfindungen ungesetzlich? Bemerkungen zur B kerhefe- Entscheidung des BGH vom 11 M rz 1975 [Are Multiplication Claims Illegal in the Case of Biological Inventions? Comments on the Baker's Yeast Decision of the Supreme Court of March 11, 1975], 80 GRUR 395, 395 (1975); Franz Wuesthoff, Patentschutz f r Pflanzenz chtungen [Patent Protection for Plant Breeders' Products], 67 GRUR 555 (1962); Wuesthoff, supra note 79, at 407. See also Bergmans, supra note 108, at 98.

n181 67 GRUR at 579.

n182 BGHZ 52, 74, 72 GRUR 672 (1969).

n183 Specifically, the Court said, "Die Wiederholbarkeit eines zum Patent angemeldeten Tierz chtungsverfahrens ist notwendige Voraussetzung f r dessen Patentierung" [The repeatability of a method for animal breeding is a prerequisite for its being patented], 72 GRUR at 673. The Court continued: Es ist kein mit dem Prinzipien des Patentrechts zu vereinbarender Grund ersichtlich, der es gestatten k nnte, von dem Erfordernis der Wiederholbarkeit der zum Patent angemeldeten Verfahrenslehre abzusehen, weil das Ergebnis der Z chtung aus sich selbst heraus erbbest ndig vermehrbar sei und somit eine Bereicherung der Allgemeinheit besser garantierte als eine Wiederholung der oft m hsamen und langwierigen Z chtung selbst. [There is no ground available which would be compatible with the principles of patent law and which could allow the method-repeatability requirement to be dropped, because the result of breeding can propagate itself and would therefore be more of a guarantee for the enrichment of the common good rather than a repetition of the difficult and time-consuming breeding itself.] Id. The legal doctrine welcomed this as a pioneering decision (eine Wegweisende Entscheidung), which, however, turned out to be a Pyrrhic victory because the reproducibility claim can rarely be met in practice. See Friedrich-Karl Beier, Annotation, Decision of the Bundesgerichtshof of Feb. 12, 1987, 36 GRUR Int. 359, 359-61 (1987); cf. Hesse, supra note 125, at 651.

n184 BGHZ 64, 101, 80 GRUR 430 (1975), abridged and translated in 6 IIC 207 (1975). This decision created a stir in the doctrine as well. See Baumbach, supra note

125, at 14; Beier & Straus, supra note 125, at 137-38; Benkard, supra note 67, at 225; Hans D. Boeters & Werner Lindenmaier, Schutz von Zellkulturen entgegen der B ckerhefe-Entscheidung - f r Erfinder Schon nich mehr aktuell? [Protection of Cell Cultures from Baker's Yeast Decision - No Longer Relevant for Inventors?], 87 GRUR 703 (1982); Bunke, supra note 125, at 132-36; Klaus D nner, Bed rfnisse der Anmelder biotechnologischer Erfindungen [Requirements for Applicants with Biotechnological Inventions], 36 GRUR Int. 315, 315 (1987); Moufang, supra note 66, at 99-100; Schulte, supra note 87, at 61-62; *Straus, The Protection of Biological Inventions, supra* note 108, at 401-07; Joseph Straus & Rainer Moufang, Hinterlegung und Freigabe von biologischem Material f r Patentierungszwecke. Patent- und eigentumsrechtliche Aspekte [Deposit and Release of Biological Material for the Purposes of Patent Procedure: Industrial and Tangible Property Issues] 53-61 (1990); Tauchner, supra note 125, at 84-86; Teschemacher, supra note 125, at 28-41; Wilhelm Tr stedt, Der BGH - Beschluss "B ckerhefe" [The Supreme Court Decision in "Baker's Yeast"], 82 GRUR 196 (1977); Wilhelm Tr stedt, Patentierung Mikrobiologischer Erfindungen [Patentability of Microbiological Inventions], 86 GRUR 95, 103 (1981); Von Pechmann, supra note 180, at 395-99; Von Pechmann, supra note 106, at 721; Vossius, supra note 125, 80 GRUR at 584- 87; Vossius, supra note 125, 84 GRUR at 579-84; Wuesthoff, supra note 179, at 409. The B kerhefe decision also met with a broad response in Belgium, see, e.g., Bergmans, supra note 108, at 98- 99.

n185 BGHZ 100, 67, 36 GRUR Int. 357 (1987) (annotated by Karl-Friedric Beier), reprinted in English in 2M Sinnott & Cotreau, supra note 108, at 742.

n186 36 GRUR Int. at 358.

n187 Id.; see also Baumbach, supra note 125; Benkard, supra note 67, at 222; Moufang, supra note 66, at 106-08; Elke Rogge, Zur Anwendbarkeit der Grunds tze des Tollwutvirus - Beschlusses des Bundesgerichtshofs auf makrobiologische Erfindungen, insbesondere im Bereich der Pflanzenz chtungen [The Applicability of the Basic Principles of the Supreme Court's Rabies Virus Decision on Macrobiological Inventions, in Particular in the Field of Plant Breeders' Products], 93 GRUR 653 (1988); Schulte, supra note 87, at 60-61; *Straus, The Protection of Biological Inventions, supra* note 108, at 410-13; Eckehart Von Pechmann, Aussch pfung des bestehenden Patentrechts f r Erfindungen auf dem Gebiet der Pflanzen- und Tierz chtung unter Ber cksichitigung des Beschlusses des Bundesgerichtshofs - Tollwutvirus [Exhaustion of Existing Patent Law for Inventions in the Field of Plant and Animal Breeding, Taking into Account the Supreme Court's Rabies Virus Decision], 92 GRUR 475 (1987).

n188 Similarly, Beier, supra note 183, at 360 (1.c), 361 (2.e); Neumeier, supra note 79, at 60.

n189 Cook, The Administration of the Plant Patent Law, supra note 58, at 276.

n190 See id.; Harry C. Robb, Plant Patents, *15 J. Pat. Off. Soc'y 752, 753 (1933);* Rossman, supra note 59, at 15; Joseph Rossman, The Preparation and Prosecution of Plant Patent Applications, *17 J. Pat. Off. Soc'y 632, 635 (1935); Van Harreveld, supra* note 42, at 90.

n191 *In re Hibberd, 227 U.S.P.Q. (BNA) 443* (Bd. Pat. App. & Interf. 1985) See also sources cited supra note 152.

n192 *Id. at 444-45.*

n193 *Id. at 444.*

n194 Id.

n195 Patent Office Notice, Plant Life - Patentable Subject Matter (Oct. 8, 1985), reprinted in 2 Cooper, supra note 30, App. H3, at App. H-6.

n196 Id. (quoting *Diamond v. Chakrabarty, 447 U.S. 303, 309-10, 206 U.S.P.Q. (BNA) 193, 197 (1980).*

n197 See Warren, supra note 176, at 145-56.

n198 International Convention for the Protection of New Varieties of Plants of Dec. 2, 1961, as Revised at Geneva on Nov. 10, 1972, on Oct. 23, 1978, and on March 19, 1991, UPOV Publication No. 221(E) (Geneva, 1991). The UPOV Convention was signed by the following 16 nations: Belgium, Canada, Denmark, France, Germany, Ireland, Israel, Italy, the Netherlands, New Zealand, South Africa, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America. See generally Noel J. Byrne, Analysis of Basic Proposal for a New Act of the International Convention for the Protection of New Varieties of Plants (Common Law Institute of Intellectual Property, 1991); Noel J. Byrne, Commentary on the Substantive Law of the 1991 UPOV Convention for the Protection of Plant Varieties (Queen Mary and Westfield College, 1992); *Van Overwalle, supra* note 1, at 201-07. For more background on the 1991 UPOV Convention, see Records of the Diplomatic Conference on the Revision of the International Convention for the Protection of New Varieties of Plants, UPOV Publication No. 346(E) (Geneva, 1992).

n199 UPOV, 1991/221D, 6.

n200 See Moufang, supra note 125, at 182; Joseph Straus, Pflanzpatente und Sortenschutz - friedliche Koexistenz [Plant Patents and Variety Protection - Friendly Coexistence], 42 GRUR 794, 794 (1993); Eckehart Von Pechmann & Joseph Straus, Die Diplomatische Konferenz zur Revision des Internationalen bereinkommens zum Schutz von Pflanzenz chtungen [The Diplomatic Conference for the Revision of the International Convention for the Protection of Varieties of Plants], 40 GRUR Int. 507, 508 (1991). Such an interpretation is corroborated by an incident that occurred during the 1991 revision: a Danish amendment aimed at eliminating the possibility of choice was later withdrawn. Personal communication with Louis Van Eylen, June 13, 1995.