

University of the District of Columbia School of Law

Digital Commons @ UDC Law

Journal Articles

Publications

2007

Tied Up in Knotts? GPS and the Fourth Amendment

Renee McDonald Hutchins

Follow this and additional works at: https://digitalcommons.law.udc.edu/fac_journal_articles



Part of the [Fourth Amendment Commons](#), [Privacy Law Commons](#), and the [Supreme Court of the United States Commons](#)

TIED UP IN KNOTTS? GPS TECHNOLOGY AND THE FOURTH AMENDMENT

Renée McDonald Hutchins^{*}

Judicial and scholarly assessment of emerging technology seems poised to drive the Fourth Amendment down one of three paths. The first would simply relegate the amendment to a footnote in history books by limiting its reach to harms that the framers specifically envisioned. A modified version of this first approach would dispense with expansive constitutional notions of privacy and replace them with legislative fixes. A third path offers the amendment continued vitality but requires the U.S. Supreme Court to overhaul its Fourth Amendment analysis. Fortunately, a fourth alternative is available to cabin emerging technologies within the existing doctrinal framework. Analysis of satellite-based tracking illustrates this last approach.

The Global Positioning System (GPS) allows law enforcement officials to monitor an individual's precise movements for weeks or months at a time. GPS technology not only is substantially different than anything the Court has previously considered, but also is a substantial threat to fundamental notions of privacy. By illustrating how, with only minor tweaking, existing Fourth Amendment law can effectively rein in intrusive applications of this one emerging technology, this Article begins to construct an analytical framework that can be applied more broadly to future technological enhancements.

This Article begins by reviewing the science and capabilities of GPS-enhanced surveillance. It concludes that satellite-based tracking is a powerful investigative tool that enables authorities to monitor the movements (both indoors and out) of an unlimited number of people for weeks or months at a time. This Article then examines the Court's historical treatment of technologically enhanced surveillance, and shows that the intrusiveness of an emerging technology is critical to its constitutional treatment. Considering the intrusiveness of GPS-enhanced tracking, this Article concludes that the unfettered use of such surveillance is inimical to fundamental Fourth Amendment principles. The most defensible treatment of GPS tracking under the existing analytical framework is that it is a search and, as such, must be preauthorized by a warrant issued only upon probable cause.

^{*} Assistant Professor, University of Maryland School of Law. I would like to thank Barbara Bezdek, Richard Boldt, Roger Fairfax, Kris Henning, Michael Millemann, Michael Pinard, and Anthony Thompson for their helpful comments on earlier drafts of this Article. In addition, I gratefully acknowledge the invaluable assistance of the members of the University of Maryland School of Law's Faculty Development Workshop and Research Fellow Susan McCarty.

INTRODUCTION	410
I. THE SCIENCE AND USES OF GPS.....	414
II. THE FOURTH AMENDMENT AND ENHANCED SURVEILLANCE METHODS.....	421
A. A Search or Not a Search, That Is the Question.....	422
1. Physical Invasion as a Proxy for Fourth Amendment Application	423
2. The Rise of the Two-Part <i>Katz</i> Test	425
B. Subjective Expectations and Objective Reasonableness	428
C. Defining Objective Reasonableness by Referencing Intrusiveness.....	430
1. Differential Treatment Based on the Type of Information Revealed.....	432
a. The Court's Permissive Treatment of Sense-Augmenting Surveillance.....	433
b. The Court's More Restrictive View of Extrasensory Surveillance Aids	436
2. Quantity as a Moderating Agent.....	438
3. An Exception: Surveillance Within the Home	442
III. THE FOURTH AMENDMENT'S REASONABLENESS REQUIREMENT AND THE USE OF GPS-ENHANCED SURVEILLANCE.....	444
A. Treatment of GPS-Enhanced Surveillance in Lower Federal Courts and State Courts	445
B. Treatment of GPS-Enhanced Surveillance in the Academy.....	452
C. GPS-Enhanced Surveillance Should Be Deemed a Search Within the Meaning of the Fourth Amendment	454
D. GPS-Enhanced Surveillance Should Be Preauthorized by a Warrant	460
CONCLUSION.....	464

INTRODUCTION

There is an electronic record of where I buy my coffee each morning. If anyone cared to, they could determine with a simple Internet search all of the places I have lived in the last decade; whether I rented or owned; how much I paid for each house I bought; and how much I made when I sold it. My local library keeps an electronic file of all the books I have ever borrowed, and my school keeps a similar database. The online vendor where I occasionally order clothing for my children keeps track of my buying preferences (and my children's sizes) to "assist" me in making future purchases. My local grocery store is kind enough to offer the same service—registering and indexing a list of every item I have ever purchased as part of the store's frequent shopper program. Consequently, my grocer knows that I have pets; that my kids are no longer in diapers; and that someone in the house is eating a lot of chicken nuggets. Along certain parts of my daily route, surveillance cameras

silently record my passing image, presumptively for my own safety. Indeed, even communications with colleagues, family, and friends are subject to review by any adequately motivated member of my Internet provider's tech staff. The degree of monitoring I am subject to is staggering, and this is all without (as far as I know) being suspected of any wrongdoing.

I do not mean to suggest that the sky is falling. It's not. But, one cannot escape the conclusion that technological advancements now enable substantial encroachments into zones formerly deemed wholly personal. This reality, though, does not augur an end to privacy in every sense. Though the necessities of modern life may at times require the disclosure of discrete portions of our daily routine to the handful of private parties that provide us with services, it is unlikely most Americans would sanction pervasive monitoring by our government.¹ If we are to avoid the Orwellian predictions of some conspiracy theorists, we must find meaningful ways to limit the government's ability to keep tabs on us. The Fourth Amendment is our first line of defense.

The Fourth Amendment provides, in part, that the "right of the people to be secure in their persons, houses, papers and effects, against unreasonable searches and seizures, shall not be violated."² Currently, two primary schools of thought exist with regard to the protection this language offers against the government's use of emerging technologies to conduct searches.

In the first camp are those who argue that, by design, the amendment has very little continuing relevance. For this camp, legislative remedies are the better course if we wish to vigorously protect our privacy against

1. Admittedly, the U.S. Supreme Court has determined that "when an individual reveals private information to another, he assumes the risk that his confidant will reveal that information to the authorities." *United States v. Jacobsen*, 466 U.S. 109, 117 (1984). There is much that is objectionable about the Court's use of the assumption of risk doctrine in defining the scope of Fourth Amendment protection. See, e.g., *Smith v. Maryland*, 442 U.S. 735, 750 (1979) (Marshall, J., dissenting) (observing that "to make risk analysis dispositive in assessing the reasonableness of privacy expectations would allow the government to define the scope of Fourth Amendment protections"). However, in this Article, I do not make the case for rejecting that doctrine. Rather, this Article assumes for the sake of discussion that disclosure of discrete units of information to particular private sources may somewhat undercut a privacy claim with regard to the disclosed units. I nonetheless maintain that the aggregation of such information by a single government source triggers Fourth Amendment concerns. For a fuller discussion, see *infra* note 244 and accompanying text.

2. U.S. CONST. amend. IV.

enhanced governmental surveillance.³ A second camp rejects the notion that the Fourth Amendment was not intended to operate in our modern, high-tech society. The view of those in this camp is grounded in a belief that underlying the Fourth Amendment is an expansive concern for the protection of privacy. However, this second camp largely concludes that the U.S. Supreme Court has so thoroughly bungled its interpretation of the amendment that the best course is to simply begin the legal analysis anew.⁴ In this Article, I suggest a somewhat different course that will reclaim the relevance of the Fourth Amendment within the contours of existing doctrine.

As a theoretical matter, it is difficult to plausibly argue that the Fourth Amendment is not animated by a spirit of privacy protection that enjoys continued significance. Consequently, while legislative remedies should offer supplemental coverage, they are not a necessary stand-in for constitutional safeguards. It is also true that, as a matter of sheer pragmatism, it is unlikely the Court will heed the call to wipe the jurisprudential slate clean. Therefore, if the Fourth Amendment is to enjoy continued vitality

3. Noted scholars have suggested that protection against invasive technologies should be provided primarily by legislative enactment and not by the Fourth Amendment. See Orin S. Kerr, *The Fourth Amendment and New Technologies: Constitutional Myths and the Case for Caution*, 102 MICH. L. REV. 801, 806 (2004). However, at least with regard to Global Positioning System (GPS) tracking, resort to legislative protections is, at this point, more aspiration than reality. As an initial matter, Title III of the Omnibus Crime Control and Safe Streets Act of 1968 governs the use of electronic monitoring devices. See 18 U.S.C. §§ 2510–2513, 2515–2522 (2000 & Supp. IV 2004). It regulates private as well as government conduct. *Id.* § 2511. However, Title III does not apply to electronic transmitting devices that trace locations. *Id.* § 2510(12)(C). Only the Fourth Amendment regulates the use of this technology. See *United States v. Gbemisola*, 225 F.3d 753, 758–59 (D.C. Cir. 2000).

Moreover, even if the provisions were interpreted to cover GPS tracking, Title I of the Electronic Communications Privacy Act of 1986, the successor to Title III, regulates the use of electronic surveillance for purposes of domestic law enforcement. See Pub. L. No. 99-508, §§ 101–111, 100 Stat. 1848 (amending scattered sections of 18 U.S.C.). The Act, in turn, looks to the Foreign Intelligence Surveillance Act (FISA) to define electronic surveillance. See 18 U.S.C. § 2511(2)(a)(ii). FISA limits the definition of electronic surveillance to “the installation or use of an electronic, mechanical, or other surveillance device . . . under circumstances in which a person has a reasonable expectation of privacy and a warrant would be required for law enforcement purposes.” 50 U.S.C. § 1801(f)(4) (2000). Thus, until courts determine that law enforcement’s use of GPS technology triggers the protections of the Fourth Amendment, the protections afforded by Title I would arguably remain inapplicable. See also 18 U.S.C. § 3117 (2000).

4. See, e.g., Akhil Reed Amar, *Fourth Amendment First Principles*, 107 HARV. L. REV. 757, 759 (1994) (“Fourth Amendment case law is a sinking ocean liner—rudderless and badly off course—yet most scholarship contents itself with rearranging the deck chairs.”); Stephen A. Saltzburg, *The Fourth Amendment: Internal Revenue Code or Body of Principles?*, 74 GEO. WASH. L. REV. 956, 1018 (2006) (“Fourth Amendment law resembles the Internal Revenue Code in its complexity. It need not. A principled approach to the Fourth Amendment remains an option.”).

in practice and not just theory, we must find ways to reclaim its relevance within the existing constitutional framework.

This Article takes a significant step toward that goal by identifying one emerging technology, and demonstrating that the Fourth Amendment, as currently interpreted by the Court, provides a meaningful check on law enforcement's use of that technology. By illustrating how existing Fourth Amendment jurisprudence can effectively rein in the use of one emerging technology, I hope to begin constructing an analytical framework that can be broadly applied to challenged searches generally.

The technology analyzed in this Article is the Global Positioning System (GPS). GPS-enabled surveillance allows a single person to remotely (and simultaneously) monitor the movements of one or more individuals for limitless periods or to determine their precise location at any moment.⁵ Because it enables the tracking of individuals more accurately and with fewer resources, GPS-enhanced surveillance is rapidly becoming a staple of police investigations.⁶ For example, in the State of Washington, the police used a GPS-enhanced tracking device to surreptitiously monitor a suspect's every move for nearly a month before his eventual arrest.⁷ However, despite its tendency to erode privacy, the Supreme Court has yet to consider whether there are any constitutional bounds upon law enforcement's use of the technology.

Part I of this Article provides an analysis of the science behind GPS-enhanced tracking technology and discusses its capabilities, both current and future. Part II then examines the Supreme Court's development of Fourth Amendment doctrine as it relates to enhanced surveillance methods. Part III considers the capabilities of GPS technology through the lens of this existing case law, and determines that while there are admittedly significant differences between GPS-enabled tracking and other previously considered forms of enhanced surveillance,⁸ those differences can be addressed within the basic analytical framework that the Supreme Court has established. The Article determines that the Court's existing decisions require Fourth

5. See *infra* Part I for a full discussion of the functioning of GPS as a system that can be used for enhanced surveillance.

6. See, e.g., NAT'L WORKRIGHTS INST., ON YOUR TRACKS: GPS TRACKING IN THE WORKPLACE 6 (2004), http://www.workrights.org/issue_electronic/NWI_GPS_Report.pdf.

7. *State v. Jackson*, 76 P.3d 217, 220–21 (Wash. 2003) (reflecting that a GPS device secretly and continuously monitored the location of the suspect's truck from October 26, 1999, until November 13, 1999).

8. See, e.g., *id.* at 221, 223–24. The technological precursor to GPS, the beeper, is a battery-operated device that emits a weak radio signal that can be followed using a receiver. Beepers do not provide pinpointed targeting of suspects and do not permit the remote tracking of targets.

Amendment protection in the form of a warrant in light of the sheer volume of information revealed by GPS-enabled tracking.⁹

I. THE SCIENCE AND USES OF GPS

Global positioning is a satellite-based technology that reveals information about the location, speed, and direction of a targeted subject.¹⁰ While it was initially developed for the U.S. military, countless civilian applications of GPS appear in the marketplace, including cellular telephones and onboard navigation systems in automobiles.¹¹ Alongside the growing acceptance by consumers, law enforcement has recently begun to employ the technology to track criminal suspects.¹²

The U.S. Department of Defense developed the Navigational Satellite Timing and Ranging Global Positioning System in the 1970s.¹³ Known alternately as “Navstar” or “GPS” technology, it was formally launched in 1978, when Rockwell International sent into orbit the first of eleven satellites built for the project.¹⁴ These eleven satellites, which were known as the Block I satellites, are no longer in use.¹⁵ However, in 1989, the government began launching the second generation of satellites. By March 1994, twenty-four Block II satellites were fully operational and controlling the system.¹⁶ Twenty-nine GPS satellites are currently in orbit and have been since 2005.¹⁷ Moreover, a recent Department of Defense report

9. See *Kyllo v. United States*, 533 U.S. 27, 33–34 (2001); *United States v. Knotts*, 460 U.S. 276, 283–84 (1983).

10. See, e.g., DEF. SCI. BD. TASK FORCE, DEP’T OF DEF., *THE FUTURE OF THE GLOBAL POSITIONING SYSTEM* 4, 25–26 (2005), http://www.acq.osd.mil/dsb/reports/2005-10-GPS_Report_Final.pdf.

11. NAT’L WORKRIGHTS INST., *supra* note 6, at 5.

12. *Id.* at 6.

13. See Alan Zeichick, *GPS Explained: How the Global Positioning System Lets You Know Where You Stand*, RED HERRING, Jan. 30, 2001, at 80, available at <http://www.redherring.com/Article.aspx?a=790#> (article may be accessed through a free subscription). Alan Zeichick is a technology analyst at Camden Associates and is the editor-in-chief of BZ Media’s *SD Times*.

14. *Id.*

15. *Id.*

16. SCOTT PACE ET AL., RAND CORP., *THE GLOBAL POSITIONING SYSTEM: ASSESSING NATIONAL POLICIES*, app. B at 243–46 (1995), available at http://www.rand.org/pubs/monograph_reports/MR614/.

17. Apart from the now defunct Block I satellites, there are five generations of satellites currently in existence (though not all in orbit). They are the Block II and Block IIA, which were manufactured by Rockwell International; the Block IIR and Block IIR-M, which were manufactured by Lockheed-Martin; and the Block IIF, which were manufactured by Boeing. In early 2005, the GPS constellation consisted of one Block II satellite, fifteen Block IIA satellites, and twelve Block IIR satellites. In December 2005, a Block IIR-M was added to the group. DEF. SCI. BD. TASK FORCE, *supra* note 10, at 44–45.

recommended an increase in the number of satellites to ensure even greater operability and accuracy of GPS.¹⁸

GPS transmits two types of information.¹⁹ The first is encrypted information for military use.²⁰ The second is unencrypted information for civilian use.²¹ Until May 2000, the information sent in the civilian transmission was intentionally riddled with random errors.²² These errors served to reduce the accuracy of the information transmitted for civilian purposes.²³ However, the government no longer includes these errors.²⁴ Thus, the current accuracy of the civilian system is, at least theoretically, as good as the information transmitted along military channels.²⁵

GPS allows a receiver on earth to “listen” to the transmissions of the Navstar satellites.²⁶ The satellites circle the earth along six prespecified paths (or orbital planes), with a group of approximately four satellites evenly spaced across each one of the paths.²⁷ Each satellite continuously transmits the position and orbital velocity of every satellite in the system.²⁸ The collective information is known as the system’s ephemeris.²⁹ A receiver on earth then “listens” to the transmissions of the four closest satellites.³⁰ Each satellite’s transmission information defines a sphere around it, enabling the receiver to determine where it may be in relation to each satellite.³¹ Based upon an overlay of the spheres, the receiver determines its precise location on earth.³²

One simple way to help visualize the technology is to imagine that you are lost in New York City. You have a map of the city in your hands, but you have no idea where on the map you are located. At just

18. *Id.* at 9.

19. See U.S. DEP’T OF DEF. ET AL., 2005 FEDERAL RADIONAVIGATION PLAN 2-2 to 2-3 (2005), <http://www.navcen.uscg.gov/pubs/frp2005/2005%20FRP%20WEB.pdf>.

20. *Id.*

21. *Id.*

22. See Statement by the President Regarding the United States’ Decision to Stop Degrading Global Positioning System Accuracy, 1 PUB. PAPERS 803 (May 1, 2000).

23. *Id.*

24. *Id.*

25. Though the government in 2000 did away with the intentional random errors that were introduced into the civilian transmission, in the event of a national emergency, it reserves the right to selectively deny civilian access to the GPS signals being sent. *Id.*

26. See Zeichick, *supra* note 13.

27. DEF. SCI. BD. TASK FORCE, *supra* note 10, at 27; see also Zeichick, *supra* note 13.

28. Zeichick, *supra* note 13.

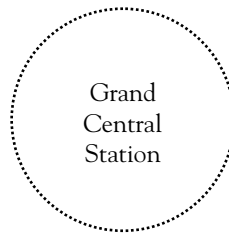
29. *Id.*

30. *Id.*

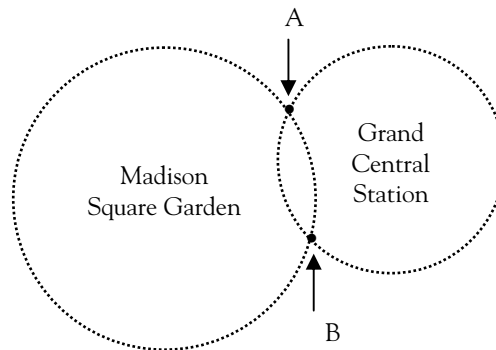
31. DEF. SCI. BD. TASK FORCE, *supra* note 10, at 28.

32. *Id.*

that moment, a friend calls. You describe your surroundings and she tells you, “You are five blocks from Grand Central Station.” You pull out a compass that you just happen to carry with you and draw a circle with a five block radius around the Station. However, you immediately realize that while the information your friend has given you narrows the universe of places you might be, it still does not give you your precise location, because you could be at any point on the boundary of the circle you have drawn³³:



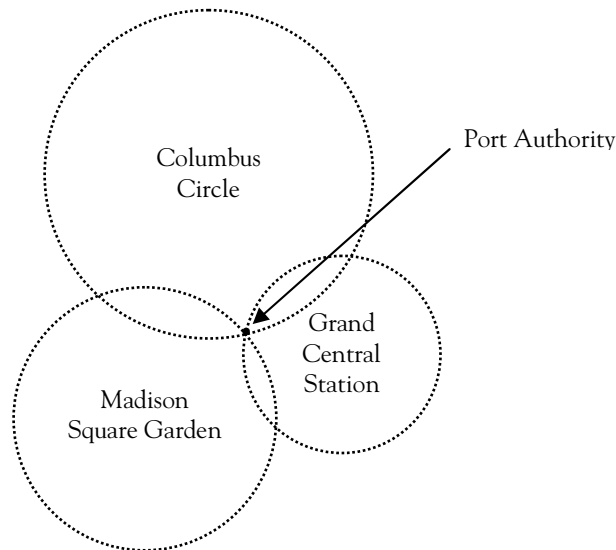
A second friend calls and tells you, “You are ten blocks from Madison Square Garden.” Using your compass, you again draw an appropriately sized circle around the Garden and realize that you can now substantially narrow the range of possibilities for your current location to the two places where the first circle and the second circle intersect:



A third friend then calls and tells you, “You are fifteen blocks from Columbus Circle.” When you combine the information from this last call with the information from the first two, you can narrow your location to the place where the three circles intersect—the Port Authority Bus Terminal,

33. Because New York City blocks tend to be longer from east to west than from north to south, the five-block area surrounding Grand Central Station would look more like an oval than a circle. But, for the sake of simplicity, I have described the bounded areas as circles.

for it is simultaneously five blocks from Grand Central, ten blocks from Madison Square Garden, and fifteen blocks from Columbus Circle:



This process of calculating a single location using multiple linear measures is known as trilateration.³⁴ GPS receivers use trilateration in three dimensions (based upon information received from four satellites) to calculate their latitude, longitude, and altitude.³⁵ In addition, a receiver can compute its speed and the direction in which it is traveling by assessing the rate of change in information received from the satellites.³⁶

Currently, the information transmitted from the GPS satellites allows a basic receiver to accurately determine its position to within one or two meters.³⁷ However, using what is known as differential GPS (or DGPS), a receiver can dramatically improve its positioning accuracy to pinpoint precision.³⁸ DGPS positioning works in the same manner as GPS positioning

34. Richard B. Langley, In Simple Terms, How Does GPS Work? (Jan. 6, 2006), <http://gge.unb.ca/Resources/HowDoesGPSWork.html>.

35. See Zeichick, *supra* note 13.

36. PACE ET AL., *supra* note 16, app. A at 220.

37. This increased accuracy is due to the augmentation of GPS with NDGPS, the Nationwide Differential GPS, and WAAS, the Wide-Area Augmentation System. DEF. SCI. BD. TASK FORCE, *supra* note 10, at 10, 40.

38. PACE ET AL., *supra* note 16, app. A at 227; see also DEF. SCI. BD. TASK FORCE, *supra* note 10, at 89 (noting that accuracies of “better than [ten] centimeters” have been achieved in civil applications).

with one additional element.³⁹ A known, fixed location is outfitted with a receiver. Information from the fixed receiver is then compared to information from the roaming receiver.⁴⁰ This comparison allows for minute corrections of error, which, depending upon the type of receivers used, can increase positioning accuracy to within centimeters.⁴¹

GPS is commonly referred to as a tracking system. However, this mischaracterization of the technology actually undervalues the system's potential. GPS receivers are passive devices, simply reading the information continuously transmitted by the orbiting satellites.⁴² Unless the receiver is also outfitted with a wireless transmitter or recording device, only the receiver can calculate its latitude, longitude, altitude, direction, and speed. A remote third party could not determine the receiver's location.⁴³ The passive nature of the system thus provides some comfort to those concerned with the privacy implications of GPS technology. Such comfort, however, is ill-founded.

The passive receipt of information enables GPS technology to support an infinite number of receivers simultaneously. As one commentator has noted, "GPS provides 24 hour per day global coverage. It is an all-weather system and is not affected by rain, snow, fog, or sand storms."⁴⁴ Furthermore, GPS receivers can be easily outfitted with wireless transmitters that send location information to third parties.⁴⁵ The third party can remotely monitor the precise location of the GPS receiver from a tracking center. In other words, the passive nature of the system makes its reach virtually limitless, and the easy modification of receivers allows them to be quickly converted into tracking devices.

As a result of these features, law enforcement has found the technology to be a useful aid to criminal investigations. GPS technology allows law enforcement officials to monitor suspects more successfully than with ordinary visual surveillance.⁴⁶ For example, the Los Angeles Police Department recently announced that it has begun to outfit its cruisers

39. PACE ET AL., *supra* note 16, app. A at 227.

40. *Id.*

41. *Id.*

42. Langley, *supra* note 34.

43. *See id.*

44. *Id.*

45. *See* State v. Jackson, 76 P.3d 217, 221 (Wash. 2003) (stating that the discovery of a missing nine-year-old victim's body was made possible by detailed information provided by a GPS tracking device, which included identification of locations visited by the suspect's truck and an exact indication of the time the truck spent motionless at each location).

46. *See id.*

with air guns that can launch GPS-enabled “darts” at passing cars.⁴⁷ The darts consist of a miniaturized GPS receiver, radio transmitter, and battery embedded in a sticky compound material. When fired at a vehicle, the compound adheres to the target, and thereafter permits remote real-time tracking of the target from police headquarters.⁴⁸

The technology has also been used by some police departments to conduct internal investigations of their own officers. For example, in Clinton Township, New Jersey, the police department surreptitiously installed GPS devices behind the grilles of its cruisers.⁴⁹ A sergeant in the department then secretly monitored the devices and caught five officers lingering over lunch breaks and hanging out in parking lots at times when they were supposed to be on patrol.⁵⁰

However, vehicular movements are far from the only thing that can be monitored using GPS-enabled surveillance. The technology is constantly becoming smaller and more efficient. For example, in an effort to enhance emergency response times, GPS technology has become a standard addition to most new model cellular telephones.⁵¹ The development of a child-sized tracking bracelet was also recently announced to enable parents to keep constant tabs on the precise location of their children.⁵² And recently, a California company announced the launch of its latest GPS device, which measures just 2.56 inches by 1.7 inches by 1.1 inches and weighs just over three ounces.⁵³ Small enough and light enough to be

47. Richard Winton, *LAPD Pursues High-Tech End to High-Speed Chases*, L.A. TIMES, Feb. 3, 2006, at B1; *LAPD to Chase GPS Darts*, TECHTREE, Feb. 4, 2006, http://www.techtree.com/techtree/jsp/article.jsp?article_id=71159&cat_id=549.

48. Winton, *supra* note 47, at B1; see also Posting of David Pescovitz to BoingBoing, http://www.boingboing.net/2006/02/03/gpsenabled_dart.html (Feb. 3, 2006, 04:27:21 PM) (describing GPS-enabled dart); StarChase, <http://www.starchase.org> (last visited Jan. 30, 2007) (official website of the only current commercial provider of GPS-enabled dart technology).

49. Brandon Bain, *Workers Object to Babylon's Tracking System*, NEWSDAY, Mar. 13, 2006, at A6.

50. *Id.*

51. See James C. White, *People, Not Places: A Policy Framework for Analyzing Location Privacy Issues 1* (Spring 2003) (unpublished masters memo, Duke University), available at <http://www.epic.org/privacy/location/jwhitelocationprivacy.pdf>; see also NAT'L WORKRIGHTS INST., *supra* note 6, at 5.

52. Dan Farmer & Charles C. Mann, *Surveillance Nation*, TECH. REV., Apr. 2003, at 34, 38.

53. *Compact GPS Tracks Footsteps Around the World*, GPS WORLD, Jan. 2006, at 64, 64, available at <http://www.gpsworld.com/gpsworld/article/articleDetail.jsp?id=267159&searchString=%22Compact%20GPS%20Tracks%20Footsteps%20around%20the%20World>; see also Press Release, Digital Angel Corp., *Digital Angel Miniaturizes GPS Transmitting Technology: Matchbook-Size Device Opens Way to Monitor People, Animals and Objects Anywhere* (July 15, 2006), available at http://www.digitalangelcorp.com/about_pressreleases.asp?RELEASE_ID=64.

planted on a person, the device has the added technological advantage of functioning well indoors. Though GPS devices historically functioned best when they could “see” the sky, the technology has now advanced to enable reliable indoor tracking as well.⁵⁴

Moreover, the current state of the technology is constantly being enhanced. In December 2005, the first of a modernized, second-generation satellite (IIR-M) was launched and became fully operational.⁵⁵ A second satellite in this series is to be launched sometime in 2007, with a total of eight IIR-M satellites ultimately scheduled for launch.⁵⁶ Also, a new generation of satellites—Block III—is currently in development and is scheduled for launch in 2013.⁵⁷ These satellites, which have a projected price tag of \$100 to \$150 million apiece, will incorporate enhanced electronics, continuous contact capabilities, and antijamming technologies.⁵⁸ In addition, “all-in-view” receivers are currently in development. These receivers will calculate their location based upon information received from all satellites in view and not just the four closest.⁵⁹ The new devices will further increase efficiency and accuracy.⁶⁰

As noted, the basic accuracy of the current system is approximately two meters (or roughly six and a half feet). However, the recently launched European Galileo project will improve that figure by half. Once Galileo becomes fully operational, the system will provide location information that is accurate to within one meter (or just over three feet).⁶¹ Though not currently accessible by U.S. law enforcement, the technological advancements of the Galileo system foreshadow similar developments in the American system. Indeed, with the launch of the Block III satellites, the accuracy of GPS may eclipse that of Galileo.⁶² Indeed, according to some estimates,

54. *Compact GPS Tracks Footsteps Around the World*, *supra* note 53, at 64.

55. *GPS Goes One Up*, GPS WORLD, Feb. 2006, at 18, available at <http://www.gpsworld.com/gpsworld/article/articleDetail.jsp?id=302702&searchString=%22GPS%20goes%20one%20up%22>.

56. *Id.*

57. DEF. SCI. BD. TASK FORCE, *supra* note 10, at 45–46.

58. *Id.*

59. *Id.* at 60.

60. *Id.* In addition to the improvements in the American system, both the Europeans and the Russians are launching their own satellite networks. See *Galileo Gets Up—Sat Launched, Signal Received, Contract Signed*, GPS WORLD, Feb. 2006, at 15, 18, available at <http://www.gpsworld.com/gpsworld/article/articleDetail.jsp?id=300336&searchString=%22Galileo%20gets%20up%22>. In December 2005, the European Union launched GIOVE-A, the first satellite in its Galileo project. *Id.* at 15. Ultimately, a full constellation of thirty satellites will comprise the Galileo system. *Id.* at 17.

61. *Temex Times Galileo*, GPS WORLD, Feb. 2006, at 58, available at <http://www.gpsworld.com/gpsworld/article/articleDetail.jsp?id=300299>.

62. *Id.*

assuming the continued evolution of computing power and surveillance technology, “by 2023 large organizations will be able to devote the equivalent of a contemporary PC to monitoring every single one of the 330 million people who will then be living in the United States.”⁶³

The ability of GPS to allow law enforcement to so thoroughly monitor the movements of individuals raises substantial Fourth Amendment concerns. As the Court has recognized, foreseeable advances in a particular technology must be considered when evaluating the appropriate limits of Fourth Amendment protection.⁶⁴ Given that GPS-based products are in development that will be small enough to implant under the human skin,⁶⁵ the cautions of the Supreme Court in *Kyllo v. United States*⁶⁶ are meaningful. As the Court noted there, “the [Fourth Amendment] rule we adopt must take account of more sophisticated systems that are already in use or in development.”⁶⁷ In light of the current and future capabilities of GPS technology, let us turn now to an examination of the historical treatment of surveillance technologies under the Fourth Amendment.

II. THE FOURTH AMENDMENT AND ENHANCED SURVEILLANCE METHODS

The Fourth Amendment protects against unreasonable searches and seizures and imposes both a particularity and probable cause requirement upon all warrants that issue.⁶⁸ The Supreme Court has interpreted the protection afforded by the amendment to mean that warrantless searches are presumptively unreasonable.⁶⁹ This general rule is subject to only a handful of limited exceptions.⁷⁰

In the context of searches, the Court’s Fourth Amendment analysis can be divided into two elements: applicability and satisfaction.⁷¹ William Greenhalgh described the elements as follows: “[B]efore spinning our wheels in an exercise of futility inquiring whether the Fourth Amendment

63. Farmer & Mann, *supra* note 52, at 38; *see also* White, *supra* note 51, at 12.

64. *Kyllo v. United States*, 533 U.S. 27, 36 (2001).

65. *See* Simon Romero, *Location Devices’ Use Rises Prompting Privacy Concerns*, N.Y. TIMES, Mar. 4, 2001, § 1, at 1.

66. 533 U.S. 27.

67. *Id.* at 36.

68. U.S. CONST. amend. IV.

69. *Johnson v. United States*, 333 U.S. 10, 13–14 (1948).

70. *Id.* at 14–15.

71. WILLIAM W. GREENHALGH, *THE FOURTH AMENDMENT HANDBOOK: A CHRONOLOGICAL SURVEY OF SUPREME COURT DECISIONS 1* (2d ed. 2003).

has been satisfied, we must pause at the threshold to inquire whether the Fourth Amendment is even applicable so as to require satisfaction.”⁷² In other words, before deciding whether a warrant is required or whether some lesser procedure will suffice in any given case, the Court must first look to whether the official conduct complained of falls within the ambit of the amendment at all. Thus, the warrant protections of the Fourth Amendment will only become relevant to law enforcement’s use of GPS-enhanced surveillance if such surveillance is deemed a search. I therefore turn first to how the Supreme Court has defined a search for Fourth Amendment purposes.⁷³ After resolving that question, I will consider satisfaction and the procedural safeguards that are necessary to make official use of GPS technology constitutional.

A. A Search or Not a Search, That Is the Question

A single definition for the term “search” is not readily communicated by the existing law. As one scholar has noted, “the Supreme Court has executed in an erratic and often contradictory manner . . . its interpretation of the Fourth Amendment.”⁷⁴ Indeed, one could fairly suggest that on even the most preliminary question—what test should be used to decide whether a search has occurred—the Court has not been clear.⁷⁵ Nonetheless, logical threads exist in the jurisprudence.

72. *Id.* at 2.

73. The Fourth Amendment prohibits both searches and seizures. *Horton v. California*, 496 U.S. 128, 133 (1990) (“A search compromises the individual interest in privacy; a seizure deprives the individual of dominion over his or her person or property.”) In the case of GPS-enhanced tracking, the installation of a device would presumably be evaluated under the seizure provisions of the amendment, while the monitoring of any such device would be evaluated under the search terms. See *United States v. Karo*, 468 U.S. 705, 712–13 (1984) (distinguishing between the constitutional issues raised by the installation and the monitoring of a tracking device). In this Article, I limit my analysis to the search prong of the Fourth Amendment. There is of course an equally interesting line of analysis raised by the question of whether installation of such a device constitutes a seizure. However, the Court has, to this point, left open the question of whether installation triggers constitutional concerns. See *United States v. Knotts*, 460 U.S. 276, 279 n.** (1983); see also *United States v. Garcia*, No. 05-CR-155-C, 2006 WL 298704, at *8 (W.D. Wis. Feb. 3, 2006) (finding that installation of a GPS-monitoring device required at least a reasonable suspicion of criminal activity). For now, I defer consideration of that issue.

74. BRADFORD P. WILSON, ENFORCING THE FOURTH AMENDMENT: A JURISPRUDENTIAL HISTORY 4 (1986); see also *Chapman v. United States*, 365 U.S. 610, 618 (1961) (Frankfurter, J., concurring) (observing that “[t]he course of true law pertaining to searches and seizures . . . has not—to put it mildly—run smooth”); *Irvine v. California*, 347 U.S. 128, 134 (1954) (describing the Court’s Fourth Amendment case law as “inconstant and inconsistent”).

75. In 1998, Justice Scalia, writing in concurrence, described the two-pronged *Katz* test as a “fuzzy” standard poorly suited for the threshold question of application. *Minnesota v. Carter*, 525 U.S. 83, 91–92 (1998) (Scalia, J., concurring); see also *id.* at 97 (criticizing the *Katz* test as

On nearly thirty occasions since 1927, the Supreme Court has analyzed law enforcement's use of sense-enhancing aids⁷⁶ through the lens of the Fourth Amendment. The Court's analysis has evolved over the years with its clearest analytical shift announced in 1967 in *Katz v. United States*.⁷⁷ Prior to *Katz*, the Court largely defined a search as a function of some physical invasion by the government. However, in *Katz* the Court rejected the physical invasion trigger, and began to rely instead upon a two-part test that examined the objective reasonableness of an individual's subjective expectation of privacy.

1. Physical Invasion as a Proxy for Fourth Amendment Application

The decision in *Olmstead v. United States*⁷⁸ marks the Court's first clear effort to analyze an enhanced form of surveillance under the Fourth Amendment. There, the Court considered whether the government's months-long use of a wiretapping device to record the private telephone conversations of petitioner Roy Olmstead (and others) constituted a constitutionally impermissible search.⁷⁹ Describing the physical means of installing the wiretap, the Court explained that "[s]mall wires were inserted along the ordinary telephone wires from the residences of four of the petitioners and those leading from the chief office. The insertions were made without trespass upon any property of the defendants."⁸⁰

Retracing its evolving interpretation of the Fourth Amendment, the *Olmstead* Court noted that it had recently taken steps to broaden

"notoriously unhelpful" and "self-indulgent"). However, just three years later, Justice Scalia, writing for the majority in *Kyllo v. United States*, lauded that same test as a readily workable touchstone, which he used to determine whether a search of the interior of a home had occurred. 533 U.S. 27, 32–34 (2001).

76. I use the terms "sense-enhancing aids" and "enhanced surveillance" to include not only technological enhancements like spike mikes and thermal imagers, but also drug-sniffing dogs. Indeed, in *United States v. Jacobsen*, 466 U.S. 109 (1984), Justice Brennan warned of the ready progression from canine-assisted to technology-assisted methods of surveillance. *Id.* at 137–38 (Brennan, J., dissenting) (warning that adherence to the conclusion that dog sniffs are not searches "may very well have paved the way for technology to override the limits of law in the area of criminal investigation").

77. 389 U.S. 347 (1967).

78. 277 U.S. 438 (1928), *overruled by Katz*, 389 U.S. 347, and *Berger v. New York*, 388 U.S. 41 (1967).

79. Roy Olmstead was suspected by the government of running a major liquor smuggling ring. The venture employed more than fifty people and grossed in the neighborhood of \$2 million annually. *Id.* at 455–56.

80. *Id.* at 456–57.

the amendment's protections.⁸¹ However, to the consternation of the *Olmstead* dissent, the Court declined to continue this expansion in the case before it.⁸² Noting that there had been no "actual physical invasion" of the defendants' property, the Court refused to find a constitutional violation.⁸³ With *Olmstead*, the Court recognized a new constitutional threshold for Fourth Amendment protection—tangible physical intrusion by the government.

Fourteen years after *Olmstead*, in *Goldman v. United States*,⁸⁴ the Court reaffirmed its commitment to the threshold requirement of tangible physical intrusion. In *Goldman*, law enforcement officers listened in on the defendants' conversations as they took place in a private office.⁸⁵ Unbeknownst to the defendants, the officers placed a detectaphone against the wall of an adjoining office to pick up and amplify the sound waves emanating from the private office.⁸⁶ When the transcriptions of the captured conversations were offered at trial, the defendants objected.⁸⁷ Adhering to the principles first enunciated in *Olmstead*, the *Goldman* Court refused to find a constitutional violation.⁸⁸ After disposing of the notion that use

81. The *Olmstead* Court surveyed its decisions in seven prior cases and found that, in each, it had maintained or expanded the application of the Fourth Amendment's protections. *Id.* at 458–62 (discussing *Boyd v. United States*, 116 U.S. 616 (1886); *Weeks v. United States*, 232 U.S. 383 (1914); *Ex parte Jackson*, 96 U.S. 727, 733 (1877); *Silverthorne Lumber Co. v. United States*, 251 U.S. 385 (1920); *Amos v. United States*, 255 U.S. 313 (1921); *Gouled v. United States*, 255 U.S. 298 (1921); *Agnello v. United States*, 269 U.S. 20 (1925)). However, signaling its reluctance to find a constitutional violation in the case before it, the *Olmstead* Court further noted that in *Gouled v. United States*, one of the later cases in the series of seven, it had "carried the inhibition against unreasonable searches and seizures to the extreme limit." *Id.* at 463.

82. In a prescient dissent, Justice Brandeis observed that "[c]lauses guaranteeing to the individual protection against specific abuses of power, must have a . . . capacity of adaptation to a changing world." *Id.* at 472 (Brandeis, J., dissenting). Criticizing the majority for its overly technical reading of the amendment, Justice Brandeis noted:

"[I]n the application of a Constitution, our contemplation cannot be only of what has been, but of what may be." The progress of science in furnishing the Government with means of espionage is not likely to stop with wire-tapping. Ways may some day be developed by which the Government, without removing papers from secret drawers, can reproduce them in court, and by which it will be enabled to expose to a jury the most intimate occurrences of the home.

Id. at 474 (quoting *Weems v. United States*, 217 U.S. 349, 373 (1910)).

83. *Id.* at 464–66.

84. 316 U.S. 129 (1942).

85. *Id.* at 131.

86. *Id.* at 131–32.

87. *Id.* at 132.

88. *Id.* at 135–36. In language reminiscent of Justice Brandeis's dissent in *Olmstead*, Justice Murphy, writing in dissent, cautioned that the *Goldman* majority's interpretation of the Fourth Amendment was insufficiently mindful of potential technological advance:

[T]he search of one's home or office no longer requires physical entry, for science has brought forth far more effective devices for the invasion of a person's privacy than the direct and obvious methods of oppression which were detested by our forebears and

of the detectaphone resulted in a trespass, the Court went on to comment that “[t]he petitioners ask us, if we are unable to distinguish *Olmstead v. United States*, to overrule it. This we are unwilling to do.”⁸⁹ The Court continued to explicitly and implicitly endorse the analytical model requiring actual physical invasion as a necessary element of any Fourth Amendment search for another three decades before rejecting it in its entirety.⁹⁰

2. The Rise of the Two-Part *Katz* Test

The rejection of *Olmstead*'s physical invasion analysis finally came in 1967 with the Supreme Court's decision in *Katz*.⁹¹ Charles Katz was a gambler who used a particular public telephone booth at approximately the same time each morning to place bets.⁹² The police investigating Katz's

which inspired the Fourth Amendment. Surely the spirit motivating the framers of that Amendment would abhor these new devices no less. . . . Such invasions of privacy, unless they are authorized by a warrant . . . or otherwise conducted under adequate safeguards defined by statute, are at one with the evils which have heretofore been held to be within the Fourth Amendment and equally call for remedial action.

Id. at 139–40 (Murphy, J., dissenting) (footnote omitted).

89. *Id.* at 135.

90. See *Clinton v. Virginia*, 377 U.S. 158, 158 (1964) (Clark, J., concurring) (finding that the physical intrusion made by a small listening device that the police had inserted into a party wall was sufficient to constitute “actual trespass” and thereby violate the Fourth Amendment); *Lopez v. United States*, 373 U.S. 427, 430–31, 439–40 (1963) (relying upon the lack of any “unlawful physical invasion of petitioner’s premises” to find that the petitioner’s Fourth Amendment rights were not violated when an individual who the petitioner knew to be an IRS agent secretly recorded conversations the two had in the petitioner’s office); *Silverman v. United States*, 365 U.S. 505, 511–12 (1961) (finding that the police use of a “spike mike,” which made contact with a heating duct in the defendant’s home, was a sufficient trespass to trigger Fourth Amendment protection); *Irvine v. California*, 347 U.S. 128, 132, 136–38 (1954) (finding that the police “flagrantly, deliberately, and persistently violated the fundamental principle declared by the Fourth Amendment” when they repeatedly entered defendant’s home surreptitiously to install a listening and recording device, but affirming conviction after refusing to impose the federal sanction of evidentiary exclusion on the states); *On Lee v. United States*, 343 U.S. 747, 751–54 (1952) (finding no violation of the Fourth Amendment because, inter alia, petitioner could not establish trespass by the wired undercover agent, who was present on the property with petitioner’s consent); cf. *Berger v. New York*, 388 U.S. 41, 44 (1967) (finding that New York’s eavesdropping statute violated the Fourth Amendment because, inter alia, it authorized “trespassory intrusion into a constitutionally protected area”); *Osborn v. United States*, 385 U.S. 323, 327 (1966) (distinguishing *Silverman*, but citing *Lopez* with approval); *Lanza v. New York*, 370 U.S. 139, 142–47 (1962) (citing with approval *Silverman*’s trespass-based notion of searches, but declining, in dicta, to extend the constitutional protections recognized there to electronic eavesdropping conducted in the visitors’ room of a public jail).

91. 389 U.S. 347 (1967).

92. *Id.* at 354 n.14.

wagering activity attached a small listening device to the outside of the telephone booth, enabling the police to record six of Katz's telephone calls. The prosecution introduced these calls into evidence at trial over Katz's objection.⁹³ The Ninth Circuit affirmed the conviction, finding that the absence of any physical intrusion into the phone booth precluded the Fourth Amendment's application.⁹⁴

Had the Supreme Court adhered to the logic enunciated in its earlier cases, it too would have affirmed the conviction. However, the Supreme Court radically departed from its earlier holdings, rejecting its predication of Fourth Amendment protection on physical intrusion.⁹⁵ Acknowledging that "the absence of such penetration was at one time thought to foreclose further Fourth Amendment inquiry,"⁹⁶ the Court went on to conclude that "[t]he premise that property interests control the right of the Government to search and seize has been discredited."⁹⁷ Indeed, the *Katz* Court appeared to go to great lengths to ensure that the Fourth Amendment was dislodged from its property rights perch.⁹⁸ As the Court

93. *Id.* at 348, 354 n.14.

94. *Id.* at 348–49.

95. *Id.* at 353. Justice Brennan suggested in his dissent in *Lopez* that the Court actually rejected a link between trespass and Fourth Amendment protection long before the *Katz* decision in 1967. 373 U.S. at 460–61 (Brennan, J., dissenting). Citing *Silverman*, 365 U.S. at 505, Justice Brennan stated "the Court . . . has expressly held . . . that an actual trespass need not be shown in order to support a violation of the Fourth Amendment." *Lopez*, 373 U.S. at 460–61 (Brennan, J., dissenting). Justice Brennan is correct that the *Silverman* Court found a Fourth Amendment violation without first requiring proof of a technical trespass within the meaning of local property law. See *Silverman*, 365 U.S. at 505, 511 ("Inherent Fourth Amendment rights are not inevitably measurable in terms of ancient niceties of tort or real property law."). However, the *Silverman* Court did require evidence of an actual physical invasion. *Id.* at 512 ("[Our] decision here does not turn upon the technicality of a trespass upon a party wall as a matter of local law. It is based upon the reality of an actual intrusion into a constitutionally protected area."). Consequently, notwithstanding Justice Brennan's observation in *Lopez*, *Silverman* cannot be read as a rejection of the physical invasion requirement first established in *Olmstead*. See also *Desist v. United States*, 394 U.S. 244, 248 (1969) (refusing retroactive application of its decision in *Katz* because "[h]owever clearly our holding in *Katz* may have been foreshadowed, it was a clear break with the past").

96. *Katz*, 389 U.S. at 352 (citing *Olmstead v. United States*, 277 U.S. 438, 457, 464, 466).

97. *Id.* at 353 (alteration in original) (quoting *Warden v. Hayden*, 387 U.S. 294, 304 (1967)).

98. *Id.* at 351. Some scholars have suggested that *Katz* should not be read to completely redefine the Court's approach to the Fourth Amendment. For example, Orin Kerr posited that the case reflects little more than the adoption of a "looser" property-based model. See Kerr, *supra* note 3, at 820–23. However, in light of the Court's own pronouncements regarding its intentions in the case, see, e.g., *Desist*, 394 U.S. at 248, I side with those who interpret the case as a "clear break" with the past, see, e.g., Sherry F. Colb, *A World Without Privacy: Why Property Does Not Define the Limits of the Right Against Unreasonable Searches and Seizures*, 102 MICH. L. REV. 889, 894 (2004) ("Protecting property . . . has in the past largely encompassed protecting privacy as well, and it is thus misleading to characterize the Fourth Amendment, textually or historically, as relevant to property but not to privacy.").

declared, “the Fourth Amendment protects people, not places.”⁹⁹ The reformulation of the Fourth Amendment analysis in *Katz* allows for fuller recognition of the true scope of protection provided by the amendment because the amendment’s reach is no longer strictly limited to age-old notions of trespass.

Newly framing the question of the existence of a search, the *Katz* Court held that “[o]ne who occupies [a phone booth], shuts the door behind him, and pays the toll that permits him to place a call is surely entitled to assume that the words he utters into the mouthpiece will not be broadcast to the world.”¹⁰⁰ Phrasing the question of constitutional application somewhat differently, Justice Harlan, in his concurring opinion, enunciated a two-part test to determine whether law enforcement activity constitutes a search: “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.’”¹⁰¹

In subsequent cases, the Court has adopted Justice Harlan’s two-pronged formulation of Fourth Amendment application as the standard analysis for determining whether or not a search has occurred.¹⁰² And, while some scholars have asserted that the time has come to “jettison” *Katz*’s “reasonable expectation of privacy” formula for defining searches,¹⁰³ the Court has, at least for now, declined to accept that invitation. Therefore, to assess whether particular government conduct constitutes a search within the meaning of the Fourth Amendment, we must consider what it means for an individual’s subjective expectation of privacy¹⁰⁴ to be objectively reasonable.

99. *Katz*, 389 U.S. at 351. Notwithstanding the *Katz* Court’s pronouncement that the Fourth Amendment “protects people, not places,” subsequent cases make clear that *Katz* should not be read as a complete rejection of the concept that some places are indeed protected by the amendment. See *Alderman v. United States*, 394 U.S. 165, 175 (1969).

100. *Katz*, 389 U.S. at 352.

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

102. See *Kyllo v. United States*, 533 U.S. 27, 32 (2001); *California v. Ciraolo*, 476 U.S. 207, 211 (1986).

103. Stephen E. Henderson, *Nothing New Under the Sun? A Technologically Rational Doctrine of Fourth Amendment Search*, 56 *MERCER L. REV.* 507, 546 (2005); see also Thomas K. Clancy, *What Does the Fourth Amendment Protect: Property, Privacy or Security?*, 33 *WAKE FOREST L. REV.* 307, 339 (1998) (arguing that use of privacy notions to define the amendment’s protection leaves the amendment subject to “the vagaries of shifting Court majorities, which are able to manipulate the concept to either expand or contract the meaning of the word at will”).

104. As Justice Brennan has observed, the right to privacy encompasses the dual (and independent) interests of security and secrecy. *Illinois v. Andreas*, 463 U.S. 765, 776 n.4 (Brennan, J., dissenting). Security is the Fourth Amendment interest intruded upon by the government’s physical intrusion into a space. Secrecy, on the other hand, is the interest potentially implicated by nonphysical forms of government surveillance. *Id.*

B. Subjective Expectations and Objective Reasonableness

The first element of Justice Harlan's test examines an individual's subjective expectations. It looks at whether an individual has demonstrated that he "seeks to preserve something as private."¹⁰⁵ To make this assessment, the Court examines the defendant's conduct to determine whether that conduct suggests a personal desire for privacy.¹⁰⁶ In this regard, the Court has found that affirmative steps like erecting fences and packaging contraband in closed luggage are sufficient to satisfy the first prong of *Katz*.¹⁰⁷

However, the analysis does not end there. A personal desire for privacy, no matter how earnestly held, does not trigger Fourth Amendment protection unless the desire is one that society is prepared to embrace as reasonable.¹⁰⁸ The Court's refusal to align completely the Fourth Amendment's protection with the first factor in *Katz* is prudent because of the obvious weaknesses in allowing individual behavior alone to define the suitable contours of rights shared by a community. As the Supreme Court has noted, "where an individual's subjective expectations ha[ve] been 'conditioned' by influences alien to well-recognized Fourth Amendment freedoms, those subjective expectations obviously could play no meaningful role in ascertaining what the scope of Fourth Amendment protection was."¹⁰⁹ In light of these concerns, the Court has determined that the Fourth Amendment demands more than the mere examination of individual hopes and beliefs.¹¹⁰ In *Katz*, this "something more" was defined as the societal assessment of reasonableness.

105. *Smith v. Maryland*, 442 U.S. 735, 740 (1979) (quoting *Katz*, 389 U.S. at 351). The first prong of the *Katz* test has alternatively been described as examining whether the defendant "acted in such a way that it would have been reasonable for him to expect that he would not be observed." *United States v. Taborda*, 635 F.2d 131, 137 (2d Cir. 1980).

106. In *Ciraolo*, the Court found that the defendant's construction of two fences—one six feet tall and a second ten feet tall—around the entire perimeter of his property, 476 U.S. at 209, demonstrated a "subjective intent and desire to maintain privacy as to his unlawful agricultural pursuits," *id.* at 211. However, the Court went on to observe that *Ciraolo* had taken no steps to shield his backyard from aerial views. *Id.* at 211–12. This failure, the Court found, left open the question of whether *Ciraolo* possessed "a subjective expectation of privacy from all observations . . ." *Id.* at 212. Similarly, in *Florida v. Riley*, 488 U.S. 445 (1989), the Court observed that the defendant's failure to completely cover his greenhouse defeated any claim that he possessed a subjective expectation of privacy in the interior of the structure. *Id.* at 450.

107. See, e.g., *Bond v. United States*, 529 U.S. 334, 338–39 (2000); *Ciraolo*, 476 U.S. at 209, 211.

108. *Smith*, 442 U.S. at 740–41.

109. *Id.* at 741 n.5.

110. See Anthony G. Amsterdam, *Perspectives on the Fourth Amendment*, 58 MINN. L. REV. 349, 384 (1974) ("An actual, subjective expectation of privacy obviously has no place in a statement of what *Katz* held or in a theory of what the fourth amendment protects.").

The second element of the *Katz* test—the objective reasonableness prong—takes an individual’s professed expectation of privacy and analyzes it through the lens of objectivity.¹¹¹ At this step of the analysis, the question becomes whether “society is prepared to recognize as ‘reasonable’” the right to privacy asserted by the individual.¹¹² According to the Court, “[t]he test of legitimacy is not whether the individual chooses to conceal assertedly ‘private’ activity. Rather, the correct inquiry is whether the government’s intrusion infringes upon the personal and societal values protected by the Fourth Amendment.”¹¹³ Indeed, in striking an appropriate balance between the two prongs of the *Katz* test, the Court has chosen to weigh far more heavily the objective reasonableness inquiry.¹¹⁴

While the Court has devoted a larger share of its analysis to the second prong of the test, it has never explicitly defined the precise factors that render a subjective expectation objectively reasonable. But, that is not to say that the Supreme Court has provided no guidance in its discussions. Although no single factor is deemed determinative in assessing the legitimacy of asserted subjective expectations, the Court has considered, for example, the manner in which a person used a particular location.¹¹⁵ The Court has also examined whether “precautions customarily taken by those seeking

111. The Court’s decision in *Oliver v. United States*, 466 U.S. 170 (1984), is a salient example of a constitutional analysis driven by the objective reasonableness prong. *Id.* at 177 (“The Amendment does not protect the merely subjective expectation of privacy, but only those ‘expectation[s] that society is prepared to recognize as reasonable.’” (alteration in original) (internal quotation omitted) (quoting *Katz v. United States*, 389 U.S. 347, 361 (1967))). In *Oliver*, the defendant was charged with growing marijuana on his property in a field behind his house. *Id.* at 173. There was little dispute that the defendant had demonstrated a clear subjective expectation of privacy with regard to the field. *Id.* Indeed, to get to the marijuana, the police traveled onto defendant’s property and around a locked gate posted with a “No Trespassing” sign. *Id.* Several hundred yards past the gate, a barn, and a parked camper, they found the defendant’s crop. *Id.* The trial court suppressed the evidence, finding that the defendant “had done all that could be expected of him to assert his privacy in the area of the farm that was searched.” *Id.* (referring to the trial court’s decision). However, while acknowledging that the defendant made clear his subjective desire for privacy, the Court concluded that that desire ought not to be given legal validity. *Id.* at 179; see also *California v. Greenwood*, 486 U.S. 35, 41 (1988) (concluding that society was not prepared to recognize as reasonable defendant’s expectation of privacy in “trash left for collection in an area accessible to the public”); *Rakas v. Illinois*, 439 U.S. 128, 143 n.12 (1978) (“Obviously . . . a ‘legitimate’ expectation of privacy by definition means more than a subjective expectation of not being discovered.”).

112. *Smith*, 442 U.S. at 740 (quoting *Katz*, 389 U.S. at 361).

113. *Oliver*, 466 U.S. at 182–83 (footnote omitted); see also *id.* at 182 n.13 (“Certainly the Framers did not intend that the Fourth Amendment should shelter criminal activity wherever persons with criminal intent choose to erect barriers and post ‘No Trespassing’ signs.”).

114. See *Hudson v. Palmer*, 468 U.S. 517, 525 n.7 (1984); *Smith*, 442 U.S. at 741 n.5 (noting that “a normative inquiry would be proper”).

115. *Rakas*, 439 U.S. at 153 (Powell, J., concurring).

privacy” were taken, and whether the governmental intrusion was one that would have been objectionable to the framers.¹¹⁶ A subjective expectation of privacy may also be deemed reasonable if it is buttressed by concepts external to the Fourth Amendment, like property law or “understandings that are recognized and permitted by society.”¹¹⁷

Finally, in the case of enhanced surveillance, the Court has also indicated that the relative intrusiveness of government conduct is a critical element of the second prong of *Katz*.¹¹⁸ It is this final conceptualization of the objective reasonableness inquiry that permits the Fourth Amendment to enjoy continued relevance, even in the face of technologically enhanced surveillance that the framers could never have envisioned.

C. Defining Objective Reasonableness by Referencing Intrusiveness

For as long as the Court has employed the two-part *Katz* inquiry to evaluate the constitutionality of enhanced surveillance, it has incorporated an examination of intrusiveness into its assessment of objective reasonableness. For example, the *Katz* Court itself, in assessing the legitimacy of *Katz*'s expectation of privacy, was guided in large part by consideration of the degree of intrusion occasioned by the government's warrantless use of a surveillance aid. Where *Katz*'s complaint was that the government's listening device broadcasted not simply the volume of his voice or number he dialed but also “the words he utter[ed] into the mouthpiece,”¹¹⁹ the Court concluded that *Katz*'s subjective expectation of privacy was objectively reasonable. In contrast, the Court has determined that no Fourth Amendment concerns are implicated where the government's intrusion is less significant.¹²⁰

Notwithstanding the Court's embrace of intrusiveness as an ingredient of the second prong of *Katz*, some commentators have suggested that continued use of the inquiry is ill-advised in that it reinvigorates the long-discarded physical invasion trigger. Under this view, the intrusiveness inquiry is seen as little more than an assessment of the “level of physical

116. *Id.* at 152–53.

117. *Minnesota v. Carter*, 525 U.S. 83, 88 (1998) (quoting *Rakas*, 439 U.S. at 143 n.12).

118. *United States v. Jacobsen*, 466 U.S. 109, 122–23 (1979) (finding that a field test that revealed only the presence of cocaine was not a search).

119. *Katz v. United States*, 389 U.S. 347, 352 (1967); see also *id.* at 353 (“The Government's activities in electronically listening to and recording the petitioner's words violated the privacy upon which he justifiably relied while using the telephone booth . . .” (emphasis added)).

120. *Smith v. Maryland*, 442 U.S. 735, 742 (1979) (characterizing the pen register used by the government as a form of technology with “limited capabilities” because it revealed only the numbers punched into the keypad, but not the contents of any communication).

invasiveness” of a particular surveillance method.¹²¹ Though the similitude of the terminology—“intrusiveness” and “invasiveness”—perhaps provides an explanation for the conflation, any analysis that reduces the Court’s intrusiveness inquiry to a measurement of physical invasion alone simply cannot be squared with the case law.¹²²

Moreover, although the point of contention may be more semantic than substantive, if the hope is to offer clarity to the contours of Fourth Amendment doctrine, a first step in that direction must be adherence to a common vocabulary. As the Court has repeatedly indicated, far from signaling a revitalization of the physical invasion trigger, the intrusiveness inquiry provides a nuanced and meaningful way to assess the encroachment into private affairs occasioned by, among other things, new forms of surveillance technology. So, what does the inquiry encompass?

A variety of terms—“nature,” “type,” “manner,” “quality,” “specificity,” “content,” and “quantity”—have been used to describe the two queries that make up the intrusiveness inquiry. For the sake of simplicity, I will use

121. See, e.g., Ric Simmons, *The Two Unanswered Questions of Illinois v. Caballes: How to Make the World Safe for Binary Searches*, 80 TUL. L. REV. 411, 436, 438–39 (2005) (suggesting that the intrusiveness inquiry should be discarded entirely because it signals a resurgence of the physical intrusion trigger). To the extent that Ric Simmons suggests only that application of Fourth Amendment search doctrine should not turn on the question of physical invasion, we are in agreement. However, I cannot agree, and the case law does not support, the further notion that the “intrusiveness” of government conduct (when properly defined as the quality and quantity of information potentially revealed by surveillance) is irrelevant to the existence of a search.

122. In his article, Simmons cites the Supreme Court’s decision in *Bond v. United States*, 529 U.S. 334 (2000), as evidence that application of an intrusiveness inquiry constitutes a revitalization of the physical invasion trigger. Simmons, *supra* note 121, at 437. In *Bond*, the Court found that a Border Patrol agent’s physical manipulation of a bus passenger’s luggage constituted an unreasonable search. 529 U.S. 334. While Simmons’s reading of *Bond* arguably finds some traction in the Court’s language, a closer reading of the case reveals that the *Bond* Court did not in fact conflate the two concepts. As Simmons noted, the Court did observe that “[p]hysically invasive inspection is simply more intrusive than purely visual inspection.” Simmons, *supra* note 121, at 436 (alteration in original) (quoting *Bond*, 529 U.S. at 337). However, beyond this observation, at no time did the Court go on to equate Fourth Amendment intrusiveness with notions of trespass. In *Bond*, the greater intrusion for purposes of the Fourth Amendment resulted from the quality and quantity of information revealed by the officer’s manipulation, not the physical nature of that inspection. Indeed, that the Court did not intend for the intrusiveness inquiry to resuscitate the physical invasion trigger is made clear by the Court’s observation that not all physical contact with the bag was constitutionally objectionable. *Bond*, 529 U.S. at 338–39 (“[A] bus passenger clearly expects that his bag may be handled. He does not expect that other passengers or bus employees will, as a matter of course, feel the bag in an exploratory manner. But this is exactly what the agent did here.” (emphasis added)). In other words, though Simmons deems the terms “physical invasion” and “intrusiveness” as legally interchangeable, the Court does not. Intrusiveness is a term of art for purposes of Fourth Amendment analysis and one that has developed a rich and significant history in the context of analyzing the constitutionality of surveillance aids. Under these circumstances, rigorous adherence to a precise use of the language is crucial.

the terms “type” and “quantity” to describe what the Court seems to consider when evaluating intrusiveness. In short, the Court has focused on what kind of information (type) is revealed by government surveillance equipment, and the amount of information (quantity) potentially disclosed by such enhanced surveillance when assessing the constitutionality of government conduct.¹²³

On paper, the inquiry suggests a balanced examination of both concerns to assess objective reasonableness.¹²⁴ In practice, however, the Court has employed a more lopsided application of the intrusiveness test that is primarily driven by its assessment of the type of information that is being uncovered. By primarily focusing upon the type of information that a particular surveillance method is capable of exposing, the Court has, in large part, tied the scope of Fourth Amendment protection to the categorization of a technology as either sense augmenting or extrasensory. The Court’s asymmetrical approach to intrusiveness is, however, neither necessary nor desirable. Applying a more balanced consideration of the two intrusiveness factors allows advanced technologies to be evaluated in a manner that is consistent with the privacy notions embedded in the Fourth Amendment.¹²⁵ Let’s look first though at how the Court has tended to analyze the first prong—type.

1. Differential Treatment Based on the Type of Information Revealed

When gauging the objective reasonableness of various privacy expectations, the Court has leaned heavily on its assessment of the type of information revealed to segregate challenged surveillance technologies into two rough groups: sense-augmenting surveillance and extrasensory surveillance. Sense-augmenting surveillance refers to

123. See *United States v. Place*, 462 U.S. 696, 707 (1983) (concluding that any expectation of privacy the owner had in his luggage was not unreasonably violated by a dog sniff because “no other investigative procedure . . . is so limited both in the manner in which the information is obtained and in the content of the information revealed by the procedure” (emphasis added)); see also *Illinois v. Caballes*, 543 U.S. 405, 409 (2005) (quoting *Place*, 462 U.S. at 707, for the proposition that a dog sniff “discloses only the presence or absence of narcotics, a contraband item” (emphasis added)); *Jacobsen*, 466 U.S. at 124 (finding that a warrantless field test for cocaine did not intrude upon any legitimate expectations of privacy where “the manner in which information is obtained through this investigative technique is much less intrusive than a typical search” (emphasis added) (quoting *Place*, 462 U.S. at 707)). It should be noted that the proposition that dog sniffs are limited inspections, which reveal only the presence or absence of contraband, has been called into question. See, e.g., *Caballes*, 543 U.S. at 411 (Souter, J., dissenting) (“The infallible dog, however, is a creature of legal fiction.”).

124. See, e.g., *Place*, 462 U.S. at 707.

125. See *infra* Part II.C.2.

surveillance that reveals information that could theoretically be attained through one of the five human senses. With regard to this type of surveillance, the Court has tended to find that simple mechanical substitutes for or enhancements of human perception typically trigger no Fourth Amendment concerns in cases in which human perception alone would not have required a warrant.

Extrasensory surveillance, conversely, is that which reveals information otherwise indiscernible to the unaided human senses. The Court has adopted a more privacy-protective view of this form of technologically enhanced police conduct. In fact, the case law suggests that surveillance of this type is largely prohibited in the absence of a warrant.

a. The Court's Permissive Treatment of Sense-Augmenting Surveillance

The first three post-*Katz* cases in which the Court used intrusiveness to measure objective reasonableness were *United States v. Caceres*,¹²⁶ *Smith v. Maryland*,¹²⁷ and *United States v. Knotts*.¹²⁸ In these cases, the Court approved the warrantless use of the surveillance aids in question only after examining the type of information revealed and categorizing the use of those aids as mere sense-augmented surveillance.

In *Caceres*, the Court considered, among other things, whether the Fourth Amendment prohibited an IRS agent's surreptitious use of a recording device during conversations with the defendant.¹²⁹ The Court found that it did not.¹³⁰ In reaching this conclusion, the Court took extended note of the fact that the recording device was essentially a mechanical substitute for

126. 440 U.S. 741 (1979).

127. 442 U.S. 735 (1979).

128. 460 U.S. 276 (1983). Prior to *Caceres*, the Court considered five cases involving enhanced surveillance without specifically examining the intrusiveness of the challenged government conduct. In each of these cases, however, the narrow nature of the question before the Court, or the broader inapplicability of *Katz*, precluded the intrusiveness inquiry. See *United States v. Chadwick*, 433 U.S. 1, 4 (1977) (observing without further comment that the challenged search of the defendant's footlocker was preceded by a dog sniff); *United States v. U.S. Dist. Court*, 407 U.S. 297, 299 (1972) (examining whether presidential authorization of enhanced surveillance in matters of national security could constitutionally replace prior judicial authorization); *United States v. White*, 401 U.S. 745, 754 (1971) (refusing to give retroactive application to *Katz*); *Desist v. United States*, 394 U.S. 244, 246 (1969) (same); *Alderman v. United States*, 394 U.S. 165, 174, 180 (1969) (limiting analysis to a question of standing and the procedures to be applied in the lower court on remand).

129. *Caceres*, 440 U.S. at 743.

130. *Id.* at 751-52.

the agent's contemporaneous written notes.¹³¹ While conceding that the type of information obtained by the recording device was somewhat better than that produced through notes or unaided memory, the Court declined to define the use of the device a search because the type of information accessed by the device was coextensive with the type of information available to the agent alone: "If the conduct and revelations of an agent operating without electronic equipment do not invade the defendant's constitutionally justifiable expectations of privacy, neither does a simultaneous recording of the same conversations"¹³²

One month after the *Caceres* decision, the Court again approved of law enforcement's warrantless use of a surveillance device after characterizing that device as mere sense augmentation.¹³³ In *Smith*, the technology at issue was a pen register.¹³⁴ Describing the type of information revealed by the device, the Court noted that "[t]he switching equipment that processed those numbers is merely the modern counterpart of the operator who, in an earlier day, personally completed calls for the subscriber."¹³⁵ The Court explained that pen registers "disclose only the telephone numbers that have been dialed Neither the purport of any communication between the caller and the recipient of the call, their identities, nor whether the call was even completed is disclosed by pen registers."¹³⁶ Once again, the Court's determination that a device permitted only sense-augmented surveillance led to the conclusion that a Fourth Amendment search had not occurred.

131. *Id.* at 750 (quoting *United States v. White*, 401 U.S. 745, 751 (1971), for the proposition that "a police agent who conceals his police connections may write down for official use his conversations with a defendant and testify concerning them, without . . . otherwise violating the latter's Fourth Amendment rights").

132. *Id.* at 751 (quoting *White*, 401 U.S. at 751).

133. Significantly, where the location of the search in *Smith v. Maryland*, 442 U.S. 735 (1979), was a private home, the Court's discussion of the intrusiveness of the technology mimics that of the intrusiveness discussion in *Kyllo v. United States*, 533 U.S. 27 (2001). In both cases, the searched location was a home, an area typically excluded from the intrusiveness inquiry. Thus, it should have mattered little how the technology worked in either case. Nonetheless, the majority in each case found it necessary to categorize the technology at issue before assessing the constitutionality of its use without a warrant. As noted above, in *Kyllo*, in which Fourth Amendment protection was extended, the majority's description of the thermal imager suggests that the device is extrasensory. 533 U.S. at 34. In contrast, in *Smith*, in which the Fourth Amendment was found not to apply, the pen register was characterized as sense augmenting. 442 U.S. at 744.

134. *Smith*, 442 U.S. at 736.

135. *Id.* at 744.

136. *Id.* at 741 (quoting *United States v. N.Y. Tel. Co.*, 434 U.S. 159, 167 (1977)). It would also be plausible to suggest that the Court's decision in *Smith* turned upon a determination that the scope of information potentially revealed by the pen register was extremely limited. For a fuller discussion of the impact of the potential disclosure inquiry on constitutional treatment, see *infra* Part II.C.2.

Four years later in *Knotts*, the Court examined what it deemed to be sense-augmenting technology once more before turning its focus to a pair of cases involving extrasensory surveillance.¹³⁷ The technology at issue in *Knotts* was a beeper placed by law enforcement in a barrel of chloroform sold to the defendant.¹³⁸ A beeper is a battery-operated tracking device that emits a weak radio signal, which can be followed using a receiver.¹³⁹ Beepers do not determine with any great degree of accuracy where a tracked subject is located. Rather, they enable agents to discern when the beeper is nearby.¹⁴⁰ In other words, effective use of a beeper requires law enforcement's presence in the vicinity, for the signal emitted by the beeper is neither sufficiently strong nor sufficiently precise to permit truly remote tracking.

The *Knotts* Court began by setting out the *Katz* two-part test as the standard under which the government's conduct should be evaluated.¹⁴¹ In working through its analysis of objective reasonableness, the Court then turned to an examination of the intrusiveness of the beeper technology.¹⁴² Qualitatively classifying beeper technology as sense augmenting, the *Knotts* Court repeatedly observed that the type of information revealed by the beeper did not exceed that which could have been discovered through unaided observation.¹⁴³ As the Court found, "[t]he governmental surveillance conducted by means of the beeper . . . amounted principally to the following of an automobile on public streets and highways."¹⁴⁴ Consequently, the *Knotts* Court

137. 460 U.S. 276 (1983). Three months after issuing its decision in *Knotts*, the Court decided *United States v. Place*, 462 U.S. 696 (1983). The extrasensory surveillance aid at issue in *Place* was a drug-sniffing dog. *Id.* at 697–98. The next year, the Court decided *United States v. Jacobsen*, 466 U.S. 109 (1984), in which it determined that a warrant was not needed to conduct a chemical field test for cocaine. *Id.* at 125.

138. *Knotts*, 460 U.S. at 277.

139. *Id.*

140. *United States v. Moore*, 562 F.2d 106, 112 (1st Cir. 1977).

141. *Knotts*, 460 U.S. at 280–81.

142. *Id.*

143. *Id.* at 282.

144. *Id.* at 281; *see also id.* at 282 (noting that “[v]isual surveillance from public places along [codefendant] Petschen’s route . . . would have sufficed to reveal all of these facts to the police”); *id.* at 283–84 (observing that both the beeper at issue in *Knotts* and the pen register at issue in *Smith* did nothing more than a human tracker or live operator would have been able to do); *id.* at 284 (criticizing the lower appellate court, which rejected the warrantless use of the beeper, for ignoring the “limited use which the government made of the signals from this particular beeper”); *id.* at 285 (commenting that “[a] police car following Petschen at a distance throughout his journey could have observed him leaving the public highway and arriving at the cabin owned by respondent”); *id.* (noting that “the beeper was [not] used in any way to reveal information . . . that would not have been visible to the naked eye from outside the cabin”).

determined that use of the beeper should not be deemed a search for purposes of the Fourth Amendment.¹⁴⁵

The Court's decisions in *Caceres*, *Smith*, and *Knotts* exemplify the Court's general treatment of technology that it believes should be classified as sense augmenting. With regard to this class of technology, the Court finds its warrantless use constitutionally unremarkable provided law enforcement's unaided observation under the same circumstances would be unobjectionable. However, the Court has not been as noninterventionist in its treatment of surveillance that the Court believes should be categorized as extrasensory.

b. The Court's More Restrictive View of Extrasensory Surveillance Aids

In contrast with its largely permissive treatment of law enforcement's use of sense-augmenting technology, the Court's assessment of the warrantless use of extrasensory aids has been notably more restrictive. The impact of characterizing a technology as extrasensory for purposes of defining its proper Fourth Amendment treatment can be seen clearly in the Court's *Kyllo* decision.¹⁴⁶

In that case, an agent at the U.S. Department of the Interior suspected that Danny Kyllo was growing marijuana inside his townhouse.¹⁴⁷ The agent was aware that such indoor growth would likely involve high-intensity lamps and would therefore generate substantial amounts of heat.¹⁴⁸ Consequently, the agent sat outside of Kyllo's home early one January

145. *Id.* at 284–85.

146. Arguing that application of the Fourth Amendment should bear no relationship to the type of information revealed by a particular technology or to the way in which the technology operates, at least one commentator has suggested that the Court's *Kyllo* decision in fact was a repudiation of the longstanding distinction between sense augmenting and extrasensory. See Simmons, *supra* note 121, at 433–34. There are two problems, however, with Simmons's conclusion. First, the Court has never suggested that functionality alone is the key to constitutional treatment. Rather, as the Court has made clear, both the functionality of a particular form of technology and the scope of information it can potentially disclose are relevant to its constitutional treatment. See, e.g., *United States v. Jacobsen*, 466 U.S. 109, 122–23 (1984). Moreover, the suggestion that *Kyllo* is a repudiation of the Court's longstanding categorization of technology simply cannot be reconciled with the clear language of the majority and dissenting opinions in the case, both of which took great pains to objectively categorize the type of information revealed by the thermal imager in question. Simmons is correct to suggest that a functionality analysis alone is ill-advised. However, this statement does little to advance a meaningful discussion of the existing analytical framework, which incorporates analysis of both the functionality of government surveillance equipment and the quantity of information potentially revealed by its use.

147. *Kyllo v. United States*, 533 U.S. 27, 29 (2001).

148. *Id.*

morning with his partner and scanned the exterior of the structure with an Agema Thermovision 210 thermal-imaging device.¹⁴⁹ The device detected infrared radiation, providing the agents with information about the relative heat being emitted from various parts of Kyllo's home.¹⁵⁰

Both the majority and the dissent in *Kyllo* carefully considered how to classify the type of information that the thermal imager revealed before deciding upon its appropriate constitutional treatment. For the majority, the thermal imager was clearly an extrasensory device, for it revealed information that was "otherwise imperceptible" to the average human being.¹⁵¹ Not surprisingly, the majority then used this characterization of the technology to build its broader conclusion that warrantless use of the thermal imager constituted a constitutionally unreasonable search.¹⁵²

In contrast, the dissenting Justices, who found the warrantless use of the thermal imager entirely unobjectionable, did so only after concluding that the thermal imager was a sense augmenting (as opposed to an extrasensory) aid. According to the dissent, "the ordinary use of the senses might enable a neighbor or passerby to notice the heat emanating from a building."¹⁵³

The *Kyllo* decision is a pointed example of the ease with which formalistic application of the intrusiveness test can cause constitutional protections to rise or fall on the talismanic incantation of the sense-augmenting or extrasensory categories. For the *Kyllo* majority, the determination that the thermal imager operated in an extrasensory fashion essentially ended the Court's analysis.¹⁵⁴ Once the initial classification had been made, the majority seemingly deemed serious scrutiny of the quantity of information potentially revealed by the thermal imager unnecessary. The *Kyllo* dissent reflects a similar drift toward formalism.¹⁵⁵

149. *Id.* at 29–30.

150. *Id.* at 30.

151. *Id.* at 38 n.5; *see also id.* at 29 (observing that the thermal imager detected "infrared radiation, which virtually all objects emit but which is not visible to the naked eye"); *id.* at 35 n.2 (disputing the dissent's description of the thermal imager as a sense-augmenting device by noting that "on the night of January 16, 1992, no outside observer could have discerned the relative heat of Kyllo's home without thermal imaging").

152. *Id.* at 40; *see also id.* at 38 n.5 (commenting that the *Kyllo* decision should be read to vindicate the notion that a constitutional line is crossed whenever technology permits perception of that which is otherwise imperceptible).

153. *Id.* at 43 (Stevens, J., dissenting).

154. *Id.* at 34 (majority opinion) ("We think 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." (internal citation omitted) (quoting *Silverman v. United States*, 365 U.S. 505, 512 (1961))).

155. *Id.* at 43 (Stevens, J., dissenting).

However, as the Court has acknowledged (though not faithfully implemented), the simple categorization of a surveillance aid should not end the constitutional inquiry. Notwithstanding the precise functional classification of any particular technology, the quantity of information that the technology can potentially disclose is also a critical component in assessing its proper constitutional treatment.¹⁵⁶ In other words, though there are certainly examples of the Court being somewhat mechanical in its constitutional treatment of surveillance technologies, such formalism is not a compulsory attribute of the intrusiveness inquiry. Indeed, while bright-line tests are certainly desirable in some areas, as discussed in greater detail below, we must resist the pressure to reduce Fourth Amendment analysis to little more than a question of into which box the government's surveillance technology can most neatly be placed.

2. Quantity as a Moderating Agent

In addition to the type of information that an emerging technology reveals, the Court has also recognized that consideration of the amount of information it can potentially disclose tempers, at the margins, the Court's unconditional application of the general rules stated above. Thus, in the case of sense-augmenting technologies, where information of an admittedly unremarkable character is nonetheless noteworthy for its sheer volume or detail, the Court has suggested that Fourth Amendment protection is appropriate. In contrast, where the quantity of information potentially revealed is tightly circumscribed, the warrantless use of extrasensory surveillance has typically been approved.

For example, in *Dow Chemical Company v. United States*,¹⁵⁷ the Court was asked to consider whether the Environmental Protection Agency's (EPA) aerial photographing of an industrial plant constituted an unreasonable search.¹⁵⁸ The Court began its analysis with an examination of the type of information revealed by the aerial camera.¹⁵⁹ In this regard, the Court noted that "a simple flyover with naked-eye observation" would not constitute a search within the meaning of the Fourth Amendment.¹⁶⁰ The Court then observed that the technology being used by the EPA was not

156. See, e.g., *United States v. Place*, 462 U.S. 696, 707 (1983) (examining both the type of information revealed by the challenged dog sniff and the quantity of information disclosed).

157. 476 U.S. 227 (1986).

158. *Id.* at 229.

159. *Id.* at 231.

160. *Id.* at 234.

an extrasensory device, but rather was a mild augmentation of a naked-eye view.¹⁶¹ However, the Court did not end its analysis with this categorization.

After acknowledging that the aerial camera was best classified as a sense-augmenting device, the Court turned its attention to the particularity of the information revealed in the photographs. For example, the Court observed that the amount of information revealed by the photographs was essentially limited to the outline of the physical plant. According to the Court, “[n]o objects as small as 1/2-inch in diameter such as a class ring, for example, are recognizable, nor are there any identifiable human faces or secret documents captured in such a fashion as to implicate more serious privacy concerns.”¹⁶² Based upon its two-fold conclusion regarding the type and the quantity of information revealed by the EPA’s technologically enhanced aerial surveillance, the Court declined to find that a search had occurred.¹⁶³

However, by way of comparison, the Court noted that a different constitutional outcome might be reached when more technologically advanced forms of aerial surveillance permit the government to uncover greater quantities of information:

It may well be, as the Government concedes, that surveillance of private property by using highly sophisticated surveillance equipment . . . such as satellite technology, might be constitutionally proscribed absent a warrant. But the photographs here are not so revealing of intimate details as to raise constitutional concerns.¹⁶⁴

A similar appreciation for the moderating effect of informational quantity (or particularity) was expressed by the Court in *Knotts*. As noted above,¹⁶⁵ the

161. *Id.* at 238 (“Here, EPA was not employing some unique sensory device that, for example, could penetrate the walls of buildings and record conversations in Dow’s plants, offices or laboratories . . .”); *see also id.* (“The mere fact that human vision is enhanced somewhat, at least to the degree here, does not give rise to constitutional problems.”). Interestingly, the district court’s decision in the case, which found that the Fourth Amendment had been breached, was grounded in reasoning that the aerial camera used by the Environmental Protection Agency (EPA) was better categorized as an extrasensory device. *Dow Chem. Co. v. United States*, 536 F. Supp. 1355, 1367 (E.D. Mich. 1982) (rejecting the EPA’s contention that “the camera can’t see what the eye can’t see,” and finding that the camera captured “a great deal more than the human eye could ever see”).

162. *Dow Chem.*, 476 U.S. at 238–39 n.5.

163. *Id.* at 239.

164. *Id.* at 238; *see also id.* at 250 n.12 (Powell, J., dissenting) (complaining that the majority opinion “holds that Dow had no reasonable expectation of privacy from surveillance accomplished by means of a \$22,000 mapping camera, but that it does have a reasonable expectation of privacy from satellite surveillance and photography”); *California v. Ciraolo*, 476 U.S. 207, 215 n.3 (1986).

165. *See supra* note 143 and accompanying text.

Knotts Court did not find that the tracking beeper before it triggered any particular constitutional concerns because it was a mere sense-augmenting device. Indeed, in keeping with the general refusal to place Fourth Amendment restraints on the police use of surveillance that only mildly augments the human senses, the Court observed that “[a] person traveling in an automobile on public thoroughfares has no reasonable expectation of privacy in his movements from one place to another.”¹⁶⁶ However, the Court also recognized a very important limitation to its language.¹⁶⁷

In response to the defendant’s warning that the Court’s ruling would make possible “twenty-four hour surveillance of any citizen of this country . . . without judicial knowledge or supervision,”¹⁶⁸ the Court was careful to note that its opinion should not be read in this fashion. Recognizing that constitutional protections may be warranted if tracking surveillance revealed more than the limited quantity of information disclosed by a beeper, the Court observed, “if such dragnet type law enforcement practices as [Knotts] envisions should eventually occur, there will be time enough then to determine whether different constitutional principles may be applicable.”¹⁶⁹ The Court’s cautionary words in *Dow Chemical* and *Knotts* underline the notion that while sense-augmenting surveillance does not typically trigger Fourth Amendment concerns, where such devices reveal information that is noteworthy for its potential volume or detail, constitutional protections may be required.

Consideration of the degree of potential disclosure has also impacted the Court’s assessment of extrasensory devices. However, while consideration of the quantity factor has extended the constitutional protection afforded to individuals who are the subject of sense-augmented surveillance, by theoretically barring the warrantless use of sense-augmented surveillance that reveals too much information, consideration of that same factor has tended to restrict the constitutional protection afforded to subjects of government surveillance enhanced by extrasensory aids, by allowing such surveillance where the amount of information revealed is limited. Put another way, analysis of the quantity of information potentially revealed determines how much information is too much in the case of

166. *United States v. Knotts*, 460 U.S. 276, 281 (1983).

167. As discussed in greater detail below in Part III.A, some lower courts and legal commentators read the *Knotts* decision as a blanket authorization of warrantless tracking in public spaces. However, where such a reading of the case ignores the important limitations that the Court itself placed on the holding, that reading should be rejected.

168. *Knotts*, 460 U.S. at 283.

169. *Id.* at 284.

sense-augmenting devices; and asks the question—is the potential disclosure sufficiently limited?—in the case of extrasensory surveillance tools. The clearest example of this is provided by the Court’s treatment of so-called binary searches—extrasensory surveillance techniques that allow the government agent to discern only the presence or absence of criminal activity.¹⁷⁰

For example, in *United States v. Place*,¹⁷¹ the Court considered the warrantless use of a dog to conduct a sniff test of closed luggage.¹⁷² Unquestionably, the information revealed by the test—the presence of narcotics—was not information that could have been ascertained by the police using their unaided senses. Nonetheless, the Court declined to find that use of the extrasensory aid was a Fourth Amendment search because the amount of information revealed was extremely restricted.¹⁷³ As the Court found, “despite the fact that the sniff tells the authorities something about the contents of the luggage, the information obtained is limited.”¹⁷⁴

Less than a year after the Court’s decision in *Place*, the Court decided *United States v. Jacobsen*.¹⁷⁵ As in *Place*, the issue was the constitutionality of the warrantless use of an investigative tool that revealed the presence of narcotics. In *Jacobsen*, the extrasensory tool in question was a chemical field test.¹⁷⁶ The *Jacobsen* Court divided its analysis into two equally significant parts—the lawfulness of the government’s initial seizure of the defendant’s property and the lawfulness of the government field test to determine that the property was cocaine.¹⁷⁷ With regard to the latter half of the analysis, the Court’s opinion was exclusively concerned with the limited information revealed by the chemical analysis in question. As the Court observed, “[t]he field test at issue could disclose only one fact previously unknown to the agent—whether or not a suspicious white powder was cocaine. It could tell him nothing more”¹⁷⁸ In refusing to distinguish *Place* from the case before it, the *Jacobsen* Court confirmed that its rule in

170. Only two binary search methods are presently being effectively employed by law enforcement agents: the dog sniff and the chemical field test for drugs. See generally Simmons, *supra* note 121.

171. 462 U.S. 696 (1983).

172. *Id.* at 697–99.

173. *Id.* at 707 (“A ‘canine sniff’ by a well-trained narcotics detection dog, however, does not require opening the luggage. It does not expose noncontraband items that otherwise would remain hidden from public view”).

174. *Id.*

175. 466 U.S. 109 (1984).

176. *Id.* at 111.

177. *Id.* at 115, 118–22.

178. *Id.* at 122.

the earlier case turned upon the fact that the dog sniff revealed such a minute quantity of otherwise imperceptible information.¹⁷⁹

3. An Exception: Surveillance Within the Home

Before turning to consider how the government's use of GPS-enabled surveillance might be analyzed under the existing doctrine, it bears mention that the one place where the relative intrusiveness of the government's conduct is generally not a relevant consideration for purposes of the Fourth Amendment is the home.¹⁸⁰ Upon examination, the Court's refusal to question the intrusiveness of the government's conduct in this context makes perfect sense. The question of intrusiveness is one that affects only the objective reasonableness of subjective expectations. However, with regard to the home, the question of objective reasonableness is not one that is typically factored into the Fourth Amendment analysis. That is because a fairly clear analytical perimeter has been drawn around the home.¹⁸¹ This perimeter finds its roots in the text of the Fourth Amendment and has been largely respected by the Court.¹⁸² Indeed, though *Katz* could be read as a declaration that places will be afforded no special protection under the Fourth Amendment,¹⁸³ the Court has consistently maintained that, at least with regard to the home, the case should not be read in this fashion. Just two years after *Katz*, the Court unambiguously declared that it did not intend for *Katz* "to withdraw any of the protection

179. *Id.* at 124 n.24 (noting that the *Place* decision was grounded not in the absence of any "physical invasion of Place's effects" but rather in the limited information revealed by the dog sniff at issue in that case); see also *Illinois v. Caballes*, 543 U.S. 405, 409–10 (2005) (observing that the different outcomes in *Caballes* and *Kyllo* could be justified in part by the amount of information revealed in each case).

180. See, e.g., *Kyllo v. United States*, 533 U.S. 27, 37 (2001) ("The Fourth Amendment's protection of the home has never been tied to measurement of the quality or quantity of information obtained.").

181. *Id.* at 40 ("We have said that the Fourth Amendment draws a firm line at the entrance to the house." (internal quotation omitted)).

182. Cf. *Irvine v. California*, 347 U.S. 128, 132, 136–38 (1954) (refusing to impose the federal exclusionary rule as a sanction in that case upon the state actors, despite their repeated intrusions into the petitioner's home to install a concealed microphone, intrusions which the Court characterized as "flagrantly, deliberately, and persistently violat[ing] . . . the Fourth Amendment").

183. See, e.g., *Alderman v. United States*, 394 U.S. 165, 191 (1969) (Harlan, J., concurring in part and dissenting in part) (complaining that "we have not buried *Olmstead*, so far as it dealt with the substance of Fourth Amendment rights, only to give it new life in the law of standing. Instead we should reject traditional property concepts entirely, and reinterpret standing law in the light of the substantive principles developed in *Katz*" (emphasis added)).

which the Amendment extends to the home,¹⁸⁴ and subsequent cases have appreciated that the home is different for purposes of the Fourth Amendment.¹⁸⁵

As a result of this line drawing, the analysis of the Fourth Amendment's application within the four walls of one's home has been somewhat modified from the traditional two-part *Katz* inquiry. In the context of the home, the Court has consistently answered the question of objective reasonableness—the second prong of the test—in the affirmative. In other words, “private residences are places in which the individual normally expects privacy free of governmental intrusion not authorized by a warrant, and that expectation is plainly one that society is prepared to recognize as justifiable.”¹⁸⁶ Consequently, the analysis of the Fourth Amendment's application in the home essentially becomes compressed into a single question—does the defendant's conduct demonstrate a subjective expectation of privacy? Thus, at least within the four walls of one's home,¹⁸⁷ if an individual plausibly asserts a subjective expectation of privacy, the Court seems prepared to assume that society will accept that expectation as objectively reasonable.¹⁸⁸

184. *Id.* at 180.

185. Compare *United States v. Knotts*, 460 U.S. 276 (1983), with *United States v. Karo*, 468 U.S. 705 (1984).

186. *Karo*, 468 U.S. at 714; see also *Knotts*, 460 U.S. at 281–82 (acknowledging the limited nature of information revealed by beeper technology, but nonetheless suggesting that the warrantless use of such technology in the home would be constitutionally impermissible).

187. The Court has seemed somewhat less inclined to include within this analytical perimeter areas beyond a home's four walls, regardless of proximity to the home. See *Florida v. Riley*, 488 U.S. 445 (1989) (applying the objective reasonableness test to permit warrantless aerial observation of a greenhouse located within a few feet of defendant's home); *California v. Ciraolo*, 476 U.S. 207 (1986) (applying the objective reasonableness test to permit warrantless aerial surveillance of the defendant's fenced backyard).

188. Arguably, the decision in *Smith v. Maryland*, 442 U.S. 735 (1979), is a notable exception to the Court's general pattern of assuming the objective reasonableness of one's subjective expectation of privacy with regard to activities conducted inside the four walls of one's home. In *Smith*, the Court was asked to consider whether the government's use of a pen register to track the numbers dialed from the defendant's home telephone was a violation of the Fourth Amendment. *Id.* at 736. In finding that the pen register's use did not constitute a search, the Court held that “even if petitioner did harbor some subjective expectation that the phone numbers he dialed would remain private, this expectation” was not reasonable. *Id.* at 743. Notwithstanding the seeming conflict between this ruling and the Court's otherwise consistent policy, it is possible to reconcile the two. The logic underlying reconciliation is weaved throughout the *Smith* opinion itself. According to the Court, Smith knowingly transmitted the telephone numbers he dialed from his home telephone to the telephone company. *Id.* at 743. This knowing transmission to a third party, according to the *Smith* Court, defeated any expectation of privacy Smith might otherwise have claimed in the information. *Id.* at 743–44. Described somewhat differently, Smith's conduct was analytically akin to leaving the sides and top of his greenhouse exposed and, therefore, deserving of no greater respect by the Court. See *Riley*, 488 U.S. at 450 (finding that an officer's observations through gaps in a greenhouse's roof and sides was not a search within the meaning of the Fourth Amendment). I do not broach in this Article the numerous concerns raised by the *Smith* Court's “assumption of risk” analysis. See generally *Smith*, 442 U.S. at 750 (Marshall, J., dissenting) (noting that “[i]t is idle to speak of ‘assuming’ risks in contexts where, as a practical matter, individuals have no realistic alternative”).

In light of the foregoing, with the exception of surveillance conducted inside a suspect's house, the question of whether the Fourth Amendment places restrictions upon law enforcement's use of GPS-enabled tracking will turn, in large part, upon how reviewing courts view the relative intrusiveness of the technology.

III. THE FOURTH AMENDMENT'S REASONABLENESS REQUIREMENT AND THE USE OF GPS-ENHANCED SURVEILLANCE

As discussed in Part II, in order to determine whether the Fourth Amendment in any way limits police use of GPS-enhanced surveillance, we must consider both whether the individual being monitored has behaved in a manner that suggests a desire for privacy, and whether the intrusiveness of GPS-enhanced surveillance—as gauged by the type and the quantity of information it potentially reveals—is sufficiently meaningful to trigger Fourth Amendment concerns. In balancing these two questions, however, one additional consideration is critical to any defensible reading of the amendment's application.

The Fourth Amendment, at its core, regulates police conduct. It erects a wall between a free society and overzealous police action—a line of defense implemented by the framers to protect individuals from the tyranny of the police state. As Anthony Amsterdam has noted, “the framers appreciated the need for a powerful central government. But they also feared what a powerful central government might bring, not only to the jeopardy of the states but to the terror of the individual.”¹⁸⁹ Any justifiable interpretation of the amendment in the future must appreciate this historical purpose. Let us now turn to how, in light of this history, the existing case law might resolve the question of whether any constitutional checks limit GPS-enhanced surveillance in the hands of the police. I begin with an examination of how that question has been answered in the lower courts.

189. Amsterdam, *supra* note 110, at 400.

A. Treatment of GPS-Enhanced Surveillance in Lower Federal Courts and State Courts

To date, three federal courts¹⁹⁰ and four state courts¹⁹¹ have directly considered the question of whether there are limitations upon law enforcement's use of GPS-enabled tracking devices. Of these seven cases, one declined to resolve the matter and the remaining six split evenly on the question of whether law enforcement should be required to obtain a warrant before engaging in the surreptitious use of a GPS tracking device.¹⁹² The cases, considered collectively, reveal little about the likely holding of any forthcoming Supreme Court decision.

190. This number does not include three federal court decisions that mention GPS tracking—*United States v. Eberle*, 993 F. Supp. 794 (D. Mont. 1998); *United States v. McIver*, 186 F.3d 1119 (9th Cir. 1999); *United States v. Levit*, 39 F. App'x 97 (6th Cir. 2002). Though the police installed a GPS device on the defendant's car in *Eberle*, 993 F. Supp. at 796–98, the legality of that action was never reached by the district court. A radio transmitter was simultaneously placed on the car by law enforcement and was, according to the district court's opinion, the only signal monitored by the surveillance team. *Id.*; see also *McIver*, 186 F.3d at 1123 (reviewing the convictions of Eberle and his codefendant McIver, and observing that use of the GPS tracking device was not at issue where that device malfunctioned, making the radio beeper the only technology used during the challenged surveillance); *Levit*, 39 F. App'x at 99 (observing, without further comment, that a GPS device was installed on the defendant's vehicle).

191. This number does not include two state court decisions that mention GPS tracking—*State v. Clifton*, 580 S.E.2d 40 (N.C. Ct. App. 2003), and *Whitehead v. State*, 574 S.E.2d 351 (Ga. Ct. App. 2002). In *Clifton*, the police located a car stolen by the defendant using the vehicle's factory-installed GPS technology. 580 S.E.2d at 42. However, the defendant never challenged this action. *Id.* Similarly, in *Whitehead*, the police tracked the location of a confidential informant using a GPS receiver. However, the defendant never raised the legality of this action as a ground for relief on appeal. *Whitehead*, 574 S.E.2d at 354–55.

192. In *United States v. Berry*, 300 F. Supp. 2d 366 (D. Md. 2004), the court found it unnecessary to resolve the question of whether the use of a GPS device constitutes a search and seizure. *Id.* at 368. However, three state courts have concluded (or assumed) that the use of a GPS device requires some form of prior judicial authorization. See *People v. Obujen*, No. H026715, 2005 WL 519233, at *10 (Cal. Dist. Ct. App. May 7, 2005) (“Assuming, without deciding, that the GPS surveillance of defendant's vehicle was a search within the meaning of the Fourth Amendment . . .”); *People v. Lacey*, No. 2363N/02, 2004 WL 1040676, at *8 (N.Y. Nassau County Ct. May 6, 2004) (finding that a warrant is required to install a GPS tracking device on a vehicle); *State v. Jackson*, 76 P.3d 217, 230–31 (Wash. 2003) (finding that a warrant is required prior to installation and use of a GPS device). In contrast, a fourth state court and two federal courts have found that law enforcement's surreptitious use of GPS surveillance triggers no Fourth Amendment concerns at all. See *United States v. Moran*, 349 F. Supp. 2d 425, 467 (N.D.N.Y. 2005) (finding that “there was no search or seizure and no Fourth Amendment implications in the use of the GPS device”); *People v. Gant*, 802 N.Y.S.2d 839, 846 (N.Y. Westchester County Ct. 2005) (reading *Knotts* to support the limitless proposition that “a person traveling in an automobile on public thoroughfares has no reasonable expectation of privacy in his movements from one place to another”); *United States v. Garcia*, No. 05-CR-155-C, 2006 WL 298704, at *8 (W.D. Wis. Feb. 3, 2006) (recognizing that vast amounts of information may be gathered through warrantless GPS tracking, but finding that “[h]owever Orwellian and outrageous this may seem, it was settled in favor of the government in *Knotts*”).

The courts in *United States v. Moran*,¹⁹³ *People v. Gant*,¹⁹⁴ and *United States v. Garcia*¹⁹⁵ rejected the notion that the warrantless monitoring of GPS-enabled tracking devices triggers constitutional protections.¹⁹⁶ However, the courts in those cases reached that conclusion by avoiding the question of whether such tracking constitutes a more substantial intrusion on privacy than previously considered forms of surveillance.¹⁹⁷

For example, in *Moran*, the police installed a GPS device on the defendant's car and monitored its movement for a period of two days.¹⁹⁸ The police did not obtain a warrant prior to installing and monitoring the device.¹⁹⁹ Before trial, *Moran* challenged the warrantless tracking of his vehicle.²⁰⁰ However, the district court denied *Moran*'s suppression motion.²⁰¹ Offering no analysis of the Supreme Court's reasoning in *United States v. Knotts*,²⁰² the district court simply cited the case as support for the unbounded proposition that *Moran* had no "reasonable expectation of privacy in his movements from one place to another."²⁰³ The *Knotts* decision, however, does not support the unqualified proposition for which *Moran* cited it. As the *Knotts* Court itself recognized, its decision was never intended to place "dragnet type" surveillance beyond the reach of the U.S. Constitution.²⁰⁴

I do not mean to suggest as an absolute matter that a court could never legitimately conclude that constitutional oversight of GPS-enabled tracking is unnecessary. However, it would seem at a minimum that before such

193. 349 F. Supp. 2d 425.

194. 802 N.Y.S.2d 839.

195. 2006 WL 298704.

196. See *supra* note 192. It should be noted that the court in *Garcia* did find that the installation of a GPS-monitoring device constituted a seizure within the meaning of the Fourth Amendment, requiring at least a reasonable suspicion on the part of law enforcement that the defendant was engaging in criminal activity. *Garcia*, 2006 WL 298704, at *7 ("There is no persuasive authority for the proposition that the government may, on nothing more than its say-so, surreptitiously apply monitoring devices to the outside of private motor vehicles.").

197. In *Gant*, a New York state trial court did not discuss the intrusive capabilities of GPS. Rather, the *Gant* court assumed *sub silentio* that GPS-enabled tracking merited the same constitutional treatment that had previously been afforded to beeper technology. *Gant*, 802 N.Y.S.2d at 846-47. Similarly, in *Moran*, 349 F. Supp. 2d at 467, the court treated use of GPS-enabled devices as indistinguishable from mere visual surveillance.

198. *Moran*, 349 F. Supp. 2d at 467.

199. *Id.*

200. *Id.*

201. *Id.* at 468.

202. 460 U.S. 276 (1983).

203. *Moran*, 349 F. Supp. at 467.

204. *Knotts*, 460 U.S. at 284 ("[I]f such dragnet type law enforcement practices as [Knotts] envisions should eventually occur, there will be time enough then to determine whether different constitutional principles may be applicable.").

a conclusion can be drawn in any principled way, the judge must be faithful to precedent. Disregard for the intrusiveness of GPS-enabled technology ignores the Supreme Court's directive that such inquiry is relevant to a determination of constitutional treatment. Under the Court's existing analytical framework, before one can sensibly dismiss GPS-enabled tracking as mere sense-augmenting technology that reveals constitutionally unremarkable quantities of data, actual analysis of the type and the quantity of information revealed by the technology must be undertaken. By failing to engage in any analysis of the intrusion occasioned by GPS-enabled surveillance, and by applying an overly simplistic reading of *Knotts*, *Moran* and its progeny offer little in the way of predictive value for future Supreme Court rulings.

Significantly, it is not just the lower court decisions permitting the unfettered use of GPS-enabled surveillance that are of limited predictive value. While the courts that have imposed a warrant requirement (or other restriction) upon use of the technology offer a bit more in the way of guidance, they too are not perfect predictors of the most likely result in the Supreme Court. As noted above, three state courts have found that GPS monitoring triggers privacy concerns. However, while these cases reach what I believe to be the most constitutionally defensible result, they do so by looking to sources outside of the Constitution. In other words, though these cases, to their credit, recognize both the self-contained limitations of the *Knotts* decision and the importance of evaluating intrusiveness before declaring an absence of constitutional harm,²⁰⁵ they ground their prohibition of warrantless GPS-enabled tracking in state, not Fourth Amendment, law.²⁰⁶

The Washington Supreme Court was the first state court to confront the question of whether a warrant is required in connection with law enforcement's GPS-enabled tracking of a criminal suspect. In *State v. Jackson*,²⁰⁷ the defendant, William Bradley Jackson, was suspected in the

205. See, e.g., *People v. Obujen*, No. H026715, 2005 WL 519233, at *10 (Cal. Dist. Ct. App. May 7, 2005) (recognizing that beeper tracking is not "equivalent to GPS surveillance, because the electronic monitoring device merely allowed police to maintain their visual surveillance of the defendant's vehicle").

206. See, e.g., *id.* (finding GPS surveillance of the defendant's vehicle permissible under California law where the defendant was a probationer and the search was legitimately related to law enforcement interests); *People v. Lacey*, No. 2463N/02, 2004 WL 1040676, at *4 (N.Y. Nassau County Ct. May 6, 2004) (finding, in a somewhat convoluted decision, that article 1, section 12 of the New York State Constitution extends the protections of the Fourth Amendment to the installation of a GPS device incorporating cellular technology).

207. 76 P.3d 217 (Wash. 2003).

disappearance of his nine-year old daughter, Valiree.²⁰⁸ After traditional means of investigation failed to turn up any leads, the police obtained a warrant to impound and search Jackson's car.²⁰⁹ Unbeknownst to Jackson, they also obtained a second warrant to install a GPS-enabled tracking device on the car.²¹⁰ For nearly a month, the police monitored this device, and were able to precisely identify the locations visited by the suspect's truck and determine the exact amount of time he spent at each location. These findings led the police to Valiree's body, which was buried in a shallow grave in a remote area of forest.²¹¹ Jackson was convicted of murder following a jury trial.²¹²

On appeal, Jackson challenged the police use of the device.²¹³ The intermediate appellate court found first that the police did not need a warrant to install and monitor the device.²¹⁴ Accordingly, the court declined to address Jackson's associated claim that the warrant had been improperly issued.²¹⁵ The Washington Supreme Court, however, rejected the intermediate appellate court's basic conclusion that a warrant was unnecessary.²¹⁶

Looking to the state constitution, the Washington Supreme Court first conceded that law enforcement would not have conducted a search if it merely observed matters that were "voluntarily exposed to the general public and observable without the use of enhancement devices from an unprotected area."²¹⁷ However, the court went on to note that such observations would constitute a search if particularly intrusive methods of viewing were employed.²¹⁸ Though the *Jackson* court did not rely upon the Supreme Court's Fourth Amendment case law, its attention to the potential intrusiveness of the technology—as determined by reference to the type and the quantity of information revealed—was entirely consistent with the mandate of cases from *Katz* to *Caceres*. Considering the two intrusiveness factors in turn, the *Jackson* court concluded that the intrusion

208. *Id.* at 220.

209. *Id.*

210. *Id.* at 220–21.

211. *Id.* at 221.

212. *Id.*

213. *Id.*

214. *Id.* at 222.

215. *Id.*

216. *Id.* at 223.

217. *Id.* at 222 (quoting *State v. Young*, 123 Wash. 2d 173, 182 (1994)).

218. *Id.* (“[T]he nature and extent of information obtained by the police, for example, information concerning a person's associations, contacts, finances, or activities is relevant in deciding whether an expectation of privacy an individual has is one which a citizen of this state should be entitled to hold.”).

upon private affairs caused by GPS-enhanced tracking was sufficient to merit the protection of a warrant.²¹⁹

Examining first the type of information uncovered by GPS-enabled surveillance, the *Jackson* court found it to be significantly different from the quality of intrusion caused by visual monitoring.²²⁰ Implicitly referencing the two categories of technology identified to date by the Supreme Court—extrasensory and sense augmenting—the *Jackson* court concluded that GPS surveillance should most fairly be treated as the former, and not the latter²²¹: “[W]hen a GPS device is attached to a vehicle, law enforcement officers do not in fact follow the vehicle. Thus, unlike binoculars or a flashlight, the GPS device does not merely augment the officers’ senses, but rather provides a technological substitute for traditional visual tracking.”²²²

Though the Washington Supreme Court’s decision in *Jackson* does a better job of tracking the intrusiveness inquiry than the decision in *Moran*, the Washington Supreme Court’s reasoning is not above critique. In finding the GPS tracking to be an extrasensory form of surveillance, the *Jackson* court placed great weight upon the fact that the device relayed a steady stream of information to law enforcement even though no police officer was actually trailing the suspect.²²³ This observation led the court to conclude that the information revealed through GPS-enhanced surveillance was qualitatively different than the information disclosed through the use of, for example, a flashlight. The U.S. Supreme Court’s decisions, however, offer little support for the “human presence” distinction recognized by the *Jackson* court.

In its discussion of the type of information revealed by certain forms of enhanced surveillance, the Supreme Court has assigned little significance to the actual presence of an officer in any given case. Rather, the distinction for the Supreme Court has depended upon whether the human senses, as a theoretical matter, could have lawfully obtained the type of information ferreted out by the technology. Thus, in *Smith v. Maryland*,²²⁴ for example, the question was not whether an operator was actually present to simultaneously complete the call for the subscriber at the time the pen register recorded the numbers that were dialed. Rather, the

219. *Id.* at 223–24.

220. *Id.* at 223.

221. *Id.* (observing that the information revealed by GPS devices was qualitatively different from that revealed by sense-augmenting forms of technology like binoculars or flashlights).

222. *Id.*

223. *Id.*

224. 442 U.S. 735 (1979).

question the *Smith* Court posed was whether the information collected by the pen register was of the sort that could have been lawfully obtained through one of the five human senses.²²⁵

Moreover, as between the analysis applied by the *Jackson* court and the quality analysis utilized in cases like *Smith*, there are a variety of advantages to the Supreme Court's approach. First and foremost, by decoupling human presence and the constitutional treatment of a technology, the Supreme Court's approach has the advantage of predictability. Under the Court's current framework, use of a technology can be evaluated using forward-looking rules that are not so circumstance-specific that they cease to be useful guides. Furthermore, though intriguing in an Orwellian, conspiracy-theory sort of way, categorizing the type of information revealed by GPS surveillance as extrasensory under the Court's existing test is not entirely plausible. In other words, if the question the Court now asks is—could the type of information revealed by enhanced surveillance have been obtained without enhancement?—the answer in the case of GPS tracking is arguably yes. Though it may be exceedingly difficult (and highly improbable), one cannot reject entirely the possibility that successful twenty-four hour surveillance of a single target might be achieved assuming an adequate commitment of staffing and resources.

More importantly, nothing is lost by conceding, at least for the purpose of assessing intrusiveness within the existing analytical framework, that the type of information revealed by GPS-enhanced tracking places the technology in the sense-augmenting category. Though constitutional protections have rarely (if ever) been recognized in the case of such technologies, an unduly rigid application of that rule is moderated by consideration of the quantity or specificity of information revealed.

Where information of an admittedly unexceptional quality is nonetheless noteworthy for its sheer volume or detail, the Supreme Court has suggested that Fourth Amendment concerns are triggered.²²⁶ It is time to give real meaning to this directive by recognizing that a technology classified as sense augmenting may nonetheless be subject to constitutional oversight when it enables the police to uncover virtual treasure troves of data. In other words, it is the quantity of information revealed by GPS-enabled tracking, not its type, which implicates the Constitution under current doctrine. To be

225. *Id.* at 744.

226. *Dow Chem. Co. v. United States*, 476 U.S. 227, 238 (1986).

sure, as the *Jackson* court noted, the quantity of information revealed by GPS-enabled tracking is substantial.²²⁷

Turning to the second prong of the intrusiveness inquiry—quantity—the *Jackson* court observed that “[i]n this age, vehicles are used to take people to a vast number of places that can reveal preferences, alignments, associations, personal ails and foibles.”²²⁸ Moreover, with the continued advances in the technology, pinpoint monitoring of the movements of individuals, not just their vehicles, is now possible. The technology’s potential for giving law enforcement a detailed stream of information about a person’s daily life, coupled with the court’s perception of the quality of that information, led the *Jackson* court to find that a warrant requirement should be placed on law enforcement’s use of GPS-enhanced tracking.²²⁹

However, although the *Jackson* court’s findings regarding the intrusiveness of GPS-enhanced surveillance are relevant to the Fourth Amendment analysis, because the *Jackson* decision ultimately relied upon state law, it offers little in the way of guidance.²³⁰ At the time of writing, the only two other decisions to dispute the legality of warrantless GPS-enabled tracking suffered a similar deficit.²³¹

In short, what direction the Supreme Court may take on the issue is as poorly predicted by the cases that find legal cause for concern in the unrestricted use of GPS-enabled tracking as it is by the cases that reject constitutional protections entirely. In fact, the one case to meaningfully consider the enhanced intrusiveness of GPS technology under the Fourth Amendment proves as unhelpful as the cases discussed above, because the court, at the last minute, pulled back from its analysis and declined to resolve the question. In *United States v. Berry*,²³² law enforcement placed a GPS-enabled tracking device on the defendant’s car for a period of just over two months.²³³ In resolving the defendant’s motion to suppress, the district court acknowledged that existing Supreme Court decisions did not answer the question of whether such enhanced surveillance was a search or seizure

227. *Jackson*, 76 P.3d at 223.

228. *Id.*

229. *Id.* at 224.

230. The *Jackson* court repeatedly noted the limitations of its holding. See, e.g., *id.* at 222 n.1 (“*Jackson* does not claim or suggest in his petition for review that the Fourth Amendment was violated. Accordingly, there is no issue before us under the Fourth Amendment.”).

231. See *supra* note 206.

232. 300 F. Supp. 2d 366 (D. Md. 2004).

233. *Id.* at 367.

within the meaning of the Fourth Amendment.²³⁴ The district court further recognized that to the extent GPS-enabled surveillance may merit different constitutional treatment, it is the greater intrusiveness of the technology that will distinguish it from the beeper technology that was considered in *Knotts*.²³⁵ However, given that much of the tracking in *Berry* was authorized by a warrant (and that the government was willing to forgo reliance on that portion of the tracking not so authorized), the district court declined to decide the issue.²³⁶

B. Treatment of GPS-Enhanced Surveillance in the Academy

The legal academy, too, has yet to find meaningful restraints within the existing constitutional framework on law enforcement's use of GPS-enhanced surveillance. For example, several commentators who have urged some restriction on GPS-enhanced surveillance position their analysis outside of the existing case law. In other words, they argue not that there is a jurisprudential basis for applying the Fourth Amendment, but rather that there ought to be, because policy considerations mandate constitutional limits.²³⁷

I also find room for disagreement with those authors favoring law enforcement's unfettered use of GPS-enabled tracking. Some commentators who endorse the unregulated use of such surveillance read *Katz* and *Knotts* to stand for the sweeping proposition that any activities conducted in public spaces are categorically excluded from the protections of the Fourth Amendment.²³⁸ These arguments find their underpinnings in the concepts of location and subjective expectation. The claim is on the one hand grounded in a belief that the Fourth Amendment simply does not apply to

234. *Id.* at 368 (“The Supreme Court’s analysis may or may not cover a GPS, which, unlike a beeper, is a substitute for police surveillance.”).

235. *Id.* (“The Supreme Court might conclude, however, that the new technology is so intrusive that the police must obtain a court order before using it.”).

236. *Id.*

237. See, e.g., Eva M. Dowdell, *You Are Here!—Mapping the Boundaries of the Fourth Amendment With GPS Technology*, 32 RUTGERS COMPUTER & TECH. L.J. 109, 137 (2005) (concluding that “GPS defies the boundaries of established doctrines”); Mark G. Young, Note, *What Big Eyes and Ears You Have! A New Regime for Covert Governmental Surveillance*, 70 FORDHAM L. REV. 1017, 1021 (2001) (proposing a “fundamental rethinking” of Fourth Amendment protections).

238. See, e.g., John S. Ganz, Comment, *It’s Already Public: Why Federal Officers Should Not Need Warrants to Use GPS Vehicle Tracking Devices*, 95 J. CRIM. L. & CRIMINOLOGY 1325, 1337 (2005).

public spaces.²³⁹ The other foundation for these arguments is the notion that some portion of the information collected through the use of GPS-enabled tracking is information voluntarily exposed to the public.²⁴⁰

Without question, “[w]hat a person knowingly exposes to the public” is not protected by the Fourth Amendment, for that individual cannot demonstrate a subjective expectation of privacy in the matter revealed.²⁴¹ However, as stated in *Katz*, “what he seeks to preserve as private, even in an area accessible to the public, may be constitutionally protected.”²⁴² Indeed, as the *Knotts* Court acknowledged, its opinion was not intended to approve surveillance (even on the public streets) akin to a twenty-four hour dragnet.²⁴³ While individuals understand that portions of their route may be observed by others, it is unlikely that most people contemplate a comprehensive mapping of their whereabouts over a span of weeks or even months, including the location of each stop and the duration of every trip segment.²⁴⁴ In the case of GPS-enabled tracking, it is this aggregation of substantial amounts of personal data that makes the limitless use of the technology constitutionally troublesome.

As the Court has acknowledged, the collection of seemingly unexceptional data by the government may become objectionable by virtue of its sheer volume.²⁴⁵ To suggest that the unfettered use of GPS-enabled tracking is contemplated by the Court’s decisions in *Katz* and *Knotts* ignores this critical element of Fourth Amendment analysis. Moreover, where the sophistication of GPS technology permits the pinpoint tracking of persons (not just vehicles),

239. Cf. GREENHALGH, *supra* note 71, at 4 (concluding that the Fourth Amendment “does not extend its protective umbrella over land in the public domain, such as streets, sidewalks, roads, or parks”).

240. Ganz, *supra* note 238, at 1337.

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

242. *Id.* at 351–52; see also *United States v. Davis*, 326 F.3d 361, 365 (2d Cir. 2003).

243. 460 U.S. 276, 283–84 (1983).

244. Commentator Stephen Henderson, advocating a “limited third party” approach to Fourth Amendment doctrine, has observed that though a driver “conveys his or her position to pedestrians and other drivers to avoid an accident . . . most drivers would not think they were conveying their entire driving route to bystanders.” Henderson, *supra* note 103, at 547–48.

245. Under the existing intrusiveness rubric for technologically enhanced surveillance, the Court has arguably only once found a sense-augmenting form of surveillance to trigger Fourth Amendment concerns based upon the quantity of information revealed. Compare *Katz*, 389 U.S. at 352 (imposing a warrant requirement where conversations were recorded), with *Smith v. Maryland*, 442 U.S. 735, 741 (1979) (refusing to apply Fourth Amendment protections where only the numbers dialed were revealed). However, the Court has repeatedly reaffirmed in theory the notion that information that is not noteworthy for its quality may nonetheless be constitutionally noteworthy for its sheer quantity. See *Dow Chem. Co. v. United States*, 476 U.S. 227, 238 (1986); *Knotts*, 460 U.S. at 284.

the overly broad application of *Knotts* allows a substantial encroachment upon personal privacy that was clearly not envisioned by the *Knotts* Court.

Finally, it bears mention that some scholars in the field have argued that the primary source of protection from intrusive technologies must come from the U.S. Congress because adequate protections cannot be found in a Fourth Amendment that has largely been interpreted to track principles of property law.²⁴⁶ While this is an arguably plausible reading of Fourth Amendment precedent, it is better advised to interpret the case law to give vitality to *Katz* and the cases that followed it.²⁴⁷ While supplemental protections can (and should) be provided by the legislative branch, the Constitution must remain a primary and vigorous source of privacy protection.²⁴⁸ In other words, maximum advantage should be made of existing case law, which is best read to extend Fourth Amendment protection to GPS-enhanced surveillance.

C. GPS-Enhanced Surveillance Should Be Deemed a Search Within the Meaning of the Fourth Amendment

And so, after reviewing the decisions of the lower federal and state courts and the available scholarship, the question still remains whether the Constitution in any way limits law enforcement's use of GPS-enhanced surveillance. The answer is, in a manner of speaking, hiding in plain sight—it can be found within the existing constitutional framework. As discussed above,²⁴⁹ that two-part framework, known as the *Katz* test, tells us that to determine whether constitutional protections are triggered we must first look to whether an individual has behaved in a manner that is consistent with a desire for privacy.²⁵⁰ Clearly, the facts of some cases involving GPS-enhanced surveillance will more obviously lend themselves to a conclusion in this regard than others.

For example, in *Jackson*, William Jackson's decision to leave his daughter's body in a shallow grave near a remote logging road, and not on

246. See, e.g., Kerr, *supra* note 3, at 838.

247. See Colb, *supra* note 98, at 897 (observing that, historically, "because privacy tended to correspond most closely with the ability to exclude others physically, it followed that privacy rights would closely track (although not mirror entirely) property rights").

248. Cf. Amsterdam, *supra* note 110, at 379 ("Even if our growing crime rate and its attendant mounting hysteria should level off, there will remain more than enough crime and fear of it in American society to keep our legislatures from the politically suicidal undertaking of police control.").

249. See *supra* Parts II.A.2, II.B.

250. *Katz*, 389 U.S. at 361.

the steps of City Hall in downtown Spokane, can clearly be seen as evidence of Jackson's subjective desire for privacy.²⁵¹ To the extent that the Supreme Court might be asked to consider the government's warrantless use of GPS-enhanced surveillance under circumstances akin to those present in *Jackson*, it is easy to see how a defendant might overcome the first hurdle of *Katz*—demonstrating a subjective expectation of privacy. It bears mention, though, that evidence of such evasive maneuvers, while sufficient, is not necessary to satisfy *Katz*.

As some courts have noted, satisfying the first prong of *Katz* requires only enough evidence to suggest that the party “acted in such a way that it would have been reasonable for him to expect that he would not be observed.”²⁵² Consequently, though the Supreme Court has never directly resolved the question, it is entirely consistent with existing precedent to understand the level of proof required from one who challenges covert tracking as bearing an inverse relationship to the length of time such surveillance is conducted. For example, it is entirely reasonable to require the proponent of suppression of an extremely brief period of GPS-enhanced surveillance to offer some evidence of surreptitious behavior, to overcome the acknowledged reality that when we travel in public discrete portions of our trip are visible to those we pass.

However, as the period of targeted surveillance becomes more protracted (as is possible with GPS-enabled tracking), a countervailing reality must be acknowledged—that citizens of this country largely expect the freedom to move about in relative anonymity without the government keeping an individualized, turn-by-turn itinerary of our comings and goings.²⁵³ In other words, I may tolerate my bank knowing where I buy my coffee every morning. And, I may anticipate that the campus police see my passing face every day on one of the three security cameras that record my image. But, I do not expect that for weeks or months at a time the various bits and pieces of my daily routine will be woven together in an unbroken stream. In cases of protracted GPS-enhanced tracking, therefore,

251. *State v. Jackson*, 76 P.3d 217 (Wash. 2003).

252. *United States v. Taborda*, 635 F.2d 131, 137 (2d Cir. 1980).

253. See, e.g., *Henderson*, *supra* note 103, at 547–48 (“On the one hand, a driver intentionally conveys his or her position to pedestrians and other drivers to avoid an accident. On the other hand, most drivers would not think they were conveying their entire driving route to bystanders, though they surely recognize the possibility that another vehicle will travel the same route and thereby gather that information. That probability, however, decreases as the route becomes more lengthy or complex.”).

it would be reasonable to require little more than the defendant's mere assertion of an expectation of privacy to surmount the first prong of *Katz*.²⁵⁴

Moreover, as between the two prongs of *Katz*, it is the second—objective reasonableness—and not the first that drives the analysis. Thus, no matter how readily presumed by a court, my individual expectation of privacy will not translate into constitutional protection unless that expectation is also one that society is willing to embrace as legitimate.²⁵⁵ Therefore, let us turn now to consider how GPS-enhanced surveillance might fare under the Court's objective reasonableness prong.

Recall that the second prong of *Katz* requires a court to determine whether an asserted expectation of privacy is objectively reasonable.²⁵⁶ Furthermore, in the case of GPS-enhanced tracking (as with all forms of technologically enhanced surveillance), objective reasonableness will be assessed with an eye toward the relative intrusiveness of the technology, meaning under existing doctrine the type and the quantity of information revealed.²⁵⁷

Considering first the type of information revealed by GPS-enhanced surveillance, some courts have plausibly suggested that the technology is best categorized as extrasensory because it operates as an ultravigilant replacement for human surveillance.²⁵⁸ On the other hand, where GPS-enabled surveillance relays information that at least arguably could have been collected through intense, dragnet-like visual surveillance, it also could be appropriately treated as sense-augmenting. Though successful around-the-clock human monitoring of one or more suspects may be a near practical impossibility, it must be conceded that it is hypothetically feasible.²⁵⁹ But, the fact that precisely classifying the qualitative nature of GPS-enhanced surveillance is difficult matters not, for, given the outcome of the quantity analysis, the constitutional result is the same whether you believe GPS-enhanced surveillance to be extrasensory (and thus presumptively deserving

254. Cf. *California v. Ciraolo*, 476 U.S. 207, 211 (1986) (accepting, at face value, the respondent's assertion of a "subjective intent and desire to maintain privacy as to his unlawful agricultural pursuits").

255. *Katz*, 389 U.S. at 361 (Harlan, J., concurring).

256. *Smith v. Maryland*, 442 U.S. 735, 740 (1979) (citing *Katz*, 389 U.S. at 361 (Harlan, J., concurring)).

257. See, e.g., *Katz*, 389 U.S. at 352–53; *Smith*, 442 U.S. at 742, 744.

258. *United States v. Berry*, 300 F. Supp. 2d 366, 368 (D. Md. 2004) (observing that GPS surveillance could either be viewed as a high-tech "substitute for police surveillance" or simply as a "more sophisticated beeper"); see *State v. Jackson*, 76 P.3d 217, 223 (Wash. 2003).

259. See *Berry*, 300 F. Supp. 2d at 368 ("A GPS merely records electronically what the police could learn if they were willing to devote the personnel necessary to tail a car around the clock.").

of constitutional protection²⁶⁰) or sense augmenting (and thus presumptively excluded from the constitutional definition of a search²⁶¹).

To be sure, surveillance involving sense-augmenting technologies has almost always been deemed to be outside the scope of Fourth Amendment protection. In fact, some conflate GPS-enabled surveillance with the beeper device addressed in *Knotts*. The Court's decisions with regard to beeper technology, however, fail to resolve the question of GPS-enabled tracking for two related reasons. First, the Court told us that it did not. The *Knotts* Court specifically advised that its decision was intended to resolve only the question of the permissible use of the technology before it. According to the Court, its decision should not be read to sanction "twenty-four hour surveillance of any citizen of this country."²⁶² More importantly, however, the appropriate constitutional treatment of GPS-enhanced surveillance is not tied up in *Knotts* because, as a factual matter, beeper and GPS technology are fundamentally different in terms of the quantity of information revealed by the science. As discussed above, application of the general rules governing qualitative categories of technology are moderated by consideration of the quantity or specificity of information revealed. In other words, as with other forms of enhanced surveillance, after GPS-enabled technology is qualitatively classified, the question of constitutional protection turns on the quantity of information revealed by the surveillance.

Since observing in *Knotts* that "a person traveling in an automobile on public thoroughfares has no reasonable expectation of privacy in his movements from one place to another,"²⁶³ at least one Justice of the Court has noted (albeit in dissent) that while "plain view may be enhanced somewhat by technology, there are limits."²⁶⁴ In the case of GPS-enabled tracking, the threshold for assessing "how much technological enhancement of ordinary perception turns mere observation into a Fourth Amendment search" has been crossed.²⁶⁵

At present, the science of GPS-enabled technology is sufficiently developed to allow law enforcement to place a tracking device in a person's effects or automobile and thereafter monitor their movements twenty-four

260. See *Kyllo v. United States*, 533 U.S. 27, 33 (2001).

261. See *United States v. Caceres*, 440 U.S. 741, 750–51 (1979).

262. *United States v. Knotts*, 460 U.S. 276, 284 (1983) ("[I]f such dragnet-type law enforcement practices as respondent envisions should eventually occur, there will be time enough then to determine whether different constitutional principles may be applicable.").

263. *Id.* at 281.

264. *Illinois v. Caballes*, 543 U.S. 405, 416 n.6 (2005) (Souter, J., dissenting) (citation omitted).

265. *Kyllo*, 533 U.S. at 33.

hours a day, for weeks or months at a time. Moreover, the system can easily support multiple devices simultaneously. Assuming adequate resources and motivation, the police could put a device in my car, on my bicycle, and in my running shoes to ensure they knew my whereabouts no matter which mode of transport I chose. Of equal concern, by utilizing multiple devices against a single target, the government would also be able to discern a wealth of information about individual choices. In other words, the government would learn not only where I am, but what I have chosen to take with me and what I have left behind.

The tracking information relayed to law enforcement by each device includes the location and duration of every stop, as well as the direction and position of travel while indoors. When interfaced with other technological developments such as satellite photographs of specific addresses,²⁶⁶ or three-dimensional schematics of buildings, GPS-enabled technology permits virtual turn-by-turn, real-time monitoring of suspects over substantial periods. There will be no possibility that a suspect might slip out anonymously on his lunch hour to visit with his drug abuse counselor or to rendezvous with a paramour.

Moreover, because of the passive nature of the system, the government can easily monitor the comings and goings of an entire family or a group of associates. Moreover, many GPS-enhanced surveillance systems retain records that can be reviewed and compared months or even years later. Accordingly, information about networks of people and associations can be developed, retained, and closely analyzed. The police could conclusively determine that every Monday I meet Diane and Kris for yoga, but on Tuesdays, Kris goes out with Roderick and Ray, while I work late. Or, that for the month of May, I frequently stopped by Julie's Tattoo Parlor before stopping at Jay and Kurt's apartment. They could generate and compare such records for weeks or months at a time to develop a comprehensive digest of my friends, associates, preferences, and desires.

Under the intrusiveness inquiry that the Court has incorporated into the objective reasonableness prong of the *Katz* test, the extensive database of information collectable through the use of GPS-enabled surveillance justifies affording some constitutional limitation on police use of the technology.

266. For an example of the type of photographs that are currently available at no cost on the Internet, visit Google Maps (<http://maps.google.com>) to search any address or neighborhood in the country. It will provide you with a labeled (hybrid) or unlabeled (satellite) photograph of virtually any location in the country. The image of most residences allows you to clearly identify the residence and surrounding objects, including the type of cars parked in the driveway and larger items left in the open, such as children's play equipment, recycling bins, and trash cans.

If the dog sniff exemplifies informational quantity tempering the impact of qualitative categorization at one end of the spectrum, GPS-enabled surveillance is the example at the other end. In other words, it is the quantity of information revealed by GPS-enabled tracking, not its quality, that merits defining use of the technology a search for purposes of the Fourth Amendment.

Moreover, including GPS-enhanced surveillance within the protection afforded by the Fourth Amendment is entirely consistent with existing norms. The government's unmonitored use of this technology would fundamentally change the relationship between our government and its citizens. If GPS-enabled tracking is deemed a nonsearch, all individuals will be forced to assume the risk that at any moment (and at all moments) the government may be keeping a continuous log of their whereabouts. Whether motivated by an honest desire to ferret out criminal conduct or nothing more than sheer curiosity, the government will be entitled to check whether we spend our lunch hour at the gym, at the temple, or at the strip club.

Without doubt, this is not the vision of free society sanctioned by the framers.²⁶⁷ Anthony Amsterdam observed that "the authors of the Bill of Rights had known oppressive government. I believe they meant to erect every safeguard against it. I believe they meant to guarantee to their survivors the right to live as free from every interference of government agents as our condition would permit."²⁶⁸ GPS-enabled technology, when used with wireless transmitters and monitored by the police, fundamentally alters this expectation of privacy in ways that are not reasonable under our constitutional system. The Fourth Amendment mounts a defense against such an erosion of a free society. And for this reason, the use of GPS-enhanced technology cannot be countenanced without judicial oversight.

In our post-9/11 environment, a frequent criticism of calls for enhanced regulation of the police is that it will unduly hamper law enforcement, which needs fewer, not greater, restraints to effectively fight crime and terrorism. To quote Justice Brennan commenting in a related context, there "is the pervasive fear that if [such] surveillance were deemed to be within the reach of the Fourth Amendment, a useful technique of

267. See *United States v. Poller*, 43 F.2d 911, 914 (2d Cir. 1930) (Hand, J.) ("[T]he real evil aimed at by the Fourth Amendment is the search itself, that invasion of a man's privacy which consists in rummaging about among his effects to secure evidence against him."). To narrowly restrict the meaning of search, therefore, or to define so loosely the contours of its existence as to allow most things to be deemed nonsearches at the whim of individual decisionmakers, is to gut the heart of the amendment.

268. Amsterdam, *supra* note 110, at 400.

law enforcement would be wholly destroyed.”²⁶⁹ This fear, however, is not borne out by the historical record. For example, despite legislative and judicial recognition that police use of wiretapping must be regulated, it remains an effective tool in the law enforcement arsenal.²⁷⁰ Moreover, as some members of the Court have cautioned for decades, unbounded police conduct is not necessary for, and indeed may be inimical to, effective law enforcement.²⁷¹

In sum, the Court’s existing framework for analyzing enhanced surveillance provides a meaningful safeguard against law enforcement’s unfettered use of GPS-enhanced tracking. A balanced formulation of the intrusiveness inquiry leads to the conclusion that GPS-enhanced tracking must be deemed a search within the meaning of the Fourth Amendment because it is a form of technology that generates vast quantities of detailed information about a targeted subject.

However, “[t]here is a vast conceptual difference between an instance of the Fourth Amendment satisfied and an instance of the Fourth Amendment inapplicable.”²⁷² Therefore, the analysis does not end with the conclusion that the proscriptions of the Fourth Amendment govern law enforcement’s use of GPS-enhanced surveillance. The question next becomes what procedural safeguards are required to make official use of the technology reasonable, and thereby constitutional.

D. GPS-Enhanced Surveillance Should Be Preauthorized by a Warrant

The Fourth Amendment instructs only 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”²⁷³ It does not provide specific guidance about how compliance with this mandate must be structured. However, the Court has filled that gap by equating the amendment’s

269. *Lopez v. United States*, 373 U.S. 427, 463 (1963) (Brennan, J., dissenting).

270. Helene Stapinski, Op-Ed., *Shrugging All the Way*, N.Y. TIMES, Dec. 10, 2006, § 14NJ, at 21 (discussing the use of a wiretap in the corruption case of Hudson County Executive Robert Janiszewski).

271. See, e.g., *Schneekloth v. Bustamonte*, 412 U.S. 218, 225 (1973) (acknowledging that society holds a “deeply felt belief that the criminal law cannot be used as an instrument of unfairness, and that the possibility of unfair and even brutal police tactics poses a real and serious threat to civilized notions of justice”); *On Lee v. United States*, 343 U.S. 747, 762 (1952) (Frankfurter, J., dissenting) (“[E]ncouragement to lazy, immoral conduct by the police does not bode well for effective law enforcement. Nor will crime be checked by such means.”).

272. GREENHALGH, *supra* note 71, at 4.

273. U.S. CONST. amend. IV.

mandate of reasonableness with the presumption that a warrant must preauthorize official conduct falling within the amendment's scope.²⁷⁴

For example, in *Johnson v. United States*,²⁷⁵ the Court struck down an opium user's multiple convictions for violations of federal narcotics laws after the police entered and searched her hotel room without a warrant. The Court first observed that a strong odor of burning opium led the agents directly to the defendant's room. Based upon this observation, the Court acknowledged that the agents arguably possessed probable cause to believe that criminal activity was afoot at the time of their warrantless entry. Nonetheless, the Court held that an assessment of whether information known to officers is sufficient to justify intruding upon a defendant's privacy is a decision to be made by a judicial officer, not the police officer on the ground.

As the Court has observed, the amendment's protections do not "den[y] law enforcement the support of the usual inferences which reasonable men draw from evidence."²⁷⁶ Rather, the amendment requires only "that those inferences be drawn by a neutral and detached magistrate instead of being judged by the officer engaged in the often competitive enterprise of ferreting out crime."²⁷⁷ Since *Johnson*, the Court has consistently declared its preference for warrants to be the presumptive baseline.²⁷⁸

274. See *Katz v. United States*, 389 U.S. 347, 357 (1967) (observing that "searches conducted outside the judicial process, without prior approval by judge or magistrate, are *per se* unreasonable under the Fourth Amendment"). However, it must be noted that the legitimacy of the warrant requirement is the subject of considerable debate. Compare Amar, *supra* note 4, at 761 (arguing that the "words of the Fourth Amendment . . . do not require warrants, even presumptively, for searches and seizures"), with Carol S. Steiker, *Second Thoughts About First Principles*, 107 HARV. L. REV. 820, 830 (1994) (arguing that "the fact that colonial history does not support the warrant requirement does not suggest that *nothing* supports it").

275. 333 U.S. 10 (1948).

276. *Id.* at 13–14.

277. *Id.* at 14; see also *United States v. Lefkowitz*, 285 U.S. 452, 464 (1932) (observing that "[s]ecurity against unlawful searches is more likely to be attained by resort to search warrants than by reliance upon the caution and sagacity of petty officers while acting under the excitement that attends the capture of persons accused of crime"); *Go-Bart Imp. Co. v. United States*, 282 U.S. 344, 357–58 (1931) (finding that the warrantless search of the defendant's office "was a lawless invasion of the premises and a general exploratory search in the hope that evidence of crime might be found"); *Agnello v. United States*, 269 U.S. 20, 32 (1925) ("The search of a private dwelling without a warrant is in itself unreasonable and abhorrent to our laws.").

278. See *Vernonia Sch. Dist. 47J v. Acton*, 515 U.S. 646, 653 (1995) ("Where a search is undertaken by law enforcement officials to discover evidence of criminal wrongdoing, this Court has said that reasonableness generally requires the obtaining of a judicial warrant." (citation omitted)); *Chapman v. United States*, 365 U.S. 610, 617–18 (1961) (finding that the state police's warrantless search of the petitioner's rented house was unconstitutional despite the

Accordingly, once law enforcement's use of GPS-enhanced technology is defined as a search for purposes of the Fourth Amendment, the warrant presumption is triggered. And use of the technology should be deemed unreasonable to the extent it is conducted without preauthorization by a neutral and detached magistrate.

Admittedly, the Court since *Johnson* has carved out a dozen or so "specifically established and well-delineated exceptions" to the warrant requirement.²⁷⁹ To name just a few, the Court has found that the presence of exigent circumstances, such as the hot pursuit of a fleeing felon, will excuse a warrantless search.²⁸⁰ Similarly, the Court has found that the warrantless seizure and search of an individual for the limited purposes of briefly investigating reasonably suspicious behavior and ensuring officer safety during such investigation are permissible.²⁸¹ Exceptions to the warrant requirement have also been carved out for consent searches,²⁸² searches conducted incident to a valid arrest,²⁸³ searches of automobiles,²⁸⁴

landlord's express authorization of the search); *cf.* *Payton v. New York*, 445 U.S. 573, 576 (1980) (finding that the Fourth Amendment "prohibits the police from making a warrantless and nonconsensual entry into a suspect's home in order to make a routine felony arrest"); *Beck v. Ohio*, 379 U.S. 89, 96 (1964) ("An arrest without a warrant bypasses the safeguards provided by an objective predetermination of probable cause."). *But see* *Amar*, *supra* note 4, at 757 (criticizing the inconsistency of Fourth Amendment law with the observation that "warrants are not required—unless they are").

279. *Katz*, 389 U.S. at 357.

280. *Warden v. Hayden*, 387 U.S. 294, 298 (1967) ("[N]either the entry without warrant to search for the robber, nor the search for him without warrant was invalid. Under the circumstances of this case, 'the exigencies of the situation made that course imperative.'" (quoting *McDonald v. United States*, 335 U.S. 451, 456 (1948))).

281. *Terry v. Ohio*, 392 U.S. 1, 27 (1968) ("[T]here must be a narrowly drawn authority to permit a reasonable search for weapons for the protection of the police officer, where he has reason to believe that he is dealing with an armed and dangerous individual, regardless of whether he has probable cause to arrest the individual for a crime.").

282. *See Schneekloth v. Bustamonte*, 412 U.S. 218 (1973) (defining the state's burden for establishing consent to search).

283. *See Chimel v. California*, 395 U.S. 752 (1969) (confirming that following arrest, an officer may search the arrestee's person and any areas within his immediate control for weapons or destructible evidence); *see also New York v. Belton*, 453 U.S. 454 (1981) (modifying the *Chimel* rule, as applied to cars, to allow the search of the entire interior of an automobile, and any containers—open or closed—contained therein, following the arrest of its occupants); *Thornton v. United States*, 541 U.S. 615 (2004) (permitting the search of the interior of a car under the *Belton* doctrine, even though the suspect was already outside of his car at the time of arrest); *United States v. Robinson*, 414 U.S. 218 (1973) (broadening the principle of *Chimel* to allow the "full search" of an arrestee's person).

284. *See Carroll v. United States*, 267 U.S. 132, 154 (1925) (finding the warrantless stop and search of cars permissible where the police have "probable cause for believing that [the] vehicles are carrying contraband or illegal merchandise").

searches of items in plain view,²⁸⁵ searches in heavily regulated industries,²⁸⁶ and “special needs” searches.²⁸⁷

However, in keeping with its stated preference for warrants, the Court has been careful when creating each of these exceptions to identify a particular motivation for excusing law enforcement’s need to secure a warrant. For example, in the case of investigatory stops and frisks, the Court noted that officer safety was a critical basis for the exception, and required that any search be limited to only that exploration necessary to discover weapons.²⁸⁸ Similarly, with regard to the exception drafted for exigent circumstances, the Court reasoned that such an exception was necessary because of the dangers of evidence destruction or harm to the pursuing officers.²⁸⁹

In the case of GPS-enhanced tracking, however, there is no reasoned basis for an exception to the warrant requirement. Indeed, in those cases where GPS-enhanced surveillance is most useful to the government, obtaining a warrant would impose little hardship. The use of GPS-enhanced tracking is most productive for law enforcement, and most troublesome in constitutional terms, when it is used over extended spans of time.²⁹⁰ But, it is in precisely these cases that officers, armed with the luxury of time, have little reason not to secure the preauthorization of a warrant. Indeed, in many cases, this is precisely what law enforcement is already doing.²⁹¹

In short, absent some logical basis for extending an existing exception to the warrant requirement (or creating a new one) to encompass GPS-enhanced surveillance, we are back to the Court’s presumptive warrant requirement. Therefore, to satisfy the Fourth Amendment’s mandate of reasonableness, law enforcement desirous of tracking suspects using GPS-enhanced surveillance should first be required to obtain the authorization of a warrant.

285. See *Coolidge v. New Hampshire*, 403 U.S. 443, 465 (1971).

286. See *New York v. Burger*, 482 U.S. 691, 707–09 (1987) (finding the warrantless administrative search of a junkyard permissible in light of the extensive regulation of the industry under state law).

287. See *Vernonia Sch. Dist. 47J v. Acton*, 515 U.S. 646, 653 (1995) (finding that random drug testing of public school athletes was appropriate in light of the “special needs [that] exist in the public school context”).

288. *Terry v. Ohio*, 392 U.S. 1, 27 (1968) (“Our evaluation of the proper balance that has to be struck in this type of case leads us to conclude that there must be a narrowly drawn authority to permit a reasonable search for weapons for the protection of the police officer, where he has reason to believe that he is dealing with an armed and dangerous individual . . .”).

289. *Cupp v. Murphy*, 412 U.S. 291, 302 (1973); *Warden v. Hayden*, 387 U.S. 294, 298–99 (1967). But see *Saltzburg*, *supra* note 4, at 957–58 (expressing the view that the Court has created many exceptions to the warrant requirement that are arbitrary and unprincipled).

290. See *supra* Part III.C.

291. See, e.g., *United States v. Berry*, 300 F. Supp. 2d 366 (D. Md. 2004); *State v. Jackson*, 76 P.3d 217 (Wash. 2003).

CONCLUSION

Writing about the Fourth Amendment, Justice Stewart stated over thirty years ago that “this basic law and the values that it represents may appear unrealistic or ‘extravagant’ to some. But the values were those of the authors of our fundamental constitutional concepts.”²⁹² Contrasting the world of the founding generation with his own, he noted, “[i]n times not altogether unlike our own they won . . . a right of personal security against arbitrary intrusion by official power. If times have changed . . . the changes have made the values served by the Fourth Amendment more, not less, important.”²⁹³ The same could be said today.

There is no question that times have changed. The world we live in is quite different from the one inhabited by the founders (or even by Justice Stewart). We face pressing safety concerns, as individuals and as a society. Law enforcement, no doubt, has its work cut out for it with terrorists and common criminals alike devising new and ever more effective ways of harming us. But, we must ask what we will have saved if we cede significant ground to a bunker mode of existence, retaining only that sliver of privacy that we cannot envision a madman exploiting. If we abandon the principles of the Fourth Amendment—principles that the founders thought so essential they must be enconced in a written constitution²⁹⁴—we will have radically altered the country in which we live. The country we will have saved from the terrorists and the street thugs will be a country none of us wishes to inhabit.

Admittedly, there are substantial pressures pushing us to allow the continued encroachment upon our privacy in the name of efficiency and security. And, concededly, those litigants most commonly urging rigor in our interpretation of the Fourth Amendment are often the least sympathetic champions of our Constitution. But this alone should not be a basis for allowing the amendment to be interpreted in a fashion that leaves us all vulnerable to the whims of law enforcement in a manner wholly inconsistent with the amendment’s spirit. The Constitution requires that we forego neither liberty nor security.²⁹⁵

292. *Coolidge v. New Hampshire*, 403 U.S. 443, 455 (1971).

293. *Id.*

294. *Cf. Chimel v. California*, 395 U.S. 752, 761 (1969) (lauding Justice Frankfurter’s observation in dissent in *United States v. Rabinowitz*, 339 U.S. 56 (1950), that the “[Fourth] Amendment was in large part a reaction to the general warrants and warrantless searches that had so alienated the colonists and had helped speed the movement for independence”).

295. *Schneekloth v. Bustamonte*, 412 U.S. 218, 225 (1973) (“This Court’s decisions reflect a frank recognition that the Constitution requires the sacrifice of neither security nor liberty.”).

As Justice Frankfurter once noted, “[t]he history of liberty has largely been the history of observance of procedural safeguards.”²⁹⁶ Providing such safeguards is in no small part the function of the Fourth Amendment. Thus, we must get past our distaste for the messenger and hear the message: The Fourth Amendment is often the last line of defense between “we the people” and what Justice Stewart once called the “well-intentioned but mistakenly over-zealous executive officers’ who are a part of any system of law enforcement.”²⁹⁷ We must take the Fourth Amendment’s mandate seriously and jealously guard those protections that exist under it.

As demonstrated by the preceding discussion of GPS-enabled tracking, the contour of a jurisprudence that is both protective and flexible exists within the boundaries of current Fourth Amendment law. This jurisprudence is relevant not just to the particular technology at issue in this Article but also to future technological developments. Therefore, we must make the most of it. The sky is not falling—yet. But, if we continue to allow the Court’s Fourth Amendment law to be interpreted in a limited fashion that reads the amendment’s protections into oblivion, George Orwell’s *1984* will become a much more likely version of our future.

296. *McNabb v. United States*, 318 U.S. 332, 347 (1943).

297. *Coolidge v. New Hampshire*, 403 U.S. 443, 481 (1971) (quoting *Gouled v. United States*, 255 U.S. 298, 304 (1921)).