

THE FORENSIC IDENTIFICATION OF MARIJUANA: SUSPICION, MORAL DANGER, AND THE CREATION OF NON-PSYCHOACTIVE THC

*Aaron Roussell**

ABSTRACT

Federal and state laws present marijuana as a dangerous substance requiring coercive control and forbid private citizens from possessing, selling, or growing it. Possession cases brought under these laws depend on a forensic confirmation of taxonomic identity as *Cannabis sativa* to establish and successfully prosecute a case. *Hemp Industries Association v. DEA* (2003), a recent federal appeals court ruling, is at odds with this forensic process.

American citizens may legally possess and even consume a similar substance—hemp and its derivatives—which can be made into such everyday objects as clothing, rope, and food products. Yet these two plants are both *Cannabis sativa* and differ only in physical structure and degree of natural

* Department of Criminology, Law & Society, University of California, Irvine. Address correspondence to Aaron Roussell, Department of Criminology, Law & Society, University of California, Irvine, Social Ecology II, Irvine, CA 92697; email: roussell@uci.edu. 949-943-9860

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Aaron Roussell is a PhD candidate in the Department of Criminology, Law & Society at the University of California, Irvine. He earned his MA in Sociology at the University of Wyoming. He has published in *Crime & Delinquency* and *Criminal Justice Policy Review*. His current research interests include research methods, drugs and addiction, structural crime correlates, urban ethnography, and critical theory.

tetrahydrocannabinol (THC). Synthetic THC is also a medically prescribed substance, which introduces further confusion into the legal standing of cannabis. Finally, recently, the Ninth Circuit's second *Hemp Industries* decision, *Hemp II*, affirmed the legality of "non-psychoactive" hemp, despite the fact that hemp contains small amounts of THC. This presents obvious difficulties for forensic testing.

The differences between marijuana and hemp remain largely social and legal, rather than chemical. These complications present conceptual and practical difficulties for the law, which is structured around neat, mutually exclusive categories. More practically, current forensic tests are incapable of discerning hemp from marijuana because of this legal confusion. This paper investigates the conflicting social, scientific, and legal understandings of marijuana and the potential practical implications of its legal status.

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I. INTRODUCTION

Suspected marijuana samples provide American forensic laboratories with a significant portion of their annual workload.¹ Federal laws present marijuana as a dangerous substance requiring coercive control and forbid private citizens from possessing, selling, or growing it.² If law enforcement suspects a substance is marijuana, that substance is subject to impound and forensic testing.³ Should a forensic science lab declare such a sample to be marijuana, the owner of the substance may be prosecuted.⁴ On the other hand, Americans may possess and even consume a similar substance—hemp and its derivatives—some of which are made into such everyday objects as clothing, rope, and food products.⁵ These two plants, in many ways, are identical, differing only in physical structure and chemical content—

¹ See JOSEPH L. PETERSON & MATTHEW J. HICKMAN, BUREAU OF JUSTICE STATISTICS, U.S. DEP'T OF JUSTICE, BULL. NO. NCJ 207205, CENSUS OF PUBLICLY FUNDED FORENSIC CRIME LABORATORIES, 2002 (2005) (stating that forty-eight percent of forensic laboratories' work requests nationwide are for the identification and analysis of controlled substances, including marijuana); see also MATTHEW R. DUROSE, BUREAU OF JUSTICE STATISTICS, U.S. DEP'T OF JUSTICE, BULL. NO. NCJ 222181, CENSUS OF PUBLICLY FUNDED FORENSIC CRIME LABORATORIES, 2005 (2008) (noting that in 2005, controlled substance analysis and identification was the most backlogged request in forensic laboratories).

² See 21 U.S.C. § 812(b)(1), sched. I(c)(10) (2006) (classifying marijuana as a Schedule I drug due to its "high potential for abuse," absence of medically approved use in treatment, and "lack of accepted safety for use of the drug"); 21 U.S.C.A. § 841(a), (b)(1)(A)(vii), (b)(1)(B)(vii), (b)(1)(D), (b)(4) (West, Westlaw through P.L. 112-39 approved 10/12/11) (stating that it is unlawful to knowingly or intentionally manufacture, distribute, or dispense a controlled substance, including marijuana).

³ See *United States v. Diaz*, No. CR 05-0167 WHA, 2006 WL 3512032, at *1-3 (N.D. Cal. Dec. 6, 2006) (explaining the procedure employed by a crime lab to test for marijuana, the second most common controlled substance analyzed); see also DUROSE, *supra* note 1, at 1 (noting that "[i]n 2005 the nation's forensic crime laboratories received evidence from an estimated 2.7 million criminal investigations," which included requests for controlled substance identification).

⁴ See 21 U.S.C. § 812, sched. I(c)(10) (2006) (including marijuana within the definition of "controlled substance"); 21 U.S.C.A. § 841(a), (b)(1)(A)(vii), (b)(1)(B)(vii), (b)(1)(D), (b)(4) (West, Westlaw through P.L. 112-39 approved 10/12/11) (listing penalties to be imposed for the unlawful act of knowingly or intentionally manufacturing, distributing, or dispensing a controlled substance, including marijuana).

⁵ See Justin M. Holler et al., *Δ⁹-Tetrahydrocannabinol Content of Commercially Available Hemp Products*, 32 J. ANALYTICAL TOXICOLOGY 428, 428 (2008) (explaining that hemp is legal to possess, but illegal to cultivate, in the United States); T. Randall Fortenbery & Michael Bennett, *Opportunities for Commercial Hemp Production*, 26 REV. AGRIC. ECONOMIES 97, 101-02 (2004) (indicating hemp's various uses, including food, fabric, and cordage).

specifically, varying in the amounts of tetrahydrocannabinol (THC) they contain.⁶ So far, no branch or level of government has yet defined acceptable limits for THC in cannabis material and appear unlikely to do so.⁷ In fact, the objectionable chemical is a medically prescribed substance, thus introducing confusion into the federal scheduling of marijuana under the Controlled Substances Act.⁸ The legal differences between marijuana and hemp thus remain largely a product of social, not chemical, differences.⁹ These complications present conceptual and practical difficulties for the law, which is structured around neat, mutually exclusive categories.¹⁰ Forensic testing depends mainly on the ability to detect THC and identify cannabis, which folds hemp into its purview.¹¹

⁶ Holler, *supra* note 5, at 428; Fortenbery, *supra* note 5, at 99.

⁷ See 21 U.S.C. § 802(16) (Supp. 2009) (excluding any mention of THC in the definition of “marihuana”); *Monson v. DEA*, 589 F.3d 952, 961–62 (8th Cir. 2009) (“[M]arijuana is defined to include *all Cannabis sativa L.* plants, regardless of THC concentration.”); 21 C.F.R. § 1308.35 (2011) (creating an exception for cannabis material containing THC that is not included in the definition of “marihuana” and that is not intended for human consumption); ECON. RESEARCH SERV., U.S. DEP’T OF AGRIC., *INDUSTRIAL HEMP IN THE UNITED STATES: STATUS AND MARKET POTENTIAL 1* (2000), available at <http://www.ers.usda.gov/publications/ages001E/ages001E.pdf> (explaining that THC content is not considered in determining the legality of *Cannabis sativa*).

⁸ See 21 C.F.R. § 1308.11(d), 1308.13(g) (2011); *United States v. Turcotte*, No. 06 C 5554, 2007 U.S. Dist. LEXIS 45678, at *6 (N.D. Ill. June 21, 2007) (explaining that marijuana and synthetic THC (Marinol) are listed in different drug classification schedules); ALISON MACK & JANET JOY, *MARIJUANA AS MEDICINE?: THE SCIENCE BEYOND THE CONTROVERSY 8* (2001) (“[D]octors can legally prescribe THC, in the form of the medicine Marinol . . .”).

⁹ See 21 U.S.C. § 802(16) (Supp. 2009) (excluding any mention of THC in the definition of “marihuana”); *Monson*, 589 F.3d at 961–62 (“[M]arijuana is defined to include *all Cannabis sativa L.* plants, regardless of THC concentration.”); 21 C.F.R. § 1308.35 (2011) (creating an exception for cannabis material containing THC that is not included in the definition of “marihuana” and that is not intended for human consumption); Richard J. Bonnie & Charles H. Whitebread, II, *The Forbidden Fruit and the Tree of Knowledge: An Inquiry into the Legal History of American Marijuana Prohibition*, 56 VA. L. REV. 971, 1021–23 (1970) (demonstrating the historical divergence among social attitudes towards hemp and marijuana).

¹⁰ See 21 U.S.C. § 812 (2006) (illustrating the rigid structure of drug classification schedules).

¹¹ See Paul L. Cary, *The Marijuana Detection Window: Determining the Length of Time Cannabinoids Will Remain Detectable in Urine Following Smoking*, NAT’L DRUG CT. INST., Apr. 2006, at 1, 2–4 (discussing the detection window of cannabinoids in forensic testing); Jeanette McDougal & William R. Walluks, *Cannabis Hemp THC in the Food-Cosmetic Supply*, DRUG WATCH INT’L (Aug. 2000), <http://www.drugwatch.org/Cannabis%20Hemp%20THC.htm> (noting that due to its THC content, hemp products could compromise efforts to

This paper investigates conflicting understandings of marijuana as a scientific and social object, and attempts to parse the intertwined worlds of scientific and legal classification. First, I provide a basic description of the two categories of the plant and their social, physical, and chemical distinctions. Then, I review the published evidence regarding the forensic testing procedures, including the future potential of DNA. Next, I summarize the legal understandings of marijuana, first parsing the linguistic shifts used by Congress in the Controlled Substances Act, and then unpacking the *Hemp Industries* decisions.¹² The final section overlays various academic disciplines and discusses the scientific and practical problems with regulating morality in this manner.

II. HEMP & MARIJUANA

Marijuana is known taxonomically as *Cannabis sativa* from the family Cannabinaceae (order Urticales, subclass Dicotyledons) and is a seed born (division Spermatophyta) and flowering (class Angiospermae) plant.¹³ Hemp, a plant cultivated abroad, but used domestically for its fibrous qualities, goes by an identical taxonomy.¹⁴ Title II of the Comprehensive Drug Abuse Prevention and Control Act of 1970 (“the Controlled Substances Act” or “CSA”) lists “Marihuana” under Schedule I, which designates it as a substance worthy of outright prohibition.¹⁵ “Marihuana,” in the CSA, has been understood broadly to mean the species *Cannabis sativa*, although this has been recently brought sharply into question through hemp and its taxonomy.¹⁶ Curiously, the constituent chemical element recognized as objectionable, psychoactive THC, is also a Schedule I substance and is listed separately.¹⁷ In sum, both “marihuana” and THC,

test for marijuana).

¹² *Hemp Indus. Ass’n v. DEA (Hemp I)*, 333 F.3d 1082 (9th Cir. 2003), *Hemp Indus. Ass’n v. DEA (Hemp II)*, 357 F.3d 1012 (9th Cir. 2004).

¹³ George R. Nakamura, *Forensic Aspects of Cystolith Hairs of Cannabis and Other Plants*, 52 J. ASS’N OFFICIAL ANALYTICAL CHEMISTS 5, 5–6 (1969).

¹⁴ See Fortenbery, *supra* note 5, at 98–99 (discussing the prohibition of cultivating hemp in the United States and stating that hemp and marijuana belong to the same species).

¹⁵ Comprehensive Drug Abuse Prevention and Control Act of 1970, Pub. L. No. 91-153, §§ 202, 401, 404, 84 Stat 1236, 1249, 1260–62, 1264–65 (1970) (codified as amended at 21 U.S.C. §§ 812, 841, 844).

¹⁶ See *Hemp II*, 357 F.3d at 1013, 1017–18.

¹⁷ 21 U.S.C. § 812, sched. I(c)(17) (2006).

though listed separately in the CSA, are both Schedule I, illegal substances. Hemp, though legal to possess, is not legal to cultivate—it remains, however, nominally unscheduled under the CSA.¹⁸

Hemp is a fibrous plant prized for its ease of cultivation and its versatility.¹⁹ Historically, the fibers that compose hemp have been important for providing paper, sail canvas, and carpet.²⁰ Although rope and clothing continue to be made from hemp, and the fiber finds its way into such esoteric products as composite panels found in automobiles, many modern uses revolve around biofuel and alternative proteins from more traditional animal and soy sources.²¹ Despite this litany of uses, hemp remains illegal to cultivate in the United States,²² although it is legal to import, possess, and consume, so long as the hemp material does not allow for THC to enter the body.²³

Marijuana, on the other hand, is an illegal drug in the United States, normally imbibed by crushing and smoking the leaves, flowers, stems, and seeds of the marijuana plant.²⁴ A description

¹⁸ Robin Lash, Comment, *Industrial Hemp: The Crop for the Seventh Generation*, 27 AM. INDIAN L. REV. 313, 322–24 (2002/2003) (arguing that hemp is not covered by the CSA); see 42 U.S.C. § 812 (2006) (listing neither hemp nor any of its products under any of the drug schedules).

¹⁹ See Fortenbery, *supra* note 5, at 98–101 (describing the multitude of uses for hemp).

²⁰ *Id.* at 98, 101–02; John H. Garland, *Hemp: A Minor American Fiber Crop*, 22 ECON. GEOGRAPHY 126, 126–27 (1946).

²¹ Fortenbery, *supra* note 5, at 101–102; Ann Woolner, *BMW Owners Show Hemp's No Longer Just for Hippies*, BLOOMBERG (July 30, 2009, 21:00), <http://www.bloomberg.com/apps/news?pid=newsarchive&sid=a3G6baGGl9ks>; Charlotte Schubert, *Can Biofuels Finally Take Center Stage?*, 24 NATURE BIOTECHNOLOGY 777, 779 (2006); RENÉE JOHNSON, CONG. RESEARCH SERV., RL 32725, HEMP AS AN AGRICULTURAL COMMODITY 4–5 (2010).

²² *Monson v. DEA*, 589 F.3d 952, 961–62 (8th Cir. 2009) (holding that the CSA “makes no distinctions between cannabis grown for drug use and that grown for industrial use,” and that Congress intended “to ban the growth of all varieties of the *Cannabis sativa L.* plant”).

²³ See 21 C.F.R. § 1308.35 (2011) (creating an exception for cannabis material containing THC that is not included in the definition of “marihuana”); *DEA Clarifies Status of Hemp in the Federal Register*, U.S. DEA (Oct. 9, 2001), <http://www.justice.gov/dea/pubs/pressrel/pr100901.html> (listing lawful hemp products). In the 2011 session of Congress, Rep. Ron Paul introduced legislation to legalize the domestic production of hemp. The bill is in committee as of this writing. *Industrial Hemp Farming Act*, H.R. 1831, 112th Cong. (2011).

²⁴ 21 U.S.C. § 812, sched. I(c)(10) (2006) (including marijuana within the definition of “controlled substance”); Scott T. Leatherdale et al., *Marijuana and Tobacco Use Among Young Adults in Canada: Are They Smoking What We Think They Are Smoking?*, 18 CANCER CAUSES & CONTROL 391, 392 (2007) (explaining how marijuana is smoked); HOWARD ABADINSKY, DRUG USE AND

of marijuana provided by the National Institute on Drug Abuse (“NIDA”) declares that marijuana “can cause distorted perceptions, impaired coordination, difficulty with thinking and problem solving, and problems with learning and memory.”²⁵ NIDA contends that marijuana is potentially addictive and may be linked to mental health problems ranging from anxiety and depression to schizophrenia and psychosis.²⁶ The Drug Policy Alliance (DPA), perhaps the leading opponent of marijuana prohibition in the United States, counters that there is little evidence of increased marijuana dependency, more evidence that marijuana use is a result of psychological conditions than the reverse, and that there is no evidence to suggest that there are long term cognitive deficiencies caused by using marijuana.²⁷

While a marijuana plant and a hemp plant, arguably, may be distinct in their full botanical glories, “[m]ost submissions to forensic laboratories are in the form of crushed plant materials that no longer retain gross botanical features.”²⁸ Indeed, one study of cannabis testing methods used 100 samples previously received and tested by the Royal Canadian Mounted Police forensic labs. The samples comprised 68 marijuana “extracts,” 20 liquid and resin hashish samples, 6 “rinses,” “washes,” or “extracts” from suspected marijuana smoking paraphernalia, and only 1 “unidentified green material,” presumably crushed botanical material.²⁹ Clearly, a sample need not resemble marijuana, or even a plant, to undergo forensic testing—

ABUSE: A COMPREHENSIVE INTRODUCTION 170–71 (Linda Schreiber-Ganster et al. eds., 7th ed. 2011) (describing common methods of ingesting marijuana).

²⁵ *NIDA InfoFacts: Marijuana*, NAT’L INST. ON DRUG ABUSE, <http://www.drugabuse.gov/Infofacts/marijuana.html> (last updated Nov. 2010).

²⁶ *Id.*

²⁷ *About Us*, DRUG POLICY ALLIANCE, <http://www.drugpolicy.org/about-us> (last visited Nov. 10, 2011); *Marijuana Facts*, DRUG POLICY ALLIANCE, <http://www.drugpolicy.org/facts/drug-facts/marijuana-facts> (last visited Nov. 10, 2011). Evaluating the extent to which these statements from DPA and NIDA conflict, or the relative “truth” content of each is not within the purview of this paper.

²⁸ Frederic Whitehurst, *Forensic Analysis of Marijuana and the Kurzman Mystery: A Case Study of Flawed Logic in Determination of Guilt*, 41 TEX. TECH L. REV. 117, 118–19 (2008); see Thomas A. Duppong, Note, *Industrial Hemp: How the Classification of Industrial Hemp as Marijuana Under the Controlled Substances Act Has Caused the Dream of Growing Industrial Hemp in North Dakota to Go Up in Smoke*, 85 N.D. L. REV. 403, 408 (2009) (noting the visual and compositional distinctions between marijuana and industrial hemp); see also *Peppers v. State*, 304 So.2d 39, 40–41 (Ala. Crim. App. 1974).

²⁹ See R.T. Coutts & G.R. Jones, *A Comparative Analysis of Cannabis Material*, 24 J. FORENSIC SCI. 291, 293 (1979).

suspicion by law enforcement is the determining factor rendering the sample suspect.³⁰

III. MARIJUANA & NON-MARIJUANA: FORENSIC SCIENCE DEFINITION

Perhaps appropriately, the overlapping categories of THC and marijuana mirror the commonly used methods of testing available to forensic science in determining botanical origin of a suspected marijuana sample.³¹ Chemical spot testing, gas chromatography/mass spectrometry, and thin layer chromatography attempt to determine the presence of THC, while microscopic analysis and DNA testing attempt to determine the donor sample's species.³² Lab technicians are supposed to use various tests to reinforce one another.³³ For example, Thornton and Nakamura's widely adopted forensic testing protocol calls for microscopic examination followed by chemical spot testing.³⁴

Physical observation, even microscopically enhanced, presents problems familiar to the criminal justice system—simply put, it is difficult to make a positive and unique identification by observation alone.³⁵ The microscopic analyst looks mainly for cystolithic “bear claw” hairs characteristic of *Cannabis sativa* to confirm that the sample is marijuana.³⁶ While this approach is

³⁰ See *id.* (indicating that the samples tested by the Royal Canadian Mounted Police, including the “unidentified green material,” were not necessarily identifiable by their botanical characteristics, but were tested due to police suspicion that the material was marijuana).

³¹ See Charles Tindall, Jane S.C. Tsai & John Mario, *Cannabis: Methods of Forensic Analysis*, in HANDBOOK OF FORENSIC DRUG ANALYSIS 43, 43–44 (Frederick P. Smith ed., 2005) (discussing the need for both quantitative and qualitative analysis of samples which implies the differences between botanical and toxicological identification).

³² *Id.* at 48–58; J.I. Thornton & G.R. Nakamura, *The Identification of Marijuana*, 12 J. FORENSIC SCI. SOC'Y 461, 461, 479–95 (1972); Heather Miller Coyle et al., *An Overview of DNA Methods for the Identification and Individualization of Marijuana*, 44 CROAT. MED. J. 315, 315–17 (2003).

³³ See Coutts, *supra* note 29, at 291; Tindall, *supra* note 31, at 44 (“In keeping with good laboratory practice, a positive identification should be based on at least two positive test results from two different test methodologies . . .”).

³⁴ Thornton, *supra* note 32, at 461; Whitehurst, *supra* note 28, at 118, 128; *People v. Park*, 380 N.E.2d 795, 800 (Ill. 1978) (prescribing Thornton and Nakamura's test as an acceptable procedure for the testing of cannabis).

³⁵ See Whitehurst, *supra* note 28, at 118–23; see also *Park*, 980 N.E.2d at 800 (explaining that physical observation must be followed by a chemical test).

³⁶ See Nakamura, *supra* note 13, at 5–8; Whitehurst, *supra* note 28, at 123; *Park*, 980 N.E.2d at 800.

appealing in its directness and simplicity, Nakamura, in his seminal paper on the subject, could not distinguish 82 of the 600 species of Dicotyledons that he microscopically examined from marijuana.³⁷ Indeed, Whitehurst reports uncertainty on the exact number of relevant Dicotyledons (ranging from 31,874 to about 400,000, depending on the source consulted) in the kingdom of classified plants.³⁸ For his part, Nakamura, an expert in marijuana identification, presents an error rate of about 14 percent for a (non-random) handpicked sample.³⁹

Having physically observed the sample, Thornton and Nakamura then call for a chemical “spot” test for the presence of THC, as “confirmation of marijuana” for a suspect sample. This “spot” test is known through various iterations as the Duqu nois test, the Duqu nois-Levin test, the rapid Duqu nois test, and the meta-Duqu nois test (“D-L test,” encompassingly).⁴⁰ Duqu nois and Negm developed the original test in 1938, and it is often performed by forensic labs.⁴¹ Bailey, in his summation of “some kind[s] of positive response[s]” to the D-L test, covers four hundred different sample materials (including coffee grounds, for example, which present a positive reaction the D-L test).⁴² He determines that various studies have produced 12 false positives out of 47 tested materials (about 25 percent error) in 1 rapid D-L study; 21 out of 143 (about 15 percent error) for a D-L test; 25 out of 249 (about 10 percent error) for meta-D-L; and none for 73 D-L entries.⁴³ Unfortunately, Bailey does not discuss the extent of the overlap between Nakamura’s 1969 sample of 600 and the D-L test papers that he utilizes in his own meta-analysis.⁴⁴

As Bailey’s paper acknowledges, any form of the D-L test is interpretive by nature. Two factors—the color (“the purple of

³⁷ See Nakamura, *supra* note 13, at 5.

³⁸ Whitehurst, *supra* note 28, at 126.

³⁹ See Nakamura, *supra* note 13, at 5 (asserting that 82 of the 600 species were selected for chemical testing).

⁴⁰ Thornton, *supra* note 32, at 461, 495; Whitehurst, *supra* note 28, at 118; Keith Bailey, *The Value of the Duqu nois Test for Cannabis—A Survey*, 24 J. FORENSIC SCI. 817, 818 (1979); *Park*, 980 N.E.2d at 800.

⁴¹ See Tindall, *supra* note 31, at 50; Whitehurst, *supra* note 28, at 118 (explaining that the method proposed by Thornton and Nakamura is favored by crime labs throughout the United States, and this method includes the D-L test); see *People v. Wind*, 208 N.W.2d 357, 360–61 (Wis. 1973).

⁴² Bailey, *supra* note 40, at 822, 833.

⁴³ *Id.*

⁴⁴ *Id.*

authentic marihuana”⁴⁵) and the progression of color over time are the only evaluative standards.⁴⁶ Tests on various substances may yield shades of blue or red, but THC yields a particular shade of deep purple or blue, which may change over the course of an hour from indigo to violet to “intense violet.”⁴⁷ “Nevertheless,” Bailey reminds us, “the experienced analyst can confidently decide if the similarly described colors perceived from test substances are distinguishable from those from cannabis.”⁴⁸ Complicating things further, Thornton and Nakamura also explain that marijuana contains other variations of cannabinal than just THC, as well as other cannabinoids.⁴⁹ In fact, different strains of marijuana are cultivated precisely to enhance or diminish different combinations of these cannabinoids and variations of cannabinal.⁵⁰ These may therefore appear in various samples in varying strengths, some of which produce different variations of purple and blue with respect to the DL test.⁵¹ Despite these realities, Thornton and Nakamura report that “there appears to be universal agreement that the final color [presumably of “authentic” THC or marijuana] is deep blue to deep violet.”⁵²

The methods discussed above represent the most inexpensive and therefore most widely used methods of forensic marijuana testing.⁵³ Other methods, less common and more expensive, include gas chromatography/mass spectrometry (GC/MS), thin-layer chromatography (TLC), and DNA testing.⁵⁴ Thornton and

⁴⁵ *Id.*

⁴⁶ *See id.* at 817–18.

⁴⁷ *See id.* at 818, 833 (explaining the progression of colors from sea-green to violet for cannabis samples).

⁴⁸ *Id.* at 817.

⁴⁹ *See* Thornton, *supra* note 32, at 477–79.

⁵⁰ *See* Robert C. Clarke & David Paul Watson, *Botany of Natural Cannabis Medicines*, in *CANNABIS AND CANNABINOIDS: PHARMACOLOGY, TOXICOLOGY, AND THERAPEUTIC POTENTIAL* 3, 11–12 (Franjo Grotenhermen & Ethan Russo eds., 2002) (discussing how marijuana growers employ seed selection techniques to produce plants with differing THC profiles).

⁵¹ *See* Thornton, *supra* note 32, at 479, 481 (explaining how the range of colors produced in a D-L test might depend upon the relative proportions of the various components in the sample tested).

⁵² *Id.* at 480.

⁵³ Carol L. O’Neal et al., *Validation of Twelve Chemical Spot Tests for the Detection of Drugs of Abuse*, 109 *FORENSIC SCI. INT’L* 189, 189–90 (stating that spot tests, including the D-L test, are widely used as the necessary reagents are inexpensive and the test itself requires comparatively little training).

⁵⁴ Coyle, *supra* note 32, at 317 (discussing how DNA-based tests can be used to identify marijuana); U.N. OFFICE ON DRUGS AND CRIME, *RECOMMENDED*

Nakamura recommend TLC when “marijuana cannot be morphologically delineated”—that is, when the results are inconclusive, rather than for the purposes of retesting a potential false positive or negative.⁵⁵ GC/MS is perhaps the most reliable method of detecting THC, but it relies on complicated and expensive equipment and a greater scientific competency of the operator than a color test, things that are prohibitive for many municipal forensic labs.⁵⁶ DNA testing would behave much as it does for human DNA samples, yielding a probabilistic determination of the species of a sample.⁵⁷ The process however, is currently undeveloped and would be very expensive because a database of representative samples has yet to be compiled from ever-evolving strains of marijuana.⁵⁸ Consequently, although the potential exists, no such testing has yet been used for forensic purposes.⁵⁹

While each method of testing offers clear advantages and drawbacks, some general problems common to all emerge, even those with low error rates. First, the paucity of research embedding cannabis within a wider botanical setting leaves open whether THC and related cannabinoids are in fact unique to

METHODS FOR THE IDENTIFICATION AND ANALYSIS OF CANNABIS AND CANNABIS PRODUCTS, at 46, U.N. Doc. ST/NAR/40, U.N. Sales No.E.09.XI.15 (2009) (commenting on the relative expense of DNA testing compared to its forensic value); RODGER L. FOLTZ ET AL., NAT'L INST. ON DRUG ABUSE, GC/MS ASSAYS FOR ABUSED DRUGS IN BODY FLUIDS 1 (Robert C. Petersen & Eleanor W. Waldrop eds., 1980) (identifying reasons GC/MS testing is not more commonly employed, including the expenses involved and the high level of training needed to perform it). See Tindall, *supra* note 31, at 56 (explaining, generally, the TLC process).

⁵⁵ Thornton, *supra* note 32, at 461.

⁵⁶ See Foltz, *supra* note 54, at 1, 67 (“More serious deterrents to wider use of GC/MS . . . are the expense of the GC/MS instrumentation and the relatively high level of training and skill required to make effective use of these instruments.”); David Rosenthal & Dolores Brine, *Quantitative Determination of Δ^9 -Tetrahydrocannabinol in Cadaver Blood*, 24 J. FORENSIC SCI. 282, 288–89 (1979) (stating that while analysis using GC/MS techniques is highly accurate, it requires complex and sophisticated equipment).

⁵⁷ See Coyle, *supra* note 32, at 317 (“[M]arijuana DNA profiles can be generated and compared between samples and may be useful for forensic purposes.”).

⁵⁸ See *id.* at 319 (discussing the difficulty of acquiring access to adequate numbers of marijuana samples).

⁵⁹ See *id.* (hypothesizing that in the future marijuana databases could be invaluable for tracking the movement of plant strains and linking individuals to drug-related crimes, as well as aiding in locating marijuana distribution centers).

marijuana.⁶⁰ Reasonably, similar plants not yet regulated by statute, may also produce cannabinoids (THC or others) and thus risk producing false positives for marijuana.⁶¹ Botanically speaking, THC results from complex evolutionary biochemical pathways for the self-defense of the plant.⁶² The entire genus is replete with cannabinoids of varying strains.⁶³ Evolution has not developed these pathways uniquely in a single species.⁶⁴

More importantly, the concept of species is itself a construction of science and its compulsion towards taxonomy. In a paper in the *Journal of Forensic Sciences* devoted to debunking the “semantic hokum” used by defense lawyers regarding confusion over the scientific classification of marijuana, biologist Small declares that “Biological nomenclature is merely the veneer of the product of taxonomists, who are concerned basically with assessing biological variation in groups of organisms. . . . [I]t is generally conceded that biological names cannot reflect the complexity of relationships of living things in a universally acceptable fashion.”⁶⁵ Indeed, he goes on to declare that “changes

⁶⁰ See Jürg Gertsch et al., *Phytocannabinoids Beyond the Cannabis Plant—Do They Exist?*, 160 BRIT. J. PHARMACOLOGY 523, 523–26, 528 (2010) (discussing research that shows plants other than cannabis have an effect on the endocannabinoid system); see *State v. Greene*, 161 N.W.2d 239, 240–41 (Wis. 1968) (holding that a positive chemical test for marijuana was sufficient evidence for a jury to find beyond a reasonable doubt that defendant sold *Cannabis sativa L.*, even though there was no evidence presented that the test could distinguish *Cannabis sativa L.* from *Cannabis indica*).

⁶¹ See *id.* at 526, 528 (pointing out that at least one phytocannabinoid, β -caryophyllene, has been discovered to be widespread in various plant oils); see also *Greene*, 161 N.W.2d at 240–41.

⁶² See Supaart Sirikantaramas et al., *Tetrahydrocannabinolic Acid Synthase, the Enzyme Controlling Marijuana Psychoactivity, is Secreted into the Storage Cavity of the Glandular Trichomes*, 46 PLANT CELL PHYSIOLOGY 1578, 1578, 1581 (2005) (illustrating that THCA synthase creates THCA and hydrogen peroxide, which may contribute to the self-defense of cannabis plants, and THCA is then converted into THC via non-enzymatic decarboxylation).

⁶³ See Clarke, *supra* note 50, at 11 (discussing the different cannabinoid profiles for different varieties of cannabis); *id.* at 1578 (“To date, about 70 cannabinoids have been isolated from marijuana.”).

⁶⁴ See Ernest Small, *On Toadstool Soup and Legal Species of Marijuana*, 21 PLANT SCI. BULL. 34, 34–35 (1975) [hereinafter Small, *Toadstool Soup*] (describing disruptive selection, which produced two types of cannabis plants); Clarke, *supra* note 50, at 9, 11 (showing that different varieties of cannabis produce differing levels of THC and cannabinoids).

⁶⁵ Ernest Small, *The Forensic Taxonomic Debate on Cannabis: Semantic Hokum*, 21 J. FORENSIC SCI. 239, 239–40, 247, 250 (1976) [hereinafter Small, *Semantic Hokum*] (criticizing an argument utilized by many defense lawyers that there are several species of marijuana, and that legislation proscribing *Cannabis sativa* does not apply to all species, as the scientific name *Cannabis*

in the consensus of use of given scientific names occur regularly and often gradually with the passage of time.”⁶⁶ Although Small contends that these constantly shifting boundaries surrounding the ontology of species do not make up a legitimate legal defense for declaring a sample of illegal *Cannabis sativa* to be something other than *Cannabis sativa*, he makes clear that the scientific division of species is a somewhat arbitrary affair and that “all variants of the genus *Cannabis* should be assigned to the species *C. sativa*.”⁶⁷ Marijuana and hemp are thus rendered scientifically analogous, while Small makes his point that cannabis is cannabis.⁶⁸

In sum, the degree to which traditional forensic science can guarantee with any measurable degree of accuracy that a sample contains the forbidden *Cannabis sativa* is somewhat in doubt.⁶⁹ One widely accepted protocol for forensic science is a combination of microscopy and the Duquenois-Levin test.⁷⁰ Physical observation produces a high error rate for even the tiny subsample on which Nakamura attempted to validate it; the D-L test produces known false positives for non-esoteric substances (e.g., coffee grounds) and also lacks comprehensive scientific

sativa is more specific than the common name marijuana).

⁶⁶ *Id.* at 247.

⁶⁷ *Id.* at 247–50. Small’s overall point is that *Cannabis sativa* L, the specifically prohibited variety of marijuana, is essentially the same thing as, for example, *Cannabis indica*, a different varietal. In other words, Small is arguing that a new strain of marijuana, perhaps bred exclusively for smoking, which may be different enough to warrant a different varietal designation remains covered by the original law. Although he glosses over some important legal points, it seems perfectly reasonable to accept his basic contention—the prohibition on *Cannabis sativa* L. applies to other variants of smoked marijuana. *Id.* at 239–40, 247–50; Small, *Toadstool Soup*, *supra* note 64, at 34–38. The points raised in the current paper transcend these concerns.

⁶⁸ See Small, *Semantic Hokum*, *supra* note 65, at 247–250; Small, *Toadstool Soup*, *supra* note 64, at 34–38; see also *State v. Wind*, 208 N.W.2d 357, 360 (Wis. 1973) (“[T]here is no essential difference between cannabis sativa L. and cannabis indica.”); *State v. Romero*, 397 P.2d 26, 29 (N.M. 1964) (“We conclude as a matter of law that marijuana is identical with cannabis, cannabis sativa L., and cannabis indica. Marijuana and cannabis indica are merely geographical oriented names of cannabis, whereas cannabis sativa L. is the botanical name of cannabis.”).

⁶⁹ Whitehurst, *supra* note 28, at 131–32 (“We are arresting vast numbers of citizens for the possession of a substance that we cannot identify by using the forensic protocol that is presently in use in most crime labs in the United States. We have no idea what the error rate of marijuana analysis is . . .”).

⁷⁰ *Id.* at 118; JOHN KELLY, FALSE POSITIVES EQUAL FALSE JUSTICE 2, 4, 7 (2008) (stating that the microscopic examination for cystolithic hairs followed by a confirmatory D-L test is the “gold standard” for identifying marijuana).

validation.⁷¹

Further, cannabis is not known to be the only species of plant containing THC.⁷² More importantly, species is a scientific category requiring somewhat arbitrary distinctions to operationalize effectively. Finally, it is clear that all of the variants of *Cannabis* are contained within the legal definition set forth in the CSA, including hemp.⁷³

IV. MARIJUANA & NON-MARIJUANA: LEGAL DEFINITIONS

The definition and subsequent identification of marijuana is important practically for the legal system, as well as generally, to maintain a sense of legal coherence. These seemingly straightforward issues surrounding marijuana identification obscure awkward compromises implicit in the merging of science and law. Even if the legal system could bracket the implications of substandard forensic science or assume that a current test could determine the exact strain of a botanical sample, the law currently does not clearly identify the object that it has prohibited.⁷⁴ This is because the distinction the law makes is not a scientific one but a social one—a distinction based on moral categories of use.⁷⁵ Yet the law is not written as such.

The difference between hemp and marijuana is a dichotomy based largely on social use rather than biology.⁷⁶ Taxonomically, marijuana and hemp are both *Cannabis sativa*.⁷⁷ While physical differences in the two strains are evident in intact mature plants,

⁷¹ See Nakamura, *supra* note 13, at 5 (depicting that Nakamura needed a chemical test to distinguish a number of dicotyledons from cannabis); Bailey, *supra* note 40, at 822, 833; KELLY, *supra*, note 70, at 3–5, 9.

⁷² See Gertsch, *supra* note 60, at 524 (arguing that the existence of other plant products which interact with the endocannabinoid system suggests that plants other than *Cannabis* may contain cannabinoids or THC).

⁷³ See Small, *Semantic Hokum*, *supra* note 65, at 250 (“[U]se of the name *C. sativa* was historically, and continues to be, comprehensive of all marihuana plants.”); U.S. DEA, *supra* note 22 (“The existence of THC in hemp is significant because THC, like marijuana, is a Schedule I controlled substance.”).

⁷⁴ See Small, *Semantic Hokum*, *supra* note 65 at 248–50 (discussing how ambiguity and subjectivity in taxonomic classification leads to semantic debates regarding marijuana legislation).

⁷⁵ See *id.* at 247 (arguing that taxonomic classifications, such as *Cannabis sativa*, are based on subjective standards which rely on social values).

⁷⁶ See U.S. DEA, *supra* note 23 (differentiating between cannabis products that cause THC to enter the human body and those that do not).

⁷⁷ Small, *Semantic Hokum*, *supra* note 65, at 250 (“[U]se of the name *C. sativa* was historically, and continues to be, comprehensive of all marihuana plants.”).

neither chemical nor microscopic analysis would be sufficient to distinguish them in a form that was not “gross botanical.”⁷⁸ Since forensic science depends primarily on these two methods for determining the probative value of samples, the question before a court (and therefore a forensic examiner) is, can the court “say that those tests uniquely identify marijuana to the exclusion of all other plants?”⁷⁹ Not only is the answer “no,” as Whitehurst argues, but even to identify a sample as *Cannabis sativa* or THC cannot be sufficient for prosecution, because of the current legality of hemp possession.⁸⁰ To determine that a sample testing positive for THC or identified as *Cannabis sativa* is truly “marijuana” requires a more amorphous social distinction.

The current federal drug enforcement regime was put in place with the enactment of the Comprehensive Drug Abuse Prevention and Control Act of 1970.⁸¹ Many state legislatures found the Act useful enough to adopt wholesale.⁸² More than simply a regulatory tool, the CSA presents, unambiguously, socio-moral statements about drug use, reminding citizens that “[t]he illegal importation, manufacture, distribution, and possession and improper use of controlled substances have a substantial and detrimental effect on the health and general welfare of the American people,” and defining an “addict” as someone who “endangers the public morals.”⁸³ Although the CSA attempts to regulate morality—inherently a proscription on activity—in fact, it refers only to physical substances, which continues to present unresolved problems for the legal system’s

⁷⁸ See Whitehurst, *supra* note 28, at 118–19, 127 (arguing that the identification methods currently available are inadequate with respect to crushed plant materials).

⁷⁹ *Id.* at 118, 127.

⁸⁰ See 21 C.F.R. § 1308.35 (2011) (creating an exception for cannabis material containing THC that is not included in the definition of “marihuana” and that do not allow THC to enter the body); U.S. DEA, *supra* note 23 (stating that many hemp products containing THC are still legal in the United States, provided the product does not allow THC to enter the body); *id.* at 131–32.

⁸¹ Comprehensive Drug Abuse Prevention and Control Act of 1970, Pub. L. No. 91-513, 84 Stat. 1236 (1970).

⁸² See Note, *Paraphernalia for Marijuana and Hashish Use: Possession Statutes and Indiana’s Pipe Dream*, 10 VAL. U. L. REV. 353, 353 & n.1 (1976) (explaining that by 1975 forty-three different jurisdictions had adopted the Uniform Controlled Substances Act, which is similar to the federal regime and “provides a comprehensive and flexible system for coordinating state and federal drug control”).

⁸³ See 21 U.S.C. §§ 801(2), 802(1) (Supp. 2009).

regulation of cannabis.⁸⁴

Congress introduces the morality of substances through the lens of social danger in the following manner: “The Congress has long recognized the *danger* involved in the manufacture, distribution, and use of certain psychotropic substances for *nonscientific and nonmedical* purposes, and has provided strong and effective legislation to control *illicit* trafficking and to regulate *legitimate* uses of psychotropic substances in this country.”⁸⁵ The CSA cites the *dangers* of its regulatory object by setting it against *nonscientific and nonmedical* objects.⁸⁶ Science and medicine, here, are tapped for their objective, regulable qualities and are treated uncritically.⁸⁷ We learn from the Act that all nonscientific and nonmedical use of psychoactive substances is dangerous to the country, as compared with all scientific and medical use, which is not.⁸⁸

Despite the inclusion of “manufacture” and “distribution,” the danger clearly stems from the “use” of illegal substances.⁸⁹ In fact, the word “use” acts generally as a catch-all throughout the Act when referring specifically to individuals and their interactions with drugs.⁹⁰ The CSA treats the words “abuse” and “addiction” as largely synonymous with “use,” which reinforces the danger by enlarging the category of “use.”⁹¹ Further, drugs are partly scheduled on the basis of their “potential for abuse,” which ranges from low to high—never zero.⁹² In titles of sections and summations, Congress uses the word “abuse,” as evidenced by the Act’s title (“Drug Abuse Prevention”), in contrast to the

⁸⁴ See 21 U.S.C. § 802 (Supp. 2009) (listing definitions of physical substances); Kimani Paul-Emile, *Making Sense of Drug Regulation: A Theory of Law for Drug Control Policy*, 19 CORNELL J.L. & PUB. POL’Y 691, 692–93, 703, 729–32 (2010) (critiquing the current regulatory system as being more concerned with threats to morality than the actual uses and effects of the substances it regulates, leading to ongoing legal tensions).

⁸⁵ 21 U.S.C. § 801a (2006) (emphasis added).

⁸⁶ *Id.*

⁸⁷ See *id.* (providing for the use of regulated substances for legitimate medical and scientific purposes).

⁸⁸ See *id.*

⁸⁹ See 21 U.S.C. § 801(1), 801a(1) (2006) (making a distinction between legitimate and illegitimate uses for psychotropic substances).

⁹⁰ See 21 U.S.C. §§ 801a(1), 802(1), (10), (27) (Supp. 2009) (showing that the CSA does not explicitly define the term “use,” though the term is used throughout the act to refer to human consumption of and interaction with controlled substances).

⁹¹ See 21 U.S.C. § 802(1), (9)(D) (Supp. 2009).

⁹² 21 U.S.C. § 812(b)(1)–(5) (2006).

Congressional findings (“The Congress has long recognized the danger involved in the . . . *use* of certain psychotropic substances . . .”).⁹³ This draws the eye to the seriousness of the problem. Again, despite the “manufacture” and “distribution” references, “use” is the category invoked for definitional purposes.⁹⁴ This semantic move can be seen in this paragraph regarding methamphetamine: “The *abuse* of methamphetamine has increased dramatically since 1990. This increased *use* has led to devastating effects on individuals and the community . . .”⁹⁵ While “use” is ostensibly a neutral label, “abuse” carries unmistakably negative moral connotations.⁹⁶

Finally, the designation “addict,” although used first in relation to opiates, is defined more broadly as the following: “[t]he term ‘addict’ means any individual who habitually *uses any narcotic drug* so as to *endanger the public morals, health, safety, or welfare*, or who is so far addicted to the use of narcotic drugs as to have lost the *power of self-control* with reference to his addiction.”⁹⁷ This section appears to make addiction an even more dangerous subcategory of use. However, while any non-medical use of drugs in the CSA might be an “improper use,” drugs are categorized partially by their addictive potential.⁹⁸ Although the Act never explicitly defines the relationship between use, abuse, and addiction, the above text defines addiction as use that is dangerous to society.⁹⁹ “Use,” though used interchangeably with “abuse” and sometimes “addiction” is the dominant paradigm; to prohibit exclusively “abuse” or “addiction” would imply the possibility of non-problematic usage of illegal drugs.¹⁰⁰ This would undermine the whole category.

⁹³ Comprehensive Drug Abuse Prevention and Control Act of 1970, Pub. L. No. 91-513, 84 Stat. 1236 (1970); 21 U.S.C. § 801a (2006) (emphasis added) (illustrating that the term “abuse” appears only once in the congressional findings).

⁹⁴ See 21 U.S.C. §§ 801(1), 801a(1) (2006) (making a distinction between legitimate and illegitimate uses for psychotropic substances).

⁹⁵ 21 U.S.C. § 801 note (2006) (emphasis added).

⁹⁶ See *id.* (describing methamphetamine as a “very dangerous and harmful drug” that has a variety of negative impacts on the individual and society as a whole).

⁹⁷ 21 U.S.C. § 802(1) (Supp. 2009) (emphasis added).

⁹⁸ See 21 U.S.C. §§ 801(1)–(2), 811(c)(7) (2006).

⁹⁹ See 21 U.S.C. § 802(1) (Supp. 2009) (describing addicts as users who pose a danger to society while failing to distinguish between the terms “use” and “abuse”).

¹⁰⁰ See Robert A. Mikos, *On the Limits of Supremacy: Medical Marijuana and the States’ Overlooked Power to Legalize Federal Crime*, 62 VAND. L. REV.

“Use” is a catchall, essentially translating as non-medical and non-scientific ingestion of dangerous psychotropic substances.¹⁰¹ Therefore, in a theme we will see repeated below with respect to THC percentages, use cannot be scaled.¹⁰² Congress wants to protect America from ingesting the danger that inheres in drugs—there is no room for use continuums.

“Manufacture” and “distribution” are also mentioned in the introductory text of the Act.¹⁰³ Congress, perhaps to preempt constitutional challenge, explicitly embeds its authority to control the danger of drug use in the Commerce Clause of the Constitution, suggesting in the CSA that “[a] major portion of the traffic in controlled substances flows through interstate and foreign commerce.”¹⁰⁴ By situating drugs within its most extensive arena of power—commerce—Congress gains wide regulatory latitude.¹⁰⁵ But by framing its legal authority in this manner, Congress also ties the issue of drugs explicitly to commerce and thus to the trading and possession of physical commodities.¹⁰⁶ This language shifts the discussion from the theme of psychotropic danger to the physical presence of an object, which can be bought, sold, or traded.¹⁰⁷ In other words, the locus of control shifts from intoxication to physicality or from ingestion to possession.¹⁰⁸ The inability to scale use translates in this shift as well, because, again, it is unacceptable to possess

1421, 1453 (2009) (arguing how a state’s tolerance of any “use” of marijuana would likely lead people to believe it is not harmful and encourage the use of the drug).

¹⁰¹ See 21 U.S.C. § 801a (2006); *U.S. v. Oakland Cannabis Buyers’ Coop.*, 532 U.S. 483, 491–92 (2001) (discussing that, under the CSA, restrictions are placed on drugs based on their current medicinal utility, as determined by the Attorney General).

¹⁰² Compare 21 U.S.C. § 801(2) (2006) (defining ‘use’ subjectively, in terms of its effects on the public health and morality), with 21 U.S.C.A. § 841(a)(1) (West, Westlaw through P.L. 112-39 approved 10/12/11) (making it illegal for any individual to intentionally manufacture, distribute, dispense, or possess a controlled substance, irrespective of quantity).

¹⁰³ 21 U.S.C. § 802(11), (15) (Supp. 2009).

¹⁰⁴ 21 U.S.C. § 801(3) (2006); see U.S. CONST. art. I, § 8, cl. 3.

¹⁰⁵ See *Gonzales v. Raich*, 545 U.S. 1, 18–19, 22 (2005) (describing the reach of the Commerce Clause, why its power extended to the CSA, and that the Constitution only requires a rational basis that home-consumed marijuana would “substantially affect interstate commerce”).

¹⁰⁶ See *id.* at 25–28 (defining the CSA as a regulatory statute, controlling the “production, distribution, and consumption of commodities” in an established inter and intrastate market).

¹⁰⁷ See *id.*

¹⁰⁸ 21 U.S.C. § 844 (West, Westlaw through P.L. 112-39 approved 10/12/11).

any amount of marijuana.¹⁰⁹

In its section on scheduling (i.e., hierarchy of prohibition), Congress underscores this by forbidding “any quantity” of proscribed substances.¹¹⁰ Rather than delineating amounts acceptable per person or levels of acceptable intoxication, the CSA states that “any material, compound, mixture, or preparation, which contains *any quantity* of the following . . . substances” is prohibited.¹¹¹ The language is plain: a given substance, in any physical manifestation and in any quantity, is illegitimate. The regulatory shift in concern from amorphous moral danger to quantifiable physical presence is complete. Moreover, by hanging its hat on the immorality of marijuana, Congress can reach no other conclusion and is imposing a kind of black and white morality.¹¹² There can be no acceptable (“moral”) levels of marijuana use, just as there can be no acceptable (“moral”) amounts of marijuana to possess.

In the case of marijuana, the CSA regulates both the plant (“Marihuana”) and the proposed psychoactive ingredient THC (mentioned as “Tetrahydrocannabinols”).¹¹³ Again, the CSA stipulates that “any material, compound, mixture, or preparation, which contains any quantity of [these] hallucinogenic substances” is illegal.¹¹⁴ No levels or limitations are mentioned—the language “any quantity” would seem to prohibit any discussion thereof.¹¹⁵ However, the CSA explicitly defines the term “marihuana”: “The term ‘marihuana’ means all parts of the plant *Cannabis sativa L.*, whether growing or not; the seeds thereof; the resin extracted from any part of such plant; and every compound, manufacture, salt, derivative, mixture, or preparation of such plant, its seeds or resin.”¹¹⁶

A plain reading makes clear what is prohibited—“all parts of

¹⁰⁹ See 21 U.S.C. § 812, sched. I(c)(10) (2006); 21 U.S.C.A. § 844(a) (West, Westlaw through P.L. 112-39 approved 10/12/11).

¹¹⁰ See 21 U.S.C. §§ 812, sched. I(c) (2006); 21 U.S.C.A. §§ 841(a), 844(a) (West, Westlaw through P.L. 112-39 approved 10/12/11).

¹¹¹ See 21 U.S.C. §§ 812, sched. I(c) (2006); 21 U.S.C.A. §§ 841(a), 844(a) (West, Westlaw through P.L. 112-39 approved 10/12/11).

¹¹² See 21 U.S.C. § 801(2) (2006) (finding that possession of controlled substances has “a substantial and detrimental effect on the health and general welfare of the American people”).

¹¹³ 21 U.S.C. § 812(c)(10), (17) (2006).

¹¹⁴ 21 U.S.C. § 812(c) (2006).

¹¹⁵ *Id.*

¹¹⁶ 21 U.S.C. § 802(16) (Supp. 2009) (emphasis added).

the plant.”¹¹⁷ In an apparent contradiction, however, the CSA continues:

Such term does not include the mature stalks of such plant, fiber produced from such stalks, oil or cake made from the seeds of such plant, any other compound, manufacture, salt, derivative, mixture, or preparation of such mature stalks (except the resin extracted therefrom), fiber, oil, or cake, or the sterilized seed of such plant which is incapable of germination.¹¹⁸

“[A]ll parts of the plant” notwithstanding, the second sentence of the quote excludes the parts of the plant encouraged in hemp cultivation, although the law does not state this explicitly.¹¹⁹ If this is true, hemp—not the flowering tops of the cannabis plant, but the stalks, fiber, edible seed oil, and related material—are not included in the definition of “marihuana.”¹²⁰ Although unclear in its discussion of danger and use, the CSA is relatively straightforward in its delineation of marijuana: all of the marijuana plant is illegal, but parts of the hemp plant are not.¹²¹ As we have seen, however, scientists concerned with issues of the law have demonstrated that, taxonomically, they are the same plant.¹²²

Congress has seen fit to ground its motivations and justifications for prohibiting marijuana in a moralistic understanding of drugs and use.¹²³ The moralistic use/non-use dichotomy this creates maps squarely on the marijuana/hemp dichotomy.¹²⁴ Yet, contradictions are embedded within the CSA itself, as it attempts to regulate the whole marijuana plant while leaving untouched the useful parts of the hemp plant.¹²⁵ The clean lines of moralism that infuse the legal categorization of cannabis become less clear, however, when juxtaposed with the science of forensics and the potential

¹¹⁷ *Id.*

¹¹⁸ *Id.*

¹¹⁹ *See id.*; Duppong, *supra* note 28, at 407–09 (explaining that while marijuana and hemp are derived from the same plant, the flower or leaves are used for the former, and stalks grown for fiber are used to produce the latter).

¹²⁰ *See* 21 U.S.C. § 802(16) (Supp. 2009); *Hemp Indus. Ass’n v. DEA (Hemp II)*, 357 F.3d 1012, 1013, 1017–19 (9th Cir. 2004).

¹²¹ *See* 21 U.S.C. § 802(16) (Supp. 2009).

¹²² Duppong, *supra* note 28, at 407.

¹²³ *See* 21 U.S.C. §§ 801(2), 802(1) (Supp. 2009).

¹²⁴ *See* DAVID P. WEST, N. AM. INDUS. HEMP COUNCIL, *HEMP AND MARIJUANA: MYTHS & REALITIES*, 5 (1998) (explaining how the conflation of the terms hemp and marijuana has proven problematic for policy makers who believe “that by legalizing hemp they are legalizing marijuana”).

¹²⁵ *See* 21 U.S.C. § 802(16) (Supp. 2009).

messiness that it entails.¹²⁶

V. LEGAL & REGULATORY FRAMEWORK

Momentarily bracketing ontological questions in favor of practical concerns, this apparent contradiction has not gone undetected by regulatory agencies. In 2003, the Drug Enforcement Agency (DEA) issued a final rule that banned the sale of consumable products containing hemp, recognizing explicitly the arguments present above:

[T]o ignore the foregoing considerations [ambiguities in the scheduling of THC] and to treat natural THC as a noncontrolled substance would provide a loophole in the law that might be exploited by drug traffickers. If natural THC were a noncontrolled substance, those portions of the cannabis plant that are excluded from the CSA definition of marijuana (the stalks and sterilized seeds of the plant) would be legal, noncontrolled substances—regardless of their THC content.¹²⁷

Consistent with the moral framing of the CSA, the DEA interprets all THC as illegitimate, rather than resolve the tension by interpreting the CSA to require levels of acceptability.¹²⁸ Correctly identifying this “rule change” as a clear threat to their commodities, the Hemp Industries Association, a business conglomerate representing various hemp interests, sued the federal government in *Hemp Industries Association v. DEA (Hemp I)*.¹²⁹ The ultimate ruling was issued by the Ninth Circuit Court of Appeals, which officially ruled on the nature and legality of the rule change, rather than the relative morality of cannabis.¹³⁰ Yet, as we have seen, the discussion of taxonomy cannot escape implicit moralizing.

At issue in the case was the nature of the rule change.¹³¹ The DEA argued that it made only an “interpretive” rule change.¹³² This amounts basically to an administrative procedure, well within the powers of the organization and requiring only internal

¹²⁶ See *supra* text accompanying notes 34–52.

¹²⁷ Clarification of Listing of “Tetrahydrocannabinols” in Schedule I, 68 Fed. Reg. 14,114 (Mar. 21, 2003) (to be codified at 21 C.F.R. pt. 1308).

¹²⁸ *Id.*

¹²⁹ 333 F.3d 1082, 1085 (9th Cir. 2003).

¹³⁰ See *id.* at 1085, 1087, 1091 (holding that the DEA’s rule was procedurally invalid without giving any consideration to the morality of the marijuana prohibition generally).

¹³¹ *Id.* at 1086–87.

¹³² *Id.* at 1084.

approval.¹³³ Such a rule would not have the “force of law,” and would merely be clarifying an existing statute.¹³⁴ The DEA, in its accompanying document, declares that its “rule clarifies that, under the CSA and DEA regulations, the listing of ‘Tetrahydrocannabinols’ in Schedule I refers to both natural and synthetic THC.”¹³⁵ Further, DEA claims that this is evident from the “plain language of the CSA and DEA regulations” that this is the case.¹³⁶ Indeed, the text of DEA’s accompanying document contains barely suppressed irritation that anyone could have misread this “plain language”:

Despite the wording of the statute, *some members of the public were under the impression (prior to the publication of the interpretive rule) that the listing of ‘Tetrahydrocannabinols’ in schedule I includes only synthetic THC—not natural THC. To eliminate any uncertainty, DEA is hereby revising the wording of its regulations to refer expressly to both natural and synthetic THC.*¹³⁷

DEA argues that it is simply clarifying the rule regarding THC, making more obvious what previously was plain enough to read.¹³⁸ Therefore, DEA argued, it is only an interpretive rule, making no substantive change to the law.¹³⁹

The Ninth Circuit disagreed, finding that DEA had made an unauthorized legislative rule change without following the proper—and considerably more arduous—external procedure specified under the Administrative Procedures Act.¹⁴⁰ The court found that DEA would be well within its rights to make this an interpretive rule if there had been no prior regulatory or case history regarding naturally-occurring THC.¹⁴¹ But there had been—DEA’s own regulatory decisions from the 1970s recognize the awkward legal status of naturally-occurring THC.¹⁴²

¹³³ *Id.* at 1086–87.

¹³⁴ *See id.* at 1090 (noting the distinction between a legislative rule which carries the force of law and an administrative interpretation of statutory law which does not).

¹³⁵ Clarification of Listing of “Tetrahydrocannabinols” in Schedule I, 68 Fed. Reg. 14,114 (Mar. 21, 2003) (to be codified at 21 C.F.R. pt. 1308).

¹³⁶ *Id.*

¹³⁷ *Id.* (emphasis added).

¹³⁸ *Id.*

¹³⁹ *Hemp I*, 333 F.3d at 1084.

¹⁴⁰ *Id.* at 1084, 1087–88, 1090–91; *see generally* Administrative Procedure Act, Pub. L. No. 79-404, 60 Stat. 237 (1946) (codified as amended in scattered sections of 5 U.S.C.).

¹⁴¹ *Id.* at 1090.

¹⁴² *See id.* at 1089–91 (articulating the various ways in which DEA has

Consistent with the scientific isolation of the THC terpenoid of marijuana, DEA added the “Tetrahydrocannabinols” category to the CSA in 1971, noting that the term referred to “[s]ynthetic equivalents of the substances contained in the plant . . . and/or synthetic substances, derivatives, and their isomers”¹⁴³ Indeed, the Ninth Circuit remarks “if naturally-occurring THC were covered under THC, there would be no need to have a separate category for marijuana.”¹⁴⁴

Ultimately, the court plays out its logic regarding the narrow legal distinction in a 2004 decision (*Hemp II*) regarding the DEA’s Final Rules. There, the Court held:

The DEA’s Final Rules purport to regulate foodstuffs containing ‘natural and synthetic THC.’ And so they can: in keeping with the definitions of drugs controlled under Schedule I of the CSA, the Final Rules can regulate foodstuffs containing natural THC if it is contained within marijuana, and can regulate synthetic THC of any kind. But they cannot regulate *naturally-occurring* THC *not* contained within or derived from marijuana—i.e., non-psychoactive hemp products—because non-psychoactive hemp is not included in Schedule I. The DEA has no authority to regulate drugs that are not scheduled, and it has not followed procedures required to schedule a substance.¹⁴⁵

By not appealing the decision to the Supreme Court, the DEA appears to have accepted the ruling of the Ninth Circuit: the marijuana plant is illegal, but at least some parts of the hemp plant which contain THC are legal, such as the stalks, fiber, seed oil, cake, and ungerminated seeds.¹⁴⁶ But the tortured path by which the court arrives at this conclusion elides important congruencies between hemp and marijuana in their collective enumeration as *Cannabis sativa*.¹⁴⁷ When the court speaks of “non-psychoactive hemp” or “naturally-occurring THC not contained within or derived from marijuana” it creates an impossible category unknown to science—THC without psychoactive properties.¹⁴⁸ Hemp and marijuana both contain

attempted to categorize naturally occurring THC).

¹⁴³ *Id.* at 1089–90.

¹⁴⁴ *Id.* at 1089.

¹⁴⁵ *Hemp Indus. Ass’n v. DEA. (Hemp II)*, 357 F.3d 1012, 1018 (9th Cir. 2004) (emphasis in original).

¹⁴⁶ *Id.* at 1017–18.

¹⁴⁷ *See id.* at 1017 (applying the definition of “marihuana” as provided in the CSA).

¹⁴⁸ *See id.* at 1018 (emphasis omitted); Holler, *supra* note 5, at 428; Gareth Pryce & David Baker, *Emerging Properties of Cannabinoid Medicines in*

THC, albeit different amounts.¹⁴⁹ Small amounts of THC are non-psychoactive in the same manner as small amounts of alcohol—increased dosage provides increased intoxication.¹⁵⁰ The Ninth Circuit’s decision in *Hemp II* is carefully worded, since to refer to “non-psychoactive THC” would be expressly nonsensical, but the issue under review is not hemp *per se*, but THC.¹⁵¹ The legally constructed category of “non-psychoactive hemp” combines the perceived harmlessness (or, morality) of hemp with the admission that, in tiny doses, THC is not only non-psychoactive—not a “drug” *per se*, in its social meaning—but even safe, perhaps even “moral.”¹⁵² One can imagine the ultimate extension of that logic—normalization, or potentially redefining moderate THC use as moral. The Court’s silence on the issue of morality not only avoids condemnation of hemp-based products, but it may in fact provide an argument *for* the morality of objects like hemp rope or sandals.¹⁵³

One obvious irony in this delicately balanced legal framework is the inconvenient legal status of dronabinol as a Schedule III drug.¹⁵⁴ Approved by DEA in 1986 as a Schedule II drug, and rescheduled as a Schedule III drug in 1999, dronabinol is

Management of Multiple Sclerosis, 28 TRENDS IN NEUROSCIENCES 272, 273 (2005) (showing that THC is largely responsible for the psychoactive effects of cannabis).

¹⁴⁹ Holler, *supra* note 5, at 428 (explaining that while hemp and marijuana are both members of the genus *Cannabis sativa*, hemp contains less than one percent THC and marijuana can be cultivated to contain between one and twenty percent THC).

¹⁵⁰ See David Baker et al., *The Therapeutic Potential of Cannabis*, 2 THE LANCET NEUROLOGY 291, 291 (2003) (arguing that increased THC content in modern cannabis has resulted in a more potent psychoactive experience for contemporary users); Salme K. Ahlström & Esa L. Österberg, *International Perspectives on Adolescent and Young Adult Drinking*, 28 ALCOHOL, RESEARCH & HEALTH 258, 258–60 (2005) available at <http://pubs.niaaa.nih.gov/publications/arh284/258-268.pdf> (discussing the implications associated with different patterns of alcohol consumption and levels of intoxication).

¹⁵¹ *Hemp II*, 357 F.3d at 1012, 1019 (enjoining the enforcement of the DEA’s “Final Rules with respect to non-psychoactive hemp”).

¹⁵² See *id.* at 1013 n.2, 1018.

¹⁵³ See *Hemp Indus. Ass’n v. DEA (Hemp I)*, 333 F.3d 1082, 1084–85, 1091 (9th Cir. 2003) (concluding that the DEA regulation was invalid due to lack of administrative authority, as opposed to any public policy issue related to the use of marijuana); see also *Hemp II*, 357 F.3d at 1018 (holding that the DEA had no authority to regulate unscheduled drugs).

¹⁵⁴ 21 C.F.R. § 1308.13(g) (2011); see Lester Grinspoon, *The Medical Marijuana Problem*, 4 J. COGNITIVE LIBERTIES, no. 2, 2003 at 63, 64–65 (2003) (explaining government approval of a synthetic form of THC for therapeutic use, and its placement as a Schedule III drug).

synthetic THC marketed under the trade name Marinol, and is used to treat various gastrointestinal issues in chemotherapy and AIDS patients.¹⁵⁵ As made clear above, at no time was the Schedule I status of synthetic THC in question, but dronabinol is listed as a Schedule III substance, although it is not mentioned in the CSA, or any of its Congressional amendments.¹⁵⁶ Schedule III drugs are available by prescription, which can be refilled without a new medical appointment.¹⁵⁷ Apart from THC (DEA code number 7370), dronabinol has its own separate DEA code number (7369) although they are defined identically as “synthetic” THC.¹⁵⁸ Perhaps expressly to remove it from law enforcement suspicion, dronabinol escapes scrutiny in “sesame oil in soft gelatin capsule[s],” presumably in plastic pill blister packaging for easy identification as “not marijuana.”¹⁵⁹

The *Hemp II* decision throws the issue of marijuana identification into sharp relief.¹⁶⁰ To maintain the legal fiction that marijuana and hemp are somehow ontologically distinct, the court is forced to create a biologically fictitious category—non-psychoactive THC.¹⁶¹ Indeed, to further confuse the issue, the CSA already recognizes a version of ostensibly non-psychoactive THC—dronabinol.¹⁶² Although the legal prohibition on marijuana remains protected as ever, the list of conditions under which

¹⁵⁵ Schedules of Controlled Substances: Rescheduling of the Food and Drug Administration Approved Product Containing Synthetic Dronabinol [(-)- Δ^9 -(trans)-Tetrahydrocannabinol] in Sesame Oil and Encapsulated in Soft Gelatin Capsules From Schedule II to Schedule III, 64 Fed. Reg. 35,928 (July 2, 1999) (to be codified at 21 C.F.R. pts. 1308, 1312).

¹⁵⁶ See 21 U.S.C. § 812, sched. 1(c)(17) (2006) (classifying THC in Schedule I, but making no reference to dronabinol); *Hemp II*, 357 F.3d at 1014, 1017 (citing *Hemp I*, 333 F.3d at 1089) (stating that the Schedule I listing of THC only applied to synthetic THC); 21 C.F.R. § 1308.13(g) (2006) (enumerating dronabinol as a Schedule III drug).

¹⁵⁷ Schedules of Controlled Substances: Rescheduling of the Food and Drug Administration Approved Product Containing Synthetic Dronabinol [(-)- Δ^9 -(trans)-Tetrahydrocannabinol] in Sesame Oil and Encapsulated in Soft Gelatin Capsules From Schedule II to Schedule III, 64 Fed. Reg. at 35,928.

¹⁵⁸ 21 C.F.R. § 1308.11(d), 1308.13(g) (2011); see U.S. DEP'T OF JUSTICE, DEA, LISTS OF: SCHEDULING ACTIONS CONTROLLED SUBSTANCES REGULATED CHEMICALS 5, 11 (2011), available at <http://www.deadiversion.usdoj.gov/schedules/orangebook/orangebook.pdf>.

¹⁵⁹ 21 C.F.R. § 1308.13(g); U.S. DEP'T OF JUSTICE, *supra* note 159, at 5.

¹⁶⁰ See *Hemp II*, 357 F.3d at 1017–19.

¹⁶¹ See *id.* (holding non-psychoactive hemp is not included in Schedule I).

¹⁶² See Schedules of Controlled Substances: Rescheduling of the Food and Drug Administration Approved Product Containing Synthetic Dronabinol [(-)- Δ^9 -(trans)-Tetrahydrocannabinol] in Sesame Oil and Encapsulated in Soft Gelatin Capsules From Schedule II to Schedule III, 64 Fed. Reg. at 35,928.

prohibition is void is growing longer.¹⁶³

VI. BUT HOW SHALL WE KNOW THEM?

Ultimately, none of this legal maneuvering answers satisfactorily the basic practical question: If any of the aforementioned legal versions of cannabis come under law enforcement scrutiny, which forensic test can successfully demarcate the boundaries of illegal cannabis/marijuana from its legal cannabis/hemp counterpart? In a word, none. The judicial process has created a legal fiction, that not only are they different, but that we can tell them apart forensically. The single consideration that might make this distinction viable would be a government statement regarding “safe” (or perhaps, more appropriately, “moral”) levels of THC. GC/MS or DNA testing could then help determine what category a suspect sample falls into based on clearly defined lines of THC content.¹⁶⁴ But this seems unlikely, since, as the Ninth Circuit points out, “DEA has failed to indicate any limit of detectable amounts for THC” and “a true zero level of [tetrahydrocannabinols] THC in hemp seed and oil [products] is not achievable.”¹⁶⁵

The overlapping categories here are socio-moral, scientific, and legal. The legal framework has thus drawn lines between that which is fundamentally morally dangerous and that which is fundamentally not. Because the social danger of drugs inheres so deeply in this issue, my reading of the Court’s implicit reasoning is that to allow even a small amount of the prohibited THC is to make a moral compromise and potentially open the door to the slippery slope of decriminalization, legalization, or to recognize the potential for non-dangerous moderate marijuana use.¹⁶⁶ It is far better to avoid this and maintain moral clarity by classifying these as different objects. In essence, to have medical value or be a useful commodity for textiles or nutrition is to be “not

¹⁶³ See Truth in Trials Act, H.R. 3939, 111th Cong. (2009) (creating a legal affirmative defense for conduct relating to the medical use of marijuana).

¹⁶⁴ See Samir A. Ross, et al., *GC-MS Analysis of the Total Δ^9 -THC Content of Both Drug- and Fiber-Type Cannabis Seeds*, 24 J. OF ANALYTICAL TOXICOLOGY 715, 715–717 (2000) (describing how the GC-MS analysis can measure amounts of THC).

¹⁶⁵ *Hemp Indus. Ass’n v. DEA (Hemp I)*, 333 F.3d 1082, 1086–88 (9th Cir. 2003). The Court conveniently ignores its own failings in this regard as well as similar problems in the original CSA.

¹⁶⁶ See *id.* at 1089–91.

marijuana.”¹⁶⁷ Thus, the division remains fundamentally social and not chemical.

However, forensic science has not signed on to the operationalization of this set of legal compromises. In determining the identity of an unknown substance in the course of a criminal investigation, any of the tests previously mentioned are likely to be employed. Should a legal cannabis object fall under suspicion, it will be tested according to accepted protocol and likely come up positive for the illegal substance marijuana.¹⁶⁸ That this situation has not yet become its own court case is perhaps only due to the nature of science with regard to legal decisions and law enforcement. The Ninth Circuit is entitled to cite sophisticated scientific studies in its rulings regarding science that “a ‘THC Free’ status is not achievable,”¹⁶⁹ but a suspect sample instead receives microscopy and the D-L field test from a lab technician or law enforcement official who may possess little or no formal scientific training.¹⁷⁰

Forensic science, as “the handmaiden of the legal system,” and prosecutors, as the enforcers of the same public morality embedded in the CSA, are in the business of suspicion.¹⁷¹ Law enforcement arranges tests for several reasons beyond simply the legal necessity to establish identity chemically.¹⁷² First, samples are often non-obvious botanicals, comprising residue or other indistinguishables.¹⁷³ A test must then separate probative cannabis material from, say tobacco residue, kitchen garbage

¹⁶⁷ *Id.* at 1085, 1088–89.

¹⁶⁸ *See* Whitehurst, *supra* note 28, at 118–19. The contested error rates are notwithstanding, of course, in regard to the tested objects. Perhaps more importantly, practically and culturally speaking, it seems plausible that a person under suspicion for marijuana possession might conceivably possess items defined legally, and marketed as, hemp. How this will be dealt with, remains an open question.

¹⁶⁹ *Hemp I*, 333 F.3d at 1085 (citation omitted).

¹⁷⁰ COMMITTEE ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIENCES COMMUNITY, NATIONAL RESEARCH COUNCIL, *Strengthening Forensic Science in the United States: A Path Forward* 36 (2009), *available at* <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf> (explaining that forensic science is sometimes performed by untrained law enforcement officers who have no scientific training).

¹⁷¹ *Id.* at 85 (citation omitted).

¹⁷² *See* KELLY, *supra* note 70, at 4 (examining a variety of forensic tests used by law enforcement).

¹⁷³ *See id.* at 8 (describing what other matter may be identified as marijuana in forensic testing).

gunk, or coffee grounds.¹⁷⁴ Second, the purpose of forensic science, in practice, is often to demonstrate guilt, rather than objectively test hypotheses.¹⁷⁵ In the world of forensic law enforcement, a sample, like a suspect in the hands of police, is not really innocent until proven guilty, but the reverse—law enforcement suspects, and relies on the lab to confirm their suspicions.¹⁷⁶ In a manner of speaking, the unknown sample is guilty until proven innocent in this respect. By way of this suspicious gaze of law enforcement, a sample is moved from the potential hemp category to the potential marijuana category, shifting the burden of proof along with it.¹⁷⁷ Once a sample tests as an illegal object, the burden of proof is on the defendant to “prove” that it is hemp or contains only “naturally-occurring” hemp THC (or, potentially, dronabinol, which carries with it lesser penalties for misuse as a Schedule III substance), and is thus not illegal.¹⁷⁸ An uphill battle, certainly, and as we have established, empirical testing only muddies these waters.¹⁷⁹

This analysis suggests that the only thing between a consumer

¹⁷⁴ See *id.* at 8–9 (indicating that a determinative forensic test is a process that must isolate the unknown compound from all other matter and that some tests will give a false positive for marijuana when testing coffee or aspirin).

¹⁷⁵ See Kimberly Cogdell Boies, *Misuse of DNA Evidence is not Always a “Harmless Error”: DNA Evidence, Prosecutorial Misconduct, and Wrongful Conviction*, 17 TEX. WESLEYAN L. REV. 403, 426, 429, 433–34 (2011) (arguing prosecutors misuse of DNA forensic evidence is biased towards seeking guilty verdicts at trial).

¹⁷⁶ See *id.*

¹⁷⁷ See *Jones v. State*, 74 So.2d 427, 430 (Miss. Ct. App. 1998) (noting the defendant’s claim that his plants were hemp plants was ignored by the court, and the plants were accepted as marijuana based on law enforcement testimony and evidence).

¹⁷⁸ See *Peppers v. State*, 304 So.2d 39, 40–42 (Ala. Crim. App. 1974) (holding that the burden is on the defendant to show that he possessed or sold legal marijuana and therefore was included in the exemption provided for in the statute); *State v. Wind*, 208 N.W.2d 357, 360–61 (Wis. 1973) (holding that while the State still needed to prove beyond a reasonable doubt that the substance sold was marijuana, a chemical test does not need to be specific to marijuana for it to be probative); *State v. Greene*, 161 N.W.2d 239, 240–41 (Wis. 1968) (holding that a positive chemical test for marijuana was sufficient evidence for a jury to find beyond a reasonable doubt that defendant sold *Cannabis sativa L.*, even though there was no evidence presented that the test could distinguish *Cannabis sativa L.* from *Cannabis indica*); 21 C.F.R. § 1308.13(g) (2011) (listing dronabinol as a Schedule III drug).

¹⁷⁹ See Christine A. Kolosov, Comment, *Evaluating the Public Interest: Regulation of Industrial Hemp Under the Controlled Substances Act*, 57 UCLA L. REV. 237, 251 (2009) (describing the difficulty in differentiating cannabis plants that contain high amounts of THC and plants that contain low amounts of THC when the plants are young in age).

of hemp products and prosecution for marijuana possession is suspicion, a purely social distinction.¹⁸⁰ This legal battle, though clearly involving social distinctions and moral judgments, ropes science into its purview. Science is implicit in the move from discussions of “the drug” in marijuana from the Marihuana Tax Act to a seemingly blanket prohibition of THC in the CSA.¹⁸¹ Yet it is a social understanding of danger to public morality that continues to motivate the definition of marijuana under the law.¹⁸² As sociologist of science Bruno Latour suggests, the thrust of science in society in contemporary times may in fact proliferate these cultural and biological “hybrids,” leaving us with theoretical complications regarding the purification of science and culture.¹⁸³ But apart from these theoretical concerns, the mobilization of morality through the lens of science in this particular manner renders the law problematic at best and incoherent at worst.

¹⁸⁰ And not all suspicion is created equal. The issue of morality and drugs is clearly tied up with political decision making regarding race, class, and their perceived danger to the normative order. Drugs offer law enforcement powerful tools that can be used with wide discretion—marijuana in particular can be used this way, given its near-ubiquity in contemporary American society. For excellent in-depth treatment of the issues surrounding drugs, discretion, arrest, and racism, see DORIS MARIE PROVINE, *UNEQUAL UNDER LAW: RACE IN THE WAR ON DRUGS* 81–83 (2007) (linking marijuana’s criminalization with its use by Mexican communities); DAVID F. MUSTO, *THE AMERICAN DISEASE: ORIGINS OF NARCOTIC CONTROL* 219–222 (Oxford University Press 3d ed. 1999) (1973) (associating marijuana use and association with Mexican immigrants); Katherine Beckett et al., *Race, Drugs, and Policing: Understanding Disparities in Drug Delivery Arrests*, 44 *CRIMINOLOGY* 105 (2006) (describing the connection between race and drug arrests); MARISA K. OMORI, WENDY REYES, AARON ROUSSELL, MATTHEW A. VALASIK, RACHEL DIGGS, AND MONA LYNCH, *POLICING IN THE “PROGRESSIVE” CITY: RACIAL DISPARITIES IN SAN FRANCISCO DRUG ARRESTS* (forthcoming technical report for the American Civil Liberties Union).

¹⁸¹ See *Hemp Indus. Ass’n v. DEA (Hemp I)*, 333 F.3d 1082, 1088–91 (9th Cir. 2003); Marcia Tiersky, Comment, *Medical Marijuana: Putting the Power Where It Belongs*, 93 *NW. U. L. REV.* 547, 548–550 (1999) (detailing the history of cannabis and marijuana in the United States from the 1800s until its classification in the CSA in the 1970s).

¹⁸² 21 U.S.C. §§ 801(2), 802(1) (Supp. 2009); see WENDY CHAPKIS & RICHARD J. WEBB, *DYING TO GET HIGH: MARIJUANA AS MEDICINE* 28–29 (2008).

¹⁸³ See BRUNO LATOUR, *WE HAVE NEVER BEEN MODERN* 1–3 (Catherine Porter trans., Pearson Education Ltd. 1993) (1991) (elucidating the interrelationship between disciplines and the analyst who separates them).