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### The Evolutionary Biology of Fungi and Fraud

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# THE EVOLUTIONARY BIOLOGY OF FUNGI AND FRAUD

WENDY GERWICK COUTURE\* & B. CLIFFORD GERWICK\*\*

## ABSTRACT

In this Article, the authors—a law professor and a biologist—offer a fresh perspective on the use of broad federal fraud statutes to combat fraud by drawing a comparison with the use of multi-site fungicides to combat plant disease. Multi-site fungicides are effective at preventing the evolution of resistant strains of fungi, but they are subject to increased regulatory scrutiny amid concerns about off-target toxicity. Similarly, broad fraud statutes serve as a stopgap to prevent the evolution of new types of fraud, but they are widely criticized as unduly vague and as interfering with the operation of specific fraud statutes. Biologists’ successful alternatives to multi-site fungicides inform the discussion of alternative ways to combat fraud that avoid the problems associated with broad fraud statutes.

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## I. INTRODUCTION

What do fraud and fungi have in common? In this Article, the authors—a law professor and a biologist—offer a fresh perspective on the use of broad federal fraud statutes to combat fraud by drawing a comparison with the use of multi-site fungicides to combat plant disease. The potential for fraud perpetrators to “evolve,” thus avoiding the reach of antifraud legislation, is central to the debate about the appropriate breadth of fraud statutes.<sup>1</sup> Similarly, the evolution of plant diseases that

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1. Thomas Rybarczyk, Comment, *Preserving a More Perfect Union: Melding Two Circuits’ Approaches to Save a Valuable Weapon in the Fight Against Political Corruption*, 2010 WIS. L. REV. 1119, 1129 (noting the mail fraud statute’s role in “stopping the ever-evolving schemer from using the

are fungicide-resistant is a crucial issue confronting plant biologists.<sup>2</sup> The strategies successfully invoked by biologists to combat plant disease in the face of evolving fungi, including the role of single-site and multi-site fungicides, provide guidance about successful strategies that could be used to fight fraud in the face of evolving fraud perpetrators, including the role of specific and broad fraud statutes.

The appropriate role of broad federal statutes in combating fraud is an especially relevant issue in the wake of the United States Supreme Court's recent decision in *Skilling v. United States*,<sup>3</sup> which significantly limited the reach of the federal mail and wire fraud statutes.<sup>4</sup> The mail and wire fraud statutes<sup>5</sup> prohibit the fraudulent deprivation, not only of money or property, but also of the "intangible right of honest services."<sup>6</sup> Before the *Skilling* decision, this so-called "honest services fraud" provision was used to prosecute a broad range of conduct, including undisclosed self-dealing by public officials and private employees.<sup>7</sup> In *Skilling*, however, the Court significantly limited the reach of these statutes by interpreting "honest services fraud" as including only frauds involving

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mails as an instrument of fraud") (citing *Durland v. United States*, 161 U.S. 306, 314 (1896)).

2. Jonathan Gressel, *Evolving Understanding of the Evolution of Herbicide Resistance*, 65 PEST MGMT. SCI. 1164, 1164 (2009) (explaining that the problem of fungicide resistance has "all to do with evolutionary biology"); Derek W. Hollomon & Keith J. Brent, *Combating Plant Diseases – The Darwin Connection*, 65 PEST MGMT. SCI. 1156, 1156 (2009), available at <http://tripsaver.lib.ncsu.edu/pdf/84007671.pdf> (recognizing that "the development of strains resistant to chemical treatments[]" is one of the "evolutionary trends" that causes "new problems of plant disease"); Margaret McGrath, *Fungicides and Mode of Action*, 15 GREENHOUSE PRODUCT NEWS (Sept. 2005), available at <http://www.gpnmag.com/Fungicides-and-Mode-of-Action--article6328> (explaining that fungicide resistance is "obtained through evolutionary processes").

3. *Skilling v. United States*, 130 S. Ct. 2896 (2010).

4. *Id.* at 2928.

5. 18 U.S.C. § 1341 (West 2011) ("Frauds and swindles"); 18 U.S.C. § 1343 (West 2011) ("Fraud by wire, radio, or television").

6. 18 U.S.C. § 1346 (West 2011) (declared unconstitutionally vague by *Skilling* when applied to conduct other than bribery and kickbacks).

7. See, e.g., *McNally v. United States*, 483 U.S. 350 (1987), superseded by *Skilling*, 130 S. Ct. at 2932.

bribery and kickbacks.<sup>8</sup> In response, during the 111th Congress, members of both houses introduced bills to enact the Honest Services Restoration Act in order to restore the formerly broad reach of “honest services fraud” to include frauds involving undisclosed self-dealing.<sup>9</sup> As Senator Leahy, one of the sponsors of the Senate bill, explained, “[t]he legislation will restore critical tools used by investigators and prosecutors to combat public corruption and corporate fraud, which the Supreme Court dramatically weakened in *Skilling v. United States*.”<sup>10</sup> The 111th Congress did not enact the Honest Services Restoration Act; but the Act has been reintroduced in the House,<sup>11</sup> and Senator Leahy has expressed hope of finding “a bipartisan solution to fixing honest services fraud.”<sup>12</sup>

In Part II of this Article, the authors demonstrate that multi-site fungicides and broad fraud statutes, such as the mail and wire fraud statutes,<sup>13</sup> operate in similar ways to prevent the evolution of resistant strains of fungi and fraud. In Part III, the authors discuss the regulatory pressure facing multi-site fungicides and the parallel criticisms leveled at broad fraud statutes, including *Skilling*’s curtailment of the reach of the mail and wire fraud statutes. In Part IV, the authors summarize the alternative means of managing fungicide resistance that scientists have developed in the face of increased regulatory scrutiny of multi-site fungicides and draw from these solutions to propose alternatives to broad fraud statutes. A brief conclusion follows, with proposals to prevent new forms of

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8. *Id.* at 2931 (“To preserve the statute without transgressing constitutional limitations, we now hold that § 1346 criminalizes only the bribe-and-kickback core of the pre-*McNally* case law.”).

9. Honest Services Restoration Act, H.R. 6391, 111th Cong. (2d. Sess. 2010) (seeking to expand the deprivation of honest services to include undisclosed self-dealing by a public official); Honest Services Restoration Act, S. 3854, 111th Cong. (2d. Sess. 2010) (seeking to expand the definition even further to include undisclosed private self-dealing by a corporate officer or director).

10. 156 CONG. REC. S7631 (daily ed. Sept. 28, 2010) (statement of Sen. Leahy for himself, Sen. Whitehouse, and Sen. Kaufman).

11. Honest Services Restoration Act, H.R. 1468, 112th Cong. (1st Sess. 2011).

12. 157 CONG. REC. S905 (daily ed. Feb. 17, 2011) (statement of Sen. Leahy for himself and Sen. Cornyn).

13. 18 U.S.C. § 1341; 18 U.S.C. § 1343.

fraud, while minimizing the adverse impacts of broad fraud statutes.

## II. MULTI-SITE FUNGICIDES AND BROAD FRAUD STATUTES PREVENT THE EVOLUTION OF RESISTANT STRAINS OF FUNGI AND FRAUD

Multi-site fungicides, which affect multiple target sites, are far less susceptible to resistance than single-site fungicides.<sup>14</sup> Similarly, broad fraud statutes like the mail and wire fraud statutes, which focus on the fraudulent behavior itself rather than the object of the fraud, are less susceptible to evasion than specific fraud statutes.<sup>15</sup> In this way, multi-site fungicides and broad fraud statutes play a similar role in preventing the evolution of resistant strains of fungi and fraud.

### A. *The Use of Multi-Site Fungicides to Combat the Evolution of Resistant Fungi*

“Fungicides,” defined broadly, are “agents used to control plant diseases caused by fungi.”<sup>16</sup> Indeed, fungicides are the most effective weapon against plant disease, which can devastate crop yields and interfere with food supply.<sup>17</sup> In light of the importance of fungicides in combating plant disease, the evolution of fungicide resistance is one of the most serious threats to global food supply and fiber production.<sup>18</sup> Fungicide

14. See Hollomon & Brent, *supra* note 2, at 1160-61.

15. See, e.g., Jason T. Elder, Comment, *Federal Mail Fraud Unleashed: Revisiting the Criminal Catch-All*, 77 OR. L. REV. 707, 707 (1998) (“The mail fraud statute occupies a unique position in federal criminal law as one of the last broad and amorphous criminal statutes.”).

16. Keith J. Brent & Derek W. Hollomon, *Fungicide Resistance: The Assessment of Risk*, FUNGICIDE RESISTANCE ACTION COMMITTEE, 6 (2d revised ed. 2007), available at [http://www.frac.info/frac/publication/anhang/FRAC\\_Mono2\\_2007.pdf](http://www.frac.info/frac/publication/anhang/FRAC_Mono2_2007.pdf) [hereinafter *Fungicide Resistance*].

17. See, e.g., Ulrich Gisi & Helge Sierotzki, *Fungicide Modes of Action and Resistance in Downy Mildews*, 122 EUR. J. PLANT PATHOL. 157, 157 (2008) (“[D]owny mildews are among the most devastating plant diseases. To avoid yield losses, disease control is required mainly by using chemical products.”).

18. Gisi & Sierotzki, *supra* note 17, at 158 (“This development [of resistance] is a common phenomenon in agricultural practice and is based on

resistance is a quintessential example of “survival of the fittest”<sup>19</sup> because resistant strains of fungi, which contain one or more resistant variants of a gene that renders the fungicide ineffective, are naturally present in the genetic background of the fungi population.<sup>20</sup> The fungicide kills, or inhibits, the growth and reproduction of all but these resistant strains.<sup>21</sup> The unaffected resistant strains remain able to infect the host plant and—depending on their fitness—multiply.<sup>22</sup>

The likelihood of fungicide resistance depends on whether the fungicide’s mode-of-action is single-site or multi-site, due to the former being far more susceptible to resistance.<sup>23</sup> Single-site fungicides act on only one target site,<sup>24</sup> while multi-site

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the selection of resistant individuals by the use of fungicides.”); Maria Lodovica Gullino et al., *Mancozeb: Past, Present, and Future*, 94 PLANT DISEASE 1076, 1081 (2010), available at <http://apsjournals.apsnet.org/doi/pdf/10.1094/PDIS-94-9-1076> (“Fungicide resistance is a serious and intensively studied issues in the management of many key fungal diseases of most crops.”); Hollomon & Brent, *supra* note 2, at 1160 (“Fungicide resistance . . . is one of the core problems limiting sustainable food and fibre [sic] production worldwide.”).

19. Hollomon & Brent, *supra* note 2, at 1162. “Pathogen adaptations to varietal resistance and to fungicides provide excellent ‘living examples’ of ‘survival of the fittest’ that demonstrate how rapidly evolutionary forces can operate in a wide range of microorganisms, and how difficult they are to hold back.” *Id.*

20. *Fungicide Resistance*, *supra* note 16, at 14. “The potential in the target pathogen for mutations conferring resistance is the basic cause of a resistance risk for a new fungicide.” *Id.*

21. Gullino et al., *supra* note 18, at 1081. “The development of resistance in a fungal population is the inevitable response to the selection pressure of fungicide use.” *Id.*

22. J. Dekker, *Development of Resistance to Modern Fungicides and Strategies for its Avoidance*, in MODERN SELECTIVE FUNGICIDES 23, 23 (H. Lyr 2d. ed., 1995).

23. *Fungicide Resistance*, *supra* note 16, at 3 (stating that “a single rather than a multiple site of action” is a “positive indicator[] of risk”); Gisi & Sierotzki, *supra* note 17, at 158 (“In contrast to multi-site fungicides, most single-site inhibitors bear a high intrinsic risk of causing the evolution of resistant pathogen sub-populations.”); Gullino et al., *supra* note 18, at 1081 (“Fungicide resistance . . . threatens the commercial potential of products, particularly those having a single-site mode of action.”).

24. Gisi & Sierotzki, *supra* note 17, at 158. “Generally, single site-fungicides act against a very specific step in the metabolism of pathogens and have only few side effects on other processes or non-target organisms.”

fungicides affect multiple target sites.<sup>25</sup> One genetic mutation may be all that is required to resist a single-site fungicide.<sup>26</sup> In contrast, resistance to a multi-site fungicide is much more difficult to achieve because there must be mutations with respect to multiple target sites.<sup>27</sup> For example, if each target site has a frequency of resistant alleles of  $1 \times 10^{-6}$ , then the frequency of having two alleles in a single strain and imparting resistance to both target sites is  $1 \times 10^{-12}$ .<sup>28</sup> As explained in evolutionary terms by biochemists Derek W. Hollomon and Keith J. Brent:

In terms of Darwin's ideas, the more mutations needed to overcome fungicide action, the slower the development of resistance will be. This explains why multisite fungicides have proved durable, and why resistance caused by a single gene change develops more rapidly than when it depends on the additive effects of changes in several genes.<sup>29</sup>

Resistance to single-site fungicides is common because only one mutation is required, while resistance to multi-site fungicides is statistically very unlikely because so many mutations are required.<sup>30</sup>

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*Id.*

25. Hollomon & Brent, *supra* note 2, at 1160 (explaining that multi-site fungicides "target many metabolic steps").

26. *Fungicide Resistance*, *supra* note 16, at 9 (explaining that single-site inhibitors are more prone to resistance because "[a] single target site can be rendered resistant through one mutation changing a single DNA-base in the target gene and, consequently, just one amino acid in the target protein[.]"); P.E. Russell, *A Century of Fungicide Evolution*, 143 J. OF AGRIC. SCI. 11, 19 (2005) (explaining that chemistry "based on a single site of action" is "usually accompanied by resistance to that chemistry being governed by a simple genetic change in the pathogen").

27. Hollomon & Brent, *supra* note 2, at 1160 (stating that multi-site fungicides "require more than one mutation to overcome inhibition"); *Fungicide Resistance*, *supra* note 16, at 9 (explaining that fungicides with multiple targets are less prone to resistance because "[s]everal mutations must occur simultaneously to confer resistance at multiple target-sites, so this will be a much rarer event").

28. See *Fungicide Resistance*, *supra* note 16, at 9. "If the chance occurrence of a single mutation that affects a target site is  $10^{-8}$ , then the chance of two such mutations, independently affecting two target sites, occurring together is  $10^{-16}$ ." *Id.*

29. Hollomon & Brent, *supra* note 2, at 1161.

30. *Id.* at 1160 (describing resistance to multi-site fungicides as



*B. The Use of Broad Fraud Statutes to Combat the Evolution of Resistant Strains of Fraud*

Fraud, just like plant disease, can be devastating because it has the potential to deprive an individual victim of his or her life's savings.<sup>31</sup> When these effects on individual victims are aggregated, they can be societally devastating, as well as having the potential to contribute to a national financial crisis.<sup>32</sup> As a result of these potential effects, prosecution under federal fraud statutes is a key tool to combat fraud.<sup>33</sup> But federal fraud statutes—like fungicides—are potentially susceptible to resistance.

A federal fraud statute's susceptibility to resistance depends on whether it is drafted specifically or broadly, with the former being far more susceptible to resistance.<sup>34</sup> As articulated by one commentator, "[f]raud is by its very nature bounded only by the versatility of the human imagination."<sup>35</sup> As a consequence, akin

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"extremely rare").

31. See, e.g., Jayne W. Barnard, *Allocution for Victims of Economic Crimes*, 77 NOTRE DAME L. REV. 39, 53-54 (2001) (providing "[a] sampling of the voices of victims of non-violent crimes"); Chad Bray, *Madoff Victims Vent Their Frustrations at Scam – Letters Released by Prosecutors Offer a Look at the Heartbreak*, WALL ST. J., Mar. 25, 2009 (describing dozens of letters received from Madoff victims regarding their frustration with the financial ruin they have been left in).

32. FIN. CRISIS INQUIRY COMM'N, CONCLUSIONS OF THE FINANCIAL CRISIS INQUIRY COMMISSION, xviii (2011), available at [http://fcic-static.law.stanford.edu/cdn\\_media/fcic-reports/fcic\\_final\\_report\\_conclusions.pdf](http://fcic-static.law.stanford.edu/cdn_media/fcic-reports/fcic_final_report_conclusions.pdf). "Unfortunately—as has been the case in past speculative booms and busts—we witnessed an erosion of standards of responsibility and ethics that exacerbated the financial crisis. This was not universal, but these breaches stretched from the ground level to the corporate suites." *Id.* at xxii. The Commission concluded that widespread mortgage fraud was one of the causes of the financial crisis. *Id.* at xxii.

33. Robert S. Bennett, *Attorney General Eric Holder Testifies Before the FCIC*, in CORPORATE LAW AND PRACTICE COURSE HANDBOOK SERIES, PLI ORDER NO. 27437 at 3 (2010) (quoting Attorney General Holder). "The Department has a long history of prosecuting financial fraud—and we will continue to do so. . . . [O]ur goal is not just to hold accountable those whose conduct may have contributed to the law meltdown, but to deter such future conduct as well." *Id.*

34. See *infra* notes 35 – 52 & accompanying text.

35. Mark Zingale, Note, *Fashioning a Victim Standard in Mail and Wire*

to a fungi's resistance to a single-site fungicide, Chief Justice Burger noted that the "ever-inventive American 'con artist'" can often evade the scope of a specific fraud statute by changing just one component of his or her fraudulent scheme.<sup>36</sup>

If an actor takes steps to thwart the state from applying a rule to the actor, the state may face a choice of either abandoning pursuit of the actor or expanding the rule to reverse the effects of the actor's thwarting behavior, producing overbreadth in the rule. Or, thinking ahead a move or more, the state may prefer in the first instance to choose a broad prohibition that is less easily avoided.<sup>37</sup>

General fraud statutes, however, which fill in the gaps among more specific statutes, are less easily evaded.<sup>38</sup> Just as a fungus is unlikely to mutate sufficiently to resist a multi-site fungicide, a perpetrator of fraud is unlikely to evade the prescripts of a broad fraud statute.<sup>39</sup>

The mail and wire fraud statutes are prime examples of broad federal fraud statutes,<sup>40</sup> requiring only the following elements for conviction:

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*Fraud: Ordinarily Prudent Person or Monumentally Credulous Gull?*, 99 COLUM. L. REV. 795, 815 (1999) ("The law 'does not define fraud; it needs no definition; it is as old as falsehood and as versable as human ingenuity.'") (citing & quoting *Weiss v. United States*, 122 F.2d 675, 681 (5th Cir. 1941)).

36. *United States v. Maze*, 414 U.S. 395, 407 (1974) (Burger, C.J., dissenting) ("The criminal mail fraud statute must remain strong to be able to cope with the new variety of fraud that the ever-inventive 'con artist' is sure to develop.").

37. Samuel W. Buell, *The Upside of Overbreadth*, 83 N.Y.U. L. REV. 1491, 1494 (2008).

38. John C. Coffee, Jr., *The Metastasis of Mail Fraud: The Continuing Story of the "Evolution" of a White-Collar Crime*, 21 AM. CRIM. L. REV. 1, 3 (1983) (arguing "for statutory reform" because "if we freeze the evolution of the statute, new forms of predatory behavior will appear to which the legislature cannot realistically be expected to respond quickly").

39. Buell, *supra* note 37, at 1494; see also Jeffrey Standen, *An Economic Perspective on Federal Criminal Law Reform*, 2 BUFF. CRIM. L. REV. 249, 287-88 (1998) ("Congress' interest in coverage is satisfied best by writing statutes to the limit of ambiguity that courts will tolerate.") (footnote omitted).

40. Elder, *supra* note 15, at 707 ("The mail fraud statute occupies a unique position in federal criminal law as one of the last broad and amorphous criminal statutes.").

- (i) a scheme to defraud that includes a material deception;
- (ii) with the intent to defraud; (iii) while using the mails, private commercial carriers, and/or wires in furtherance of that scheme; (iv) that did result or would have resulted in the loss of money or property or the deprivation of honest services.<sup>41</sup>

These elements encompass a broad range of conduct. First, as noted by Professor John Coffee, the term “scheme to defraud . . . comes as close to a general prohibition of evil intent[,]” rather than imposing a limitation on the reach of the mail and wire fraud statutes.<sup>42</sup> Moreover, the object of the fraud is similarly unbounded, requiring merely the loss of money, property, or honest services.<sup>43</sup> Consequently, even after the Supreme Court’s recent ruling in *Skilling* that only schemes involving bribery or kickbacks fall within the scope of “honest services fraud,”<sup>44</sup> it remains “rare that criminal conduct cannot be placed within [the] reach[.]” of these statutes.<sup>45</sup> One commentator provided the following humorous example of the breadth of conduct that falls within the scope of the mail fraud statute: “[A] boy away at camp lies to his mother about winning the soccer match because he knows she will send him a batch of cookies. While he has technically committed mail fraud, no prosecutor would charge the child for lying to his mother in a letter.”<sup>46</sup>

Indeed, the ability of the mail and wire fraud statutes to ensnare fraudsters who fall outside the scope of more specific

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41. Christopher J. Stuart, *Mail and Wire Fraud*, 46 AM. CRIM. L. REV. 813, 816 (2009) (citing 18 U.S.C. § 1341 (2006)); see also *Neder v. United States*, 527 U.S. 1, 20-25 (1999).

42. Coffee, *supra* note 38, at 27 (“No other term in the federal criminal lexicon seems as all embracing as ‘scheme to defraud.’”).

43. Ellen S. Podgor, *Criminal Fraud*, 48 AM. U. LAW. REV. 729, 747-48 (1999) [hereinafter Podgor, *Criminal Fraud*] (citing the mail fraud statute as an example of a “generic fraud statute” whose focus “is almost exclusively on the fraud and not on the object of the offense”).

44. *Skilling v. United States*, 130 S. Ct. 2896, 2931 (2010) (quoting *United States v. deVegter*, 198 F.3d 1324, 1327-28 (11th Cir. 1999)).

45. Ellen S. Podgor, *Tax Fraud—Mail Fraud: Synonymous, Cumulative or Diverse?*, 57 U. CIN. L. REV. 903, 903 (1989) [hereinafter Podgor, *Tax Fraud*].

46. Todd E. Molz, Comment, *The Mail Fraud Statute: An Argument for Repeal by Implication*, 64 U. CHI. L. REV. 983, 1001 (1997).

statutes is central to the debate regarding their appropriate breadth.<sup>47</sup> In reference to this role, the mail and wire fraud statutes have been described as “a first line of defense[,]”<sup>48</sup> “a stopgap device . . . ,”<sup>49</sup> and “a virtual catch-all federal fraud statute.”<sup>50</sup> Most recently, Senator Leahy alluded to this role of the mail and wire fraud statutes when introducing legislation to expand the meaning of “deprivation of honest services.”<sup>51</sup> “Too often, loopholes in existing laws have meant that corrupt conduct can go unchecked. The honest services fraud statute has enabled prosecutors to root out corrupt and fraudulent conduct that would otherwise slip through those loopholes; we must tighten it so it can perform that important role again.”<sup>52</sup> In

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47. See, e.g., *United States v. Czubinski*, 106 F.3d 1069, 1079 (1st Cir. 1997) (“The broad language of the mail and wire fraud statutes are both their blessing and their curse[] [because] [t]hey can address new forms of serious crime that fail to fall within more specific legislation.”); *United States v. Henderson*, 386 F. Supp. 1048, 1053 (S.D.N.Y. 1974) (“Over the years the public has been subjected to fraudulent schemes beyond those specifically referred to in the statute, and resourceful prosecutors have used the mail fraud statute effectively and properly against all those schemes.”). See also Randall D. Eliason, *Surgery With A Meat Axe: Using Honest Services Fraud to Prosecute Federal Corruption*, 99 J. CRIM. L. & CRIMINOLOGY 929, 954-55 (2009) (“[O]ne of the virtues of mail and wire fraud over the years has been the ability of prosecutors to use those malleable statutes to pursue criminal conduct that may implicate federal interests but may not clearly be covered by more targeted federal legislation. One example of the use of mail and wire fraud to fill such a legislative gap is the prosecution of state and local corruption.”) (internal citation omitted); Elder, *supra* note 15, at 712-13 (“In the last few decades, federal mail fraud prosecutors expanded the mail fraud statute’s scope to reach new ‘cutting-edge’ crimes. Prosecutors may use the mail fraud statute to prosecute crimes that lack any other statutory reference.”).

48. *United States v. Maze*, 414 U.S. 395, 405 (1974) (Burger, C.J., dissenting).

49. *Id.*; see also Podgor, *Tax Fraud*, *supra* note 45, at 904 (discussing how the mail fraud statute “later came to be characterized as the ‘stopgap’ provision because the mail fraud statute was used to criminalize conduct that was morally reprehensible but was omitted from the literal terms of other criminal statutes”) (internal citations omitted).

50. Eliason, *supra* note 47, at 953.

51. 156 CONG. REC. S7631 (daily ed. Sept. 28, 2010) (statement of Sen. Leahy for himself, Sen. Whitehouse, & Sen. Kaufman).

52. *Id.* See also Molz, *supra* note 46, at 985. “[T]he broad language of the mail fraud statute allows courts to adapt the statute to new forms of

this way, the mail and wire fraud statutes operate much like a multi-site fungicide; preventing the evolution of resistant types of fraud by capturing virtually all potential new frauds within their reach.

*C. Differences Between The Roles of Fungicides in Fighting Fungi and Fraud Statutes in Fighting Fraud*

As explained above, multi-site fungicides and broad fraud statutes play a similar role in fighting the evolution of resistant strains of fungi and fraud.<sup>53</sup> However, the analogy is not perfect for three reasons: a lack of a causal relationship, an unknown mode of action, and the ability of choice regarding application.

First, there is not a causal relationship between the application of fungicides and the existence of resistant strains of fungi, but a causal relationship does exist between the scope of fraud statutes and the existence of resistant strains of fraud.<sup>54</sup> Fungicides do not cause the gene mutations that create resistant strains of fungi; they merely select for these naturally occurring mutants.<sup>55</sup> Fraud statutes, however, can cause a would-be perpetrator of fraud to alter his or her conduct so as to evade the strictures of the statute.<sup>56</sup> Ideally, the actor is deterred from his or her fraudulent course altogether.<sup>57</sup> In a less perfect world, the actor—the aforementioned “ever-inventive American ‘con artist’”—changes his or her *modus operandi* so as to fall

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fraud, thereby deterring criminals from finding and exploiting loopholes and, by delegating lawmaking power to the courts, lowering the cost of legislating for Congress.” *Id.*

53. See *supra* Part II.A-B.

54. See *infra* notes 55-59 & discussion.

55. *Fungicide Resistance*, *supra* note 16, at 12 (explaining that resistance develops “from selection of initially rare mutants”).

56. Buell, *supra* note 37, at 1495 (arguing that “if the criminal actor is resourceful and strategic – which often means the actor is particularly threatening and blameworthy – the failure to focus on the dynamism of the regulated actor can be a significant mistake”).

57. See, e.g. *Randall v. Loftsgaarden*, 478 U.S. 647, 664 (1986) (asserting the Congressional aim of the Securities Act of 1933 was “to deter fraud and manipulative practices in the securities markets”) (citing 15 U.S.C. § 77a, *et seq.* (West 2011)).

58. *United States v. Maze*, 414 U.S. 395, 407 (1974) (Burger, C.J., dissenting).

The criminal mail fraud statute must remain strong to be able to cope

outside the scope of current prohibitions.<sup>59</sup> In essence, fungi lack free will to change their genetic makeup so as to avoid a fungicide, while fraudsters possess the ability to alter their conduct so as to avoid a fraud statute.

Second, a fungicide's mode of action is not always known to be either multi-site or single-site, adding to the complexity of managing resistance.<sup>60</sup> A statute's breadth, on the other hand, is usually anticipated at the time of drafting and passage, allowing for greater understanding of the statute's role in criminalizing fraud.<sup>61</sup> Of course, this is not always the case, as exemplified by the Racketeer Influenced and Corrupt Organizations statute,<sup>62</sup> whose reach now far exceeds the prosecution of organized crime.<sup>63</sup>

Finally, a grower of crops must pick and choose among

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with the new varieties of fraud that the ever-inventive American 'con artist' is sure to develop. Abuses in franchising and the growing scandals from pyramid sales schemes are but some of the threats to the financial security of our citizenry that the Federal Government must be ever alert to combat.

*Id.*

59. BLACK'S LAW DICTIONARY 1095 (9th ed. 2009) (defining *modus operandi* as "[a] method of operating or a manner of procedure; esp[ecially] a pattern of criminal behavior so distinctive that investigators attribute it to the work of the same person").

60. *Fungicide Resistance*, *supra* note 16, at 10-11 ("Formerly it took a long time to identify a mode-of-action . . . . It is now usual for a new fungicide group to be introduced with some information on its mode-of-action . . . ").

61. Frank H. Easterbrook, *Statutes' Domains*, 50 U. CHI. L. REV. 533, 544 (1983) (suggesting "that unless the statute plainly hands courts the power to create and revise . . . the domain of the statute should be restricted to cases anticipated by its framers and expressly resolved in the legislative process").

62. 18 U.S.C. §§ 1961-68 (West 2011).

63. Sarah Baumgartel, *The Crime of Associating with Criminals? An Argument for Extending the RICO "Operation or Management" Test to RICO Conspiracy*, 97 J. CRIM. L. & CRIMINOLOGY 1, 5 (2006) ("Today, RICO reaches past the prosecution of organized crime to encompass what might otherwise be categorized as everyday business fraud, securities violations, political corruption, and various other white collar crimes."); Robert G. Morvillo & Barry A. Bohrer, *Checking the Balance: Prosecutorial Power in an Age of Expansive Legislation*, 32 AM. CRIM. L. REV. 137, 139 (1995) (arguing that RICO's "use has expanded beyond those areas it was originally designed to combat to include within its ambit conduct that few envisioned as 'racketeering activity'").

fungicides.<sup>64</sup> A grower's decision to apply a single-site fungicide may allow a resistant strain of fungi to survive and flourish. No such choice must be made with respect to statutes because they apply simultaneously. The mere enactment of a broad fraud statute operates like a consistent application of multi-site fungicide to a crop. The choice among fraud statutes, to the extent one is eventually made, occurs at the prosecution stage.

Despite these differences between the operations of fungicides and fraud statutes, sufficient similarities exist that lessons learned in the context of plant disease inform the debate about the appropriate breadth of fraud statutes.

### III. MULTI-SITE FUNGICIDES AND BROAD FRAUD STATUTES ARE BOTH UNDER PRESSURE

As discussed above, multi-site fungicides and broad fraud statutes are effective in preventing the evolution of resistant strains of fungi and fraud because they are difficult to evade. But, both multi-site fungicides and broad fraud statutes face increased scrutiny. Multi-site fungicides are subject to increased regulatory pressure,<sup>65</sup> which can interfere with the ability to register or re-register these fungicides for sale.<sup>66</sup> Multi-site fungicides are subject to this scrutiny because, as victims of their own success in managing resistance, they are used frequently<sup>67</sup> and because they are viewed as being more

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64. See FUNGICIDE RESISTANCE ACTION COMM., FRAC RECOMMENDATIONS FOR FUNGICIDE MIXTURES DESIGNED TO DELAY RESISTANCE EVOLUTION 1 (Jan. 2010), *available at* [http://www.frac.info/frac/publication/anhang/Resistance%20and%20Mixture%20Jan2010\\_ff.pdf](http://www.frac.info/frac/publication/anhang/Resistance%20and%20Mixture%20Jan2010_ff.pdf) [hereinafter FRAC RECOMMENDATIONS] (discussing the grower's decision-making process as he or she chooses which fungicide or fungicides to apply to a crop pursuant to a "disease control programme").

65. See *id.* at 2 (noting that "more regulatory restrictions are being imposed on multi-site fungicides . . .").

66. In the United States, for example, under the Federal Insecticide, Fungicide, and Rodenticide Act, absent an exception, "no person in any State may distribute or sell to any person any pesticide that is not registered . . ." with the Environmental Protection Agency. 7 U.S.C. § 136a(a) (West 2011).

67. Gullino et al., *supra* note 18, at 1082 (noting that multi-site fungicides like "mancozeb have undergone extensive regulatory review in many countries, primarily because of their frequency of use and worldwide

likely to have problems with off-target toxicity.<sup>68</sup> Broad fraud statutes are criticized for comparable reasons.

First, like multi-site fungicides, broad fraud statutes are used extensively,<sup>69</sup> often in factual scenarios where more specific fraud statutes are on the books. In recognition of this phenomenon, commentators have described the mail and wire fraud statutes as “bread-and-butter statutes for federal prosecutors of white-collar crime”<sup>70</sup> and, even more colorfully, as “what Archimedes long sought—a simple fulcrum from which one can move the world.”<sup>71</sup> Conduct falling within the scope of myriad specific statutes—including antitrust violations,<sup>72</sup> securities fraud,<sup>73</sup> bank fraud,<sup>74</sup> insurance fraud,<sup>75</sup> election fraud,<sup>76</sup> money laundering,<sup>77</sup> real estate fraud,<sup>78</sup> credit

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importance to agriculture”).

68. Russell, *supra* note 26, at 23 (“Such compounds [with multi-site modes of action] are likely to be general toxophores and may thus not pass today’s stringent regulatory processes.”); McGrath, *supra* note 2 (“Most fungicides being developed today have a single-site (specific) mode of action because this is associated with lower potential for negative impact on the environment, including people and other non-target organisms.”).

69. ADMINISTRATIVE OFFICE OF THE U.S. COURTS, BUREAU OF JUSTICE STATISTICS, FEDERAL JUSTICE STATISTICS RESOURCE CENTER, *available at* <http://bjs.ojp.usdoj.gov/fjsrc/>. In 2009, of the 9,183 defendants charged in the filing offense category of “fraud,” 402 defendants were charged with wire fraud, and 502 defendants were charged with mail fraud. *Id.* (Note that some of the 9183 defendants were likely charged with both wire and mail fraud.) For purposes of comparison, 101 defendants were charged with violating the False Claims Act, 18 U.S.C. § 287, and 58 defendants were charged with securities fraud under the Securities Exchange Act of 1934, 15 U.S.C. § 78j. *Id.*

70. Eliason, *supra* note 47, at 953.

71. Coffee, *supra* note 38, at 3.

72. *See, e.g.*, 15 U.S.C. § 1 (West 2011).

73. 15 U.S.C. § 78j (West 2011).

74. 18 U.S.C. § 1344 (West 2011).

75. *See, e.g.*, 18 U.S.C. § 1341; *Pac. Mut. Life Ins. Co. v. Haslip*, 499 U.S. 1 (1991).

76. 18 U.S.C. § 1341.

77. *See, e.g.*, 18 U.S.C. § 1956(h) (West 2011); *United States v. Santos*, 553 U.S. 507 (2008).

78. *See, e.g.*, 18 U.S.C. § 1341; *James-Dickinson Farm Mortg. Co. v. Harry*, 273 U.S. 119 (1927).



card fraud,<sup>79</sup> identity theft,<sup>80</sup> health care fraud,<sup>81</sup> tax fraud,<sup>82</sup> and franchise fraud<sup>83</sup>—can also potentially be charged as mail or wire fraud.<sup>84</sup> Indeed, evidence suggests that prosecutors often choose to charge mail or wire fraud, even if the alleged conduct falls within the scope of a more specific statute.<sup>85</sup>

Just as the widespread use of multi-site fungicides has contributed to increased regulatory scrutiny, the extensive use of the wire and mail fraud statutes has been widely criticized, especially where the alleged conduct sounds in a more specific fraud statute. First, this practice renders superfluous the more specific criminal statutes, which often reflect a nuanced Congressional determination of the scope of criminality within a specific factual scenario.<sup>86</sup> Moreover, this use of the so-called

79. 18 U.S.C. § 1029 (West 2011).

80. *See, e.g.*, 18 U.S.C. § 1028A (West 2011) (“Aggravated identity theft”); *Flores-Figueroa v. United States*, 556 U.S. 646 (2009).

81. 18 U.S.C. § 1347 (West 2011).

82. 26 U.S.C. § 7206 (West 2011).

83. *See, e.g.*, 18 U.S.C. § 1341; 15 U.S.C. § 2806 (West 2011).

84. *See* Eliason, *supra* note 47, at 955; Podgor, *Tax Fraud*, *supra* note 45, at 908; Standen, *supra* note 39, at 252-53; David Overlock Stewart, *Raising the Stakes: Resisting the Upward Transformation of Antitrust and Fraud Charges*, 20 AM. J. CRIM. L. 207, 208 (1993); Stuart, *supra* note 41, at 814-15; Elder, *supra* note 15, at 715.

85. As one of this Article’s authors has previously documented, out of a data set “[o]f the seventy-nine cases sounding in securities fraud . . . , prosecutors charged wire or mail fraud in forty-nine cases, or sixty-two percent[.]” of the time. Wendy Gerwick Couture, *White Collar Crime’s Gray Area: The Anomaly of Criminalizing Conduct Not Civilly Actionable*, 72 ALB. L. REV. 1, 9 n.32 (2009) (explaining how the data was compiled).

86. Coffee, *supra* note 38, at 3 (“Useful as this expansion [of the mail and wire fraud statutes] may be to the prosecutor, its consequence is also to dwarf and trivialize much of the remainder of substantive federal criminal law. Statutory defenses in other more limited statutes would thereby be circumvented, and the power of the prosecutor over the defendant would be measurably enhanced.”) (internal citation omitted); Eliason, *supra* note 47, at 934 (“The concern now is that prosecutors are frequently discarding the scalpel of bribery and gratuities altogether and instead are performing surgery with the meat axe of honest services fraud.”); Molz, *supra* note 46, at 985 (“[B]ad’ gap-filling occurs when prosecutors and courts use the mail fraud statute to fill gaps in existing statutes, undermining the congressional judgment embodied in those statutory gaps.”); Standen, *supra* note 39, at 291 (“[P]rosecutors when faced with such a plethora of competing provisions will tend to resist exploring the complexity of the code and will tend to

“wire/mail fraud run-around” imposes *criminal* liability on some “conduct that is not even *civilly* actionable.”<sup>87</sup> Furthermore, because of the sentencing disparities between mail and wire fraud and more specific statutes, the prosecutor, in making charging decisions, has wide discretion over the defendant’s potential sentence.<sup>88</sup> As a result, the prosecutor wields substantial—perhaps undue—leverage during plea negotiations.<sup>89</sup>

In addition, just as multi-site fungicides pose a potential concern for off-target toxicity, the vagueness of broad fraud statutes potentially causes harm. First, the vagueness of broad fraud statutes risks running afoul of due process,<sup>90</sup> which requires that a criminal statute “clearly define the conduct it

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charge offenders under one of the several omnibus statutes, such as mail fraud, thereby rendering much of Congress’ Herculean effort in writing so many statutes superfluous.”) (internal citation omitted).

87. Couture, *supra* note 85, at 11-12 (emphasis added) (demonstrating that the materiality standard for wire and mail fraud is lower than for securities fraud, resulting in the criminalization of false statements that are not civilly actionable).

88. Podgor, *Tax Fraud*, *supra* note 45, at 924 (“Thus, by proceeding with mail fraud [as opposed to tax fraud], the government is not only assured of a felony conviction, but in some cases a greater prison sentence against the defendant.”) (footnote omitted); Standen, *supra* note 39, at 251-52 (arguing that the overlap among statutes with different sentencing ranges and the mandatory nature of sentencing guidelines affords prosecutors undue discretion over punishment).

89. Podgor, *Tax Fraud*, *supra* note 45, at 904 (noting that the ability to charge mail fraud rather than tax fraud may “strengthen the government’s ability to obtain a plea bargain or a compromised jury verdict”); Stewart, *supra* note 84, at 213-14 (citing examples of disparate sentencing guidelines depending on the addition of fraud counts). “The power to transform an antitrust case into a fraud prosecution provides a powerful club to force plea agreements.” *Id.* at 213.

90. U.S. CONST. amend. V (“[N]or shall any person . . . be deprived of life, liberty, or property, without due process of law[.]”); U.S. CONST. amend. XIV, § 1 (“[N]or shall any State deprive any person of life, liberty, or property, with out due process of law[.]”). “To satisfy due process, ‘a penal statute [must] define the criminal offense [1] with sufficient definiteness that ordinary people can understand what conduct is prohibited and [2] in a manner that does not encourage arbitrary and discriminatory enforcement.’” *Skilling v. United States*, 130 S. Ct. 2896, 2927-28 (2010) (quoting *Kolender v. Lawson*, 461 U.S. 352, 357 (1983)).

proscribes,”<sup>91</sup> for the benefit of both the law abider and the law enforcer.<sup>92</sup> Indeed, in the context of mail/wire fraud, the Supreme Court in *Skilling* relied on “the due process concerns underlying the vagueness doctrine” to interpret “honest services” fraud as including only frauds involving bribery and kickbacks.<sup>93</sup>

Moreover, the vagueness necessitated by broad fraud statutes, even if within Constitutional constraints, imposes societal costs. First, uncertainty chills lawful conduct, quelling legitimate market behavior for fear of later second-guessing by a prosecutor.<sup>94</sup> Second, by effectively prohibiting everything sounding in fraud and then leaving it to prosecutors to decide which subsets of illegal behavior to prosecute, Congress delegates its lawmaking function, implicating separation of power concerns.<sup>95</sup> This delegation to prosecutors also enables

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91. *Skilling v. United States*, 130 S. Ct. 2896, 2935 (Scalia, J., concurring in part & concurring in the judgment).

92. *Id.* “Our cases have described vague statutes as failing ‘to provide a person of ordinary intelligence fair notice of what is prohibited, or [as being] so standardless that [they] authorize[e] or encourage[e] seriously discriminatory enforcement.’” *Id.* (quoting *United States v. Williams*, 553 U.S. 285, 304 (2008)); Brian Slocum, *RICO and the Legislative Supremacy Approach to Federal Criminal Lawmaking*, 31 LOY. U. CHI. L.J. 639, 653 (2000) (“[A]n indispensable requirement of the unconstitutionally vague doctrine is that criminal statutes provide sufficient ‘guidance’ not only to those who must obey the laws but also to those who must interpret the laws.”).

93. *Skilling*, 130 S. Ct. at 2931. “To preserve the statute without transgressing constitutional limitations, we now hold that § 1346 criminalizes *only* the bribe-and-kickback core of the pre-*McNally* case law.” *Id.* (footnote omitted).

94. Dan M. Kahan, *Three Conceptions of Federal Criminal-Lawmaking*, 1 BUFF. CRIM. L. REV. 5, 13 (1997) (“There may be reason to be concerned about unfair surprise, for example, when courts adopt contentious and imaginative readings of the securities fraud and antitrust laws because these statutes govern the behavior of individuals who are engaged in legitimate market behavior and who legitimately look to law to guide their conduct.”) (citation omitted); Zingale, *supra* note 35, at 814 (“[A]nother potential disadvantage to this broader [victim] standard [in mail and wire fraud]: an expansion of governmental second-guessing of arm’s-length business transactions among private citizens. Were mail-fraud prosecution widespread enough, such governmental meddling could possibly lead to a chilling effect on an otherwise robust free-market economy.”).

95. *Molz*, *supra* note 46, at 984 (“[P]rosecutors, aided by courts, use the

discriminatory enforcement.<sup>96</sup> Finally, by affording prosecutors the discretion to pick and choose the areas of emphasis within broad statutes, statutes of this nature “interfere with the effective implementation of any rational system of national priorities.”<sup>97</sup>

In sum, both multi-site fungicides and broad fraud statutes—although effective at preventing the evolution of resistant strains of fungi and fraud—are subject to increased scrutiny. As a consequence, scientists and lawmakers alike face the challenge of developing additional means of preventing resistance by fungi and fraudsters, while avoiding the costs associated with multi-site fungicides and broad fraud statutes.

#### IV. ALTERNATIVES CAN PREVENT THE EVOLUTION OF RESISTANT STRAINS, WHILE AVOIDING THE COSTS ASSOCIATED WITH MULTI-SITE FUNGICIDES AND BROAD FRAUD STATUTES

In the face of increased regulatory pressure, scientists have developed alternative means of managing fungicide resistance, with some success.<sup>98</sup> These alternatives include the combination of several single-site fungicides, the combination of single-site and multi-site fungicides, and non-fungicide solutions. These alternatives, which have already been tested in the context of fungicides, shed light on the following potential alternatives to reliance on broad fraud statutes: the combination

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[mail fraud] statute to fill gaps in the criminal law left by Congress, despite the Constitution’s declaration that ‘all legislative powers’ therein granted are vested in the Congress.”) (internal citation omitted) (quoting U.S. CONST. art. I, § 1); Slocum, *supra* note 92, at 653 (“When a statute is too vague to provide sufficient guidance, the judiciary is placed in the position of usurping the property function of the legislature by ‘making the law’ rather than interpreting it.”); Jack Stark, *The Proper Degree of Generality for Statutes*, 25 STATUTE L. REV. 77, 80 (2004) (“If the three branches of government ought to be distinctly separate, counsel should be wary of drafting very generally and thereby allocating to the judicial and executive branches considerable power to interpret the law.”).

96. *Skilling*, 130 S. Ct. at 2935 (Scalia, J., concurring in part & concurring in the judgment) (quoting *United States v. Williams*, 553 U.S. 285, 304 (2008)).

97. Coffee, *supra* note 38, at 10 (footnote omitted).

98. See, e.g., Dale L. Shaner, *Herbicide Resistance: Where Are We? How Did We Get Here? Where Are We Going?* 9 WEED TECH. 850 (1995).

of specific fraud statutes, the combination of broad and specific fraud statutes, and non-statutory means of combating fraud.

*A. The Combination of Single-Site Fungicides or Specific Fraud Statutes To Combat the Evolution of Resistant Fungi or Fraud*

As an alternative to multi-site fungicides, scientists have successfully combined multiple single-site fungicides.<sup>99</sup> By combining several single-site fungicides, each of which would individually be highly susceptible to resistance, scientists can reduce the likelihood of selecting for resistant biotypes, while avoiding many of the regulatory concerns associated with multi-site fungicides.<sup>100</sup> These combinations are especially effective when the combined fungicides are negatively cross-resistant—when the development of resistance to one of the fungicides renders the strain more susceptible to another fungicide in the combination.<sup>101</sup>

Similarly, several prominent scholars have advocated replacing generic fraud statutes like the mail and wire fraud

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99. Gullino et al., *supra* note 18, at 1081 (“Mixtures of fungicides that combine a high resistance risk with . . . another single-site fungicide that is not cross-resistant to its mixing partner [is] a common response to this problem.”); *but see* FRAC RECOMMENDATIONS, *supra* note 64, at 2-3 (“[M]ixtures between single-site fungicides are appearing in the market and it is clear that more care regarding the resistance statutes in pathogen populations needs to be taken when recommending them.”).

100. Hollomon & Brent, *supra* note 2, at 1161.

Evolution of resistance is favored by the sole repeated use of fungicides with the same mode of action. Involving fungicides with other modes of action and other disease control measures may stop or, at the very least, slow down the evolution of resistance, benefiting farmers and manufacturers, and prolonging the usefulness of the few modes of action available in practice, which have been identified and developed at considerable expense of both public and private resources.

*Id.*

101. *Fungicide Resistance*, *supra* note 16, at 14 (“Exposure of pathogens to two fungicides that exhibit this negative cross-resistance, should greatly reduce any resistance risk associated with either component, because a shift to resistance against one automatically confers sensitivity against the other.”); Dekker, *supra* note 22, at 32-33; Gressel, *supra* note 2, at 1166 (explaining “negative cross-resistance” [in the context of herbicides]; a mutant resistant to one herbicide was supersensitive to another”).

statutes with a combination of specific, non-overlapping statutes.<sup>102</sup> Of these scholars, Professor Ellen S. Podgor explains that a fraud statute can be drawn with more specificity by “focusing on the object of the offense, as opposed to the fraud component.”<sup>103</sup> Although implementing this proposal would require additional legislation, it would not expand the current scope of criminality<sup>104</sup> nor entail excruciating specificity.<sup>105</sup>

No scholar has explicitly incorporated the concept of negative cross-resistance into this proposed solution, although it would seem to apply equally to fungi and fraud. For example, when drafting a statute that prohibits fraud in connection with the offer or sale of registered securities, Congress should anticipate that potential fraudsters may adapt their behavior to evade the scope of this statute, either by planning their offering to satisfy an exemption from registration, or by disregarding the registration requirements altogether. Therefore, Congress should simultaneously draft a statute that prohibits fraud in connection with the offer or sale of unregistered securities. These two statutes, although specific, would operate with negative cross-resistance.

In the context of plant disease, the solution of combining single-site fungicides solves the problem of overuse of multi-site fungicides and allays concerns about potential off-target toxicity, but it is not as effective as multi-site fungicides at preventing resistance. Similarly, in the context of fraud, the solution of combining specific fraud statutes solves the problem

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102. Podgor, *Criminal Fraud*, *supra* note 43, at 735 (“This Article does not call for increased criminalization to encompass more fraudulent conduct. Rather, it calls for specificity within the criminal code.”); Standen, *supra* note 39, at 288 (describing the “definitional” approach to reform of the criminal code where “specific crimes would be written with more precision, and certain crimes deleted or merged”).

103. Podgor, *Criminal Fraud*, *supra* note 43, at 749.

104. *Id.* at 735 (“Additional statutes may be warranted, but the conduct subject to prosecution need not be extended.”).

105. See, e.g., Ellen S. Podgor, *Do We Need a “Beanie Baby” Fraud Statute?*, 49 AM. U. L. REV. 1031, 1042 (2000). “Should the appropriate statute be ‘toy fraud’ to encompass not only fraudulent Beanie Babies, but also fraud with respect to Pokemons? Or perhaps product fraud would offer a more efficient range for these criminal prosecutions.” *Id.* (internal citation omitted).

of bull-dozing more specific fraud statutes and allays concerns about undue vagueness, but it is not as effective as broad fraud statutes at preventing the evolution of new types of fraud.

*B. The Combination of Multi-Site and Single-Site Fungicides or Broad and Specific Fraud Statutes To Combat the Evolution of Resistant Fungi or Fraud*

Scientists have developed a second alternative to extensive use of multi-site fungicides: the combination of single-site fungicides with a multi-site fungicide.<sup>106</sup> This solution does not eliminate the use of multi-site fungicides and thus is not immune to the increased regulatory scrutiny afforded multi-site fungicides, but it can lower the use rate of multi-site fungicides.<sup>107</sup> At the same time, the combination is far less susceptible to resistance than a combination consisting only of single-site fungicides.<sup>108</sup>

Scholars have proposed a similar solution in the context of fraud: coexistence combined with repeal.<sup>109</sup> Under this proposal, broad and specific fraud statutes continue to coexist, but the broad statutes are repealed—either explicitly or by implication—when the charged conduct falls within the scope

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106. FRAC RECOMMENDATIONS, *supra* note 64, at 5 (“Mixing a high or medium risk single site fungicide with a low risk multisite[. . .] has been, and still is, a firm favorite for managing resistance development to the high or medium risk fungicide.”); Gullino et al., *supra* note 18, at 1081 (“Mixtures of fungicides that combine a high resistance risk with a low risk multi-site compound . . . [is] a common response to this problem.”); *see, e.g.*, Russell, *supra* note 26, at 19 (explaining the resistance management strategy of “only selling the chemistry in mixture with a compound from a different mode of action, usually mancozeb”).

107. FRAC RECOMMENDATIONS, *supra* note 64, at 5. “In many cases, reduced rates (compared to recommended solo use rates) of both the high or medium risk and the low risk [multisite] components are used. The critical requirement for such a mixture is that the does rates used for the individual components must be capable of providing good disease control if used solo.” *Id.*

108. *Fungicide Resistance*, *supra* note 16, at 31 (considering “important conditions of use that affect risk . . . to be . . . alternation or combined application with other types of fungicide with different mechanisms of action and/or resistance, and preferably with lower inherent risk, can reduce risk”).

109. Podgor, *Criminal Fraud*, *supra* note 43, at 760 (“Precluding the use of generic statutes when conduct can be prosecuted by a specific statute can provide limitations.”).

of the specific fraud statute.<sup>110</sup> As one commentator explains, the operation of repeal by implication is as follows:

When Congress passes a criminal statute governing particular conduct, the new statute will implicitly repeal the mail fraud statute's coverage of that conduct. Courts and prosecutors will then be forced to respect the subsequent enactment of Congress. But because repeal by implication does not rely on a particular theory of fraud to cabin the mail fraud statute, prosecutors will still have the statute--their most effective weapon against novel crimes--at their disposal.<sup>111</sup>

Although it is a minority position,<sup>112</sup> a few courts have held that broad fraud statutes, such as the mail and wire fraud statutes, are inapplicable in factual scenarios covered by specific fraud statutes.<sup>113</sup> For example, in *United States v. Henderson*,<sup>114</sup> the court for the Southern District of New York refused to allow tax fraud to be prosecuted as mail fraud.<sup>115</sup>

The court is of the view that the statute does not include within its proscription a scheme to defraud the Internal Revenue Service in the collection of income taxes. There is in such a case no need to use the mail fraud statute as a "stopgap device" until "particularized legislation" is enacted

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110. *See id.*

111. Molz, *supra* note 46, at 1007.

112. Podgor, *Tax Fraud*, *supra* note 45, at 916 (declaring the "minority view" is found in "[t]he lone case clearly rejecting the government's use of mail fraud charges for the mailing of fraudulent tax returns . . . *United States v. Henderson*[,] 386 F. Supp. 1048 (S.D.N.Y. 1974)). In contrast, under the majority view, "the mailing of a fraudulent tax return[]" is a permissible mail fraud violation. *Id.* at 918 (internal citation omitted). *See, e.g.,* *Edwards v. United States*, 312 U.S. 473, 483-84 (1941) (rejecting the petitioner's argument that the Securities Act of 1933 repealed by implication the mail fraud statute as applied to securities) ("We see no basis for a conclusion that Congress intended to repeal the earlier statute. The two can exist and be useful, side by side.") (footnote omitted); *United States v. Simon*, 510 F. Supp. 232, 236-37 (E.D. Penn. 1981) (rejecting the defendant's argument that a specific statute dealing with Medicaid fraud preempted the applicability of the more general mail fraud statute).

113. *E.g., United States v. Henderson*, 386 F. Supp. 1048 (S.D.N.Y. 1974).

114. *Id.*

115. *Id.* at 1053.



“to deal directly with the evil,” for Congress has enacted legislation that affords adequate protection of the public interest in the collection of income taxes.<sup>116</sup>

This solution, like a combination of multi-site and single-site fungicides, would be effective in combating resistant strains of fraud. Moreover, it could potentially lower the overall use rate of broad fraud statutes and prevent the broad fraud statutes from rendering the specific statutes superfluous.<sup>117</sup> This solution would not, however, cure the vagueness (or prevent the resultant harms) of broad fraud statutes.

*C. Non-Fungicide or Non-Statutory Ways to Combat the Evolution of Resistant Fungi or Fraud*

Faced with effective but imperfect alternatives to multi-site fungicides, scientists have proposed that growers implement additional non-fungicide means of controlling plant disease.<sup>118</sup> Examples include disease-resistant varieties, crop rotation, hygienic practices,<sup>119</sup> and bio-control agents like natural predators.<sup>120</sup> Similarly, any discussion of the appropriate breadth of fraud statutes should incorporate non-statutory means of preventing the evolution of new strains of fraud. As such,

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116. *Id.*; see Podgor, *Tax Fraud*, *supra* note 45, at 933. “In the wake of overzealous prosecutions, prosecutorial misconduct, and misuse of office, it is necessary for our courts to restrict the virtually unbridled power of prosecutors. Requiring that tax fraud violations be charged as tax fraud and not mail fraud will serve as a step in that direction.” *Id.*

117. Molz, *supra* note 46, at 1007 (“Repeal by implication offers a way to preserve the strength of the mail fraud statute while mitigating its weaknesses.”).

118. See, e.g., ENVTL. PROT. AGENCY, *Pesticides and Food: What “Integrated Pest Management” Means*, <http://www.epa.gov/pesticides/food/ipm.htm> (explaining that, under “Integrated Pest Management,” growers coordinate among pest control options, including “using mechanical trapping devices, natural predators (e.g., insects that eat other insects), insect growth regulators, mating disruption substances (pheromones), and . . . [t]he use of biological pesticides . . .”).

119. *Fungicide Resistance*, *supra* note 16, at 32 (“[T]he greater the use of non-chemical methods, such as disease-resistant varieties, rotation of crops, or hygienic practices . . . [the less] fungicide selection pressure.”).

120. ENVTL. PROT. AGENCY, *supra* note 118; Russell, *supra* note 26, at 23 (“Biocontrol will undoubtedly contribute more in the future[.]”).

education and increased enforcement represent two potential avenues for achieving the goals of non-statutory prevention.

One non-statutory method of preventing the evolution of new types of fraud is to educate the potential victim, thereby depriving the fraud perpetrator of a target.<sup>121</sup> For example, the Securities and Exchange Commission publishes a manual, titled *Avoiding Fraud*, which provides “tips to help you avoid being scammed.”<sup>122</sup> Similarly, the State Department, in recognition that “[s]cams evolve constantly,” publishes brochures to “help alert you to the indicators of some common scams and actions you should take[.]”<sup>123</sup>

A second non-statutory method of preventing the growth of resistant strains of fraud is to increase enforcement of existing specific fraud statutes. Ways to increase enforcement include improved coordination between federal and state agencies,<sup>124</sup>

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121. See, e.g., U.S. POSTAL INSPECTION SERV., *Top Ten Ways to Prevent Fraud*, <http://www.deliveringtrust.com/topten/index.php?videoToPlay=one>. To help educate the public, the Chief Postal Inspector, Guy Cottrell, and the USPS Vice President and Consumer Advocate, Delores J. Killette, provide the “top ten ways to prevent fraud”: (1) “If it sounds too good to be true, it probably is[.]” (2) “No one needs your help to transfer money in an out of the United States[.]” (3) “Check your monthly statements[.]” (4) “Never deposit a check if you don’t know who sent it to you. Just because your ATM or Internet bank account says ‘funds available’ doesn’t mean the check has cleared. Never accept a check for payment if the amount is greater than what you’re owed[.]” (5) “Your bank will never email or call asking for your account number. Limit the amount of personal information you give out over the phone or Internet[.]” (6) “There are legitimate work-at-home jobs involving process checks[.]” (7) “Foreign lotteries are illegal in the United States[.]” (8) “Never send money to a company you don’t know before checking with the Better Business Bureau, your financial advisor, or family members[.]” (9) “Shred unwanted documents containing personal information[.]” and (10) “It’s a good idea to order your credit report once a year, and review it thoroughly.” *Id.*

122. U.S. SEC. & EXCH. COMM’N, *Avoiding Fraud, What You Can Do to Avoid Investment Fraud*, <http://investor.gov/investing-basics/avoiding-fraud> (identifying “red flags” and explaining “persuasion tactics” commonly used by perpetrators of fraud).

123. U.S. DEP’T OF STATE, BUREAU OF CONSULAR AFFAIRS, *International Financial Scams*, [http://travel.state.gov/travel/cis\\_pa\\_tw/financial\\_scams/financial\\_scams\\_3155.html](http://travel.state.gov/travel/cis_pa_tw/financial_scams/financial_scams_3155.html).

124. See, e.g., FIN. FRAUD ENFORCEMENT TASK FORCE, *About the Task Force, What is the Financial Fraud Enforcement Task Force?*,

technologically advanced investigative techniques,<sup>125</sup> and whistleblower protections.<sup>126</sup> Because research suggests that fraud perpetrators are often repeat offenders,<sup>127</sup> prosecuting these individuals early in their careers would potentially prevent them from later developing new types of fraud. For example, the Financial Fraud Enforcement Task Force, established in November 2009, is charged with “hold[ing] accountable those who helped bring about the last financial crisis as well as those who would attempt to take advantage of the efforts at economic recovery.”<sup>128</sup>

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<http://www.stopfraud.gov/about.html> [hereinafter FRAUD TASK FORCE].

125. Denise D. Callahan, *Securities Fraud on the Internet Poses Problems for Investors and Regulators*, 2 No. 12 WALLSTREETLAWYER.COM: SEC. ELEC. AGE 14 (1999) (recommending that “customized search engines could facilitate the detection of Internet securities fraud”).

126. Comm’r Luis A. Aguilar, U.S. SEC. & EXCH. COMM’N, *Speech by SEC Commissioner: Enlisting Whistleblowers in the Battle Against Securities Fraud*, (Nov. 3, 2010), <http://www.sec.gov/news/speech/2010/spch110310laa-whistleblowers.htm>. “I view a whistleblower program as having the potential to significantly enhance the Commission’s enforcement of the federal securities laws. A strong whistleblower program is one that results in high-quality information being submitted to the Commission and enhances the Commission’s enforcement program and message of deterrence.” See also James A. Kaplan, *Whistle-Blowing is the Best Way to Fight Corporate Fraud*, FORBES.COM (Dec. 14, 2010, 2:00 PM), available at <http://www.forbes.com/2010/12/14/whistle-blower-personal-finance-dodd-frank-act.html> (discussing the advantages of “the new Investor Protection Act, . . . a whistle-blower compensation fund . . . waiting to be disbursed at the discretion of the Securities and Exchange Commission”).

127. See, e.g., W. STEVE ALBRECHT ET AL., *FRAUD EXAMINATION* 46 (South-Western Pub., 3rd ed. 2008) (“The [second] highest rate of repeat offenders is probably fraud perpetrators who are not prosecuted or disciplined.”); Jayne W. Barnard, *Securities Fraud, Recidivism, and Deterrence*, 113 PENN. ST. L. REV. 189, 214 (2008) (suggesting that many securities fraud recidivists may be “‘hard wired’ to commit manipulative crimes[.]” and thus unlikely to be deterred by the threat of legal sanctions).

128. FRAUD TASK FORCE, *supra* note 124. (“The task force is improving efforts across the government and with state and local partners to investigate and prosecute significant financial crimes, ensure just and effective punishment for those who perpetrate financial crimes, recover proceeds for victims and address financial discrimination in the lending and financial markets.”).

## V. CONCLUSION

Plant biologists face the quandary of developing a fungicide that, in addition to withstanding resistance, has an excellent regulatory profile. In fact, some scientists have described this as the “holy grail for agrochemical industry fungicide discovery programs.”<sup>129</sup> Similarly, Congress and legal scholars face the dilemma of drafting fraud legislation that, while being unsusceptible to evasion, does not interfere with nuanced specific legislation and is not unduly vague. As Professor Coffee asks, “[w]hat compromise then is possible between strict construction and infinite expansion?”<sup>130</sup>

Plant biologists’ solutions in the quest for this “holy grail” shed new light on alternative proposals to combat fraud, which Congress should take into account when considering the Honest Services Restoration Act.<sup>131</sup> If broad fraud statutes are jettisoned altogether in favor of combinations of specific statutes, drafters should incorporate concepts of negative cross-resistance. To the extent that broad fraud statutes continue to coexist with specific fraud statutes, the broad statutes should be repealed—either explicitly or by implication—when the charged conduct falls within the scope of the specific fraud statute. Finally, statutory means of combating fraud should be supplemented with non-statutory means, including education of potential victims and increased enforcement of existing specific fraud statutes.

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129. Gullino et al., *supra* note 18, at 1082 (“The holy grail for agrochemical industry fungicide discovery programs can probably be defined as a product with low use rate, multi-site mode of action (i.e., low resistance risk), systemic properties, good plant selectivity, and an excellent regulatory profile.”).

130. Coffee, *supra* note 38, at 3.

Useful as this expansion [of the mail fraud statute] may be to the prosecutor, its consequence is also to dwarf and trivialize much of the remainder of substantive federal criminal law. . . . Yet conversely, if we freeze the evolution of the statute, new forms of predatory behavior will appear to which the legislature cannot realistically be expected to respond quickly.

*Id.*

131. Honest Services Restoration Act, H.R. 1468, 112th Cong. (1st Sess. 2011).