No. 11-564

In The
Supreme Court of the United States

STATE OF FLORIDA,

Petitioner,

v.

JOELIS JARDINES,

Respondent.

On Writ Of Certiorari To The Supreme Court Of Florida

BRIEF OF *AMICI CURIAE* FOURTH AMENDMENT SCHOLARS IN SUPPORT OF RESPONDENT

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INTRODUCTION

The *amici curiae* submit this Brief in support of Respondent, and urge the Court to affirm the decision of the Florida Supreme Court.

INTEREST OF *AMICI CURIAE*[1]

Amici curiae are professors and scholars in Fourth Amendment studies. *Amici* submit this brief in support of Respondent's position that a warrantless canine drug-detection sniff performed at the front door of a private residence violates the Fourth Amendment. No other brief submitted in this case considers the scientific literature concerning canine drug-detection sniffs and analyzes how those scientific findings impact the legal analysis of canine home-sniffs.

[1] The parties have consented to the filing of this brief in letters submitted to the Court.

No counsel for a party authored this brief in whole or in part, and no counsel or party made a monetary contribution intended to fund the preparation or submission of this brief. No person other than *amici curiae*, its members, or its counsel made a monetary contribution to its preparation or submission.

SUMMARY OF ARGUMENT

A canine drug-detection sniff of a home is a search under the Fourth Amendment because the sniff is a sense-enhancing tool that provides police information about a home's interior – information that would not otherwise be obtained without physical entry into the home. *Cf. United States v. Karo*, 468 U.S. 705, 715 (1984). Warrantless police entry into the home is the "chief evil" against which the Fourth Amendment was intended to prevent. *United States v. United States District Court*, 407 U.S. 297, 313 (1972). In addition to requiring a warrant for police physically to enter a home, *see Payton v. New York*, 445 U.S. 573, 590 (1980), a warrant is also required when police direct a device at a home to gain information, even if that device does no more than provide measurements that enable police to *infer* that illegal activity is taking place inside. *See Kyllo v. United States*, 533 U.S. 27, 34 (2001).

Although it was once believed that drug-detection dogs alert solely to contraband – *see United States v. Place*, 462 U.S. 969, 707 (1983) (describing a canine sniff as "*sui generis*" because "the sniff discloses only the presence or absence of narcotics, a contraband item") – scientific research now establishes that drug-detection dogs do not alert to the contraband itself. Instead, drug-detection dogs alert to certain volatile[2]

[2] "Volatile" means "[r]eadily pass[ed] off by evaporation." McGraw-Hill Dictionary of Scientific and Technical Terms 2267 (6th ed. 2003).

substances – generally, break-down products of the illegal drug. These decomposition odor constituents are in no way illegal or even unique to contraband. In fact, these volatile molecules or compounds are also found in substantial quantities in ordinary household items. Therefore, rather than detecting the contraband itself, a detection dog's alert to these entirely-legal molecules or compounds instead produces an *inference* that contraband is *also* present.

For canine sniffs performed in lesser-privacy contexts (i.e., sniffs of luggage at airports, *Place*, 462 U.S. at 707, or lawfully-stopped vehicles, *Illinois v. Caballes*, 453 U.S. 405 (2005)), the inferencing on which the canine-sniff technique relies generates the subsidiary question of the individual dog's "reliability" for contraband detection. For canine sniffs of the home, however, the "search" issue must not collapse into a simple tally of the detection dog's training and field accuracy. The Fourth Amendment requires more. The home is the constitutionally protected area that is afforded the highest Fourth Amendment protection. *See United States v. Martinez-Fuerte*, 428 U.S. 543, 561 (1976). Similar to *Kyllo*, the canine-sniff technique is a sense-enhancing tool that reveals non-contraband information from which police *infer* that contraband is hidden inside the home.

Because the canine-sniff techniques relies on detection of noncontraband molecules and compounds within a home as the basis to infer that contraband is hidden inside, a canine drug-detection sniff is "capable of detecting lawful activity" within the home. *See*

Caballes, 543 U.S. at 409-10. Scientific research establishes that instead of smelling cocaine, drug-detection dogs alert to methyl benzoate – an odor shared by snapdragons, petunias, perfumes and food additives. Instead of smelling heroin, drug-detection dogs alert to acetic acid – an odor shared by vinegar and aspirin that is past its prime. Instead of smelling MDMA ("Ecstasy"), drug-detection dogs alert to piperonal – an odor shared by soap, perfume, food additives and even lice repellant. Law enforcement is well-aware of this research and in fact uses these specific, noncontraband molecules and compounds to prepare pseudo drug training aids – devices which train drug-detection dogs and reinforce their field training – to alert to these precise substances, not a more complex odor signature for contraband. And because these shared smells – entirely-lawful odor constituents – are readily found in homes throughout the country, canine drug-detection sniffs may reveal lawful activity within the home.

To view *Kyllo*'s understandable concern about "advancing technology" and its potential to "shrink" Fourth Amendment protection for the home, *see Kyllo*, 533 U.S. at 34, 35, as a *limitation* on Fourth Amendment protection against similarly-intrusive police investigation would be more than ironic; it cuts against the Court's steadfast refusal to allow labels to be used as pidgeonholes to cabin Fourth Amendment protection. *See, e.g., Katz v. United States*, 389 U.S. 347, 362 (1967) (Harlan, J., concurring) (observing that limiting Fourth Amendment protection to cases

involving physical penetration of a constitutionally protected area would "in the present day, [be] bad physics as well as bad law, for reasonable expectations of privacy may be defeated by electronic as well as physical invasion."). A canine drug-detection sniff is a "search" under the Fourth Amendment because it is a sense-enhancing police tool that reveals information about the home that would not otherwise be obtained without physical entry.

For these reasons the Court should affirm the Florida Supreme Court and hold that a canine drug-detection sniff conducted at the front door of a home is a search under the Fourth Amendment.

ARGUMENT

Scientific research reveals that courts should not be outfoxed by the concept of the infallible dog. Since *Illinois v. Caballes,*[3] we now know that drug-detection dogs alert to certain volatile[4] substances – generally, break-down products of the illegal drug – not the illegal drug itself. These volatile alert-producing substances are not themselves illegal and, in fact, are found in substantial quantities in ordinary household items. Therefore, a positive canine sniff produces

[3] 543 U.S. 405 (2005) (finding that the warrantless canine sniff of the exterior of a lawfully-stopped vehicle was reasonable under the Fourth Amendment).

[4] *See* note 2, *supra*.

nothing more than an inference that contraband is also present. This inference may be reliable enough in close-proximity sniffs involving lesser expectations of privacy – luggage at an airport, *United States v. Place*, 462 U.S. 696, 707 (1983), or lawfully stopped vehicles, *Caballes*, 543 U.S. at 409 – to support the warrantless use of canine sniffs. But acceptance of the canine-sniff inference in such lower-privacy contexts does not mean that a canine sniff of the home should be treated the same way.

First, the home is afforded the most stringent Fourth Amendment protection – protection from physical intrusion to gain information as well as police use of devices that serve as surrogates for physical intrusion, either by providing (1) direct access to the home's interior, or (2) information that allows police to draw inferences about what is going on inside the home. Here, the canine drug-detection sniff makes possible sense-enhanced police inferencing about the interior of the home that is analogous to the technology-assisted inferencing about a home's interior that the Court rejected in *Kyllo v. United States*, 533 U.S. 27 (2001), and *United States v. Karo,* 468 U.S. 705 (1984).

Second, the information disclosed by a canine home-sniff requires careful consideration. Science has thrown back the curtain from the fiction of the *sui generis* canine sniff. To be sure, drug-detection dogs are trained to detect specific odors and to alert based upon recognition of those odors. But the desire to link a canine alert to the "odor of contraband" is an appeal

to anthropomorphic fantasy – more akin to Aesop's fables than science-based reality. There is no such thing as the "odor of contraband" because drug-detection dogs are not trained to alert to odors *unique* to contraband. Instead, detection dogs are trained to alert to odors *shared* with flowers, perfume, soap, insecticide, food additives, vinegar, cleaning supplies – and the list goes on and on. The volatile molecules or compounds to which the drug-detection dog alerts are not themselves illegal and are present in ordinary household items. Therefore, canine home-sniffs are "capable" of revealing noncontraband information about the home's interior. *See Caballes*, 543 U.S. at 409-10.

On a related issue, the canine-sniff technique's accuracy when used to detect contraband hidden inside a home has not been studied scientifically, and is therefore an unknown. Significantly, however, the State of Florida's "residual odor" argument[5] posed in its Petition for a Writ of Certiorari in *Florida v. Harris*, if accurate, raises a red flag for canine home-sniffs since people generally have less control over access to their front doors than they do personal items like luggage or car trunks. Relying on nothing

[5] The State asserts: "A dog's superior sense of smell allows it to detect trace amounts and residual odors of a drug that may remain after the odor-emanating drug is no longer present, or that may be carried by any object or a person who had contact with drugs in another location." Petition for a Writ of Certiorari at 18 *Florida v. Harris*, *cert. granted,* 132 S.Ct. 1796 (2012) (No. 11-817), 2011 WL 6934743 at *18 [hereinafter *Harris* Pet.].

more than the certainty of circular rhetoric, the State of Florida's position that warrantless canine home-sniffs should be permissible is scientifically flawed and legally simplistic.

I. Warrantless Canine Drug-Detection Sniffs of the Home Violate the Fourth Amendment Because Canine Sniffs Are a Sense-Enhancing Tool That Allows Police To Infer That Contraband Is Present and Warrantless Sense-Enhanced Inferencing About a Home's Interior Violates the Fourth Amendment

The Fourth Amendment guarantees "[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures. . . ." U.S. Const. amend. IV. A "search" for Fourth Amendment purposes occurs when the government intrudes on a person's "constitutionally reasonable expectation of privacy." *Katz v. United States*, 389 U.S. 347, 360 (1967) (Harlan, J., concurring). The Court has recently reminded that a search also occurs when the government "physically occupie[s] private property for the purpose of obtaining information." *United States v. Jones*, 132 S. Ct. 945, 949 (2012). The home is a constitutionally protected area for which the Court has afforded the "most stringent" Fourth Amendment protection. *See United States v. Martinez-Fuerte*, 428 U.S. 543, 561 (1976). Absent exigent circumstances, the Court prohibits warrantless physical entry into the home. *See Mincey v. Arizona*, 437 U.S. 385, 393-94 (1978).

A. Sense-Enhanced Police Inferencing About a Home's Interior Violates the Fourth Amendment Because It Reveals Information That Would Not Otherwise Have Been Obtained Without Physical Entry Into the Home

In addition to prohibiting warrantless physical entry into a home, the Court also prohibits the warrantless use of analogs for physical entry – sense-enhancing devices that reveal information about the home's interior. In *United States v. Karo*, a federal agent learned that the defendants planned to purchase ether from a confidential informant for use in extracting cocaine from imported clothing. 468 U.S. at 708. Pursuant to a warrant (which was later invalidated) and the informant's consent, the agents installed a beeper into a can of ether that was eventually delivered over to the defendants. *Id*. The agents used the beeper to track the can's location as it was moved from place to place, including several houses. *Id*. at 708-09. Tracking the beeper enhanced the agents' observation of these houses because it revealed the location of the houses into which the can was taken and, as the investigation went on, disclosed whether the can remained present inside. *Id.* at 715. *Karo* equated the agents' beeper-assisted surveillance of the houses to warrantless physical entry to determine whether the can was still there, a clearly impermissible investigation strategy, *id.* at 715, and held that monitoring the beeper after it was withdrawn into a private residence was a search under the Fourth Amendment. *Id.* at 714.

Despite the reliability of the information that the beeper revealed,[6] the Court required a warrant to track the beeper's location within a home because the beeper disclosed "a critical fact about the interior of the premises that the Government is extremely interested in knowing. . . ." *Id*. at 715. As *Karo* explained: "Indiscriminate monitoring of property that has been withdrawn from public view would present far too serious a threat to privacy interests in the home to escape entirely some sort of Fourth Amendment oversight." *Id*. at 716.

Like the beeper in *Karo*, the thermal imager in *Kyllo* also enhanced the officer's ordinary perceptions. 533 U.S. at 35 n.2 (observing that "on the night [that the thermal scan was performed], no outside observer could have discerned the relative heat of Kyllo's home without thermal imaging."). The thermal scan, conducted from the lawful vantage point of a public street, revealed temperature gradients that were consistent with high-intensity lights used in an indoor marijuana growing operation. *Id.* at 30. In finding that the warrantless use of the thermal imager violated Kyllo's reasonable expectation of privacy, *Kyllo* framed the issue as "what limits there are

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[6] Although the beeper was "not sensitive enough" to identify the specific storage locker in storage facilities where the defendants hid the beeper-infected can at various times, the beeper did reveal, apparently with complete accuracy, the houses into which the can was taken. *See id*. at 708-09.

upon this power of technology to shrink the realm of guaranteed privacy." *Id.* at 34.

Kyllo held that a warrant was required to perform the thermal scan of Kyllo's home, explaining that "obtaining by sense-enhancing technology any information regarding the interior of the home that could not otherwise have been obtained without physical 'intrusion into a constitutionally protected area' constitutes a search – at least where (as here) the technology in question is not in general public use." *Id.* at 34 (*quoting Silverman v. United States*, 365 U.S. 505, 512 (1961)) (internal citation omitted). In requiring a warrant, *Kyllo* rejected the dissent's proposed distinction between devices that provide direct access to the home's interior (so-called "through-the-wall" technologies) and those that simply enabled police to draw inferences about what was going on inside a house. *Id*. at 36. As the majority explained, while inferencing alone was not a search, the thermal imager provided a measurement (the relative heat emanating from portions of Kyllo's home) that allowed police to infer information about the home's interior. *Id.* at 37 n.4. Thus, the thermal scan was a search because it provided information to police that made possible their technology-assisted inference that Kyllo was growing marijuana inside his home.

In addition to *Kyllo*'s concern that technological advances could "erode the privacy guaranteed by the Fourth Amendment," *id.* at 34, the Court also noted the importance of providing to law enforcement "clear specifications of those methods of surveillance that

require a warrant." *See id.* at 40. The value of providing clear guidelines for police investigation of the home may dovetail with *Karo*'s observation that requiring a warrant to track a beeper inside a house would have the "salutary effect" of preventing police "abuse" of the device. *See Karo*, 468 U.S. at 717.

i. Warrantless Use of a Sense-Enhancing Aid To Obtain Information About a Home Violates the Fourth Amendment, Even If the Sense-Enhancing Aid Is Not a Device or Advancing Technology, If the Sense-Enhancing Aid Reveals Information That Would Not Otherwise Have Been Obtained Without Physical Entry

Unlike the naked-eye aerial surveillance of a home's curtilage that the Court approved in *Florida v. Riley*, 488 U.S. 445 (1989) and *California v. Ciraolo*, 476 U.S. 207 (1986), a canine drug-detection sniff enhances the human officer's ordinary sense of smell,[7]

[7] Although *Ciraolo* allowed police to use the technology of air flight to gain a better vantage point from which to make an inspection of the suspect's curtilage, the Court has noted that the officer there did no more than look at the curtilage without sense-enhancement of the officer's ordinary eyesight. *See Dow Chemical Co. v. United States*, 476 U.S. 227, 234-35 (1986) ("In *California v. Ciraolo*, decided today, we hold that *naked-eye* aerial observation from an altitude of 1,000 feet of a backyard within the curtilage of a home does not constitute a search under the Fourth Amendment.") (citation omitted) (emphasis

(Continued on following page)

and additionally, requires physical invasion into the home's curtilage in order to conduct. A warrant is required for police to use a device to gather information that is otherwise secreted within a home, even if that device simply substitutes for the officer's own perceptions. *See Kyllo*, 533 U.S. at 35 n.2 ("The fact that equivalent information could sometimes be obtained by other means does not make lawful the use of means that violate the Fourth Amendment."). It cannot be gainsaid that a canine drug-detection sniff enhances, not just substitutes for, a human officer's ordinary sense of smell. *See, e.g.,* Brent A. Craven, et al., *The fluid dynamics of canine olfaction: unique nasal airflow patterns as an explanation of macrosmia*, 7 J. Royal Soc'y Interface 933, 933 (2010) ("The olfactory acuity of the dog . . . is roughly 10 000-100 000 times that of the human.") (citation omitted) (commas omitted in original).

Regardless of what canine handlers may believe is occurring when a drug-detection dog alerts,[8]

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added); *cf. United States v. Jones*, 132 S. Ct. 945, 953 (2012) ("This Court has to date not deviated from the understanding that *mere* visual observation does not constitute a search.") (*citing Kyllo*, 533 U.S. at 31-32) (emphasis added).

[8] Almost all of our understanding of the canine-sniff investigative technique arises from anecdotal discussions in judicial opinions concerning the individual detection dog at issue, not scientific studies. *Compare R. v. Kang-Brown*, [2008] 1 S.C.R. 456, 2008 SCC 18 ¶ 15 (Can.) (four Justices of the Canada Supreme Court observing, "[t]he available information is in essence limited to the facts that . . . police officers believe in [detection dogs'] overall reliability and to the praise of a particular dog

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detection dogs react to volatile, organic molecules or compounds which are not themselves illegal. *See*, *e.g.*, Michael Macias, et al., *A Comparison of Real Versus Simulated Contraband VOCs for Reliable Detector Dog Training Utilizing SPME-GC-MS*, 40 Am. Lab. 16 (2008), *available at* http://www.pawsoflife.org/Library/Detection/Marcias.pdf ("It has been shown that canines respond to volatile organic compounds (VOCs) in the headspace above the drug instead of the parent compound itself."). Therefore, a positive canine alert produces nothing more than an inference that contraband is also present. In fact, it is the sniff technique's reliance on inferencing, rather than detection of the contraband itself, that generates the separate issue of the individual detection dog's "reliability" for contraband detection. For this reason, the canine-sniff inference is nothing like the contraband-specific chemical test at issue in *United States v. Jacobsen*. 466 U.S. 109, 122 (1984) (finding that the chemical field test of a lawfully-seized white powder that the agent suspected was cocaine did not violate the Fourth Amendment because the test revealed only whether the powder was cocaine and "nothing more, not even whether the substance was sugar or talcum powder.").

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deployed. . . .") *with* Lisa Lit, et al., *Handler beliefs affect scent detection dog outcomes*, 14 Animal Cognition 387, 393 (2011), *available at* http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3078300/pdf/10071_2010_Article_373.pdf (finding "that handler beliefs affect working dog outcomes, and human indication of scent location affects distribution of alerts. . . .").

Kyllo's understandable concern about "advancing technology" and its potential to "shrink" Fourth Amendment protection for the home notwithstanding, *see Kyllo*, 533 U.S. at 34, 35, the warrantless use of the thermal imager there violated the Fourth Amendment because it allowed police to infer what was going on inside Kyllo's home. Regardless of whether future devices might come to reveal more detailed thermal images than the "relatively crude" measurement of radiant heat described in *Kyllo*, *see id.* at 36, *Kyllo*'s primitive scan violated the Fourth Amendment because it disclosed information that would not otherwise have been obtained without physical entry into the home. Therefore, any attempt to label canine drug-detection sniffs as "technology" or "advancing technology," *cf. id.* at 35, as a starting point to determining whether a warrant is required or, instead, to label the detection sniff as a "natural" aid, as the United States military describes it,[9] are unnecessary and, perhaps, beside the point. The

[9] Military R. Evid. 313(b) provides in pertinent part: "Inspections shall be conducted in a reasonable fashion . . . [and] may utilize any reasonable *natural* or technological *aid*. . . ." (emphasis added). As the Manual for Courts-Martial explains, "[a]n inspection is conducted for the primary function of ensuring mission readiness. . . ." Manual for Courts-Martial United States App. 22, Military R. Evid. 313(b), A22-21 (2008 ed.), *available at* http://www.au.af.mil/au/awc/awcgate/law/mcm.pdf. Due to their importance, unscheduled inspections may be conducted on the "intentionally minimal" standard of reasonable suspicion. *Id.* at A22-23. Rule 313(b) means that "dogs may be used to detect contraband in an otherwise valid inspection for contraband." *Id.*

essential question – does the sense-enhancing police tool reveal information about the home that would not otherwise be obtained without physical entry – remains unaffected by these labels and must be answered in the affirmative for canine sniffs of the home.

ii. *Illinois v. Caballes*'s Treatment of the Canine-Sniff Technique Does Not Control the Outcome For Warrantless Canine Sniffs of the Home

For sense-enhancing devices directed at the home, it is important to distinguish between the "capability" of a sense-enhancing tool to reveal noncontraband information about the home as contrasted with the tool's "accuracy" in detecting contraband. On the accuracy issue, at present there are no scientific studies that consider the reliability of the canine-sniff technique when performed on the exterior of a house in order to detect contraband hidden inside. The lack of scientific study concerning canine home-sniffs as well as potential canine-sniff impediments in a home-setting counsels caution in extending the warrantless use of canine sniffs beyond the close-proximity sniffs of luggage and vehicles. *Cf.* Gary Settles, *Sniffers: Fluid-Dynamic Sampling for Olfactory Trace Detection in Nature and Homeland Security – The 2004 Freeman Scholar Lecture*, 127 J. of Fluids Eng'g 189, 199 (2005), *available at* http://www.mne.psu.edu/psgdl/Pubs/2005-Settles-JFE.pdf (explaining that a detection dog's ability to "read" an

olfactory "message" is directly tied to "proximity sniffing").

But for inferencing about the home, warrantless use of even reliable sense-enhancing tools violates the Fourth Amendment. *Cf. Karo,* 468 U.S. at 708-09 (beeper revealing, with apparently-perfect accuracy, the location of the houses involved). In *Kyllo*, for example, nothing in the Court's treatment of thermal scans suggests that police were wrong very often, or ever, about whether the heat-generating activity detected within the home was a marijuana growing operation or instead a lawful horticultural pursuit, like orchid growing. *Cf. Kyllo*, 533 U.S. at 38 (stating that the thermal imager "*might disclose*, for example, at what hour each night the lady of the house takes her daily sauna and bath. . . .") (emphasis added). It was the fact that police used a sense-enhancing device to deduce what Kyllo was doing inside his home that motivated *Kyllo*'s protective result, not the odds that police might have been wrong about the conclusion the thermal imager enabled them to draw. As the Court later explained in *Caballes*, "[c]ritical to [the *Kyllo*] decision was the fact that the device was *capable* of detecting lawful activity – in that case, intimate details in a home, such as 'at what hour each night the lady of the house takes her daily sauna and bath.'" 543 U.S. 405, 409-10 (2005) (*quoting Kyllo*, 533 U.S. at 38) (emphasis added). Therefore, in the home context it is the *capability* that a sense-enhancing tool might detect lawful activity that was important in *Caballes*, not the likelihood that it would do so.

For canine sniffs of the home, the importance of distinguishing between "capability" and "reliability" cannot be overstated. Although Caballes argued that drug-detection dogs alerted to noncontraband, he did so to bolster his view that the canine sniff technique was unreliable, an argument that the *Caballes* majority rejected. *Id.* (Court finding no evidence in the record to support Caballes's argument that detection-dog error rates called into question whether the dogs alerted only to contraband). Aside from Caballes's false-alert argument, the Court was not called upon to consider whether a detection dog actually alerts to the illegal drug or instead to substances that are found in both the illegal drug and lawful household items, and whether a canine home-sniff is a context in which that distinction should make a difference. Therefore, whether a canine drug-detection sniff is "capable" of revealing noncontraband information about the home was not addressed by *Caballes*.

B. Scientific Evidence Demonstrates That Drug-Detection Dogs Alert To Non-contraband Substances, Not the Illegal Drug Itself

The issue is not *that* a dog can smell; instead, the issue is *what* the dog smells. Studies show that drug-detection dogs alert to certain volatile substances that are found in street drugs, not the illegal drug itself. *See, e.g.,* Norma Lorenzo, et al., *Laboratory and field experiments used to identify* Canis lupus *var.* familiaris *active odor signature chemicals from drugs,*

explosives, and humans, 376 Analytical and Bioanalytical Chemistry 1212, 1213 (2003) ("Previous studies with narcotics detector dogs have shown that the dogs alert to volatile odor chemicals associated with drugs rather than the parent drug itself."). Therefore, a drug-detection dog does not alert to contraband, but instead to the odor of an organic molecule or compound that the dog is trained to *associate* with contraband. The State of Florida comes close to admitting as much in *Harris*. *See Harris* Pet. at 20 (asserting that "the drug detection dogs used by federal agencies are trained to detect the odor of narcotics and not the presence of contraband."); *see also id*. at 23 n.5 (describing that U.S. Customs and Border Protection ("Customs") trains its detection dogs "to detect the odor of contraband and not to the presence of the drug.").

i. Cocaine and Methyl Benzoate

Snapdragons. Petunias. Perfume. Food additives. Cocaine. Common to all of these items is methyl benzoate, also known by its more "romantic" name, Oil of Niobe.

In cocaine, methyl benzoate is a decomposition product or break-down product that is produced when cocaine hydrochloride is exposed to humid air. *See* L. Paul Waggoner, et al., *Canine olfactory sensitivity to cocaine hydrochloride and methyl benzoate*, *in* Chemistry- and Biology-based Technologies for Contraband Detection 216, 216 (Pierre Pilon & Steve Burmeister

eds., 1997). Methyl benzoate is a volatile, aromatic molecule, and its particular, sweet-smelling odor is detectible in the air, or "headspace," associated with the drug. *Cf.* Robert A. Raguso & Olle Pellmyr, *Dynamic headspace analysis of floral volatiles: a comparison of methods*, 81 OIKOS 238, 239 (1998) (describing methods of collecting "floral scent compounds" for "[h]eadspace analysis" of volatile scent compounds). Studies show that drug-detection dogs alert to methyl benzoate, rather than cocaine itself. Kenneth G. Furton, et al., *Field and Laboratory Comparison of the Sensitivity and Reliability of Cocaine Detection on Currency Using Chemical Sensors, Humans, K-9s and SPME/GC/MS/MS Analysis*, *in* Investigation and Forensic Science Technologies 41 (Kathleen Higgins ed., 1998) ("To date, the only chemical found to produce consistent drug dog alerts [for cocaine detection] has been methyl benzoate.").

In fact, some drug-detection dogs are trained to alert *exclusively* to methyl benzoate, not cocaine.[10] Other drug-detection dogs, such as those used by Customs, undergo field training for cocaine detection

[10] In civil forfeiture proceedings, canine detection of methyl benzoate provides a way for law enforcement to distinguish money that is seizable because of its connection to drug trafficking from money in general circulation (because of circulated currency's contamination with cocaine residue). *United States v. Funds in the Amount of Thirty Thousand Six Hundred Seventy Dollars ($30,670.00)*, 403 F.3d 448, 458 (7th Cir. 2005). Therefore, some drug-detection dogs are trained to alert *solely* to methyl benzoate, not cocaine. *Id.*

using methyl benzoate training devices.[11] *See* Chad H. Dowell, Dept. of Health and Human Servs., Health Hazard Evaluation Report 2004-0012-2948 U.S. Customs and Border Protection Canine Enforcement Training Center Front Royal, Virginia 1 (2004), *available at* http://www.cdc.gov/niosh/hhe/reports/pdfs/2004-0012-2948.pdf (describing that Customs uses "pseudo drugs" as training aids, which Customs produces itself in its "pseudo building" located at its facility). Although the phrase "odor of contraband" might suggest that detection dogs are trained to detect a complex bouquet of aromas or a unique odor signature for cocaine, in fact, detection dogs trained to alert to pseudo cocaine are exposed to methyl benzoate and no other volatile substance. *Cf. id*. at 1-3 (based upon a master list of substances that Customs identified as training-aid constituents, *see id.* at 1, it appears that the sole *volatile* constituent in Customs's pseudo cocaine is methyl benzoate).[12]

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[11] A pseudo drug training device is prepared by placing a specified amount of the pseudo drug required – here, methyl benzoate – into a heat-sealed plastic bag, which is then placed inside a delivery system, such as PVC pipe, for use as "hides" in detection dog field training. *Cf.* Michael Macias, et al., *Detection of piperonal emitted from polymer controlled odor mimic permeation systems utilizing* Canis familiaris *and solid phase microextraction-ion mobility spectrometry*, 195 Forensic Sci. Int'l 132, 133, 134 (2010) (describing the preparation of a pseudo drug training device for detection of Ecstasy using piperonal).

[12] Customs's preparation of "pseudo drugs" or "pseudo narcotics" includes the use of "acetic acid, benzaldehyde, methyl benzoate, piperonal, cab-o-sil,® and microcrystalline cellulose." *Id.* By a process of elimination, it appears that methyl benzoate

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Like the excessive heat detected in *Kyllo* (which, while suspicious, was not itself unlawful), methyl benzoate is a lawfully-possessed molecule that is associated with many ordinary household items, not just cocaine. In fact, methyl benzoate is found in such abundance in household sources that it surpasses a detection dog's sniff threshold. Methyl benzoate is produced by flowers – like snapdragons and petunias; its sweet smell serves as an airborne chemical attractant for pollinating insects. Natalia Dudereva, et al., *Developmental Regulation of Methyl Benzoate Biosynthesis and Emission in Snapdragon Flowers*, 12 Plant Cell 949, 949, 950 (2000), *available at* http://www.plantcell.org/content/12/6/949.full.pdf (identifying methyl benzoate as a floral scent of more than thirty flower species). Importantly, a snapdragon's or petunia's methyl benzoate emission is *on-going* until the flower is pollinated. *See* Florence Negre, et al., *Regulation of Methylbenzoate Emission after Pollination in Snapdragon and Petunia Flowers*, 5 Plant Cell 2992, 2992 (2003), *available at* http://www.plantcell.

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is the sole volatile constituent of Customs's pseudo cocaine. To explain, acetic acid is the volatile constituent of pseudo heroin, benzaldehyde is the volatile constituent of pseudo methamphetamine, and piperonal is the volatile constituent of pseudo MDMA, leaving, by elimination, methyl benzoate as the sole volatile substance in Customs's pseudo cocaine. *Cf. id*. Additionally, Customs's pseudo drug preparations are distributed throughout the country for use in canine drug-detection field training. *Id*. (describing that after preparation, "the pseudo drug is transferred and weighed into smaller bags for shipment throughout the country.").

org/content/15/12/2992.full.pdf (explaining that plants "emit scent at maximum levels when [their] flowers are ready for pollination" and that "[t]he scent of many flowers is reduced markedly soon after pollination."); *see also* Dudereva, *supra*, at 954 (explaining that the snapdragon's emission of methyl benzoate is "four times higher during the daytime than at night.").

If the ordinary snapdragon flower emits 56.5 micrograms of methyl benzoate in a twenty-four hour period, *see* Dudereva, *supra*, at 950, then a bouquet of twenty flowers would emit 1130 micrograms of methyl benzoate per twenty-four hours. Even if, for argument's sake, one averages the bouquet's methyl benzoate emission over the entire twenty-four hour period (which would be incorrect since the snapdragon's emission of methyl benzoate is four times higher during the day, *see id*.), the bouquet would emit 47.1 micrograms of methyl benzoate per hour. And if a drug-detection dog readily alerts to 10 micrograms of methyl benzoate,[13] then it follows that more substantial sources of methyl benzoate – like snapdragons or petunias – are capable of triggering a detection dog's

[13] *See* Furton, *Field and Laboratory*, *supra*, at 44, Table 2 (stating that for "Pseudo cocaine in Bill [currency] that detection dogs alerted with "80% (4/5)" accuracy to "10 µg [micrograms] Methyl Benzoate in White Paper"). A 10-microgram alert threshold is used here because it is likely a conservative value; other studies show canine drug-detection alerts in response to substantially smaller amounts of methyl benzoate. *See* Lorenzo, *supra*, at 1213-14 (noting that the "effective dose for 50% of the canines and humans tested is approximately 1 µg [microgram] of methyl benzoate spiked onto currency.").

alert. Here, methyl benzoate's well-documented volatility or rapid evaporation rate – which in other contexts (like civil forfeiture proceedings) helps to ensure that cocaine is present or had been recently present – works *against* a home's occupants because flowers churn out methyl benzoate on an on-going basis, *see* Negre, *supra*, at 2992, which arguably may mimic the appearance of a fresh cocaine source. Because the methyl benzoate production of unpollinated flowers exceeds the minimum threshold required to trigger most detection-dog alerts, there is no way to know whether the detection dog sniffing at a front door has alerted to the flower arrangement that the lady (or gentleman) of the house has displayed in the foyer without physical entry into the home to identify the methyl benzoate source.

Additionally problematic, methyl benzoate, or Oil of Niobe as the perfume industry calls it, is a common ingredient in perfumes. P. Aggarwal, et al., *The Use of Thermogravimetry to Follow the Rate of Evaporation of an Ingredient Used in Perfume*, 49 J. of Thermal Analysis 595, 596 (1997) ("Methyl benzoate is used as a base in certain perfumes. It is found in essential oils and has a dry fruity, slightly phenolic odor."). While some say there is not enough methyl benzoate in perfume to trigger a detection dog's alert,[14] regardless

[14] For illustration purposes (which are not intended to suggest legal authority), expert testimony on this point was given in a civil forfeiture case, which is available as an unpublished decision. *See United States v. $60,020.00 in U.S. Currency*, ___ F. Supp. 2d ___, 2011 WL 4720741, at *3 (W.D.N.Y.

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of how much methyl benzoate is present in an individual spritz of perfume, logic dictates there is much more of this sweet-smelling molecule in the contents of an entire bottle. *Cf. Horton v. Goose Creek Indep. Sch. Dist.*, 690 F.2d 470, 474 (5th Cir. 1982) (in a Section 1983 case arising from a false-positive canine sniff of a schoolchild, the student had a small bottle of perfume in her purse); *see also Jacobsen v. $55,900 in U.S. Currency*, 728 N.W.2d 510, 534-35 (Minn. 2007) (Hanson, J., concurring) (noting that "methyl benzoate is a common chemical used in multiple consumer products – solvents, insecticides, perfumes, etc.").

The home is a common repository for methyl benzoate-containing perfumes and cleansing products that rely on methyl benzoate to mask the cleansers' chemical odor. *See*, *e.g.*, U.S. Patent No. 6,572,847 B2 (filed Mar. 26, 2001) (noting that methyl benzoate is a commonly used "odorant," meaning that it is a fragrance added as an "odor mask" in commercially available products). Yet, no scientific studies consider whether ordinary households sources of methyl benzoate could induce a positive canine alert. The

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2011) (expert testifying that some perfumes and personal-use products contain methyl benzoate in small amounts, but that the amounts in these products are below a detection dog's threshold for methyl benzoate detection). Notwithstanding, there is no published scientific research that uses the amount of methyl benzoate in an entire bottle of perfume as a research variable (perhaps because the amount of methyl benzoate in any given perfume is protected proprietary information) in determining whether these more substantial amounts of methyl benzoate could produce a positive drug-detection alert.

studies that do exist are "interference studies" that consider whether household items like rosemary, oregano, sesame seeds, and black pepper can *mask* illegal drugs from canine detection. *See, e.g.,* Hanh Lai, et al., *Headspace sampling and detection of cocaine, MDMA, and marijuana via volatile markers in the presence of potential interferences by solid phase microextraction-ion mobility spectrometry (SPME-IMS)*, 392 Analytical and Bioanalytical Chemistry 105, 107 (2008). Studies that examine whether household items are capable of producing a false-*negative* canine sniff add nothing to the discussion of whether other household items might produce a false positive. Therefore, interference studies are simply inapposite to the question of whether detection dogs are capable of alerting to lawful methyl-benzoate sources found in the ordinary home.

ii. Heroin and Acetic Acid

Vinegar. Aspirin. Food additives. Wart removers. "Green" or "Earth-friendly" household cleaning supplies. Heroin. Common to all of these items is acetic acid.

Studies show that acetic acid is the dominant odor signature of heroin and is the organic compound to which drug-detection dogs alert. *See* Michael Macias, *The Development of an Optimized System of Narcotic and Explosive Contraband Mimics for Calibration and Training of Biological Detectors*, 104 (May 27, 2009) (Florida Int'l Univ. Electronic Theses

and Dissertations, Paper 123), *available at* http://digitalcommons.fiu.edu/123 (last visited June 16, 2012) (discussing the odor profiles of drugs and commercially available drug-mimic scents); *see also* James E. Girard, Criminalistics: Forensic Science, Crime, and Terrorism 277 (Jones & Bartlett Learning, 2d ed. 2011) ("Acetic acid is the major organic component of vinegar. For this reason, drug-sniffing dogs are trained to recognize the vinegar-like odor that may still be present in clandestine shipments of poorly purified heroin.").

The problem for heroin detection is that acetic acid is commonly found in ordinary household items; it is, for example, the constituent of vinegar that gives it its characteristic odor. *See* Macias, *Development of an Optimized System*, *supra*, at 104-09 (graphing the concentration of acetic acid in balsamic vinegar, red wine, apple cider, and white distilled vinegar). The same odor that is produced by the "deacetylation process of heroin to morphine" – acetic acid – is also produced in vinegar as "a direct result of the fermentation process . . . of ethyl alcohol with ethyl acetate." *Id*. at 104. One scent is produced in either case – with two very different origins.

While an opened bottle of vinegar is probably not routinely transported in luggage or vehicles (the bottle presumably remains sealed on the drive home from the grocery store), it goes without saying that vinegar is routinely used in the home, perhaps increasingly so. In an era when people are concerned about the environment as well as exposing their

children to chemical cleansing products, it is not just the old-fashioned who clean their homes' floors and windows with vinegar and vinegar-based products. *Cf.* Mary G. Lankford, et al., *Assessment of materials commonly utilized in health care: Implications for bacterial survival and transmission*, 34 Am. J. Infection Control 258, 260 (2006) (comparing effectiveness of a variety of disinfectants, including "distilled, white vinegar").

Significantly, however, there are no scientific data, or even anecdotal discussions in judicial cases or scientific literature, that reassure that drug-detection dogs can differentiate between the acetic acid sources commonly found in the home and heroin. In fact, based on the similarity between heroin and vinegar (i.e., acetic acid) the limited research available raises the concern of detection-dog confusion in drug-detection dogs trained with single-ingredient pseudo heroin (in which acetic acid is the sole volatile ingredient). *See* Macias, *Development of an Optimized System*, *supra*, at 104 (noting that because "[t]raining compounds need to be representative of the actual sample of interest (i.e. heroin) and distinguishable from common, everyday items (i.e. vinegar) . . . , the use of acetic acid as a single training compound may not be sufficient.").

Nevertheless, acetic acid has been used for years in pseudo drug training aids to train detection dogs to alert to heroin or to reinforce their heroin-detection field training, *cf. id*. at 112, Table 21. In fact, acetic acid may be the *sole* volatile compound in some

"pseudo heroin" training aids. *Id*.; *see also* Dowell, *supra*, at 1.[15] Therefore, there is no way to know whether the drug-detection dog sniffing at a front door has done no more than discover that it was housekeeping day for the lady (or gentleman) of the house without physical entry to identify the acetic acid source.

In addition to vinegar, many routine over-the-counter medications, such as aspirin, break down to produce acetic acid. *See* T.P. Wampler, et al., *Dynamic headspace analyses of residual volatiles in pharmaceuticals*, 23 J. of Chromatographic Sci. 64 ("Acetylsalicylic acid (aspirin) degrades to produce acetic acid, thus causing a vinegary smell in samples which are either past their prime or which have been improperly stored."). The home is, of course, an appropriate place for people to store their medications, both prescription and over-the-counter. People should not be left to wonder whether improperly stored medications or even pills that have been kept too long might provoke a drug-detection dog's alert.

iii. Canine Detection of Other Illegal Drugs

MDMA: Because of the rise in use of MDMA, also known as "Ecstasy," drug-detection dogs are now

[15] Based upon Custom's list of ingredients used in its various "pseudo drug" training aids, *see* Dowell, *supra*, at 1, it appears that acetic acid is the sole *volatile* substance in Customs's pseudo heroin. *Cf*. *id.* at 1-3. *See also* note 12, *supra*.

being certified to detect MDMA. *See* Lorenzo, *supra*, at 1213. Yet just as drug-detection dogs smell methyl benzoate instead of cocaine, drug-detection dogs alert to the volatile molecule, piperonal, rather than MDMA. *See* Michael Macias, et al., *Availability of Target Odor Compounds from Seized Ecstasy Tablets for Canine Detection*, 56 J. Forensic Sci. 1594, 1597 (2011) (explaining that drug-detection dogs trained to alert to Ecstasy are reacting to piperonal). As with cocaine and heroin, Customs prepares a pseudo drug training aid for detection of MDMA, which trains drug-detection dogs to alert to piperonal, not MDMA itself. *See* Dowell, *supra*, at 1-3.

Yet piperonal appears in a wide array of ordinary household products, like (1) soap, *see* Sigeru Torii, et al., *An electrochemical procedure for a practical preparation of piperonal from isosafrole*, 49 J. Org. Chem. 1830, 1830 (1984); (2) food additives and flavor enhancers, *see* J. Enrique Cometto-Muniz, *Odor, taste and flavor perception of some flavoring agents*, 6 Chemical Senses 215 (1981); and (3) even lice repellents, *see* Susan Peock & J.W. Maunder, *Arena Tests with Piperonal, A New Louse Repellent*, 113 J. Royal Soc. Health 292, 294 (1993). Because the odor of piperonal is also produced by ordinary household items, a drug-detection dog that is trained to alert to piperonal is capable of revealing lawful activity within the home. *See Caballes*, 453 U.S. at 409-10.

Marijuana: It should come as no surprise that there is a wealth of information on the internet about marijuana, including non-scientific discussions about

marijuana detection (with the focus being on ways to avoid it). From a legitimate research perspective, however, while "interference" studies exist there is otherwise no empirical data on canine marijuana detection and the related issue of whether "smell-alike" plants exist that could produce a positive canine alert. Nevertheless, anecdotal reports documented by legitimate media sources suggest that a drug-detection dog's alert to the presence of marijuana in a home is "capable" of revealing lawful activities. *See Caballes*, 543 U.S. at 409-10.

In Britain, a pink flowering plant, called moss phlox, when grown in suburban gardens has produced positive canine drug-detection alerts and police raids on homes. *See Pensioners' fragrant garden plants spark police drugs raid*, Irish Exam'r, Dec. 6, 2008 ("Police have apologised to Ivor Wiltshire, 77, and his wife Margaret, 79, for raiding their home with sniffer dogs to search for a cannabis factory in the loft. After finding no evidence of illegal activity the culprit is thought to be a seemingly harmless garden plant which grows small pink flowers known as moss phlox or phlox subulata."); *see also* Kathleen Faulkner, *Police Raid on Middle-Class Couple Who Grew a Plant that Smelled Exactly like Cannabis*, Daily Mail, Dec. 27, 2011 ("Police swooped on the Vincent's home after a drug dog went berserk at the smell. A neighbor said: 'Drug cops were crawling up and down the alleyway that borders their house. . . . A sniffer dog was there too, barking whenever it got close to their garden.").

Anecdotal reports are, of course, not science, but the legitimacy of the canine-sniff technique has long depended on anecdotal data. News reports are just more of the same. Regardless of the overall reliability of the canine-sniff technique for detection of marijuana, if smell-alike garden plants can induce a positive canine alert, then a canine home-sniff is capable of revealing lawful activity. *See Caballes*, 543 U.S. at 409-10. Without research, there is no way to know whether the drug-detection dog sniffing at the home has discovered that the lady (or gentleman) of the house enjoys gardening – of the entirely lawful sort – without physical entry to rule out a smell-alike plant.

iv. The Accuracy of Canine Home-Sniffs Cannot Be Assumed by Extrapolation From the Close-Proximity Sniffs of Luggage and Vehicles

Law enforcement claims that drug-detection dogs can reliably detect contraband in luggage and vehicles should not be used as a basis for assuming the reliability of canine home-sniffs. Differences between close-proximity sniffing and home-sniffs suggest caution in assuming that all canine drug-detection sniffs are one and the same. For home-sniffs, the drug-detection dog cannot obtain the same proximity to the volatile substance's source as would typically be the case for luggage and vehicle-sniffs. *Cf.* Gary S. Settles, et al., *The External Aerodynamics of Canine Olfaction, in* Sensors and Sensing in Biology and Engineering 323, 327 (Friedrich G. Barth et al. eds.,

2003) (describing "marked[ ]" differences in the mechanics of distance sniffing – calling it a "long sniff" – and close-proximity sniffing, where the dog is given "free investigation of the scent"). From a practical perspective, in order to determine whether canine drug-detection sniffs of the home can be reliable, we need scientific research – research that considers whether canine sniffs of ordinary homes (that are not secreting contraband) can produce false-positive canine alerts, not simply another "interference" study that examines whether "masking" strategies can trick drug-detection dogs into false-*negatives*.

Additionally, home occupants generally have less control over the people who access their front doors and associated curtilage areas than they do personal items like luggage. If the State's residual odor argument in *Harris* is correct, *see Harris* Pet. at 18, there is a real risk that a drug-detection dog could alert to contraband waste molecules[16] left behind by others –

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[16] Contraband waste molecules have the potential to contaminate surfaces associated with the front door of a residence. For instance, the U.S. Department of Justice has explained:

> [P]articulate contamination is easily transferred from one surface to another, so a person who has handled cocaine will transfer cocaine particles to anything else he or she touches, including skin, clothing, *door handles*, furniture, and personal belongings. Completely removing particular contamination from an object requires rigorous cleaning, and, in the case of bare hands, a single thorough washing may not be sufficient to remove all particles.

Nat'l Inst. of Justice, U.S. Dep't of Justice, Guide for the Selection of Drug Detectors for Law Enforcement Applications: NIJ

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even a marijuana seed dropped from a visitor's pocket onto the doormat.[17] Based upon the lack of control over the front-door location of the canine sniff along with situational impediments that may impact a home-sniff's reliability, canine sniffs of the home are different from close-proximity sniffs and should not be treated the same way.

CONCLUSION

Drug-detection dogs do not alert to the "odor of contraband"; instead, they alert to the odors for which they were trained to detect. As scientific research establishes, drug-detection dogs are trained to alert to odors that are not unique to contraband. These odors are also produced by lawful items found in the ordinary home. Because a detection-dog's sniff at the front door of a private residence is capable of revealing lawful activity inside, it is therefore a search under the Fourth Amendment.

Guide 601-00, at 6 (2000), *available at* https://www.ncjrs.gov/pdffiles1/nij/183260.pdf (emphasis added).

[17] *Cf. Fla. Dep't of Highway Safety & Motor Vehicles v. Jones*, 780 So. 2d 949, 950 (Fla. Dist. Ct. App. 2001) (discussing a drug-detection dog's alert to marijuana "residue" consisting of stems and seeds of an estimated weight of less than one gram, which the Florida State Trooper testified was too small in amount to recover because "[i]t was embedded in the carpet and would have taken tweezers to recover") (internal quotation marks omitted).

For the reasons stated above, the Florida Supreme Court's decision must be affirmed.

Respectfully submitted,

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