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Microbiological Plant Patents**

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SUMMARY

THIS PAPER IS A CRITICAL EXAMINATION and re-evaluation of present patent practise in the field of microbiology. This field has been dominated for 26 years by the decision of the C.C.P.A. in *In re Arzberger,* 46 *USPQ* 32, 1940 C.D. 653, 521 O.G. 272, 112 F 2d 834 (C.C.P.A. 1940). It is the position of the writers that the *Arzberger* case is unsound from legal, economic, and policy viewpoints.

INTRODUCTION

IN A SINGLE FAR-REACHING DECISION, the Court of Customs and Patent Appeals held in *In re Arzberger*[1] that bacteria are not patentable subject matter within the meaning of the Townsend-Purnell Plant Patent

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** This study has resulted in part from the work of Messrs. Daus and Bond in a trial practice case in The George Washington University Law School. Much counsel and useful information was given by persons in the patent profession, both in and out of Government. The authors are Assistant Examiners in the U.S. Patent Office and the opinions expressed in this paper represent their personal views and not the official view of the U.S. Patent Office.

[1] 46 *USPQ* 32, 1940 C.D. 653, 521 O.G. 272, 112 F2d 834 (C.C.P.A. 1940).

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Act of 1930.[2] Arzberger had developed a bacterial strain[3] with improved characteristics for the manufacture of acetone, butanol and ethanol, important commercial solvents.

The Primary Examiner had rejected the claim to the bacterium as not within the plant patent provisions. The Patent Office Board of Appeals sustained this rejection adopting the Examiner's excellent answer by reference.

The Court of Customs and Patent Appeals affirmed the Patent Office Board of Appeals. The court held that the meaning of "plant" as employed in the statute did not encompass bacteria.[4] It based its holding on two basic grounds. These grounds were the legislative history of the plant patent statute and canons of statutory construction. The court, in reviewing the legislative history of the statute, found that bacteria were never mentioned and that the basic purpose of the statute was to aid agriculture to an extent equal to the protection granted to manufacturing industry by the usual mechanical or utility patent. The court held that bacteria for the purpose of producing organic solvents by fermentation were not an aid to agriculture. The court further held that bacteria are not produced by any of the methods which Congress discussed.[5]

This paper will discuss the reasoning of the court, raise questions concerning the court's conclusions, and point out an apparently little recognized alternative to patenting micro-organisms as plants, namely, the possibility of claiming living micro-organisms as compositions of matter.

Reconsideration Is Necessary

The lapse of 26 years since the *Arzberger* decision without any reported challenge requires the demonstration of a necessity for its re-

[2] 35 U.S.C. 161-4, previously R.S. 4886 (35 U.S.C. 31).

[3] "*Clostridium saccharo-butyl-acetonicum-liquifaciens.*" Plants are classified into four phyla: Thallophytes, Bryophytes, Pteridophytes and Spermatophytes, the latter two, pines and seed-bearing plants sometimes classified together, comprise the great majority of all plant patents (Plant Patents 27 and 2050 are drawn to mushrooms).

Thallophytes comprise: Bacteria, fungi (yeasts, molds and mushrooms) and algae. Algae are morphologically similar to fungi except that they additionally possess chlorophyll. Intermediate between algae and fungi are lichens, combinations of algae and fungi living together symbiotically. Sometimes bacteria are included as fungi. Separate sciences of bacteriology and mycology have evolved, tending to favor their separate classification. See Robbins, L. J., 42 *JPOS* 830 (1960).

[4] For contemporary analyses see Parker, C. B., 22 *JPOS* 622 (1940) and Kegan, A. I., 18 Ind. Eng. Chem. (News Ed.) 852 (1940).

[5] "Grafting, budding, cutting, layering, division and the like."

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consideration. Does this decision aid and serve the purpose of the patent system, namely to promote the sciences and useful arts?

A recently publicized theft of valuable antibiotics-producing cultures shows the inadequacy of the protection afforded by the law of trade secrecy.[6] A further example of such inadequacy may well be the decline of the industry directly concerned with the *Arzberger* invention itself, that of fermentation-produced acetone.

In 1940, the year *Arzberger* was decided, the relatively young fermentation-acetone industry[7] produced 60 million pounds of acetone, 20 percent of the total.[8] In 1960, the overall market tripled, but the fermentation acetone comprised only 1½ percent of the total.[9] The results are tabulated as follows:

TABLE 1
ACETONE PRODUCTION[10]

Years		Fermentation	Synthetic	Percentage of fermentation	Price
	(Million lbs./yrs.)	(Million lbs./yr.)	(Million lbs./yr.)	(%)	(¢/lb.)
1940	300	60	240	20	
1945	349	42.4	307.4	12.1	7
1950	482.5	23.7	448.8	4.9	7.5
1955	436.8	27.4	409.4	6.2	7
1960[11]	761.3	11.7	749.6	1.5	8

In spite of steady prices and expanding consumption, the fermentation-market share declined disproportionately.

It is a temptation to consider the *Arzberger* decision the major factor in the decline of a relatively unprotected, agriculturally based in-

[6] American Cyanamid v Fox, 244 N.Y.S. 2d 91 (1964), the facts of which are set out in 42 *Chemical and Engineering News* 22 (Jan. 20, 1964) and 44 and E.N. 14 [Jan. 31, 1966]). See also *Chemical Engineering*, April 25, 1966, pp. 148-150.

[7] During World War I, acetone was needed in the manufacture of cordite explosives and airplane "dope." Chaim Weizmann was induced by the British government to aid in the development of a commercial process. The U. S. Government established a plant at Terre Haute, Indiana. Since the by-product, butanol, was then unsalable, the industry closed at war's end. At subsequent stages butanol became the major product for use in automotive lacquers. Presently the demand for acetone somewhat exceeds that for butanol.

[8] Kirk-Othmer, Vol. I, *Encyclopedia of Chemical Technology* 91 (1947).

[9] Calculated from Kirk-Othmer, Vol. I, *Encyclopedia of Chemical Technology* 63 (2d. Ed. 1963). (The major source of synthetic acetone is isopropyl alcohol. Hatch *Isopropyl Alcohol* 26 (McGraw Hill, 1961).

[10] *Ibid.*

[11] By 1960, fermentation capacity had declined to 4.5 million pounds of acetone.

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dustry[12] in contrast to the growth of a synthetic organic-chemical production which has not been denied patent protection. However, it should not be forgotten that the decline of the fermentation-acetone industry may be due in part to support prices for raw materials.[13] Even in 1960, the fermentation-acetone industry was a significant consumer of agricultural products.[14]

An additional reason for reconsideration of the *Arzberger* case is the fact pattern disclosed in the tetracycline case before the Federal Trade Commission.[15] The Commission found that the organisms placed on public deposit when Cyanamid obtained some of its Aureomycin patents were very weak and would not produce antibiotics in any commercially significant amount. In actual practice other bacterial strains were employed which yielded a commercially successful product and process. This Aureomycin patent will expire shortly and yet the public will not be enabled to practice the invention described in the patents since the commercially successful organism, a most critical part of the invention, has been withheld as a trade secret. Were patents allowed on the actual organism as such, it is submitted that this could be avoided. If the effective organisms could be protected by patent, trade secrecy would not be necessary to protect these valuable advances. Patenting of micro-organisms as such would tend to favor a more complete disclosure of inventions in this field and the public would ultimately benefit.

Another reason for the re-examination of *Arzberger* is that some new technologies involving microbiology[16] have been developed since the

[12] The fermentations produce 65-85% butanol, 3-25% acetone and 1-10% ethanol, depending on the bacterial strain and substrate. Prescott and Dunn, *Industrial Microbiology* 250-5 (3rd Ed. McGraw Hill, 1959) 312-6, 320 (2d. Ed. McGraw Hill, 1949). It should be noted that the bacteria used, while isolated originally from soil, require special heat "shocking" in order to produce commercial amounts of solvents. The process organisms are not found as such in nature and are truly "domesticated."

[13] It may well be that, as in nylon, agricultural-support prices have put a floor under agricultural competition minimizing risks of decreased prices for the synthetic chemical producers.

[14] The acetone production could consume 60 million bushels, almost twice as much corn as the two second largest corn refineries combined.

[15] See "In the Matter of American Cyanamid, et al.," FTC Docket No. 7211, Opinion Accompanying Final Order, Footnote 14, bridging pages 10-11. The order requires Cyanamid to make the organism available. The order has been appealed to the Sixth Circuit and was argued in December, 1965. As of the time of this writing, there has been no decision by the court.

[16] Examples are food from petroleum and paper-making wastes (yeasts); life-support systems in spore capsules (algae) and microbiological fuel cells. It is conceivable that specialized strains may be critical in developing new technologies.

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Arzberger decision. The impact of the decision on these new technologies should be considered.

Interpretation of the Word "Plant"

The *Arzberger* court gives a very narrow interpretation of both Congress' language and intent. In a statute relating to the arts and sciences, the court applied the popular meaning of the word *plant* rather than the scientific, or technical meaning. The court cited a tariff case to justify its interpretation.[17] Tariffs deal with goods as they are identified and used generally in commerce. In tariff cases commercially accepted terms should be used, since the purpose of a tariff statute is to regulate trade and commerce.

The constitutional purpose of patent laws is to promote the sciences and useful arts. Therefore, the correct use of the canon of statutory construction, that the words of a statute should be interpreted by the purpose or intent of the statute, would require that the words of the Plant Patent Act (as well as all of the patent statutes) be interpreted in their scientific and technological meaning. The court in *Arzberger* clearly erred in its application of this canon. The statute expressly states that all provisions of the patent statute apply to plants, with the exception that the requirements of 35 U.S.C. 112 are relaxed.[18] Presumably these provisions include the standard of invention, "would have been obvious . . . to a person having ordinary *skill in the art* to which said subject matter pertains."[19] It is far more reasonable that Congress intended that the term *plant* should be interpreted by its scientific and technical meaning just as the terms in the remainder of the patent statutes are interpreted. Congress explicitly requires plant patents to comply with the other patent sections[20] as far as possible.[21]

The definition of a "plant" should, therefore, be determined only by technical considerations. The Plant Patent Act was directed to protect workers in the art of developing new plants, technical people skilled in the biological sciences, not the public at large.

A still further insight into the scope of the term *plant,* as employed in the plant-patent statute, comes from the reading of the statute itself.

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[17] Nix v. Hedden, 149 U.S. 304, 13 S.Ct. 881, 882.

[18] 35 U.S.C. 161. See also *In re* LeGrice 301 F2d 929, 133 *USPQ* 365 (C.C.P.A., 1962).

[19] 35 U.S.C. 103 (underlining added).

[20] Except 35 U.S.C. 112 where compliance is to be to the extent possible. 35 U.S.C. 162. The writers recognize description problems will arise if bacteria are held patentable. That is not insurmountable, but is outside the scope of this paper.

[21] A discussion of the then current law on statutory interpretation appears in Brief for Appellant, pp. 12-15, *In re* Arzberger, 46 *USPQ* 32 (C.C.P.A. 1940).

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The statute specifically excludes from its protection tuber propagated plants and plants found in an uncultivated state. Congress intended some plants to be excluded from protection and it has enumerated two categories specifically. It would appear clear that the intent of Congress was to *include* rather than *exclude* all other categories of plants since, if Congress really intended to exclude other categories, it would have specifically so provided.[22, 23]

The Legislative Record Implies That Manual Manipulation Is a Necessary Part of Asexual Reproduction.

The legislative history of the plant patent statute indicates the Congress intended that the process of asexual reproduction of a patentable variety of plant should at some point be caused or aided by some manual act. Otherwise, it is argued, where is the inventive act or acts whereby the invention can be said to have been made?

Modern fermentors are generally equipped with agitators to (1) disperse sterile air into fine bubbles to provide oxygen more efficiently, and (2) to break up clumps of micro-organisms so that there is a greater surface-area-to-weight ratio, favoring transfer of nutrients into the bacterial cells and thereby stimulating growth.[24] It is apparent that Congress intended to limit asexual reproduction to *manually aided* reproduction.[25]

The use of agitators to break apart the growing bacterial fungal, algae or yeast cells is division by human agency.[26] The commercial propagation of micro-organisms in fermentors is asexual reproduction on a large scale.[27] In *Arzberger* the size of bacteria is mentioned as a possible distinction between patentable and unpatentable plants. However, it is almost axiomatic in patent law that a difference of size or in degree is not a patentable distinction.

The *Arzberger* court relied on the stated purpose of Congress in enacting the Plant Patent Act which was to benefit agriculture. The court stated that bacteria do not generally benefit agriculture and

[22] See Appendix I.

[23] In view of the fact that all statutes are prospective in their effect rather than retrospective, Congress probably intended the statute to cover varieties of plants which were not specifically mentioned.

[24] Also it is postulated that the agitator reduces the thickness of stagnant films on the cells, stimulating growth.

[25] There is little patentable distinction in the process use of mechanical means to accomplish what can be done manually.

[26] It would appear that asexual reproduction of higher plants, if it could be done mechanically, would not be without the purview of the Plant-Patent Act.

[27] See Appendix II, "Industrial Asexual Reproduction."

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accordingly are outside the scope of the Act. If Congress intended to allow discriminations between patentable novel economic plants on the basis of their ultimately intended roles variously found by horticulturists, agronomists, mycologists, and bacteriologists, or on the ground that, to be patentable under the Act, the plant must be tillable in the ordinarily recognized sense to grow a crop, Congress did not express its purpose.[28] It would appear that Congress did not intend that discrimination be permitted between types of plants which would be granted patent protection[29] on either botanical, social[30] or economic grounds. The Congress did not leave the Patent Office or the courts free to discriminate as to the ultimate uses of new plant varieties, but created a new category of patentable subject matter: plants.

Bacteria Are Within Congress' Intent to Aid Agriculture

The U. S. Department of Agriculture maintains extensive facilities at the Northern Research Laboratories, Peoria, Illinois, for the development of new micro-organisms and processes useful for converting agricultural products into other marketable materials, such as antibiotics, et cetera, through the use of fermentation.[31] In view of the extensive support given by the Congress to the Department of Agriculture for the purpose of carrying out this type of research and development work, it must be concluded that Congress considers this type of activity consistent with the overall purpose of the Department of Agriculture, namely, advancing and aiding agriculture.[32]

Proposed Alternative Protection: Composition of Matter

There is some belief that living matter cannot be patented because such subject matter would fall within the doctrine of the unpatentability of "principles of nature." Justice Douglas stated in *Funk Bros. Seed Co.* v. *Kalo Innoculant Co.*,[33] that "the qualities of these bacteria, like the heat of the sun, electricity or the quality of metals, are part of the storehouse of knowledge of all men." It is important to note, however, that the varieties of bacteria involved in the *Kalo* case were all old, well-known varieties, not a new variety produced by the interven-

[28] Congress did intend that new plants of drug and medicinal value be protected by this Act. H.R.Rep. No. 1129, 71st Cong. 2d. Sess. 9 (1930).

[29] Save for those specifically excluded, as tubers.

[30] Except as limited by 35 U.S.C. 101 to "useful."

[31] Sen. Report 448, 87th Cong. 1st Sess. 124 (1961).

[32] See Appendix III, "The Research Work of The U.S.D.A. as Evidence."

[33] 333 U.S. 127. The Court decided the case on aggregation, not whether living bacteria can be patented. Had the Court wished to state that bacteria cannot be patented, it had opportunity to so state. Its silence may be significant.

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tion of the inventive skill of man. In *Kalo* the Court had to decide whether the claimed compositions containing these old varieties were really proper combinations or whether they were merely aggregations of old, noncooperating elements or subcombinations. The Court held the compositions to be mere aggregations and not proper combinations. Justice Douglas stated, "We think the aggregation of species fell short of invention." Had the Court wished to state that living matter could not be the proper subject of a mechanical or utility patent, it could have. The fact that it did not so state is deemed significant. After all, as was so aptly stated by Justice Frankfurter in his concurring opinion in *Kalo,* "Everything that happens may be deemed the work of nature."

No record has been found of an attempt to claim industrially useful micro-organisms as compositions of matter. There is no requirement in the statute that a composition of matter be nonliving in order to be patentable. Living as well as nonliving bodies have mass, occupy space, et cetera. "Composition of matter," as employed in 35 U.S.C. 101, includes living matter unless some rule of statutory construction or decision gives a narrower interpretation to the term. No such rule or decision has been found. Thus, living matter is believed patentable under 35 U.S.C. 101 provided the remaining statutory requirements for patentability are satisfied.[34] The existence of patents drawn to living organisms and cultures used in foods, insecticides,[35] et cetera, is indicated in the footnote below.[36]

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[34] The requirements of 35 U.S.C. 112 are particularly troublesome.

[35] No reason is seen why such patents do not include cultures for fermentation.

[36] The following are typical of living matter patented as compositions of matter and are by no means exhaustive: (The number of the patent, its month of issue, the patentee and the Patent Office classification are given in that order).

1) Bacteria
   3,133,066 12-1963 Emond 167-13
   Claims 1 and 2 are drawn to composition containing oil and *Bacillus thuringiensis* spores. Reference to the patent file indicates emphasis on the living character of the composition, and of synergistic effects.
2) Yeasts
   2,919,194 12-1959 Johnston 99-96
   Claim 21 is drawn to dry baker's viable yeasts comprising the yeast, less than 8% moisture.
3) Yeast and Bacteria
   1,894,135 1-1933 Torok *et al.* 99-96
   Claim 10 is drawn to "a yeast preparation containing lactic acid separated from their nutrient medium."
4) Mushroom mycellia ("spawn")
   2,262,851 11-1941 Lescarboura 47-111
   Claims 1-10 are drawn to pulps overgrown with mushroom mycellium.
5) Virus
   2,271,819 2-1942 Green 167-78

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It is also interesting to note that former Commissioner of Patents Watson testified before a congressional committee which was considering a proposed revision of the Plant Patent Act, that "patents are granted on cultures."[37]

CONCLUSIONS

We conclude:

1. A need for a change exists. The fate of the acetone-fermentation industry, regression in an expanding market, might have been altered had the *Arzberger* decision held bacteria patentable as plants.

2. Presently used protection, patent claims drawn to the uses of novel organisms and to processes for their isolation, is inadequate. Trade secrecy as indicated by the recent *American Cyanamid* v. *Fox* case cited, *supra,* results in inadequate protection of valuable microbiological cultures. Furthermore, one of the purposes of the patent laws is the discouragement of resort to trade secrecy. If this purpose of the patent laws is a valid one, and it is deemed so by all supporters of the patent system, then full disclosure and patent protection to the inventor advances the public interest more than nondisclosure and trade secrecy.

3. Congress' support of the excellent microbiological work of the United States Department of Agriculture indicates that the narrow

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Claims 3 and 4 are drawn to a distemper virus vaccine described by the process for its production.
2,518,978 8-1950 Cox *et al.* 167-80
Claim 5 is drawn to a hog cholera virus developed by a specified process.
2,966,433 12-1960 Cox 167-78
Claims 1 and 2 are drawn to live polio viruses made by a specified process.

6) Plant seeds
3,080,285 3-1963 Openwald, *et al.* 167-65
Claims 1-4 are drawn to seed covered with medication.

7) Eggs
3,088,865 5-1963 Wernicoff *et al.* 167-531
Claim 8 is drawn to an egg treated by the method of addition of hormones.

8) Eggs plus bacteriophages
2,851,006 9-1958 Taylor *et al.* 119-1
Claims 1-8 are drawn to eggs inoculated with *Salmonella* phages (a virus which attacks *Salmonella* bacteria), providing resistance thereto.

Two mushrooms have been patented under the plant statute:
Plant Patent 27 9-1932 Lambert 47-59
Plant Patent 2,050 4-1961 Robbins 47-59
It is noteworthy that 2050 issued subsequently to *In re* Arzberger, yet the Patent Office did not cite it. It is also noted that these appear to violate the policy of not permitting patenting of the edible portion of the plant, the stated reason for exclusion of potatoes under the plant statutes.

[37] S. Rep. No. 932 86th Cong. 1st Sess. 7 (1959), in support of a bill to remove the provisions excluding tuber propagated plants.

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interpretation of the intent of Congress by the court in *Arzberger* is not justified.

4. Plant protection is appropriate, since industrial fermentation is mechanical asexual reproduction on the grand scale.

5. Alternatively, the use of utility claims to the micro-organisms as composition of matter is suggested. This form of claim has been allowed for foods and nonindustrial products, generally with a "carrier." No reason is seen to exclude industrial micro-organisms since one of the purposes of the patent system is to advance industry as well as agriculture.

6. During the 26 years since the narrow interpretation of intent of Congress in the *Arzberger* case, we have noted the shrinkage of an agriculturally based industry, the acetone-fermentation industry. During this same period of time we have described increasing amounts of work in the field of microbiological fermentation by the U. S. Department of Agriculture. This work has been an attempt to relieve, at least partially, the oversupply of grain and other farm products in this country. The rewards of this work have been remarkable, but in view of the problem of vast surplus products confronting agriculture today, is it not time to attempt a broader policy and encourage private incentive as well as Government in this field?

7. "Plant" should be interpreted in its scientific sense as would be expected in a statute drawn to a scientific, technical subject.

8. Improvements in synthesis of chemicals are patentable. What would happen if agriculturally based industry were given the incentive to develop new strains of micro-organisms such that fermentation would be enabled to compete with the synthetic processes? Assuming that patents form any valid function by stimulating business and inventive activity to generate available technical know-how (which must be assumed to justify any patents for any inventions), the grant of a patent under the Plant Patent Act for micro-organisms would clearly fulfill both the constitutional[38] purpose of the patent statutes in promoting science and useful arts and carry out Congress' specific intent to aid agriculture. No reason is seen why such an approach should not be given a full and fair trial.

9. In considering the scope and effect of the Townsend-Purnell Plant Patent Act of 1930, as amended in 1954, should it not be interpreted to include plant breeder-microbotanists as inventors on a par with mechanical, electrical and chemical artisans, as well as the plant breeder-botanist? We believe the answer to be affirmative.[39]

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[38] U. S. Constitution, Article I, Section 8, Clause 8.

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APPENDIX I

LEGISLATIVE HISTORY OF THE PLANT-PATENT ACT

On February 11, 1930, identical bills were simultaneously introduced in the Senate by the Hon. John G. Townsend, Jr. of Delaware (S. 3530) and in the House of Representatives by the Hon. Fred S. Purnell of Indiana (H.R. 9765). These bills were referred to the respective committees on patents in the Senate and House, and to the Secretaries of Agriculture and of Commerce. The proposal was to grant patents on:

"Any new and distinct variety of asexually reproduced plant other than a tuber-propagated plant or a plant which reproduces itself without human aid," and that "The words invented and discovered as used in this section, in regard to asexually reproduced plants, shall be interpreted to include invention and discovery in the sense of finding a thing already existing and reproducing the same as well as in the sense of creating."

The Secretary of Agriculture on March 17, 1930, reported back that "the proposed legislation would appear to be desirable and to lend far-reaching encouragement to agriculture and benefit to the general public."

The Secretary of Commerce referred the bill to the Commissioner of Patents and reported back his general approval although questioning (March 12, 1930) the constitutionality of the proposal to grant patents on mere "finds."

On March 24th, Senator Townsend introduced new S. 4015, still including provision for patents on newly found varieties of plants. On April 30th, the Senate Committee on Patents, apparently without public hearing, filed its reports and recommended that its bill (4015), but with Amendments eliminating newly found plants, be passed.

On April 3rd, Mr. Purnell introduced new H.R. 11372 omitting the "mere finds." On April 9th, the House Committee on Patents held a public hearing on H.R. 11372 and added a section barring patents on plants which had been "introduced to the public prior to the approval of the act." On April 10th, the House Committee made its report and recommended passage of the Act.

On April 14, 1930, Senate Bill 4015 was called on the calendar with an amendment offered by Senator McKellar of Tennessee, and approved by Senator Townsend, barring plants that had been "introduced to the public" prior to the approval of the Act.

The discussions which took place show that Senator Dill had grave doubts as to the wisdom of the legislation, especially as to plants of a food-producing nature. Senator Caraway also questioned the practicability of the scheme, and on objection of Senator Black the bill was passed over for the day.

On April 17th, the bill (S. 4015) was again called up, and again passed over. Senator Copeland introduced a number of letters from agronomists favoring the bill.

On May 12th the bill was again called and amendments agreed to, striking out the provision to protect a "newly found variety of plant." The endorsements of various agriculturists and societies were noted on the record and the bill then passed by the Senate without a record vote.

The House Bill 11372 was called on the consent calendar May 5, 1930. Mr. Stafford remarked, "This is establishing a precedent to provide for a patent to those who develop a rare species of cattle or chicken."

Mr. Fiorello LaGuardia (of New York) objected to immediate consideration and

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[39] "The tremendous forces of plant life have not yet been fully harnessed by man, but the advances made so far by the plant breeder clearly indicate that his contribution may some day be greater and more important than the services of steam or electricity." J. Rossman, 13 *JPOS* 11 (1931).

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there was quite an interesting informal discussion indicating that Mr. LaGuardia had reviewed the report of the House Committee and appreciated the great importance of the bill and the "difficulties in carrying out the provisions of this bill." He further stated, "I will go further and state that I consider Luther Burbank the Outstanding American of his time." But he did not "believe it possible to protect him by patent rights." (Mr. Burbank died in 1926.)

It was pointed out that the bill had the approval of the Commissioner of Patents, but at Mr. Stafford's request it was "passed over without prejudice."

On May 13th, Mr. Vestal, Chairman of the House Patent Committee, asked unanimous consent to take up Senate Bill 4015, which he said was in the exact language of the House bill, as reported by his committee. There was no discussion and the bill was passed without a record vote. The House bill was then laid on the table.

The bill was approved by President Hoover on May 23rd, 1930, as the Townsend-Purnell Plant Patent Act of 1930.

The Act has been amended once, in 1954, to broadly include newly found discoveries, cultivated sports, induced and discovered mutants and seedlings.

The original statute of 1930 did not specifically preclude the grant of patents on the latter categories of the 1954 amendment. The law appears to have been intended to cover only such inventions or discoveries as have been made as the result of some act of creation on the part of the inventor. The act may have been an accident. The inventor may not have had any specific intention except that of experimentation, but if a new plant is produced having distinguishing characteristics, such a plant is patentable.

If, on the other hand, the alleged inventor merely found the sport or freak product of unaided nature, under the Act of 1930, prior to amendment in 1954, no amount of reproduction could have sufficed to develop patentable novelty. It is undoubtedly true that if the Act of 1930 had been passed as originally proposed there would have been justification for the grant of patents on mere finds or accidental discoveries of freaks of nature, and now the 1954 amendment gives statutory recognition of the right to such claims, provided that the varieties of plants newly found by plant explorers or other varieties growing in an uncultivated or wild state are not found in cultivated areas.

An attempt in 1959 to remove the exclusion of tuberous plants was unsuccessful.

APPENDIX II

Industrial Asexual Reproduction

Plant patents carry the right to exclude others from asexual reproduction of the protected plant. This has particular significance to the fermentation industries.

Bacteria and fungi reproduce by cell division, fungi at a considerably slower rate. When a sterile tube of nutrient medium is inoculated with a bacterium, typically a lag of several hours, days, or even weeks takes place until the cell divides. Once it starts, it divides at a rapid rate until it reaches a certain level characteristic of the particular conditions in the medium. This cell division produces an increase in numbers which gives a straight line on semilogarithmic graph papers. This rapid rate is called the "log phase." It is characteristic of most species that a transfer of cells growing in log phase produces a minimum lag time. Once the log phase stops, the organisms become unstable regarding production of antibiotics and other products, since many of the cells become "old."

In expensive installations such as the 40,000 gallon fermenter used for penicillin, it is not economical to introduce a single cell into such a volume. It would take too long to get started and to find if the proper organism is growing. Accordingly,

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serial transfers in the log phase are made in successively larger tanks, each 5 to 10 percent of the volume of the next tank. This permits rapid utilization of the larger fermenter at reasonable cost, with an identity check run at each transfer. The material transferred is called the "inoculum." It takes weeks from the initial transfer to the inoculation of the large fermenter and its harvest.

This growth in inoculum is asexual reproduction on a grand scale. The right to exclude others from this is a much broader right than the right to exclude others from a process of using the given strain, since (1) the difficulty of proving identity of a process of use is greater than that of proving the identity of two microbiological strains, and (2) the typically narrow process claims may readily be avoided by those skilled in the art.

The measure of protection given the inventor would be considerably greater if it covered the sole right to asexually reproduce the organism.

APPENDIX III

The Research Work of the U. S. Department of Agriculture as Evidence of Congress' Intent

A casual survey of the work done by the Northern Research Laboratories (N.R.L.), Peoria, Illinois, indicates just how active the U. S. Department of Agriculture is in the area of industrial fermentations and microbiology. A major repository of cultures is maintained at Peoria.

During the years of World War II, the Northern Regional Research Laboratory played a very large role in the successful development of the antibiotic penicillin by fermentation using molds called Penicillia. The classic reference work on these molds (at least at that time) is Thom, *The Penicillia,* (Williams and Wilkens, 1930). Florey and Heatley, who had conceived the idea of producing penicillin as an antibiotic for medicinal use and had carried this idea out on a small scale in England, came to the United States where more extensive facilities, free from the war ravages of England, were available. They consulted with Mr. Thom, who was then the principal mycologist of the USDA (Raper, *USDA Yearbook,* [1943-47] p. 700). Florey and Heatley went to these famed laboratories to have penicillin production started, in view of N.R.L.'s previous work on fermentation for industrial chemicals (Sen. Rep. 448, 87th Cong., 1st Sess., 124 [1960]). Subsequent results indicated the justification of this choice (USDA Research Achievement Sheet 52 [c], March 4, 1946).

Subsequent work led to patents on mushroom culture, (Humfeld, Pat. No. 2,693,665; yeasts, Wickerham *et al.,* 2,764,487; penicillin derivatives, Stodola *et al.,* 2,573,741).

Considerable work has been done by the USDA on commercialization of citric-acid manufacture, lactic-acid purification, glutonic and fumaric-acid fermentations, as well as other processes not yet commercial (Stodola *et al., USDA Yearbook* [1950-51] pps. 86-91).

Some commercially used antibiotics have been developed by N.R.L., e.g., hydroxystreptomycin, polymixin and subtilin (Raper *et al., USDA Yearbook* [1950-51] pps. 734-41).

Work on commercialization of riboflavin by fermentation is also reported (Tanner, *USDA Yearbook* [1950-51] pps. 762-3).

Recent USDA work is reported for raising the nutritive value of wheat and other grains (New York Times, April 13, 1966, describing the work of Dr. Wang of N.R.L.).

It is noted that none of these patents have claims drawn to the organisms. E. L. Peterson, Assistant Secretary, USDA, has stated the Department's policy that no

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patents are filed on any plant material eligible for patenting (Sen. Rep. No. 932, 86d Cong., 1st Sess. 8 [1959]). The Department of Agriculture opposed expansion of the Plant Act to embrace potatoes (S. Rep. No. 932, 5) in view of its own activity in potatoes. This is in interesting reversal of the original situation in which the USDA proposed and the Patent Office opposed the original Plant-Patent Act.

In view of the continued extensive activity of the USDA in microbiology, it is submitted that Congress' intent to aid agriculture reflected in annual appropriations as well as the plant-patent statute, must be interpreted as embracing microscopic plants such as yeasts, molds and bacteria.

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