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Kyllo v. United States: A Temporary Reprieve from Technology-Enhanced Surveillance of the Home

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Kyllo v. United States: A Temporary Reprieve from Technology-Enhanced Surveillance of the Home

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INTRODUCTION

Technology-enhanced surveillance encroaches on virtually every aspect of our daily lives.¹ Video cameras routinely record our actions

1. See, e.g., Jay Bookman, *Technology: In Your Face: The Ways Surveillance Equipment Can Scan, Tape, Track and Profile You*, ATLANTA J.-CONST., Mar. 25, 2001, at D1 (noting that as the price and size of surveillance equipment falls we will soon be living in a "watched world").

in public areas, business establishments, and the workplace.² Our use of the Internet is monitored and tracked,³ which may lead to the release of personal information to third parties.⁴ Even mundane, everyday tasks, such as going through the checkout line at the grocery store, are subject to some type of surveillance.⁵ Law enforcement agencies also increasingly rely on technology-enhanced surveillance to obtain evidence of criminal behavior.⁶ For example, municipalities use video cameras to monitor for criminal activity in targeted neighborhoods⁷ and for traffic violations at intersections and along the roadways.⁸

Some commentators view such everyday surveillance as an invasion of privacy;⁹ however, other technology-enhanced

2. See, e.g., Andrew Zipern, *Surveillance: When Big Brother Is Watching, A Device Watches Back*, N.Y. TIMES, Nov. 22, 2001, at G3 (noting that the average worker in New York City is recorded by video surveillance more than seventy times a day).

3. See Shawn C. Helms, *Translating Privacy Values with Technology*, 7 B.U. J. SCI. & TECH. L. 288, 290 (2001) (discussing the loss of anonymity in cyberspace).

4. See A. Michael Froomkin, *The Death of Privacy?*, 52 STAN. L. REV. 1461, 1463 (2000) (arguing that the state and private sector now enjoy unprecedented abilities to collect personal data).

5. See Steven E. Brier, *Smart Devices Peep into Your Grocery Cart*, N.Y. TIMES, July 16, 1998, at G3 (discussing technologies used by supermarkets to track consumer purchases).

6. See generally Gregory S. Fisher, *Cracking Down on Soccer Moms and Other Urban Legends on the Frontier of the Fourth Amendment: Is it Finally Time to Re-Define Searches and Seizures?*, 38 WILLAMETTE L. REV. 137, 149–50 (2002) (summarizing the use of potentially invasive high-technology devices in law enforcement); Roberto Iraola, *New Detection Technologies and the Fourth Amendment*, 47 S.D. L. REV. 8, 9–15 (2002) (discussing new technologies aimed at detecting weapons, explosives, drugs, and persons); Mark G. Young, Note, *What Big Eyes and Ears You Have!: A New Regime for Covert Governmental Surveillance*, 70 FORDHAM L. REV. 1017, 1023–38 (2001) (reviewing surveillance technologies that the government, including law enforcement agencies, is currently using or developing).

7. See, e.g., Kim Cobb, *Police Cameras Worrying Watchdogs: Focus May Be On Safety, But Privacy Concerns Also High*, HOUS. CHRON., July 15, 2001, at 1A (describing the use of video surveillance coupled with facial recognition software to identify wanted criminals from a crowd of people in public areas).

8. See, e.g., James F. Sweeney, *The All-Seeing Eye: Growing Number of Surveillance Cameras Sparks Big Brother Privacy Debate*, PLAIN DEALER, Jan. 6, 2002, at L1 (discussing the proliferation of surveillance cameras, including those at traffic intersections). See generally Andrew W.J. Tarr, Recent Development, *Picture It: Red Light Cameras Abide by the Law of the Land*, 80 N.C. L. REV. 1879 (2002) (describing the use of electronic cameras at intersections to detect drivers who run red lights).

9. See, e.g., Christopher S. Milligan, Note, *Facial Recognition Technology, Video Surveillance, and Privacy*, 9 S. CAL. INTERDISC. L.J. 295, 326 (1999) (arguing that the use of video and other new surveillance techniques invades personal privacy); cf. Susan Bandes, *Power, Privacy and Thermal Imaging*, 86 MINN. L. REV. 1379, 1388 (2002) (noting that it is conceivable that technology can offer greater protection of privacy); William C. Heffernan, *Criminal Law: Fourth Amendment Privacy Interests*, 92 J. CRIM. L. &

surveillance devices proposed for use by law enforcement agencies are potentially more intrusive.¹⁰ For example, the government is developing surveillance devices that emit radar waves capable of penetrating solid objects, such as brick walls, to detect hidden contraband or criminal suspects.¹¹ The Federal Aviation Administration is currently testing a full-body X-ray machine called “BodySearch” that can detect objects hidden under clothing, but also produces revealing images of the human anatomy.¹² Devices that passively detect wavelengths in the millimeter portion of the electromagnetic spectrum are also being developed to detect concealed weapons.¹³ Ordinary video cameras can be modified with off-the-shelf infrared optical components to allow the viewer to “see” through clothing.¹⁴ More sophisticated infrared-based, thermal-imaging technology is also being proposed for use as a lie-detector test to screen passengers in airports.¹⁵ Although the terrorist attacks

CRIMINOLOGY 1, 101 (2002) (noting that people welcome technological innovations for the efficiencies that they offer everyday life and that technology can also serve as a shield for privacy); Jeffrey Rosen, *A Watchful State*, N.Y. TIMES, Oct. 7, 2001, at 6–38 (noting that the general public in Great Britain supports the widespread use of video surveillance systems).

10. See Mike Snider, *Technology Offers a Feeling of Security*, USA TODAY, Nov. 15, 2001, at 1D (describing surveillance technology proposed for use in airports and along U.S. borders).

11. For information regarding such technology under development, see United States Department of Justice, at <http://www.nlectc.org/virlib/>.

12. See AS&E, *BodySearch Personnel Inspection System*, at http://www.as-e.com/products/pr_b_t_body.html (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) [hereinafter AS&E, *BodySearch Personnel Inspection System*] (describing the BodySearch Personnel Inspection System for screening individuals for the presence of concealed weapons, drugs, and illegal contraband).

13. See Charles J. Murray, *Picking Up the Pieces*, ELEC. ENGINEERING TIMES, Sept. 17, 2001, at 1 (describing millimeter wavelength detection systems and their proposed use for airport security).

14. See *Naked to the World: Cameras Let Voyeurs See Through Clothes*, at http://www.abcnews.go.com/sections/gma/goodmorningamerica/gma010807xray_cameras_hunter.html (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (describing an infrared video camera that allows users to see through people’s clothes). Although private citizens use this technology for voyeuristic purposes, law enforcement could potentially use it to detect weapons or contraband concealed under clothing. Such law enforcement use might be deemed constitutional if these modified video cameras are considered to be “in general public use.” See *infra* note 28 and accompanying text (quoting the U.S. Supreme Court’s holding in *Kyllo v. United States*, 533 U.S. 27, 40 (2001)).

15. See Jill Burcum, *Seeing Through the Mask of Deceit: A Lie Detector Using Thermal Imaging May Be a Way to Screen for Terrorists at Airports*, STAR TRIB. (Minneapolis, Minn.), Jan. 3, 2002, at A1 (describing the potential application to airport security of a lie-detector device that identifies deceitful people by measuring the heat emitted from their faces).

on September 11, 2001, raised awareness of the need for improved technologies for airport security,¹⁶ the government has contemplated the use of these devices to detect concealed weapons and contraband for several years.¹⁷

The common thread among these technology-enhanced surveillance techniques is that they each detect a form of electromagnetic radiation.¹⁸ Because these devices are designed, in principle, to conduct a “search,” their proposed use has raised Fourth Amendment concerns.¹⁹ Although the Supreme Court has acknowledged that advances in technology have affected the degree of privacy protected by the Fourth Amendment,²⁰ the Court has previously reserved judgment regarding how much technological enhancement of ordinary perception is too much.²¹ In *Kyllo v. United States*,²² however, the Court recently confronted the question of “what limits there are upon [the] power of technology to shrink the realm of guaranteed privacy” under the Fourth Amendment.²³

Like the proposed surveillance techniques discussed above, the technology at issue in *Kyllo*, a thermal imager, discretely detects a form of electromagnetic radiation without the subject being aware of the surveillance.²⁴ Because thermal imaging and other surveillance devices under development exhibit technological similarities, one commentator hoped the Court’s resolution of the thermal-imaging case in *Kyllo* would provide guidance for law enforcement use of

16. See Charles J. Murray, *Wanted: Next-gen Tech for Weapons Detection*, EE TIMES, Sept. 14, 2001, at http://www.eetimes.com/printablearticle?doc_id=OEG20010914S0035 (on file with the North Carolina Law Review) (describing the potential use of milliwave detection technology in airport security).

17. See George Dery III, *Remote Frisking Down to the Skin: Government Searching Technology Powerful Enough to Locate Holes in Fourth Amendment Fundamentals*, 30 CREIGHTON L. REV. 353, 354–58 (1997) (describing new technologies that perform the equivalent of a frisk, but without physically touching the body).

18. Electromagnetic radiation includes radiation ranging from cosmic rays to radio frequencies, including X-rays, visible light, and infrared radiation. See generally HUGH D. YOUNG, FUNDAMENTALS OF WAVES, OPTICS, AND MODERN PHYSICS (2d ed. 1976) (explaining the basic concepts of electromagnetic radiation).

19. See generally Dery, *supra* note 17 (discussing Fourth Amendment implications of remote frisking technologies).

20. See, e.g., *California v. Ciraolo*, 476 U.S. 207, 215 (1986) (stating that technology enabling human flight has exposed portions of the house and its curtilage that once were private).

21. See *Kyllo v. United States*, 533 U.S. 27, 33–34 (2001) (reviewing the Court’s treatment of the effect of advances in technology on Fourth Amendment jurisprudence).

22. 533 U.S. 27 (2001).

23. *Id.* at 34.

24. See *infra* notes 36–41 and accompanying text (describing thermal imagers).

other radiation-detecting devices.²⁵ Thus, some commentators predicted that *Kyllo* would be one of the most important cases heard by the Court in 2001.²⁶

The Court in *Kyllo*, however, specifically addressed the narrower issue of “whether the use of a thermal-imaging device aimed at a private home from a public street to detect relative amounts of heat within the home constitutes a ‘search’ within the meaning of the Fourth Amendment.”²⁷ In so doing, the Court limited the scope of *Kyllo* to surveillance of the home, holding in a 5–4 decision that “where . . . the Government uses a device that is not in general public use, to explore details of [a private home] . . . , the surveillance is a Fourth Amendment ‘search,’ and is presumptively unreasonable without a warrant.”²⁸ Although the Court’s decision in *Kyllo* is at first blush a victory for individual privacy rights against the government’s use of technology-enhanced surveillance devices, this decision actually may set the stage for an erosion of Fourth Amendment protection against unreasonable searches.²⁹

This Comment suggests that *Kyllo*’s holding limits Fourth Amendment protection from technology-enhanced surveillance devices to the home and therefore does not apply to other such devices currently in use or proposed for use by law enforcement officials for searching individuals outside the home. This Comment also argues that the Court’s reasoning is short-sighted because it adopts a standard that only affords Fourth Amendment protection from high-technology surveillance devices that are not in general

25. Dery, *supra* note 17, at 379–83 (comparing the legal analysis of millimeter-wavelength detection technology cases with that of thermal-imaging cases).

26. See, e.g., Erwin Chemerinsky, *Law Enforcement and Criminal Law Decisions*, 28 PEPP. L. REV. 517, 532 (2001) (stating that the Fourth Amendment cases, including *Kyllo*, promise to be some of the most important of the Term); Tony Mauro & Jonathan Ringel, *Justices Not Hot on Thermal Imaging*, RECORDER, Feb. 21, 2001, at 1, (noting that an American Bar Association panel highlighted *Kyllo* as an important case for setting constitutional rules on high-tech surveillance devices); William P. Weiner, *Is the Thermal Imaging of a Home an Unreasonable Search, a Reasonable Search or Not a Search at All?*, at www.abanet.org/publiced/preview/features/kyllo_us.html (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (suggesting that, because *Kyllo* deals with the conflict between personal autonomy and privacy and the governmental desire to obtain information, it will have an impact beyond whether thermal-imaging evidence should be admitted or suppressed in a criminal case).

27. *Kyllo*, 533 U.S. at 29.

28. *Id.* at 40.

29. *The Supreme Court, 2000 Term: Leading Cases*, 115 HARV. L. REV. 306, 356 (2001) (concluding that the rule emerging from *Kyllo* erodes the scope of Fourth Amendment protection) [hereinafter *Leading Cases*]; Fisher, *supra* note 6, at 169 (concluding that *Kyllo* could erode an individual’s privacy rights).

public use. Furthermore, this Comment asserts that the Court misapplied the analytical framework of *Katz v. United States*,³⁰ a flaw that could limit the precedential value of *Kyllo* in future Fourth Amendment cases.

Section I presents the facts surrounding *Kyllo* and a brief description of thermal-imaging technology. Section II provides an overview of Fourth Amendment jurisprudence on technology-enhanced surveillance devices. Section III discusses Fourth Amendment doctrines adopted by the lower courts in deciding thermal-imaging surveillance cases. Section IV provides an overview and analysis of the Court's decision in *Kyllo*. Finally, Section V applies the Court's rationale in *Kyllo* to other high-technology surveillance devices.

I. FACTS OF *KYLLO* AND A DESCRIPTION OF THERMAL-IMAGING TECHNOLOGY

Federal law enforcement agents suspected that Danny Kyllo was growing marijuana in his unit of a residential triplex.³¹ Growing marijuana indoors requires the use of high-intensity lamps that emit a significant amount of heat, which is typically vented outside to maintain an optimal temperature in the building for growing marijuana.³² Early one morning, agents scanned the triplex with a thermal imager,³³ a device that has become commonplace in drug eradication efforts,³⁴ to determine if the amount of heat emanating from Kyllo's unit was consistent with the use of such lamps.³⁵

30. 389 U.S. 347 (1967). *Katz* is discussed in detail in Section II, *infra* notes 71–77 and accompanying text.

31. *United States v. Kyllo*, 190 F.3d 1041, 1043 (9th Cir. 1999) (noting that a law enforcement task force investigating other targeted suspects began to suspect that Kyllo was involved in a conspiracy to grow and distribute marijuana), *cert. granted*, 530 U.S. 1305 (2000), *rev'd and remanded*, 258 F.3d 1004 (9th Cir. 2001), *rev'd*, 533 U.S. 27 (2001).

32. *Id.* at 1044; see Douglas A. Kash, *Prewarrant Thermal Imaging as a Fourth Amendment Violation: A Supreme Court Question in the Making*, 60 ALB. L. REV. 1295, 1296 (1997) (explaining that the high-intensity lamps required for indoor marijuana growing operations can generate temperatures exceeding one hundred degrees Fahrenheit, whereas the optimum temperature for growing marijuana is about sixty to seventy degrees); Carrie L. Groskopf, Comment, *If It Ain't Broke, Don't Fix It: The Supreme Court's Unnecessary Departure from Precedent in Kyllo v. United States*, 52 DEPAUL L. REV. 201, 205–07 (2002) (providing an overview of the pervasive use of marijuana in the United States, law enforcement's attempts to combat such use, and use of indoor growing operations to avoid detection).

33. *Kyllo*, 190 F.3d at 1044; see also *infra* notes 36–41 and accompanying text for a description of thermal imagers.

34. See Erik G. Luna, *Sovereignty and Suspicion*, 48 DUKE L.J. 787, 867 (1999) (stating that “for a number of years, the government has utilized ‘thermal imagers’ to

A thermal imager is a passive monitoring device—it emits no rays or beams.³⁶ Thermal imagers operate like ordinary video cameras except that they detect and record infrared radiation instead of visible light.³⁷ A thermal imager converts infrared radiation into images that are displayed on a black and white video monitor.³⁸ The shades of these images correspond to relative temperature: black is cool, white is hot, and shades of gray indicate relative temperature differences.³⁹ Thermal imagers are very sensitive to changes in temperature; for example, they can detect temperature differences as small as one-tenth of a degree Celsius.⁴⁰ Although the image recorded by a thermal imager is relatively crude, a thermal imager produces discernable images of objects in its field of view including humans.⁴¹

The thermal-imaging scan of Kylo's unit showed that the temperatures of a side wall and the roof over the garage of his unit were substantially higher than that of the neighboring units in the triplex.⁴² Based on the thermal-imaging data, the agents concluded that Kylo was using high-intensity lamps to grow marijuana in his

search private residences for illegal drug cultivation"); Tracy M. White, Note, *The Heat is On: The Warrantless Use of Infrared Surveillance to Detect Indoor Marijuana Cultivation*, 27 ARIZ. ST. L.J. 295, 295–96 (1995) (noting law enforcement's use of forward-looking infrared devices to establish evidence of indoor marijuana cultivation).

35. *Kyllo*, 190 F.3d at 1044 (describing how an agent of the United States Bureau of Land Management and an officer of the Oregon National Guard used a thermal imager to examine the triplex of homes where Kylo resided).

36. In that sense, a thermal imager is a non-intrusive device that does not penetrate walls. See, e.g., *A Primer on Infrared Thermography*, at <http://www.infraredtraining.com/itetechnicalnotes/infraredprimer.htm> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (describing how thermal-imaging devices work).

37. All objects emit infrared radiation. See Paul Walorski, *What is Infrared*, at <http://www.ipac.caltech.edu/Outreach/Edu/infrared.html> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review). The amount of infrared radiation that an object emits is proportional to its absolute temperature—the warmer the object, the more infrared radiation it emits. Infrared radiation is invisible to the naked eye. *Id.* (describing infrared radiation and comparing it to visible light). Although humans might “see” the effect of heat radiating from an object, i.e., the “mirage effect,” what the eye is actually observing is a change in the refractive index with respect to temperature and not the infrared radiation or “heat waves” itself. See *What is the Mirage Effect?*, at <http://www.physlink.com/Education/AskExperts/ae428.cfm> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review).

38. *Kyllo v. United States*, 533 U.S. 27, 29–30 (2001).

39. *Id.*

40. See, e.g., *Thermography Infrared Camera/Prism DS*, <http://www.x20.org/thermal/prismds.htm> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (describing specifications of an infrared imaging camera).

41. *Id.* (providing examples of images recorded by an infrared imaging camera).

42. *United States v. Kyllo*, 190 F.3d 1041, 1044 (9th Cir. 1999), cert. granted, 530 U.S. 1305 (2000), rev'd and remanded, 258 F.3d 1004 (9th Cir. 2001), rev'd, 533 U.S. 27 (2001).

home.⁴³ Relying on records of utility bills, tips from informants, and the thermal-imaging data, a magistrate judge issued a search warrant for Kylo's home.⁴⁴ When agents executed the search warrant, they found an indoor-growing operation involving more than one hundred marijuana plants.⁴⁵

A federal grand jury indicted Kylo on one count of manufacturing marijuana.⁴⁶ At trial, Kylo moved unsuccessfully to suppress the evidence seized from his home, entered a conditional guilty plea and was sentenced to a prison term of sixty-three months.⁴⁷ The Ninth Circuit remanded the case for an evidentiary hearing regarding the intrusiveness of thermal imaging.⁴⁸ On remand, the district court upheld the validity of the warrant that relied, in part, on the thermal-imaging data and reaffirmed its denial of Kylo's motion to suppress.⁴⁹ A divided court of appeals initially reversed,⁵⁰ but that opinion was withdrawn⁵¹ and the panel, after a change in composition, affirmed the district court.⁵² The U.S. Supreme Court granted certiorari during the October 2000 term.⁵³

43. *Id.* (noting that the agents based their conclusion on an inference from the thermal-imaging results).

44. *Id.* at 1043–44.

45. *Id.* at 1044.

46. *Id.*

47. *Id.* The trial court's denial of Kylo's motion to suppress was upheld on appeal. See *United States v. Kylo*, 809 F. Supp. 787, 792 (D. Or. 1992) (denying Kylo's motion to suppress the thermal-imaging evidence); see also *United States v. Kylo*, 809 F. Supp. 787, 794 (D. Or. 1993) (upholding, on reconsideration, its earlier order denying Kylo's motion to suppress).

48. *United States v. Kylo*, 37 F.3d 526, 530–31 (9th Cir. 1994) (remanding the case to the district court for findings on the technological capabilities of the thermal imager, including whether the thermal imager "can detect sexual activity in the bedroom . . . or, at the other extreme, whether it can only detect hot spots where heat is escaping from a structure").

49. *United States v. Kylo*, 1996 U.S. Dist. LEXIS 3864 (D. Or. 1996) (finding that, because the thermal imager recorded only the heat emitted from the home and not intimate details of the home, it did not intrude on the privacy of the individuals within the home).

50. *United States v. Kylo*, 140 F.3d 1249 (9th Cir. 1998).

51. *United States v. Kylo*, 184 F.3d 1059 (9th Cir. 1999).

52. *United States v. Kylo*, 190 F.3d 1041, 1046–47 (9th Cir. 1999) (holding that, because the thermal scan did not intrude into activities within Kylo's home and Kylo did not have a reasonable expectation of privacy in the information that the thermal imager provided, the use of the thermal imager did not constitute a search under the Fourth Amendment), *cert. granted*, 530 U.S. 1305 (2000), *rev'd and remanded*, 258 F.3d 1004 (9th Cir. 2001), *rev'd*, 533 U.S. 27 (2001).

53. *Kyllo v. United States*, 530 U.S. 1305 (2000).

II. APPLICATION OF THE FOURTH AMENDMENT TO TECHNOLOGY-ENHANCED SURVEILLANCE

The Fourth Amendment provides that “[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated.”⁵⁴ The threshold question in Fourth Amendment cases is whether or not the government conduct constitutes a “search”—if that conduct does not constitute a “search,” the Fourth Amendment does not apply.⁵⁵ The Court’s definition of a “search” for Fourth Amendment purposes has evolved through a series of cases addressing the government’s use of sense-enhancing technology.⁵⁶ These cases established the Fourth Amendment doctrine that lower courts have applied to cases involving thermal-imaging surveillance.⁵⁷

Courts historically tied Fourth Amendment jurisprudence to common law trespass.⁵⁸ The existence of a search, therefore, depended on whether a physical trespass had occurred.⁵⁹ When first confronted with what at the time was a new surveillance technology, e.g., the wiretapping of telephone lines, the U.S. Supreme Court adhered to this trespass-based Fourth Amendment doctrine. In *Olmstead v. United States*,⁶⁰ the Court held that the wiretapping of telephone lines was not a search within the meaning of the Fourth Amendment because an actual physical invasion of the defendant’s

54. U.S. CONST. amend. IV. The Fourth Amendment was adopted in response to the use of general warrants and writs of assistance, which enabled British soldiers to conduct wide-scale searches of colonists’ homes for contraband. *See Boyd v. United States*, 116 U.S. 616, 624–29 (1886) (discussing the history of the Fourth Amendment).

55. *See* Wayne R. LaFare, *The Fourth Amendment: “Second to None in the Bill of Rights,”* 75 ILL. B.J. 424, 427 (1987) (“[T]he police conduct in question must constitute either a ‘search’ or a ‘seizure’ as those terms are used in the Fourth Amendment.”).

56. *See, e.g., Dery, supra* note 17, at 358–65 (discussing the evolution of the Court’s Fourth Amendment doctrine as applied to sense-enhancing technology).

57. *See infra* notes 108–39.

58. *See Goldman v. United States*, 316 U.S. 129, 134–36 (1942) (holding that use of a dictaphone to overhear conversations did not violate the Fourth Amendment because the information was not obtained by trespass or unlawful entry), *overruled in part by Katz v. United States*, 389 U.S. 347 (1967); *Olmstead v. United States*, 277 U.S. 438, 457–66 (1928) (holding that tapping telephones did not violate the Fourth Amendment because no trespass was committed upon any property of the defendants), *overruled in part by Katz v. United States*, 389 U.S. 347 (1967). *But see Silverman v. United States*, 365 U.S. 505, 510–12 (1961) (holding a technical trespass not necessary for Fourth Amendment violation).

59. *See Olmstead*, 277 U.S. at 466 (noting that no cases to date have found a violation of the Fourth Amendment unless an actual physical intrusion of the defendant’s house or curtilage occurred for the purpose of making a search or seizure).

60. 277 U.S. 438 (1928).

house did not occur.⁶¹ *Olmstead* thus gave rise to the doctrine that electronic surveillance does not constitute a search for Fourth Amendment purposes where no physical trespass occurs.⁶² Although the doctrine articulated in *Olmstead* was not without its critics,⁶³ the Court applied it to an electronic-surveillance case fourteen years later.⁶⁴ In *Goldman v. United States*,⁶⁵ the Court applied this doctrine to hold that the use of a listening device, such as a dictaphone, placed against the wall adjoining a defendant's office did not violate the Fourth Amendment because the placement and use of the dictaphone was not accomplished through a trespass or unlawful entry.⁶⁶ Thus, under *Olmstead* and *Goldman*, private activities, such as conversations, in the home or office gave rise to no specific Fourth Amendment protection so long as a physical trespass was not involved in observing the activities.

The Court did not always sustain law enforcement's use of warrantless electronic surveillance under this trespass-based Fourth Amendment doctrine, however. For example, in *Silverman v. United States*,⁶⁷ the Court held that the police officer's use of a microphone attached to a foot-long spike violated the Fourth Amendment because they conducted an unauthorized physical penetration into the premises occupied by the defendants to accomplish the eavesdropping, even though the police officers themselves did not physically trespass on the defendants' property.⁶⁸ *Silverman* exposed

61. *Id.* at 466. In *Olmstead*, federal prohibition officers inserted wire taps along the telephone wires running from the basement of a large office building and from the streets near residences of persons suspected of unlawfully dealing in the liquor trade. The officers applied the wire taps without trespassing on the defendants' property. *Id.* at 457.

62. See Morgan Cloud, *The Fourth Amendment During the Lochner Era: Privacy, Property, and Liberty in Constitutional Theory*, 48 STAN. L. REV. 555, 598-616 (1996).

63. See, e.g., *Olmstead*, 277 U.S. at 472-73 (Brandeis, J., dissenting) (describing technological advances, such as wiretaps, as "means far more effective than stretching on the rack" for obtaining disclosure in violation of the Fourth Amendment's protections and proposing that the Court "adopt a construction susceptible of meeting modern conditions").

64. *Goldman v. United States*, 316 U.S. 129, 135-36 (1942).

65. 316 U.S. 129 (1942).

66. *Id.* at 134. The Court refused to distinguish *Goldman* from *Olmstead*. Instead, the Court found no difference between a person using a telephone to project his voice beyond the confines of his home or office and assuming the risk that the conversation might be intercepted, and a person talking in his own office, who does not intend for his voice to go beyond the four walls of the office, and thus does not assume the risk of someone using a listening device in the next room to overhear the conversation. *Id.* at 135.

67. 365 U.S. 505 (1961).

68. *Id.* at 506-07. The Court distinguished *Silverman* from *Goldman* because the officers inserted the "spike mike" into the wall separating their observation post from the

the inconsistency of the trespass-based doctrine,⁶⁹ as the Court adhered to the traditional concept of a trespass and physical intrusion being necessary for Fourth Amendment violation, but articulated a new standard by stating that a Fourth Amendment violation arises if an “actual intrusion into a constitutionally protected area” occurs.⁷⁰ This new standard, however, was short-lived, as *Katz v. United States*⁷¹ eventually decoupled Fourth Amendment rights from trespass and property law and rejected *Olmstead*’s trespass-based theory.⁷²

In *Katz*, FBI agents attached an electronic listening device to the outside of a public phone booth and recorded conversations that defendant *Katz* made to place illegal gambling bets. Justice Stewart, writing for the Court, proclaimed that “the Fourth Amendment protects people, not places.”⁷³ Under this concept, “[w]hat a person knowingly exposes to the public, even in his own home or office, is not a subject of Fourth Amendment protection.”⁷⁴ Accordingly, “[w]hat he seeks to preserve as private, even in an area accessible to the public, may be constitutionally protected.”⁷⁵

The Court held that *Katz* was protected under the Fourth Amendment because he “justifiably relied” on the privacy of the telephone booth.⁷⁶ The test that ultimately emerged from *Katz*, however, came from Justice Harlan’s concurrence, which requires “first that a person have exhibited an actual (subjective) expectation of privacy and, second, that the expectation be one that society is prepared to recognize as ‘reasonable.’ ”⁷⁷ In refining this two-prong test, the Court has subsequently held that a Fourth Amendment

suspect’s premises until it contacted a heating duct, thus converting the entire heating system into a conductor of sound. *Id.*

69. Although the type of information obtained in *Silverman* was the same as that obtained in *Goldman*, the Court in *Goldman* held that the officers’ eavesdropping was not a search because their microphone had been placed against a wall on the side opposite the defendant’s office, whereas the Court in *Silverman* found a constitutional violation where police used a foot-long microphone to penetrate a party’s wall, thereby trespassing on the private property of the defendant.

70. *Silverman*, 365 U.S. at 512.

71. 389 U.S. 347 (1967).

72. *Id.* at 353; see also Ric Simmons, *From Katz to Kyllo: A Blueprint for Adapting the Fourth Amendment to Twenty-First Century Technologies*, 53 HASTINGS L.J. 1303, 1312 (2002) (noting that *Katz*, by considering the acts of the defendant to protect his privacy, i.e., shutting the door to the phone booth, represented a departure from *Goldman* and *Silverman*, which only considered the acts taken by the government agents).

73. *Katz*, 389 U.S. at 351 (citations omitted).

74. *Id.*

75. *Id.* at 351–52.

76. *Id.* at 353.

77. *Id.* at 361 (Harlan, J., concurring).

search does not occur unless “the individual manifested a subjective expectation of privacy in the object of the challenged search” and “society [is] willing to recognize that expectation as reasonable.”⁷⁸

Although some jurisprudence following *Katz* gave a broad meaning to the right to privacy,⁷⁹ most decisions have diminished these rights.⁸⁰ Several cases involving technology-enhanced surveillance have used the analytical framework from *Katz* to limit, rather than protect, Fourth Amendment rights.⁸¹ The progeny of *Katz* most relevant to the thermal-imaging cases are those decisions involving visual surveillance.⁸²

Historically, English law considered visual surveillance to be lawful because “the eye cannot . . . be guilty of a trespass.”⁸³ Visual surveillance of a home is still allowed under the Fourth

78. *California v. Ciraolo*, 476 U.S. 207, 211 (1986).

79. *See, e.g., O'Connor v. Ortega*, 480 U.S. 709, 718 (1987) (finding that government employees have a reasonable expectation of privacy in personal property stored in desks and file cabinets located on government property); *New Jersey v. T.L.O.*, 469 U.S. 325, 337–40 (1985) (holding that school children have a reasonable expectation of privacy in personal property and that they do not necessarily waive that right to privacy by entering onto public school grounds).

80. *See* Thomas K. Clancy, *What Does the Fourth Amendment Protect: Property, Privacy, or Security?*, 33 WAKE FOREST L. REV. 307, 335 (1998) (noting that “the overall tendency of the Court has been to contract the protected individual interest as a consequence of modern technological advances and their utilization by the government”).

81. *See, e.g., United States v. Knotts*, 460 U.S. 276, 285 (1983) (holding that monitoring signals from an electronic tracking device placed in a container of a chemical solvent to be used in a drug laboratory did not invade any legitimate expectation of privacy and did not constitute a search under the Fourth Amendment because the monitoring did not reveal any information that could not have been obtained through visual surveillance); *Smith v. Maryland*, 442 U.S. 735, 745–46 (1979) (holding that the use of a pen register to record numbers dialed from a suspect’s home was not a “search” under the Fourth Amendment because the suspect had no reasonable expectation of privacy in the numbers that he voluntarily made available to telephone company personnel). *But see United States v. Karo*, 468 U.S. 705, 712–14 (1984) (holding that the installation of an electronic tracking device in a container of chemical solvent to be used in a drug laboratory did not constitute a search, but monitoring the signal while the device was in a private residence violated the Fourth Amendment).

82. *See, e.g., Florida v. Riley*, 488 U.S. 445, 450–52 (1989) (holding that visual surveillance from a helicopter at an altitude of four hundred feet of the interior of a greenhouse in the backyard of a residence was not a search requiring a warrant under the Fourth Amendment); *Dow Chem. Co. v. United States*, 476 U.S. 227, 231 (1986) (finding no Fourth Amendment violation where the Environmental Protection Agency engaged in warrantless aerial photographing of Dow Chemical’s manufacturing plant because any person with access to a camera and an airplane could have taken the same photographs); *Ciraolo*, 476 U.S. at 215 (finding no reasonable expectation of privacy from aerial surveillance in an age where commercial flights are routine); *see also infra* Section IV notes 140–61 discussing the Court’s decision in *Kyllo*.

83. *Boyd v. United States*, 116 U.S. 616, 628 (1886) (quoting *Entick v. Carrington*, 95 Eng. Rep. 807 (K. B. 1765)).

Amendment.⁸⁴ For example, in *California v. Ciraolo*,⁸⁵ the Court held that “aerial observation . . . from an altitude of 1,000 feet of a fenced-in backyard within the curtilage of a home” did not violate the Fourth Amendment.⁸⁶ The Court in *Ciraolo* reasoned that, although the defendant had met the subjective expectation of the privacy test under *Katz*, his expectation “that his marijuana plants were constitutionally protected from being observed with the naked eye from an altitude of 1,000 feet” was unreasonable.⁸⁷

Likewise, in *Dow Chemical Co. v. United States*,⁸⁸ where a government agency photographed a manufacturing facility with a precision aerial-mapping camera, the Court held that the use of such a camera in an area falling somewhere between “open fields” and “curtilage” did not intrude into the manufacturer’s reasonable expectations of privacy.⁸⁹ Important to the context of *Kyllo*, the Court in *Dow Chemical* noted that surveillance of private property with more sophisticated equipment not generally available to the public might be constitutionally proscribed.⁹⁰ The Court also suggested that more detailed surveillance techniques might have led to a different result, noting that “an electronic device to penetrate walls or windows . . . would raise very different and far more serious questions.”⁹¹ The Court in *Dow Chemical* further found that it was “important that this is *not* an area immediately adjacent to a private home, where privacy expectations are most heightened.”⁹² Three years after *Dow Chemical*, the Court narrowed this doctrine by holding in *Florida v. Riley*⁹³ that an aerial surveillance of a private

84. *Ciraolo*, 476 U.S. at 213 (noting that the “Fourth Amendment protection of the home has never been extended to require law enforcement officers to shield their eyes when passing by a home on public thoroughfares”).

85. 476 U.S. 207 (1986).

86. *Id.* at 209.

87. *Id.* at 215.

88. 476 U.S. 227 (1986).

89. *Id.* at 239.

90. *Id.* at 238 (noting that, although the photographs gave the government more detailed information than naked-eye views, they were not so revealing of intimate details as to raise constitutional concerns).

91. *Id.* at 239.

92. *Id.* at 237 n.4.

93. 488 U.S. 445 (1989). In *Riley*, an officer, while circling overhead at an altitude of four hundred feet in a helicopter, observed with his naked eye what he thought was marijuana growing in a greenhouse on the suspect’s property. *Id.* at 448. Relying on its decision in *Ciraolo*, the Court held that observation of the suspect’s curtilage from this vantage point did not violate the Fourth Amendment. *Id.* at 452.

home that discloses “no intimate details connected with the use of the home or curtilage” does not constitute a search.⁹⁴

Cases that did not involve the use of technology-enhanced surveillance devices, but nevertheless implicated the Fourth Amendment doctrine articulated in *Katz*, are also relevant to the thermal-imaging cases. In *United States v. Place*,⁹⁵ the Court held that use of a trained, narcotics-detecting dog to sniff luggage in a public place did not constitute a search within the meaning of the Fourth Amendment because, in part, the canine sniff discloses only the presence or absence of narcotics.⁹⁶ In *California v. Greenwood*,⁹⁷ the Court held that the Fourth Amendment did not prohibit the warrantless search of garbage left for collection outside the curtilage of the home because society did not accept a subjective expectation of privacy in the garbage as objectively reasonable.⁹⁸ Many lower courts adopted one of these two approaches in analyzing thermal-imaging cases.⁹⁹

The protection the Fourth Amendment traditionally affords people in their homes is also relevant to the thermal-imaging cases.¹⁰⁰ With a few exceptions, warrantless searches of a home are considered unreasonable and are therefore unconstitutional.¹⁰¹ In contrast, the Court affords less protection outside the curtilage of the home,¹⁰² a

94. *Id.*

95. 462 U.S. 696 (1983).

96. *Id.* at 707.

97. 486 U.S. 35 (1988).

98. *Id.* at 40. The Court in *Greenwood* concluded that, because he left his garbage on a public street “readily accessible to animals, children, scavengers, snoops, and other members of the public,” the defendant abandoned any claim he may have had to Fourth Amendment protection. *Id.* at 40–41. Furthermore, because the defendant deliberately placed his garbage at the curb for the express purpose of having a third party take it, he would have no reasonable expectation of privacy in the items that he discarded. *Id.* at 41.

99. See *infra* notes 113–26 and accompanying text.

100. *Silverman v. United States*, 365 U.S. 505, 511 (1961) (stating that the “right of a man to retreat into his own home and there be free from unreasonable government intrusion” is “at the very core” of the Fourth Amendment).

101. See, e.g., *Illinois v. Rodriguez*, 497 U.S. 177, 181 (1990) (noting that an exception to the unconstitutionality of a warrantless entry of a home occurs where voluntary consent has been given or where a third party possesses common authority over the premises).

102. See, e.g., *Oliver v. United States*, 466 U.S. 170, 179 (1984) (holding the government’s warrantless physical intrusion into private, open fields was not an unreasonable search under the Fourth Amendment because “open fields do not provide the setting for those intimate activities that the Amendment is intended to shelter from government interference or surveillance”). The Court in *Oliver* concluded that “an individual has no legitimate expectation that open fields will remain free from warrantless intrusion by government officers.” *Id.* at 181; see also *United States v. Dunn*, 480 U.S. 294, 301–05 (1987) (holding that peering, without a warrant, into a barn to observe a drug laboratory did not violate the Fourth Amendment because the barn was not within the

concept that becomes important when considering the scope of the Court's decision in *Kyllo* and its hypothetical application to thermal-imaging cases already decided by lower courts.

Although a thermal imager is technically most related to other optical devices, such as sophisticated cameras used to conduct visual surveillance,¹⁰³ the lower courts did not necessarily follow the progeny of *Katz* dealing with the constitutionality of visual surveillance¹⁰⁴ when confronted with thermal imaging cases. Instead, the lower courts attempted to analogize the information obtained with a thermal imager to that obtained by sifting through garbage or from a drug-sniffing dog.¹⁰⁵ The Court did not follow these strained analogies and instead focused on the sanctity of the home and distinguished *Kyllo* from the visual surveillance progeny of *Katz* that dealt with the warrantless observation of, for example, manufacturing facilities.¹⁰⁶

III. LOWER COURT DECISIONS INVOLVING THERMAL-IMAGING SURVEILLANCE

Before the Court heard *Kyllo*,¹⁰⁷ five circuits, including the Ninth Circuit, held that the warrantless use of a thermal imager did not violate the Fourth Amendment.¹⁰⁸ Only one Circuit, the Tenth, held that the use of a thermal imager constituted an unconstitutional

curtilage of the home and observations from open fields do not violate any other privacy expectation).

103. See *Dow Chem. Co. v. United States*, 476 U.S. 227, 239 (1986).

104. See *supra* notes 82–94.

105. See *infra* notes 113–26.

106. See *infra* notes 140–61.

107. *Kyllo v. United States*, 533 U.S. 27 (2001).

108. See *United States v. Kyllo*, 190 F.3d 1041, 1046 (9th Cir. 1999) (concluding that the thermal-imaging surveillance did not reveal intimate details so as to violate the Fourth Amendment), *cert. granted*, 530 U.S. 1305 (2000), *rev'd and remanded*, 258 F.3d 1004 (9th Cir. 2001), *rev'd*, 533 U.S. 27 (2001); *United States v. Robinson*, 62 F.3d 1325, 1330 (11th Cir. 1995) (holding that thermal-imaging surveillance of an occupied home was not an unreasonable search in violation of the Fourth Amendment), *cert. denied*, 517 U.S. 1220 (1996); *United States v. Ishmael*, 48 F.3d 850, 853–57 (5th Cir. 1995) (holding that the warrantless use of a thermal imager in an “open field” does not violate the Fourth Amendment), *cert. denied*, 516 U.S. 818 (1995); *United States v. Myers*, 46 F.3d 668, 670 (7th Cir. 1995) (finding that thermal imaging is not a search within the meaning of the Fourth Amendment), *cert. denied*, 516 U.S. 879 (1995); *United States v. Ford*, 34 F.3d 992, 995–97 (11th Cir. 1994) (holding that ground surveillance with a thermal imager of an unoccupied mobile home on leased land is not an unreasonable search under the Fourth Amendment); *United States v. Pinson*, 24 F.3d 1056, 1058–59 (8th Cir. 1994) (concluding that the warrantless use of a thermal imager did not violate the Fourth Amendment because the defendant did not have a reasonable expectation of privacy in the heat emanating from his home), *cert. denied*, 513 U.S. 1057 (1994).

search under the Fourth Amendment.¹⁰⁹ The circuit courts have also decided several cases involving thermal-imaging on other grounds without addressing the Fourth Amendment implications of the thermal-imaging surveillance.¹¹⁰

The outcome of the thermal-imaging cases in the lower courts often turned on how the court framed the inquiry in the first prong of the *Katz* analysis: (1) whether the defendants retain an expectation of privacy in the heat radiated *from* their home or (2) whether the defendants possess an expectation of privacy in the heat produced from the activities *within* their home.¹¹¹ Although the lower courts typically started their analysis of thermal-imaging cases with the two-pronged test from *Katz*,¹¹² they did not rely exclusively on the line of cases following *Katz* that addressed surveillance by electronic devices or visual surveillance. The lower courts instead generally analyzed thermal-imaging cases under one of three approaches: waste heat, canine sniff, or intimate details.

A. Waste-Heat Approach

Under the waste-heat approach, courts draw an analogy between the heat emanating from a structure in which high-intensity lamps

109. See *United States v. Cusumano*, 67 F.3d 1497, 1506 (10th Cir. 1995) (holding that the surveillance of a home with a thermal imager intrudes upon an expectation of privacy that society deems reasonable), *vacated on other grounds en banc* by 83 F.3d 1247 (10th Cir. 1996).

110. See *United States v. Black*, No. 99-6117, 2001 U.S. App. LEXIS 7755, at *18 (6th Cir. Apr. 18, 2001) (declining to address the constitutionality of the thermal-imaging surveillance because sufficient evidence to establish probable cause existed without the thermal-imaging data), *cert. denied*, 534 U.S. 891 (2001); *United States v. Olson*, 21 F.3d 847, 849-50 (8th Cir. 1994) (finding sufficient evidence independent of the thermal-imaging results to support a finding of probable cause), *cert. denied*, 513 U.S. 888 (1994); *United States v. Deaner*, 1 F.3d 192, 197 (3rd Cir. 1993) (withholding judgment on the use of a thermal-imaging device because the rest of the factual evidence would have supported probable cause to issue a search warrant to determine if marijuana was being cultivated in a private residence); *United States v. Barnett*, 989 F.2d 546, 556-57 (1st Cir. 1993) (holding that, although an officer with limited experience operated the thermal-imaging device used in aerial surveillance and the readings were questionable, other factual data supported probable cause for a search warrant to investigate the manufacture of methamphetamine), *cert. denied*, 510 U.S. 850 (1993), and *cert. denied*, 519 U.S. 849 (1996).

111. See James Francis Barna, Note, *Reforming the Katz Fourth Amendment "Reasonable Expectation of Privacy" Test: The Case of Infrared Surveillance of Homes*, 49 WASH. U. J. URB. & CONTEMP. L. 247, 275-78 (1996) (noting that when a court finds that a person's expectation of privacy refers to the heat emitted from the home, the thermal-imaging surveillance is deemed constitutional, whereas, if a court finds that the expectation of privacy refers to the sanctity of the home, the thermal-imaging surveillance is found to be unconstitutional).

112. *Id.* (discussing the application of the *Katz* test to thermal-imaging cases).

were being used and garbage left outside of one's home.¹¹³ In one of the first decisions addressing the constitutionality of thermal imaging, the United States District Court for the District of Hawaii held that the nonintrusive use of thermal imaging for detecting "waste heat" did not amount to a search within the meaning of the Fourth Amendment.¹¹⁴ In that case, the district court concluded that the defendant did not have a legitimate expectation of privacy in the waste heat because she voluntarily vented it outside where it was exposed to the public and she did not attempt to impede its escape from the structure.¹¹⁵ Moreover, the court determined that even if the defendant could demonstrate a subjective expectation of privacy in the waste heat, such an expectation would not be one that society would view as objectively reasonable.¹¹⁶ The Seventh, Eighth, and Eleventh Circuits have also applied the waste-heat doctrine to thermal-imaging cases.¹¹⁷

A criticism of the waste-heat approach is that waste heat, unlike garbage, can only be detected by a high-tech device.¹¹⁸ Additional criticisms of this approach are that, due to the laws of thermodynamics, dissipation of heat is an inevitable result of heat

113. This approach is based on *California v. Greenwood*, 486 U.S. 35 (1988), where the Court held that the warrantless search of garbage left outside the defendant's home would violate the Fourth Amendment only if the defendant manifested a subjective expectation of privacy in his garbage that society would accept as objectively reasonable. *Id.* at 40-41; see T. Wade McKnight, Comment, *Passive, Sensory-Enhanced Searches: Shifting the Fourth Amendment "Reasonableness" Burden*, 59 LA. L. REV. 1243, 1255-56 (1999) (discussing lower court decisions that have relied upon the waste-heat approach).

114. *United States v. Penny-Feeney*, 773 F. Supp. 220, 228 (D. Haw. 1991), *aff'd on other grounds sub nom.* *United States v. Feeney*, 984 F.2d 1053 (9th Cir. 1993). The Ninth Circuit initially overruled the "waste-heat" approach in *United States v. Kyllo*, 140 F.3d 1249, 1254-55 (9th Cir. 1998) (finding a reasonable expectation of privacy in an indoor marijuana-growing operation because the thermal-imaging data revealed intimate details of the home), *withdrawn by* 184 F. 3d 1057 (9th Cir. 1999).

115. *Penny-Feeney*, 773 F. Supp. at 226.

116. *Id.* (analogizing heat waste vented outside the home to garbage bags left on the curb in *Greenwood*).

117. *United States v. Myers*, 46 F.3d 668, 669-70 (7th Cir. 1995) (finding that because no attempt was made to exercise control over the heat emanating from the home, any expectation of privacy was unreasonable), *cert. denied*, 516 U.S. 879 (1995); *United States v. Ford*, 34 F.3d 992, 995 (11th Cir. 1994) (concluding that where the defendant took affirmative actions to vent excess heat generated by the grow lamps, he did not exhibit a subjective expectation of privacy in the heat emitted from the structure); *United States v. Pinson*, 24 F.3d 1056, 1058-59 (8th Cir. 1994) (concluding that the warrantless use of a thermal imager did not violate the Fourth Amendment because the defendant did not have a reasonable expectation of privacy in the heat emanated from his home), *cert. denied*, 513 U.S. 1057 (1994).

118. *State v. Siegal*, 934 P.2d 176, 186 (Mont. 1997) (stating that waste heat is not as readily accessible to the public as is discarded garbage).

production that does not require a deliberate act and the affirmative act of insulating a building to retain the heat is indicative of a subjective expectation of privacy in that heat.¹¹⁹ Based on these criticisms, one would think that cases where the defendant actively vents the excess heat (no expectation of privacy) could be distinguished from those cases where the heat naturally emanates from the structure (a subjective expectation of privacy) under the waste-heat approach. The Eleventh Circuit, however, when confronted with this scenario, declined to make such a distinction.¹²⁰

B. *Canine-Sniff Approach*

Some courts have drawn an analogy between thermal imagers and the use of trained, narcotic-detecting dogs to search individuals for contraband.¹²¹ This approach has its genesis in *United States v. Place*,¹²² where the Court held that exposure of luggage in a public place to a trained, narcotic-detecting dog does not constitute a search under the Fourth Amendment.¹²³ Like the use of drug-sniffing dogs, use of a thermal imager is non-intrusive and does not involve a physical search of the person.¹²⁴ A criticism of the canine-sniff approach is that, unlike trained dogs, a thermal imager does not discriminate between heat produced by legal and illegal activities.¹²⁵

119. *Id.* (noting that the dissipation of heat is not preventable in the same way that one can conceal garbage and that no matter how much one insulates a building, heat will still escape).

120. *Compare* *United States v. Robinson*, 62 F.3d 1325, 1330 (11th Cir. 1995) (finding no subjective expectation of privacy in the heat generated by an indoor marijuana growing operation where no steps were taken to prevent the heat from escaping), *cert. denied*, 517 U.S. 1220 (1996), *with* *Ford*, 34 F.3d at 995 (concluding that a defendant who punched holes in the floor of the building and installed a blower to vent the excess heat did not exhibit a subjective expectation of privacy in the heat emitted from the building).

121. *See* *Myers*, 46 F.3d at 670 (concluding that, analogous to the scent of drugs emanating from luggage, society is not willing to protect as reasonable an expectation of privacy in the waste heat emitted from a home); *Ford*, 34 F.3d at 997 (finding that the heat the defendant intentionally vented from his home was a waste byproduct of his marijuana cultivation and is analogous to scents emanating from contraband in luggage); *Pinson*, 24 F.3d at 1058 (finding that detecting heat escaping from a home with a sense-enhancing infrared camera is analogous to detecting odor emanating from a compartment with the sense-enhancing instrument of a canine sniff).

122. 462 U.S. 696 (1983).

123. *Id.* at 707 (holding that the use of nonintrusive equipment, such as a police-trained dog, does not constitute a search for purposes of the Fourth Amendment).

124. *See* *United States v. Penny-Feeney*, 773 F. Supp. 220, 227 (D. Haw. 1991), *aff'd on other grounds sub nom.* *United States v. Feeney*, 984 F.2d 1053 (9th Cir. 1993).

125. *See* *People v. Deutsch*, 44 Cal. App. 4th 1224, 1231 (1996) (noting that "because the thermal imager is indiscriminate in registering sources of heat it is an intrusive tool, which tells much about the activities inside the home which may be quite unrelated to any illicit activity"); *State v. Siegal*, 934 P.2d 176, 187 (Mont. 1997) (noting that the "flaw in the

For example, the heat produced in Kyllo's home could have been emitted from high-intensity heat lamps used to grow legal herbs instead of marijuana.¹²⁶

C. *Intimate-Details Approach*

The intimate-details approach is derived from dictum in *Dow Chemical Co. v. United States*,¹²⁷ where the Court stated that aerial photographs taken of an industrial complex were "not so revealing of intimate details as to raise constitutional concerns."¹²⁸ This approach is an extension of the *Katz* standard, but examines the content of the information revealed by the surveillance instead of the means used to obtain it.¹²⁹ The Court has often used this approach to limit, rather than enhance, the expectation of privacy provided under *Katz*.¹³⁰

Most courts that have relied on the intimate-details approach determined, by examining the underlying scientific principles of thermal imaging, that the use of the thermal imager is not a search under the Fourth Amendment because this technology cannot reveal any "intimate details" about the activities occurring inside the home.¹³¹ Other courts have taken the view, however, that interpretation of the thermal-imaging data allows the government to

canine-sniff approach is that the thermal imagers provide information about heat emissions both legal and illegal while canine sniffs only provide information about the presence of illicit substances"); see also Richard S. Julie, Note, *High-Tech Surveillance Tools and the Fourth Amendment: Reasonable Expectations of Privacy in the Technological Age*, 37 AM. CRIM. L. REV. 127, 135-36 (2000) (criticizing the application of the canine-sniff approach to thermal-imaging cases because heat is naturally emitted by ordinary, non-criminal behavior, as opposed to the odor emitted by narcotics, which almost always constitutes direct evidence of a crime).

126. The irony of Kyllo's street address, 878 Rhododendron Drive, in Florence, Oregon, has not been lost on pundits. See, e.g., George F. Will, *Not Too Strict to Apply Justice*, WASH. POST, June 17, 2001, at B7 (noting that Kyllo was not growing rhododendrons in his home on Rhododendron Drive).

127. 476 U.S. 227 (1986).

128. *Id.* at 238.

129. See *Simmons*, *supra* note 72, at 1322-23 (discussing the use of a results-based test in Fourth Amendment jurisprudence).

130. See *Florida v. Riley*, 488 U.S. 445, 452 (1989) (finding no evidence in the record showing "intimate details connected with the use of [his] home or curtilage were observed"); *California v. Ciraolo*, 476 U.S. 207, 215 n.3 (1986) ("Aerial observation of curtilage may become invasive, either due to physical intrusiveness or through modern technology which discloses to the senses those intimate associations, objects or activities otherwise imperceptible to police or fellow citizens.").

131. See *United States v. Ishmael*, 48 F.3d 850, 856 (5th Cir. 1995) (concluding that, because thermal imaging is a "passive, nonintrusive instrument" that does not send any beams or rays into the area on which it is fixed or in any way penetrates within that area, no intimate details of the home are observed), *cert. denied*, 516 U.S. 818 (1995).

monitor intimate details of domestic activities that generate a significant amount of heat.¹³² Still other courts have found that, although the use of thermal imaging was not intrusive enough to trigger a Fourth Amendment violation, more advanced technology may do so in the future.¹³³ One commentator feared that the Supreme Court would adopt the intimate-details approach if it was confronted with the issue of thermal-imaging surveillance, and thereby limit an individual's Fourth Amendment protection from such government conduct.¹³⁴

D. *General Criticisms of the Canine-Sniff and Waste-Heat Approaches*

A general criticism of the canine-sniff and waste-heat approaches is that both rely on strained analogies between the capabilities of thermal imaging and some unrelated, non-technological surveillance technique.¹³⁵ Unlike garbage, which can be sifted without the aid of any sense-enhancing device, the heat produced from high-intensity lamps in an indoor marijuana growing operation can only be detected by sophisticated infrared detectors. Also, unlike the use of trained narcotic-detecting dogs that, in effect, enhance a human's sense of smell, the use of thermal-imaging equipment provides entirely new

132. See *United States v. Cusumano*, 67 F.3d 1497, 1504 n.11 (10th Cir. 1995) (noting the capabilities of thermal imagers to detect human forms and activities), *vacated on other grounds en banc*, 83 F.3d 1247 (10th Cir. 1996); *Commonwealth v. Gindelsperger*, 743 A.2d 898, 901–02 (Pa. 1999) (“Courts that have . . . found the use of thermal imaging devices to be constitutionally repugnant have done so based upon the conclusion that these devices do, in fact, reveal intimate details regarding activities occurring within the sanctity of the home, the place deserving the utmost protection pursuant to the Fourth Amendment.”).

133. *United States v. Myers*, 46 F.3d 668, 670 n.1 (7th Cir. 1995) (“While it is true that other technology may be, or may become so advanced that it could unlawfully penetrate the walls of our home or be otherwise unacceptably intrusive, this is not the case before us.”).

134. See Merrick D. Bernstein, Note, “*Intimate Details*”: *A Troubling New Fourth Amendment Standard for Government Surveillance Techniques*, 46 DUKE L.J. 575, 578 (1996) (arguing that the Supreme Court's adoption of an “intimate details” standard would alter “the balance between the government's interest in effective surveillance and citizens' privacy rights”).

135. See Barna, *supra* note 111, at 278–80 (arguing that such analogies overlook the fact that infrared devices do more than simply amplify human senses, because humans cannot see, touch, hear, smell, or taste infrared radiation); see also McKnight, *supra* note 113, at 1259 (concluding that courts are straining to put a “square peg in a circle” by applying such analogies); Simmons, *supra* note 72, at 1343–47 (arguing that a distinction between “sense-enhancing” devices and “sense-replacing” devices is irrelevant because it focuses on the method of search, rather than the results of the search).

information (i.e., the relative amount of infrared radiation) that cannot be detected directly by the human senses.¹³⁶

Although the fundamental differences in the detection capabilities of thermal imagers make the analogies to waste heat and canine sniffs strained, the majority of courts that have addressed the constitutionality of thermal-imaging surveillance nevertheless have applied one or both of these approaches.¹³⁷ In fact, the Ninth Circuit in *Kyllo* relied on both the waste-heat and the canine-sniff approaches in concluding that the use of a thermal imager did not constitute a search under the Fourth Amendment and that *Kyllo* did not have a subjective expectation of privacy in the heat emitted from his home.¹³⁸ The Ninth Circuit also applied the intimate-details approach to find that, even if *Kyllo* could demonstrate a subjective expectation of privacy in the heat emitted from his home, he had not established that this expectation of privacy would be accepted by society as objectively reasonable.¹³⁹

IV. THE SUPREME COURT'S DECISION IN *KYLLO*

The Court narrowly framed the issue in *Kyllo* by addressing only “whether the use of a thermal-imaging device aimed at a *private home* . . . to detect relative amounts of heat *within* the home constitutes a ‘search.’”¹⁴⁰ The Court further emphasized the sanctity of the home by asserting that “[a]t the very core’ of the Fourth Amendment ‘stands the right of a man to retreat into his own home and there be free from unreasonable governmental intrusion.’”¹⁴¹ The Court reasoned that to withdraw protection of the reasonable expectation of privacy that exists in the home “would be to permit police technology to erode the privacy guaranteed by the Fourth Amendment.”¹⁴²

136. See *supra* note 37 (explaining that the human eye cannot detect infrared radiation).

137. See *supra* note 113–26 and accompanying text; cf. *State v. Young*, 867 P.2d 593, 603 (Wash. 1994) (rejecting the garbage and canine-sniff analogies).

138. *United States v. Kyllo*, 190 F.3d 1041, 1046 (9th Cir. 1999), *cert. granted*, 530 U.S. 1305 (2000), *rev'd and remanded*, 258 F.3d 1004 (9th Cir. 2001), *rev'd*, 533 U.S. 27 (2001).

139. *Id.* at 1047; see *supra* notes 127–34 and accompanying text (describing intimate-details approach).

140. *Kyllo v. United States*, 533 U.S. 27, 29 (2001) (emphasis added).

141. *Id.* at 31 (quoting *Silverman v. United States*, 365 U.S. 505, 511 (1961)). The Court's emphasis on privacy in the home is consistent with the fundamental right to privacy articulated under due process and equal protection jurisprudence. See *Stanley v. Georgia*, 394 U.S. 557, 564–65 (1969) (articulating the right to read or view pornography in the privacy of one's home); *Griswold v. Connecticut*, 381 U.S. 479, 484–86 (1965) (upholding the right of married couples to use contraceptives in the privacy of the home).

142. *Kyllo*, 533 U.S. at 34.

While the Court recognized the difficulty in applying *Katz* when the search of public areas, such as telephone booths, automobiles, or even the curtilage of residences, is at issue, no such difficulty exists where the search is of the *interior* of homes.¹⁴³ Along these lines, the Court in *Kyllo* found that “obtaining by sense-enhancing technology any information regarding the interior of the home that could not otherwise have been obtained without physical ‘intrusion into a constitutionally protected area’ constitutes a search—at least where (as here) the technology in question is not in general public use.”¹⁴⁴ Thus, with this analysis, the Court intended to preserve “that degree of privacy against government that existed when the Fourth Amendment was adopted.”¹⁴⁵ On this basis, the Court held that the information obtained by the thermal imager was the product of a search.¹⁴⁶

The Supreme Court in *Kyllo* did not follow any of the three approaches adopted by the lower courts in thermal-imaging cases.¹⁴⁷ The Court rejected the government’s argument that “the thermal imaging must be upheld because it detected ‘only heat radiating from the external surface of the house.’”¹⁴⁸ To counter this argument, the majority drew an analogy between the thermal imager capturing only heat emanating from a home and a directional microphone picking up

143. *Id.*

144. *Id.* (quoting *Silverman v. United States*, 365 U.S. 505, 512 (1961)). Application of this test to the facts in *Kyllo* indicated that the surveillance amounted to a search because the thermal imager “reveals the relative heat of various rooms in the home . . .” which is “information regarding the interior of the home.” *Id.* at 35 n.2. By quoting this language, the Court gives credence to the standard articulated in *Silverman* that the Court declined to follow in *Katz* and perhaps signals that the Court is retreating to property-based Fourth Amendment jurisprudence. See *Katz v. United States*, 389 U.S. 347, 353 (1967); *infra* notes 203–05 and accompanying text.

145. *Kyllo*, 533 U.S. at 34. *But see* Bandes, *supra* note 9, at 1383 (noting that relying on Framers’ intent can be problematic when the particular concerns and expectations of the Framers’ historical time is conflated with the values underlying the Fourth Amendment); Raymond Shih Ray Ku, *The Founders’ Privacy: The Fourth Amendment and the Power of Technological Surveillance*, 86 MINN. L. REV. 1325, 1329 (arguing that “instead of asking whether the Founders would have considered the act in question a search, the Court should ask whether the Founders enjoyed this level of security from government surveillance and harassment”).

146. *Kyllo*, 533 U.S. at 34–35.

147. The Court, if anything, followed most closely the Ninth Circuit’s decision in *United States v. Kyllo*, 140 F.3d 1249, 1254–55 (9th Cir. 1998), *withdrawn*, 184 F.3d 1059 (9th Cir. 1999), and the Tenth Circuit’s decision in *United States v. Cusumano*, 67 F.3d 1497 (10th Cir. 1995), *vacated on other grounds en banc*, 83 F.3d 1247 (10th Cir. 1996).

148. *Kyllo*, 533 U.S. at 35 (citing the Brief for the United States at 26, *Kyllo v. United States*, 533 U.S. 27 (2001) (No. 99-8508)). This argument is the focal point of the dissenting opinion, which asserts that a fundamental difference between “off-the-wall” observation and “through-the-wall surveillance” exists. *Id.* at 41 (Stevens, J., dissenting).

only sound emanating from a house¹⁴⁹ and noted that the mechanical interpretation of the Fourth Amendment advocated by the government and the dissent was rejected in *Katz*, where the eavesdropping device picked up only sound waves that reached the exterior of the phone booth.¹⁵⁰ Thus, the majority argued that to hold otherwise would leave the homeowner at the mercy of advancing technology, including imaging technology that could discern all human activity in the home.¹⁵¹ In doing so, the majority adopted a rule that takes into account more sophisticated systems that are already in use or under development.¹⁵²

The government, relying on *Dow Chemical*, also contended that “the thermal imaging was constitutional because it did not ‘detect private activities occurring in private areas.’”¹⁵³ In response to this contention, the majority distinguished *Kyllo* from *Dow Chemical*, because an industrial complex, such as that at issue in *Dow Chemical*, does not share the Fourth Amendment sanctity of the home.¹⁵⁴ The Court asserted that, in the home, all details are intimate, because the entire area is held safe from prying government eyes.¹⁵⁵ The Court claimed, however, that limiting the prohibition of thermal imaging to intimate details would fail to provide “a workable accommodation between the needs of law enforcement and the interests protected by the Fourth Amendment.”¹⁵⁶ In developing this line of thought, the Court did not draw a connection between the sophistication of the surveillance equipment and the intimacy of the details that it

149. *Id.* at 35.

150. The dissent concluded that the thermal imaging did not constitute a search because “the equipment . . . did not penetrate the walls of [Kyllo’s] home” but instead did no more than “passively measure heat emitted from the exterior surfaces of [Kyllo’s] home.” *Id.* at 42–44 (Stevens, J., dissenting). Such an approach, however, is inconsistent with the teaching of *Katz*. See WAYNE R. LAFAYE, SEARCH AND SEIZURE § 2.2(d) at 75 (3d ed. Supp. 2002) (noting that the dissent’s approach would have produced a different result in *Katz* itself).

151. *Kyllo*, 533 U.S. at 35–36.

152. The Court discusses various technologies under development, including a radar-based, through-the-wall surveillance system, handheld-ultrasound through-the-wall surveillance, and a radar flashlight that will allow officers to detect individuals through interior building walls. *Id.* at 36 n.3. For information regarding such technology under development, see generally United States Department of Justice, National Institute of Justice, at <http://www.nlectc.org/virlib/>.

153. *Kyllo*, 533 U.S. at 37 (citing Brief for United States at 22, *Kyllo v. United States*, 533 U.S. 27 (2001) (No. 99-8508)).

154. *Id.*

155. *Id.* at 37–38 (claiming that under this interpretation, for example, the level to which *Kyllo* heated his residence was an “intimate detail”).

156. *Id.* at 38 (quoting *Oliver v. United States*, 466 U.S. 170, 181 (1984)).

observed.¹⁵⁷ The Court, therefore, declined to enunciate a rule based on the performance characteristics of a particular surveillance device because to do so would require it to specify which home activities are “intimate.”¹⁵⁸

Ultimately, the Court drew “a firm line at the entrance to the house” for Fourth Amendment purposes¹⁵⁹ and stated that the line “must be not only firm but also bright.”¹⁶⁰ While the Court acknowledged the possible conclusion that the thermal imaging in *Kyllo* did not significantly compromise the homeowner’s privacy, it purported to “take the long view, from the original meaning of the Fourth Amendment forward” in holding that “[w]here, as here, the Government uses a device that is not in general public use, to explore details of a private home that would previously have been unknowable without physical intrusion, the surveillance is a [Fourth Amendment] ‘search,’ and is presumptively unreasonable without a warrant.”¹⁶¹

The decision in *Kyllo*, from a Court that is generally believed to favor crime-control interests over privacy rights,¹⁶² came as a surprise to most Court-watchers.¹⁶³ The Court also heard six other Fourth Amendment cases during the same term that it decided *Kyllo*.¹⁶⁴ Loosely construed, these six cases break down equally into three victories for the Fourth Amendment rights of criminal defendants and three pro-law enforcement decisions.¹⁶⁵ Another surprising

157. *Id.* The Court acknowledged, however, that the case involved “officers on a public street engaged in more than naked-eye surveillance of a home.” *Id.* at 33.

158. *Id.* at 38–39.

159. *Id.* at 40 (quoting *Payton v. New York*, 445 U.S. 573, 590 (1980)).

160. *Id.*

161. *Id.*

162. See Chemerinsky, *supra* note 26, at 517–18 (noting that over the past few Terms criminal defendants have prevailed in a surprising number of cases in what is considered to be a conservative Court with great deference to law enforcement).

163. See David Cole, *Scalia’s Kind of Privacy*, NATION, July 23, 2001, at 6–7 (expressing surprise at the decision in *Kyllo* from a typically conservative Court). See generally, Stanley E. Adelman, *Safe at Home, But Better Buckle Up on the Road—Supreme Court Search and Seizure Decisions, 2000–2001 Term*, 37 TULSA L.J. 347 (2001) (reviewing recent Fourth Amendment cases before the Supreme Court).

164. See Charles H. Whitebread, *Recent Criminal Decisions of the United States Supreme Court: The 2000–2001 Term*, CT. REV., Summer 2002, at 41, 41–42 (2001) (reviewing the recent Supreme Court decisions involving an individual’s Fourth Amendment rights in the face of technological advance and law enforcement authority); see also Chemerinsky, *supra* note 26, at 517 (noting that criminal defendants prevailed in two out of the three Fourth Amendment cases heard during the Court’s 2000 Term).

165. See *Saucier v. Katz*, 533 U.S. 194, 209 (2001) (holding that a military officer who detained a protester was entitled to qualified immunity from suit, a decision that involved an issue separate from the Fourth Amendment question of whether unreasonable force

aspect of these Fourth Amendment cases is the shifting alignments of the Justices.¹⁶⁶ Unlike other areas of jurisprudence, which have involved fairly consistent voting patterns,¹⁶⁷ the Court exhibits shifting coalitions in Fourth Amendment cases.¹⁶⁸ These shifts are particularly apparent in *Kyllo* and *Atwater v. City of Lago Vista*.¹⁶⁹ These odd alliances make the Court's future direction in Fourth Amendment jurisprudence unpredictable.¹⁷⁰

was used in the seizure); *Arkansas v. Sullivan*, 532 U.S. 769, 769–72 (2001) (per curiam) (holding that officers can conduct an inventory of the contents of a car after arresting the driver for speeding); *Atwater v. City of Lago Vista*, 532 U.S. 318, 325–26 (2001) (holding that police had discretion to arrest and handcuff a person for a minor offense); *Ferguson v. City of Charleston*, 532 U.S. 67, 86 (2001) (holding that a state hospital testing pregnant women for drugs and then reporting the results to police constitutes an unconstitutional search); *Illinois v. McArthur*, 531 U.S. 326, 328 (2001) (ruling that police officers who have probable cause to search a home for easily destroyed contraband can keep a suspect from entering his own home during the brief time it takes to get a search warrant); *City of Indianapolis v. Edmond*, 531 U.S. 32, 35–36 (2001) (holding that a drug checkpoint with drug-sniffing dogs violated the Fourth Amendment because the checkpoint's primary purpose was indistinguishable from general interests of crime control).

166. In *Kyllo*, a 5–4 decision, Justice Scalia delivered the opinion of the Court, in which Justices Souter, Thomas, Ginsburg, and Breyer joined. *Kyllo*, 533 U.S. at 29. Justice Stevens filed a dissenting opinion, in which Chief Justice Rehnquist and Justices O'Connor and Kennedy joined. *Id.* at 41.

167. David J. Garrow, *A Reliably Assertive Supreme Court*, CHRISTIAN SCI. MONITOR, July 2, 2001, at 9 (stating that in most 5–4 decisions handed down by the present Court, the narrow majority is comprised of Chief Justice Rehnquist, and Justices O'Connor, Scalia, Kennedy, and Thomas, with the minority being comprised of Justices Stevens, Souter, Ginsburg, and Breyer).

168. See, e.g., Marcia Coyle, *Search Cases Puzzle Experts*, NAT. L.J., June 25, 2001, at A1 (noting that the very conservative Justice Scalia wrote the *Kyllo* opinion, whereas conservative Chief Justice Rehnquist and Justices O'Connor and Kennedy joined Justice Stevens, the Court's most liberal justice, in dissenting from the decision); David G. Savage, *Taking a Page From History: Old English, Colonial Law Revisited in Pot Scanning, Warrantless Arrest Cases*, A.B.A. J., Aug. 2001, at 32 (noting that the *Kyllo* decision confounded Supreme Court observers and pundits, not so much for the final outcome, but because of the odd alliance of the justices, with Chief Justice Rehnquist and the more liberal Justice Stevens in dissent, joined by swing votes of Justices O'Connor and Kennedy, who almost always make up the majority). See generally, Christopher E. Smith and Steven B. Dow, *Criminal Justice and the 2000–2001 U.S. Supreme Court Term*, 79 U. DET. MERCY L. REV. 189 (2002) (providing an empirical interpretation of the individual Supreme Court Justices' votes in criminal justice cases, including those involving Fourth Amendment issues).

169. 532 U.S. 318 (2001) (holding that police had discretion to arrest and handcuff a person for a minor traffic offense). In *Atwater*, Justice Souter, joined by Chief Justice Rehnquist and Justices Scalia, Kennedy and Thomas, delivered the opinion of the Court. *Id.* at 322.

170. See Coyle, *supra* note 168 (noting that a pattern in the Fourth Amendment rulings has not emerged).

Law enforcement officials expressed initial disappointment in the *Kyllo* decision.¹⁷¹ Proponents of the use of thermal imaging in law enforcement, however, took a more pragmatic approach and viewed the decision in *Kyllo* as only requiring officers to obtain a search warrant before using thermal imagers to scan for heat characteristics of homes.¹⁷² This view is in line with that of the ABA Criminal Justice Section Task Force on Technology, which recommended requiring police to obtain a warrant in most investigations where they want to use high-tech surveillance equipment.¹⁷³ In the context of conducting searches of indoor marijuana growing operations, other evidence, such as high electric bills and informant tips, is typically available to support the necessary probable cause to obtain a search warrant.¹⁷⁴ Thus, *Kyllo* does not handcuff law enforcement totally in the war on drugs—the ultimate effect of *Kyllo* on law enforcement

171. See, e.g., Glen Elsasser, *Odd Court Alliance Voids Police Tactics; Scalia Joins 5–4 Majority Ruling on Heat Detector*, CHI. TRIB., June 12, 2001, at 1, (quoting the past president of the National Association of Chiefs of Police as stating the decision in *Kyllo* was “a shock to us”); Jack Dunphy, *Scalia Hits a Clinker*, NAT. REV. ONLINE, June 22, 2001, at <http://www.nationalreview.com/dunphy/dunphy062201.shtml> (on file with the North Carolina Law Review) (stating that the *Kyllo* decision denies police officers a valuable tool in the fight against drugs).

172. Thomas D. Colbridge, *Kyllo v. United States: Technology Versus Individual Privacy*, 70 F.B.I. L. ENFORCEMENT BULL. 10 (2001) (discussing the practical implications of *Kyllo*), available at <http://www.fbi.gov/publications/leb/2001/october2001/oct01p25.htm> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review); Ku, *supra* note 145, at 1372–73 (arguing that “obtaining a warrant is not a significant burden on law enforcement” and that it insulates “the search from subsequent constitutional challenge”); David Ruppe, *Technology and the Fourth Amendment*, at http://abcnews.go.com/sections/us/DailyNews/scotus_thermal010611.html (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (noting that law enforcement officers have been instructed not to use thermal imagers without first obtaining probable cause through other means).

173. See generally Christopher Slobogin, *Technologically-Assisted Physical Surveillance: The American Bar Association’s Tentative Draft Standards*, 10 HARV. J.L. & TECH. 383 (1997) (describing the ABA’s efforts to establish guidelines for technologically-assisted physical surveillance, including surveillance using video cameras, tracking beepers, telescopic devices, illumination devices, and detection systems, such as thermal imagers). The ABA recently enacted these standards. See ABA STANDARDS FOR CRIMINAL JUSTICE, ELECTRONIC SURVEILLANCE STANDARDS (THIRD): TECHNOLOGICALLY-ASSISTED PHYSICAL SURVEILLANCE (1999); see also John Gibeaut, *High-Tech Heat Seeking: Warrantless Use of Detection Device Splits Appeals Courts*, A.B.A. J., Aug. 1998, at 34, 35 (discussing ABA recommendations before *Kyllo* was decided).

174. See *supra* note 110 (describing how courts have declined to address the constitutionality of thermal-imaging searches because other evidence supported the search warrants).

might be only to require the extra step of obtaining a search warrant before scanning a home with a thermal imager.¹⁷⁵

The effect of *Kyllo* on the Court's future Fourth Amendment jurisprudence, however, might be more profound. In the remainder of this section, this Comment argues (A) that the Court in *Kyllo* deviated from the precedent established by *Katz* and its progeny; (B) that the holding in *Kyllo* is limited to protecting against technology-enhanced surveillance of the home and should not be applied to surveillance of subjects in other locations; and (C) that the Court's adoption of the "in general public use" standard is short-sighted and provides only temporary protection from technology-enhanced surveillance.

A. *The Court in Kyllo Deviated from Katz and its Progeny*

One commentator suggests that one of the most favorable aspects of *Kyllo* is that "the opinion is true to the teaching of *Katz*."¹⁷⁶ Although the Court in *Kyllo* remained true to *Katz* and its progeny by examining whether the thermal-imaging surveillance intruded upon a justified expectation of privacy under Justice Harlan's two-prong test, the Court, as it has on other occasions,¹⁷⁷ misapplied *Katz* and deviated from precedent in the *Katz* progeny in at least two significant ways: (1) the Court failed to show judicial restraint when it protected against "potential, as opposed to actual, invasions of privacy,"¹⁷⁸ and (2) the Court did not adequately address whether *Kyllo* "knowingly exposed"¹⁷⁹ the heat from the high-intensity lamps to the public. Although consideration of these factors might not have

175. See Adam Miller, *Not Quite up in Smoke: Florida Cops Will Be Slowed, Not Stymied, By Ruling that Bans Using Heat Sensors to Detect Pot Crops*, BROWARD DAILY BUS. REV., June 20, 2001, at A1 (quoting a special prosecutor for the U.S. Attorney's office in Miami as saying that obtaining a warrant is "an extra hurdle but, in the long run, I don't think it will have a huge negative impact [on drug enforcement]"); see also Jonathan Ringel, *Search Warrant Necessary to Use Heat-Detection Device*, LEGAL INTELLIGENCER, June 12, 2001, at 4 (suggesting that *Kyllo* will not hamper police investigations because, according to detectives, using a thermal imager is normally the last step in an investigation after the police have used other means, such as informant tips and electricity bills, to establish probable cause for a search warrant).

176. See LAFAVE, *supra* note 150, § 2.2(d) at 75 (noting that the most important aspect of *Kyllo* is that it addresses "whether there has been an intrusion upon a justified expectation of privacy, and not (as in the pre-*Katz* era) whether there had been a physical intrusion into some protected area").

177. See Lewis R. Katz, *In Search of a Fourth Amendment for the Twenty-first Century*, 65 IND. L.J. 549, 563 (1990) (arguing that the Court has misapplied the exceptions articulated in *Katz* to the point that the exceptions have now swallowed the rule).

178. *United States v. Karo*, 468 U.S. 705, 712 (1984).

179. *Katz v. United States*, 389 U.S. 347, 351 (1967).

changed the outcome of *Kyllo*, the Court's failure to properly address these issues might ultimately diminish the precedential value of *Kyllo* in deciding future Fourth Amendment cases.

By taking into account technology "already in use or in development"¹⁸⁰ the Court in *Kyllo* protected against "potential, as opposed to actual, invasions of privacy."¹⁸¹ Commentators generally applaud the Court for having the foresight to limit the use of technology-enhanced surveillance now, as opposed to waiting until surveillance techniques become more sophisticated.¹⁸² By guarding against future, more invasive surveillance techniques, the Court expanded the Fourth Amendment protection against invasions of privacy. But in doing so, the Court went against the precedent established in *Karo*,¹⁸³ and failed to exhibit judicial restraint.¹⁸⁴ The Court has never held that "potential, as opposed to actual, invasions of privacy constitute searches for purposes of the Fourth Amendment."¹⁸⁵ In deciding Fourth Amendment cases, the Court should only consider the facts of the case at hand.¹⁸⁶

By considering the facts in the record from the lower court decisions, the Court in *Kyllo* could have reached the same conclusion—that the thermal-imaging surveillance constituted a search—without erroneously addressing potential invasions of privacy from technology under development. The record in *Kyllo* shows that the operator of the thermal imager stated in his report that "the thermal scan showed high heat loss from the roof [of *Kyllo's* residence] above the garage and from the wall facing [the adjacent

180. See Whitebread, *supra* note 164, at 42 (quoting *Kyllo v. United States*, 533 U.S. 27, 36 (2001)).

181. *Karo*, 468 U.S. at 712.

182. See, e.g., LAFAVE, *supra* note 150, at 76 (noting that the majority in *Kyllo* rightly opted for taking the long view in addressing thermal-imaging and other technology-enhanced surveillance techniques); cf. *United States v. Myers*, 46 F.3d 668, 670 n.1 (1995) ("While it is true that other technology may be, or may become so advanced that it could unlawfully penetrate the walls of our homes or be otherwise unacceptably intrusive, this is not the case before us.").

183. *Karo*, 468 U.S. at 712.

184. See Sean D. Thueson, Note, *Fuzzy Shades of Gray: The New "Bright-Line" Rule in Determining When the Use of Technology Constitutes a Search*, 2 WYO. L. REV. 169, 201 (2002) (noting that the majority opinion in *Kyllo* fails to adhere to the principle of judicial restraint).

185. *Karo*, 468 U.S. at 712 (noting that "[i]t is the exploitation of technological advances that implicates the Fourth Amendment, not their mere existence").

186. See *Dow Chem. Co. v. United States*, 476 U.S. 227, 239 n.5 (1986); *Karo*, 468 U.S. at 712.

unit in the triplex].”¹⁸⁷ Based on these facts alone, the thermal scan could not be inferred to reveal any intimate details of the interior of the home. But the operator’s testimony went on to describe that “the main conclusion that I reached was that there was definitely something unusual *within* the structure that was generating excess heat.”¹⁸⁸ Thus, the Court was correct in holding that the thermal scan was a search of the interior of the home, but it articulated an overly broad rule by also including technology under development.

The Court in *Kyllo* also did not take into account the exceptions enunciated in *Katz* for the reasonable expectation of privacy within the home for things “knowingly exposed” to the outside world.¹⁸⁹ *Kyllo* took no affirmative action to conceal the heat emanating from his house.¹⁹⁰ One could argue that he “knowingly exposed” the excess heat to the public, and under the exception enunciated in *Katz* he would no longer have a reasonable expectation of privacy in that heat. If the Court truly followed *Katz*, it would have at least noted and addressed this exception.¹⁹¹ Most of the lower courts adopted the waste-heat doctrine.¹⁹² The Court should have considered whether the waste-heat approach fell within the “knowingly exposed” exception under *Katz*. This exception, as applied to the facts of *Kyllo*, is not as strained, for example, as the overhead surveillance allowed in *Ciraolo* where the suspect had erected a ten-foot high fence around his property.¹⁹³ By addressing the waste-heat doctrine under the “knowingly exposed” exception provided in *Katz*, the Court could have provided lower courts with a mechanism for

187. *Kyllo v. United States*, No. 92-51-FR, 1996 U.S. Dist. LEXIS 3864, at *4 (D. Or. March 15, 1996) (quoting Transcript, at 139), *aff'd*, 190 F.3d 1041 (9th Cir. 1999), *rev'd*, 533 U.S. 27 (2001).

188. *Id.* (quoting Transcript, at 139) (emphasis added).

189. See *Katz v. United States*, 389 U.S. 347, 351 (1967).

190. *United States v. Kyllo*, 190 F.3d 1041, 1046 (1999), *cert. granted*, 530 U.S. 1305 (2000), *rev'd and remanded*, 258 F.3d 1004 (9th Cir. 2001), *rev'd*, 533 U.S. 27 (2001).

191. Contra Christopher Slobogin, *Peeping Techno-Toms and the Fourth Amendment: Seeing Through Kyllo's Rules Governing Technological Surveillance*, 86 MINN. L. REV. 1393, 1417-18 (2002) (asserting that the proper inquiry is not the one posed by the majority opinion in *Katz*, but rather the reasonable expectation of privacy test articulated in Justice Harlan's concurring opinion).

192. See *supra* notes 113-20 and accompanying text.

193. *California v. Ciraolo*, 476 U.S. 207, 214 (1986) (concluding that the defendant's expectation that his backyard was protected from observation from an airplane at an altitude of 1,000 feet was unreasonable and not an expectation that society was prepared to honor despite defendant's assertion that he did not “knowingly expose” his yard to aerial viewing).

distinguishing between suspects who actively vent the excess heat¹⁹⁴ and those, like *Kyllo*, who merely take no affirmative acts to conceal the heat emanating from the structure. As it now stands, courts have refused to make a distinction between these seemingly dissimilar circumstances.¹⁹⁵

B. Kyllo Provides Fourth Amendment Protection from Technology-Enhanced Surveillance of the Home Only

Kyllo has been hailed as a landmark case that will stand along with the Warren Court's decision in *Katz*.¹⁹⁶ However, because it restricts protection from technology-enhanced surveillance to the home, the ruling in *Kyllo* is more limited than the general proscription of electronic surveillance articulated in *Katz*.¹⁹⁷ The Court's "emphasis on the home raise[s] the prospect that warrantless imaging of other locations might be upheld."¹⁹⁸ For example, under this reasoning, the decision in *Kyllo* should not be applied to the thermal-imaging surveillance of outbuildings or unoccupied structures on private property. Thus, the lower court decisions in *United States v. Ishmael*¹⁹⁹ and *United States v. Ford*²⁰⁰ in the Fifth and Eleventh Circuits, respectively, could hypothetically withstand scrutiny under *Kyllo*.²⁰¹

By leaving open the question of whether technology-enhanced searches in public places are legal, the Court in *Kyllo* assured citizens

194. See, e.g., *United States v. Ford*, 34 F.3d 992, 995 (11th Cir. 1994) (noting that the defendant took affirmative actions to vent the excess heat generated by the grow lamps).

195. See *supra* note 120 and accompanying text.

196. See *Cole*, *supra* note 163, at 7.

197. See *Katz v. United States*, 389 U.S. 347, 351–52 (1967) (citing *Rios v. United States*, 364 U.S. 253 (1960)).

198. Linda Greenhouse, *Justices Say Warrant is Required in High-Tech Search of Homes*, N.Y. TIMES, June 12, 2001, at A1; see Heffernan, *supra* note 9, at 103 (concluding that the best interpretation of *Kyllo* is that houses enjoy a "specially privileged position" under the expectations of privacy test).

199. 48 F.3d 850, 853 (5th Cir. 1995) (holding that the surveillance of an underground bunker in an open field with a thermal imager does not violate the Fourth Amendment), *cert. denied*, 516 U.S. 818 (1995). The appeals court in *Ishmael* relied on *Oliver v. United States*, 466 U.S. 170, 181 (1984), which held that "an individual has no legitimate expectation that open fields will remain free from warrantless intrusion by government officers."

200. 34 F.3d 992, 997 (11th Cir. 1994) (holding that surveillance of an unoccupied mobile home with a thermal imager is not an unreasonable search).

201. The decision in *Kyllo* has already resulted in a reversal of a case in the Seventh Circuit where thermal imaging was used to scan an occupied residence. See *United States v. Real Prop.* Located at 15324 County Highway, 2001 U.S. App. LEXIS 19837 (7th Cir. Sept. 4, 2001) (remanding an earlier decision to the District Court to reconsider the facts in light of *Kyllo*).

of their right to privacy in their homes from technology-enhanced searches, but once individuals cross the “firm line at the entrance to the house,”²⁰² they may leave many of their Fourth Amendment rights behind. Even though the Court purports to follow *Katz*, it ignores the majority holding of that case that the Fourth Amendment protects “people, not places.”²⁰³ Thus, the Court failed to recognize that *Katz* focused on an individual’s expectations of privacy and “signaled a dramatic shift away from location-specific privacy protections.”²⁰⁴ Viewed in this way, *Kyllo* marks a return to the pre-*Katz* world, in which common law property principles governed Fourth Amendment jurisprudence.²⁰⁵ The Court in *Kyllo*, however, discussed at length the traditional property-based concepts of the Fourth Amendment but settled on following the more modern approach in *Katz*.²⁰⁶

Although *Kyllo* can be criticized for limiting Fourth Amendment protection from technology-enhanced surveillance to the home, the Court was confronted with facts relating solely to the surveillance of the home.²⁰⁷ As mentioned previously, the Court should consider only the facts of the case at hand.²⁰⁸ Although the Court failed to show restraint by including developing technologies in its decision, it did properly limit its analysis of *Kyllo* to the home.

Expanding the rule in *Kyllo* to offer protection at other locations would most likely result in “a watering-down of the protections afforded the home rather than an upgrading of privacy as to

202. *Kyllo v. United States*, 533 U.S. 27, 40 (2001) (quoting *Payton v. New York*, 445 U.S. 573, 590 (1980)).

203. *Katz v. United States*, 389 U.S. 347, 351 (1967); see also Fisher, *supra* note 6, at 169–70 (noting that the Court’s emphasis on a physical location, i.e., the home, is at odds with the long-recognized principle that the Fourth Amendment protects people, not places); Quin M. Sorenson, Comment, *Losing a Plain View of Katz: The Loss of a Reasonable Expectation of Privacy Under the Readily Available Standard*, 107 DICK. L. REV. 179, 195 (2002) (arguing that, although the Court in *Kyllo* recognizes the sanctity of the home, the “in general public use” standard effectively compromises the protection afforded activities in the home).

204. See Ku, *supra* note 145, at 1367 (arguing that limiting *Kyllo* to the interior of the home runs counter to the true meaning of *Katz* and returns Fourth Amendment analysis to *Olmstead*); *Leading Cases*, *supra* note 29, at 352 (suggesting that the Court’s decision in *Kyllo* indicates the possible return of Fourth Amendment doctrine to the concept of physical trespass).

205. See Cole, *supra* note 163.

206. *Kyllo*, 533 U.S. at 31–32.

207. See LAFAVE, *supra* note 150, at 80–81 (arguing that the Court in *Kyllo* decided only the issue before the Court).

208. See *Dow Chem. Co. v. United States*, 476 U.S. 227, 239 n.5 (1986).

everything else.”²⁰⁹ *Kyllo* should not be read as settling any issues regarding technology-enhanced surveillance beyond the home.²¹⁰ Therefore, an application of the holding in *Kyllo* to surveillance not involving the home would be erroneous.

C. *The Court in Kyllo Adopts a Standard That Only Affords Fourth Amendment Protection from Technology-Enhanced Surveillance Devices That Are Not in General Public Use*

The line of cases following *Katz* gradually eroded Fourth Amendment rights against technology-enhanced surveillance.²¹¹ At first blush, *Kyllo* appears to have attenuated, if not completely halted, this erosion. In fact, the dissent in *Kyllo* asserts that the Court formulates a new rule.²¹² But, by limiting its holding to technology-enhanced surveillance devices that are “not in general public use,”²¹³ *Kyllo* actually falls in line with the visual surveillance cases following *Katz*.²¹⁴ In *Ciraolo*, the Court recognized that the government’s use of “routine” technology does not impose upon a reasonable expectation of privacy.²¹⁵ Also, the Court in *Dow Chemical* stated, “[i]t may well be . . . that surveillance of private property by using highly sophisticated surveillance equipment not generally available to the public . . . might be constitutionally proscribed absent a warrant.”²¹⁶ Thus, although *Kyllo* purports to enhance Fourth Amendment protection against technology-enhanced surveillance, it has much in common with the *Katz* progeny that served to diminish such protection.

As Justice Stevens articulated in his dissenting opinion, the general use standard is “somewhat perverse because it seems likely that the threat to privacy will grow, rather than recede, as the use of

209. See LAFAVE, *supra* note 150, at 80–81 (suggesting that the Court appropriately left for another day whether the rule in *Kyllo* should apply to locations with a lower expectation of privacy than the home).

210. *Id.*; see Heffernan, *supra* note 9, at 103–05.

211. See *supra* notes 80–82.

212. *Kyllo v. United States*, 533 U.S. 27, 46–49 (2001) (Stevens, J., dissenting).

213. *Id.* at 40.

214. See *supra* notes 83–94.

215. See *California v. Ciraolo*, 476 U.S. 207, 215 n.3 (1986).

216. *Dow Chem. Co. v. United States*, 476 U.S. 227, 238 (1986). *Dow Chemical* cuts both ways. The passage goes on to state that “the photographs here are not so revealing of intimate details as to raise constitutional concerns. Although they undoubtedly give the EPA more detailed information than naked-eye views, they remain limited to an outline of the facility’s buildings and equipment.” *Id.* Justice Scalia properly distinguished *Kyllo* from *Dow Chemical*, because *Dow Chemical* involved an industrial site. See *Kyllo*, 533 U.S. at 33.

intrusive equipment becomes more readily available.”²¹⁷ The price of thermal-imaging equipment is already dropping,²¹⁸ and the use of thermal imagers in law enforcement, fire fighting, and other public safety applications is becoming more prevalent.²¹⁹ One can imagine, as thermal-imaging technology improves and becomes more compact and cost-effective, its use will be more pervasive²²⁰ and likely will make its way into general public use.²²¹ For example, night-vision technology that once was limited to military applications has become popular for outdoor recreational use.²²² If thermal-imaging devices also take this route, the “not in general public use” standard could

217. *Kyllo*, 533 U.S. at 47 (Stevens, J., dissenting).

218. See, e.g., *American Night Vision from Excalibur Electric Optics*, at <http://www.nightvis.com/site/prices/default.asp> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (listing a hand-held thermal imager with a suggested retail price of \$7,995, which is almost half the price of its more sophisticated counterpart, and the suggested retail price of a mobile surveillance system of \$5,999).

219. Thermal imagers also are used in search and rescue operations to locate lost persons. By detecting body heat, thermal imagers can locate persons even in thick underbrush. See National Fire & Rescue, *Q&A Forum: Thermal Imaging Cameras*, at <http://www.nfrmag.com/backissues/MarApr2001/feature1.asp> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) [hereinafter National Fire & Rescue].

220. See, e.g., Jeffrey P. Campisi, Comment, *The Fourth Amendment and New Technologies: The Constitutionality of Thermal Imaging*, 46 VILL. L. REV. 241, 270–71 (2001) (noting that advances in technology and lower costs will make the use of thermal-imaging surveillance more pervasive). For example, a night vision option using a small thermal imager is available on selected Cadillac automobiles for \$2,250.00. See <http://www.cadillac.com/cadillacjsp/models/deville/index.html> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review).

221. See Slobogin, *supra* note 191, at 1402–06 (providing possible definitions of the “in general public use” standard, including the “Wal-Mart test,” i.e., if a device is available at Wal-Mart, or comparable retail outlets, the device is likely to be accessible by a large segment of the public); see also *People v. Katz*, No. 224477, 2001 WL 1012114, at *2 n.4 (Mich. Ct. App. Sept. 4, 2001) (suggesting that devices sold at retail outlets may be in “general public use”).

222. See, e.g., ITT Industries, at <http://www.ittnv.com/itt/Active/ConOtherPages/orhome> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (presenting night-vision equipment for outdoor recreational use). Night-vision equipment, such as binoculars and rifle scopes, operate on a different principle than do thermal imagers. *Katz*, 2001 WL 1012114, at *2 n.4. Night-vision technology uses image intensification or light amplification, which takes a small amount of ambient light in the visible spectrum and converts the light energy into electrical energy, or electrons. See *How Night Vision Works*, at <http://www.ittnv.com/itt/Active/ConLeftMenu/HowNVWorks> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review). These electrons are multiplied and then transmitted to a phosphor screen, which converts the electrons into light energy, i.e., photons, that allows the viewer to see images. *Id.*; see also *Katz*, 2001 WL 1012114, at *2 n.4 (classifying the use of night vision binoculars to enhance visual images as different from thermal imagers, which detect “invisible heat” levels).

very soon undermine the Fourth Amendment protection that *Kyllo* purportedly provides.²²³

The rule articulated in *Kyllo* would be acceptable if the Court did not include the “in general public use” standard.²²⁴ Instead of tying Fourth Amendment rights to whether a surveillance technology is “in general public use,” the Court should adopt a standard that is grounded on fundamental rights against unreasonable searches.²²⁵ If the Court truly had followed the teaching of *Katz*, it would have focused on the object of the government’s intrusion—the interior of the home—and not on the tools used by the government or the phenomena measured by those tools.²²⁶

Although the majority purports to take the “long view,”²²⁷ the decision in this respect is rather shortsighted because technology routinely outpaces the legal system.²²⁸ For example, the issue of the constitutionality of the “search” in *Kyllo* first arose in 1992 but was not resolved by the Supreme Court until 2001.²²⁹ Thermal-imaging

223. See Slobogin, *supra* note 191, at 1395 (noting that the dissent might be correct in suggesting that the “in general public use” exception will eventually swallow the majority’s prohibition of technology-enhanced surveillance of the home).

224. See Simmons, *supra* note 72, at 1320 (noting, with approval, that the Court in *Kyllo*, relied first on a “results-based test” by considering whether the device obtains information that could not have been obtained without physical intrusion into a constitutionally protected area, but, with disapproval, that the Court relied a “method-based test” by adding the “in general public use” exception); Slobogin, *supra* note 191, at 1437 (concluding that the “in general public use” exception represents a “potentially huge loophole[] in the Fourth Amendment’s protection”). See generally, Douglas Adkins, *The Supreme Court Announces a Fourth Amendment “General Public Use” Standard for Emerging Technologies but Fails to Define It: Kylo v. United States*, 27 DAYTON L. REV. 245 (2002) (providing criticism of the “in general public use” standard).

225. See *Carroll v. United States*, 267 U.S. 132, 149 (1925) (“The Fourth Amendment is to be construed in the light of what was deemed an unreasonable search and seizure when it was adopted, and in a manner which will conserve public interests as well as the interests and rights of individual citizens.”); Bandes, *supra* note 9, at 1389–90 (noting the “in general public use” rule will ultimately diminish privacy and whether a particular technology has entered common use has little to do with how law enforcement should be allowed to use it); Slobogin, *supra* note 191, at 1396 (arguing that the extent to which a particular technological device is used by the general public should be irrelevant to a Fourth Amendment analysis).

226. See *United States v. Cusumano*, 67 F.3d 1497, 1504 n.11 (10th Cir. 1995), *vacated on other grounds en banc* by 83 F.3d 1247 (10th Cir. 1996); see also Simmons, *supra* note 72, at 1321–22 (arguing “the method of surveillance should be irrelevant and the results of the surveillance are all that should matter in determining whether an individual’s reasonable expectation of privacy has been infringed”).

227. *Kyllo v. United States*, 533 U.S. 27, 40 (2001).

228. See Slobogin, *supra* note 191, at 1412 (questioning how courts will deal with the rapid pace of technological development in deciding whether something is “in general public use”).

229. *Kyllo*, 533 U.S. at 27.

technology has improved significantly since the issue first arose in *Kyllo*.²³⁰ The rule in *Kyllo* might not even offer protection against thermal-imaging surveillance today given the pervasiveness and availability of thermal-imaging equipment; at best *Kyllo* offers a temporary reprieve from the governmental intrusion of technology-enhanced surveillance.²³¹ Certainly, if thermal imagers become widely available to the general public, such as through retail commercial outlets, their warrantless use by law enforcement would not violate the Fourth Amendment under the standard articulated in *Kyllo*.²³²

V. APPLICATION OF *KYLLO* TO OTHER TECHNOLOGY-ENHANCED SURVEILLANCE DEVICES

Current case law, including *Kyllo*, that addresses technology-enhanced surveillance devices deals almost exclusively with thermal imaging.²³³ Law enforcement is currently using or proposing to use more sophisticated surveillance techniques, many of which have general similarities to thermal imaging.²³⁴ The thermal-imaging cases, therefore, may provide some insight into the direction the Court will take with regard to the constitutionality of other high-technology

230. See National Fire & Rescue, *supra* note 219.

231. See *Leading Cases*, *supra* note 29, at 356 (concluding that *Kyllo* could reduce a citizen's rights against unreasonable searches to pre-*Katz* levels). Professor LaFave, however, does not give much weight to the "in general public use" standard in *Kyllo* and suggests that this phrase was only a tentative qualification of the prohibition against technology-enhanced surveillance. See LAFAVE, *supra* note 150, at 78 (arguing that the Court does not assert that there is a general public use exception, but that its holding in *Kyllo* applies at least where the technology is not in public use and that the Court reserved this question for another day). He cautions, however, that "even the most tentatively stated exceptions to a rule have a tendency to harden into immutable limitations with the passage of time." *Id.* Support for this proposition comes from *Dow Chemical*, wherein the Court held that the use of a \$22,000 aerial-mapping camera came under this type of general use exception. See *Dow Chem. Co. v. United States*, 476 U.S. 227, 239, 242 n.4 (1986). Therefore, even if the "in general public use" exception is applied to technology-enhanced surveillance after *Kyllo*, Professor LaFave recommends that this exception should be construed to mean more than the theoretical possibility that a member of the public engaging in such surveillance undermines one's justified expectation of privacy. See LAFAVE, *supra* note 150, at 79-80 (distinguishing *Kyllo* from *Dow Chemical*, where the Court indicated that "any person" taking aerial photographs with a high-precision mapping camera would diminish the expectation of privacy). This distinction should hold even though many other non-law enforcement uses for thermal imagers, such as firefighting and search and rescue operations, exist.

232. See Slobogin, *supra* note 191.

233. See *Leading Cases*, *supra* note 29.

234. See *supra* notes 9-17.

surveillance devices.²³⁵ These devices may be characterized according to the analogies that can be drawn between them and thermal imaging, including (A) more sophisticated infrared devices that could be used for surveillance purposes; (B) devices capable of conducting surveillance of the home; and (C) technology-enhanced surveillance devices for airport security.

A. *More Sophisticated Infrared Devices*

The ruling in *Kyllo* appears to prohibit the use of any technology-enhanced surveillance device that can sense images, sounds, or smells coming from a home, at least if the device is not in general public use.²³⁶ This prohibition would likely include more sophisticated infrared systems that could be used to detect and identify chemical solvents, for example, emanating from an illegal drug manufacturing laboratory.²³⁷ Such infrared devices are available commercially,²³⁸ and, although these infrared devices are currently used primarily for environmental and industrial hygiene monitoring,²³⁹ manufacturers of such devices list their use in drug enforcement surveillance as a typical application.²⁴⁰

The use of more sophisticated infrared technology in drug enforcement operations would be distinguishable from the thermal imagers used in *Kyllo*, because the thermal imager only provides evidence of a temperature differential between the house and the surroundings. One of the criticisms of thermal imaging is that this temperature differential does not provide direct evidence of criminal activity.²⁴¹ Other activities within the home could give rise to the

235. See Dery, *supra* note 17, at 373–92.

236. See Savage, *supra* note 168.

237. Every chemical compound has a unique infrared spectrum, which is analogous to a molecular fingerprint. See FTIR—Foreign Transform Infrared Spectroscopy, *at*, <http://www.wcaslab.com/tech/tbftir.htm> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review). When coupled with an optical device, such as a monochromator or an interferometer, that separates the wavelengths of light, an infrared detector can be used to identify specific chemical compounds in the air. See George Russwurm & Jeffrey Childers, *Open-path Fourier Transform Infrared Spectroscopy*, in 2 HANDBOOK OF VIBRATIONAL SPECTROSCOPY 1750, 1751–53 (John M. Chalmers & Peter R. Griffiths eds., 2002).

238. See, e.g., Block Engineering, *at* <http://www.blockeng.com/ispec.htm> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (describing the Block I-Spec imaging spectrometer that could potentially be used in drug enforcement operations).

239. See Russwurm & Childers, *supra* note 237, at 1769–70.

240. See, e.g., Block Engineering, *supra* note 238 (on file with the North Carolina Law Review) (describing applications of the “I-SPEC” imaging spectrometer).

241. *People v. Deutsch*, 44 Cal. App. 4th 1224, 1231 (1996) (noting that “because the thermal imager is indiscriminate in registering sources of heat it is an intrusive tool, which

observed temperature differential.²⁴² In contrast, the use of more sophisticated infrared technology to detect specific solvents that are not commonly used in the household for legal activities, but are used in the manufacture of illegal drugs, could be direct evidence of criminal activity.²⁴³ The information produced by such a device is specific enough to eliminate any ambiguity regarding the source of the detected activity.

A court addressing the use of more sophisticated infrared devices would also have to consider whether the defendant had a subjective expectation of privacy in the solvent vapors. That is, would the waste doctrine adopted by the lower courts in thermal-imaging cases apply in this situation?²⁴⁴ In analogous situations, the Court has held that smoke rising from a chimney may be observed without a warrant.²⁴⁵ Solvent vapors, emanating from a house, however, might not be visible without the aid of a technological device. Justice Stevens addressed this point in his dissenting opinion, where he stated that in the context of monitoring for public health reasons,

public officials should not have to avert their senses or their equipment from detecting emissions in the public domain such as excessive heat, traces of smoke, suspicious odors, odorless gases, airborne particulates, or radioactive emissions, any of which could identify hazards to the community. In my judgment, monitoring such emissions with “sense-enhancing technology” . . . and drawing useful conclusions from such monitoring, is an entirely reasonable public service.²⁴⁶

tells much about the activities inside the home which may be quite unrelated to any illicit activity”).

242. Operating a sauna, hot tub, or clothes dryer could result in a thermal imager recording a measurable temperature differential between rooms of a home. For example, Justice Scalia speculated that a thermal imager could disclose “at what hour each night the lady of the house takes her daily sauna and bath” *Kyllo v. United States*, 533 U.S. 27, 38 (2001).

243. See Heffernan, *supra* note 9, at 105 (noting that, under *Place*, technology that accurately identifies contraband and does not produce false positives with respect to legal activities is compatible with the Fourth Amendment).

244. See *supra* notes 113–20 and accompanying text.

245. See *Air Pollution Variance Bd. v. W. Alfalfa Corp.*, 416 U.S. 861, 865 (1974) (holding that a state health inspector may observe smoke plumes emitted from chimneys without a warrant because “[h]e had sighted what anyone in the city who was near the plant could see in the sky—plumes of smoke”).

246. *Kyllo*, 533 U.S. at 45 (Stevens, J., dissenting) (comparing the monitoring of emissions from homes in a public health context to the reasonable belief articulated in *Greenwood* that police are not expected to avert their eyes from evidence of criminal activity).

Under this reasoning, the ruling in *Kyllo* may not prevent the use of passive infrared monitoring devices that provide specific information regarding criminal activity in the home. Although Justice Stevens's dissenting opinion specifically addresses the use of sense-enhancing technology for monitoring hazardous air emissions as a "public service,"²⁴⁷ under some circumstances polluters are subject to criminal charges.²⁴⁸ Thus, the use of sophisticated infrared equipment to monitor for criminal behavior, such as the manufacture of illegal drugs, could also be deemed "entirely reasonable" under this approach.

B. Other Technology-Enhanced Surveillance Devices for Monitoring the Home

Thermal imagers and the more sophisticated infrared systems described in the preceding section are passive devices—that is, they do not emit rays or beams.²⁴⁹ The government is also developing active surveillance devices, such as through-the-wall radar devices, that emit radar waves that can penetrate solid objects.²⁵⁰ The Court in *Kyllo* explicitly rejected the use of such through-the-wall technologies for surveillance in the home.²⁵¹ Interestingly, Justice Brennan foresaw and disapproved of this type of technology almost twenty years ago.²⁵²

The Court in *Kyllo*, however, did not proscribe the use of these devices outside of the home, for example, in commercial buildings or public places. A patrolling officer might carry one version of this technology, a "radar flashlight," and use it to detect suspects hiding in

247. *Id.*

248. *See generally* 42 U.S.C. § 7413(c) (2000) (providing criminal penalties for violating provisions of the 1990 Clean Air Act Amendments).

249. *See supra* note 36 and accompanying text.

250. For information regarding technology projects under development, see generally United States Department of Justice, National Law Enforcement and Corrections Technology Center, *Project Title: Radar Flashlight*, at <http://www.nleetc.org/virlib/> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review).

251. *Kyllo*, 533 U.S. at 36 n.3.

252. *See* United States v. Jacobsen, 466 U.S. 109, 137–38 (1983) (Brennan, J., dissenting). Justice Brennan stated:

[T]he Court adopts a general rule that a surveillance technique does not constitute a search if it reveals only whether or not an individual possesses contraband In fact, the Court's analysis is so unbounded that if a device were developed that could detect, from the outside of a building, the presence of cocaine inside, there would be no constitutional obstacle to the police cruising through a residential neighborhood and using the device to identify all homes in which the drug is present.

Id. (Brennan, J., dissenting).

buildings.²⁵³ One could imagine exigent circumstances, for example, threats to officer safety²⁵⁴ or the need to pursue a fugitive,²⁵⁵ where the use of such devices might be allowed in surveillance of the home.

C. *The Use of Technology-Enhanced Surveillance Devices for Airport Security*

Several technology-enhanced surveillance devices are being proposed for use in airport security. Two such devices are X-ray backscatter²⁵⁶ and millimeter scanner²⁵⁷ technology. These technologies are in current use or are being proposed for use in the detection of contraband or weapons on persons or moving vehicles.²⁵⁸ X-ray backscatter devices can detect the presence of guns, drugs, plastic explosives, and other contraband even when these items are hidden in the middle of a fully-packed cargo truck.²⁵⁹ The U.S. Customs Service currently uses truck-based X-ray inspection systems along the Mexican border.²⁶⁰ Customs officials at John F. Kennedy International Airport have used a similar system that reveals images

253. See United States Department of Justice, National Law Enforcement and Corrections Technology Center, *Project Title: Radar Flashlight*, at <http://www.nlectc.org/virlib/> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review) (describing a handheld radar flashlight device that would enable law enforcement officers to detect individuals through interior building walls). Researchers expect radar flashlights to go on the market sometime during 2002 and to be priced between \$1,000 to \$1,500. See Linda Rothstein, *Move Over, Superman, I've Got X-Ray Vision Too*, BULL. OF ATOMIC SCIENTISTS, July/Aug. 2001, at 8 (discussing advances in high-tech surveillance techniques).

254. See *Terry v. Ohio*, 392 U.S. 1, 27 (1968) (holding that officers may make protective searches for weapons).

255. See *Payton v. New York*, 445 U.S. 573, 590 (1980) (holding that a warrantless entry may be effected under exigent circumstances).

256. These surveillance devices use a technique in which images are made from X-rays back-scattered from dense objects (as opposed to waves passing through them). See AS&E, at <http://www.as-e.com/technology/technology.html> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review)

257. See Dery *supra* note 17. The human body emits millimeter radiation that goes through clothing. *Id.* Anything that blocks the emitted radiation, such as a gun, shows up as a shadow in the images produced by the millimeter wave scanner. *Id.* The advantage of this device over current "metal detectors" is that it can detect non-metallic objects, including ceramics, that might be molded into a weapon and carried on a person. *Id.*

258. See AS&E, at <http://www.as-e.com/products/products.html> (last visited Jan. 5, 2003) (on file with the North Carolina Law Review)

259. See *id.* (describing the "MobileSearch Inspection System," a truck-mounted mobile X-ray detection system for inspecting containers, vehicles, or any large items).

260. Ivan Amato, *X-ray Vision; a Surprising Supreme Court Ruling Sheds Light—and Other Beams—on the Latest Snooping Technology*; TIME, June 25, 2001, at 57.

of weapons underneath one's clothing²⁶¹ to search for contraband on persons.²⁶² The Federal Aviation Administration has purchased five X-ray backscatter systems for testing.²⁶³

Technology-enhanced surveillance devices that detect radiation in the millimeter wavelength range are also being developed to replace or augment metal detectors for use in airport security.²⁶⁴ These devices are also capable of detecting people and objects through walls.²⁶⁵ One such device, dubbed "Millivision," is a passive system that measures naturally-occurring electromagnetic waves produced by the objects, including people, being viewed.²⁶⁶ The device can be used to conduct "remote frisks" for weapons or contraband on individuals or as a gateway scanner.²⁶⁷ The proposed use of Millivision devices to search persons for concealed weapons or contraband has raised Fourth Amendment concerns.²⁶⁸

The decision in *Kyllo* would not apply to the use of technology-enhanced surveillance devices proposed for use in airport security for several reasons: (1) their proposed use is not for the surveillance of a home; (2) similar screening devices are already in general public use;

261. See AS&E BodySearch Personnel Inspection System, *supra* note 12 (describing the "BodySearch Personnel Inspection System" for screening individuals for the presence of concealed weapons, drugs, and illegal contraband).

262. Kathryn R. Urbonya, *Projecting an Image: Court to Decide If High-tech Heat Scan Is a Search Under the Fourth*, A.B.A. J., Dec. 2000, at 38 (noting that "[t]he more we use technology, the fewer secrets we have").

263. See Snider, *supra* note 10.

264. See Murray, *supra* note 13, at 112. Like thermal imagers, these systems measure thermal emissions from an object. *Id.* A human body emits a signature radiation in the millimeter wavelength range, which lies between microwaves and infrared radiation. *Id.* The manufacturer of such systems, Millivision LLC, in Amherst, Massachusetts, offers three types of systems: a portable unit the size of a radar gun, a gateway scanner, and a video-surveillance type camera unit. *Id.*

265. See Peter Eggleston, *Video Meets Vision: A System That "Sees" Through Walls!*, ADVANCED IMAGING, Mar. 1, 2000, at 10 (describing how the Millivision system operates). Millimeter frequencies are capable of penetrating building materials. *Id.* Human bodies have a high emissivity for radiation in this part of the spectrum, whereas metals, plastics and ceramics do not. *Id.* Therefore, these objects appear as a shadow against a bright image of a human body. *Id.*

266. See Bruce Wiebusch, *New-Wave Detectors; Millimeter Waves Could Detect More Weapons—and Speed Security Checks at Airports*, DESIGN NEWS, Sept. 4, 2000, at 73 (describing the development of the Millivision system for airport security).

267. See Dery, *supra* note 17, at 357–58 (discussing potential applications of the Millivision technology); see also Murray, *supra* note 13 (discussing millimeter-wave technology used for airport screening).

268. See Alyson L. Rosenberg, Comment, *Passive Millimeter Wave Imaging: A New Weapon in the Fight Against Crime or a Fourth Amendment Violation?*, 9 ALB. L.J. SCI. & TECH. 135, 158 (1998) (advocating application of a "reasonable suspicion" standard for use of the Millivision device to search for weapons and a higher standard of "reasonably likely" to search for contraband).

and (3) society, especially in the current climate of increased airport security, would most likely accept such searches as reasonable. Courts have sustained the practice of requiring all persons entering the gate areas of airports to submit to electronic searches of themselves and their possessions.²⁶⁹ The one drawback with these sophisticated screening devices is that, in their current configurations and operating conditions, they display the shape of anatomical features.²⁷⁰ In that regard, the public may not be willing to accept such searches as reasonable unless the manufacturers or entities that are conducting the searches can devise a way to protect such "private" information.

CONCLUSION

Technological innovations generally outpace growth in the law. The "in general public use" reasonableness standard articulated in *Kyllo* is fluid and will change with advances in technology. By adopting this standard, the Court ensured that it will revisit high-technology surveillance issues in the not-so-distant future. Rather than building upon the precedent established in *Katz* and using the opportunity in *Kyllo* to demarcate fundamental Fourth Amendment rights to privacy, the Court tied this standard to the current state of technology. Law enforcement only has to wait until a particular surveillance device becomes ubiquitous. If everybody owns a version of the surveillance device, then nobody will have a reasonable expectation of privacy, even in the home. In the end, by expressly limiting its protection to homes, *Kyllo* stands for the proposition that "[a] man's home may be his castle, but . . . the streets still belong to the police."²⁷¹

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269. See *United States v. Davis*, 482 F.2d 893, 905 n.32, 912 (9th Cir. 1973).

270. See Dery, *supra* note 17, at 356-57 (describing Millivision's ability to "see" through clothing and display the shape of the subject's body).

271. Cole, *supra* note 163, at 7.