Forensic Afterlives

Zoë Crossland, *Columbia University*

ABSTRACT

The practices involved in forensic investigation center on a search for physical clues and traces that may be used to reconstruct past events. The forensic corpse is therefore involved in a materially grounded semiotics, which provides the basis for making claims about the past. Using the examples of forensic pattern matching (such as craniofacial mapping and fingerprints) and forensic entomology, I explore the different life worlds that emerge after a person's death and how they are mobilized by forensic investigators. In this form of inquiry, claims to the real are articulated through the signs that different beings—whether human, insect, or microbe—perceive inhering in the corpse. Such forms of forensic investigation offer a productive site for thinking about the ontological status of fact and of the corpse in the context of posthumanism. Forensic signs stretch across our divided categories of the living and the dead, human and animal, nature and culture, providing alternate ways to conceptualize the relationships at play in such assemblages.

Popular forensic science commonly draws on the image of the speaking corpse, conjuring the figure of the witness who accuses from beyond the grave. This is a well-worn figure of empiricism, one that situates the dead body as a fact that exists within the world of the real. It presents the dead as testifying facts that not only stand aside from the stories told by the living, but have their own representational power. Within the framework of forensic science this postmortem speech is generally understood as a rhetorical device, a form of prosopopeia that functions to assert the truthfulness and reliability of forensic facts. And yet, its constant recurrence in mass-market accounts of forensic investigations suggests that it recognizes something that is otherwise unrecognizable; a kind of animacy not only for the dead but also for fact and evidence. In this essay

Contact Zoë Crossland at 452 Schermerhorn Ext., Mail Code: 5523, 1200 Amsterdam Avenue, New York, NY 10027-7003 (zc2149@columbia.edu).

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I want to think carefully about where this animacy is located, and why this submerged acknowledgment of postmortem forms of life persists in the discourse around the forensic corpse. This not only opens possibilities for conceptualizing postmortem life, but also disturbs a vision of forensic science as an uncomplicated humanist endeavor in which a firm boundary is inscribed between death and life, and between fact and interpretation. As Thomas Keenan and Eyal Weizman observe, "the blurring between life and death, objects and subjects, manifests itself everywhere within the discourse of and around forensic anthropology" (2012, 65). Lingering in the zones of indeterminacy between living and dead, human and nonhuman, reveals a more complex humanist subject than that which is usually positioned as the negative pole for posthumanist accounts. How might attending to the animacy of the forensic dead offer alternate routes to conceptualize fact and forensic truth claims? To explore these questions I turn to two regions of forensic practice: the various forms of pattern recognition, and the world of forensic entomology. Before turning to these examples, however, I'd first like to spend some more time with the image of the speaking dead.

The figure of the speaking corpse is often invoked in the mass market literature on forensic investigation (Crossland 2015). Although the vast majority of forensic writing deals with restrained questions of method and correct protocol, there is also a flourishing popular literature, much of it written by practitioners themselves. (Forensic anthropological examples include: Ubelaker and Scammell 1992; Maples and Browning 1994; Rhine 1998; Manhein 1999; Koff 2004; Bass and Jefferson 2003.) In these literary spaces, forensic specialists allow themselves more freedom, expressing ideas that would never pass peer review. In *Death's Acre*, a memoir by forensic anthropologist William Bass (coauthored with Jon Jefferson), Bass explains that the human skeleton makes a record of past events and processes and has an ability to "reveal them to anyone with eyes trained to see the rich visual record, to hear the faint whispers rising from the dead" (2003, 34). This image of the work of the forensic anthropologist fuses the expertise involved in deciphering the skeleton's "rich visual record" to a supernatural ability to hear the whispers of the dead. It also expresses a tension between the training needed to decipher the evidence of the dead body, and the apparent unforced insistence of the corpse, which quietly asserts its evidence regardless of who is there to hear it. The eminent forensic anthropologist Clyde Snow famously described bones as witnesses: "Although they speak softly, they never lie and never forget" (Joyce and Stover 1991, 144). Thomas Keenan and Eyal Weizman suggest that despite this "blurring between life and death," Snow was "a good scientist" who knew "the difference between subjects and objects"

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(Keenan and Weizman 2012, 65–66). His use of the image of the corpse as witness was, they remark, a way of identifying the truth as self-evident, "lingering fossilized in the object" (2012, 67).

Of course the image of the speaking corpse participates in a broader empiricist imaginary of self-evidence, in which not just dead bodies, but facts in general are understood to speak for themselves (Daston 2007). Within this frame, the subjectified fact acts as the necessary corollary to the objectivity of the expert, displacing any expression of inappropriate emotion or desires from investigator to the evidence under analysis (Crossland 2009, 75). In what Bruno Latour describes as a naive "epistemological myth" (2004, 64), facts must always speak truthfully. Latour suggests that this allows the representatives of fact (in this case forensic scientists) to "make the mute world speak, tell the truth without being challenged, put an end to the interminable arguments through an incontestable form of authority that would stem from things themselves" (2004, 14). Yet the transition from the speech of facts to the apparently uncontestable speech of experts is fraught with problems. The difficulty of this work of interpretation can be acknowledged, but in popular accounts it is carefully contained through a discourse of expertise in which facts are represented in language without the subjectivity of the expert intervening. The academic literature, in contrast, is more actively engaged with problems of expert error and misidentification.

Alongside concerns around how the forensic expert decodes and relays the speech of the dead, there is another complication, lodged in the figure of the witness. The evidence of the dead is often described as a kind of testimony, in which the dead act as their own witnesses. Barbara Shapiro observes that English jurisprudence was drawn upon as a resource for imagining fact within the natural philosophy of the seventeenth century (Shapiro 1994, 2002). Carried over into the empirical tradition were "many of the assumptions and much of the technology of fact-finding in law" (1994, 227). This inheritance seems to remain with us, and it points to unacknowledged dimensions to how fact is imagined today. Why retain the figure of the witness within the image of the speaking fact? This would seem to be fraught with pitfalls. Witnesses are notoriously untrustworthy, offering testimony that suffers from the frailties of memory and the deceits of those with something to hide. Within an imaginary where facts must be maintained separate from the values of those who interpret them, there seems to be a risk in allowing the subjectivity of the human witness to enter into the naturalized world of objective fact. Reaching for the metaphor of the corpse as witness would seem to be a hazardous move; what does it offer to offset this risk? Of course the image of the testifying witness is a figure that resonates in the con-

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text of legal inquiry. Keenan and Weizman note that it also recognizes that human remains never resolve entirely into objects, but always retain some trace of the subject (2012, 13). I'd suggest that the corpse as witness also offers something more. And this is a recognition that testimony is given toward an end; that the speaking facts of the corpse are in a relationship with those who collect and disseminate them; and that the corpse's speech must be heard in order to have any efficacy. It is in this recognition that the ongoing life of forensic facts may be located.

The notion of the speaking corpse therefore has a dual aspect. On the one hand, in asserting that facts speak independently of any work that goes on around them, it effaces and narrows down the agency of the investigator. In this case all of the problems and errors that may be introduced into forensic evidence are understood to come from problems of subjectivity and the lack of proper expertise on the part of the forensic analyst, whose role is only to communicate the facts without intervening. And yet, on the other hand, it acknowledges that testifying speech expects a recipient and that the corpse can only have life through others. This is a richer kind of speech than Latour recognizes in his discussion of how it is channeled through those "spokespersons" who represent the dead. Certainly the self-evident speech of fact is one dimension to the speaking corpse. But also present is the submerged acknowledgment that the speech of the corpse can land in a range of ways, can variously affect those who experience it, and importantly, is itself speech that interprets prior events. Thus, on the surface the image emphasizes fact as logos—the mythical originating speech of presence that Derrida critiqued (1998). But also present is another way of imagining fact as testimony—as a sign to someone or something of another displaced referent. The speech of the witness is the semiotic point of articulation between events experienced by the witness, and the judge and jury's understanding of those events. Even forensic facts that appear to be self-evident rely on someone recognizing the signs through which their self-evidence is made manifest. Keenan and Weizman suggest that in considering the work of legal truth-telling we attend to forensic aesthetics, involving "technologies of persuasion, representation, and power" in various forums including that of the law court (2012, 67), but this is only part of the life of evidence. How do we also deal with the persistent assertion that facts themselves are speaking? Rather than treating it only as a rhetorical flourish I turn now to the semiotics of forensic evidence to better understand how fact speaks, and how that speech is located within an unfolding semiotic process. It is clear that the forensic fact does not constitute an originary moment of presence that puts an end to the chain of signification, or as Latour

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puts it, an end to argument. Nevertheless, forensic facts have a degree of stability, resting in places of semiotic comfort that are grounded in particular sedimented habits. It is these habits that give facts some steadfastness and predictability, enough for claims of truth to be made around them. And yet as habits they are neither closed nor absolute; it is this that provides an entry for them to be challenged and corrected.

Turning now to the examples of pattern recognition and entomology I explore the nature of the propositions made by the dead, inquiring too into what kind of speech is recognizable within the forums of forensic practice. In any forensic investigation the concept of evidence is central, and it turns out that it is also central to the varied afterlives of the dead. Evidence may be construed as a set of semiotic relations, and in tracking how the evidence of the corpse is deployed we can also see how new forms of life emerge and persist. Following the work of Charles Sanders Peirce and recent related research in biosemiotics, I trace how the life of the dead emerges in and through semeiosis (Peirce's preferred spelling, which I use from this point). It is here that we can find ways to think productively about the postmortem agency and life of the dead, as well as the life of evidence.

Pattern Identification

Fundamental for the claims made through forensic evidence is the capacity of material traces to disrupt representations made about the past, and to engender new narratives. The events of the past are revealed, not because a murderer confesses, but because an assemblage of material signs is interpreted to reconstruct what took place. In this way the semeiotic trace can intervene into language and discourse and reorient it toward a different narrative. The forensic trace constrains what may be said of it, and yet in order for the trace to speak, it must be interpreted by a forensic scientist and expert witness. Charles Sanders Peirce recognized this tension, noting that when we speak of an individual fact we attribute to it the character "of being independent of any qualities or determinations, or, as we may say, having brute fighting force, or self-assertion. The individual fact insists on being here irrespective of any reason, whether it be true or not that when we take a broader view we are able to see that, without reason, it never could have been endowed with that insistency" (*CP* 1.434).

The complex semeiosis involved in how fact speaks is opened up by recent debates over pattern identification, a practice shared by a number of different forensic fields. For example, the analysis of saw marks on bones found at a crime scene may encompass an effort to match "witness marks" left in the kerf cut with

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a particular type of saw blade (Symes 1992; Saville et al. 2007). Another osteological example is that of craniofacial superposition, where a comparison is made between the shape and features of an unidentified skull and the features recorded in photographs of a missing person, usually done with the help of video and three-dimensional computer imaging (Wilkinson and Rynn 2012; Damas and Cordón 2016). One of the earliest deployments of craniofacial identification in a criminal case was by anthropologist Aleš Hrdlička, based on work carried out over 1931–32 (discussed in Ubelaker 2015). Hrdlička concluded that "examination discloses that all features of this skull closely correspond with the aforementioned photographs and information, and not a single feature fails to correspond. Furthermore, the mere fact that the skulls of different individuals greatly vary, in view of the aforementioned close correspondence, indicates that this skull is in all probability that [of the missing person]" (Ubelaker 2015, 1413; also discussed in Ubelaker 1999, 727–28). The originating models for this work of forensic pattern matching lie in the practices of the nineteenth century with the development of anthropometric techniques of identification, and especially the emergence of fingerprinting.

Friction ridge impressions (palm prints, sole prints, and fingerprints) are one of the most well-established and long-standing forms of pattern recognition as forensic evidence. Although fingerprints take us on a slight detour away from the speaking corpse, they are worth staying with for a moment for what they reveal of how forensic evidence operates. An interest in using fingerprints to track identities emerged in the context of colonial governance in the second half of the nineteenth century, particularly in India, and well before fingerprints were used by police (Cole 2004, 2). Christopher Pinney has described how the development of fingerprints was situated within what one colonial medic called the "uncertainty of general evidence in India" in which judicial investigations were imbued with "an atmosphere of obscurity" (Pinney 1997, 20). A key figure in the development of fingerprinting techniques was civil administrator William J. Herschel, who had jurisdiction over the Hooghly district of West Bengal; Pinney draws attention to the contrast Herschel drew between the "penetrating certainty" offered by fingerprints, and the "slippery facts" normally presented in court (1997, 21). The apparent ability of fingerprints to attest to identity without the intervention of language was of great imaginative appeal, especially in the repressive context of colonial rule. This capacity was examined in detail by Francis Galton in a foundational study published toward the end of the century (1892). This drew on the work of Herschel and others and developed a classificatory framework to index and analyze fingerprints (Galton 1892). Galton's

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work was then developed and elaborated upon by the Bengal Police (Cole 2001, 81–90). By the early twentieth century, fingerprints had become a formalized part of police work transnationally (Cole 2001). Given this long history of use, fingerprints have come to be widely understood as providing solid proof of identity, and a stable basis for forensic claims. Jennifer Mnookin (2008) notes that the forensic faith in fingerprints was encapsulated in an influential district court opinion (United States v. Havvard [2000]), which observed that "the methods of latent print identification . . . have been tested for roughly 100 years . . . with the highest possible stakes—liberty and sometimes life." Accordingly, she observes that fingerprints have long been held to constitute "the very archetype of reliable expert testimony" understood to have "an error rate that is essentially zero, when properly applied" (2008, 128).

And yet, despite the great trust placed in forensic science's "most cherished epistemic artifact" (Cole 2008, 105), since the early 2000s the reliability of fingerprints as courtroom testimony has been questioned with greater frequency (Cole 2001; Epstein 2001). Friction ridge analysis, it turns out, is not as straightforward as it had been presented by forensic experts. Biometric prints work with a set of ten clear full impressions, something rarely if ever found in the context of a crime scene. Instead crime scene prints (often termed "finger marks") are often distorted and usually partial—perhaps just a fingertip, or the edge of a palm. To further complicate matters, their orientation can be indiscernible, and they may offer little clarity on which finger or thumb made the impression. Although some crime scene prints may have been left in ink, paint, or blood, most comprise the oils and sweat that collect on the skin and so are usually concealed from casual examination. To reveal and record such latent prints, they have traditionally been dusted with powder and lifted using adhesive tape from whatever surface they cling to. In so doing, characteristics of the surface and the dust or dirt that has accumulated upon it are also lifted, making it difficult to distinguish the trace of the fingerprint from the noise within which it sits (Cole 2001, 171).

These interpretive problems have not prevented fingerprint experts from asserting that they could make a definitive match, traditionally using the "language of absolute certainty" (Mnookin 2008, 139). A landmark report on forensic science in the United States commissioned by the National Academies of Science (NRC 2009) noted that "the friction ridge community actively discourages its members from testifying in terms of the probability of a match." When experts claim they have made a match, "they are communicating the notion that the prints could not possibly have come from two different individuals" (2009, 141–42). This is referred to as individualization—"the conclusion that a piece of evidence (here, a pattern left by friction ridges) comes from a single unam-

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biguous source" (NRC 2009, 136). In this tradition of expertise, fingerprints speak assertively and unambiguously. Outside the realm of fingerprints, most other forms of pattern recognition have been viewed with more circumspection. The acceptance of craniofacial superposition as a mode of identification is contested within the field of forensic anthropology (see discussion in Huete et al. 2015). Many argue that it should not be used to make a positive identification, but only deployed to exclude possible matches (e.g., Gordon and Steyn 2016). Others go further. Cattaneo et al. call it "a 'last chance' possibility" and remark that it "should only be used for excluding identity if gross incompatibilities are present" (2006, 374–75). And yet, despite these concerns, it remains admissible as evidence in many domains (Mallett and Evison 2013). The work of pattern matching has come under increasing scrutiny within the forensic community since standards for assessing forensic science in the United States were introduced after key Supreme Court decisions in the cases of Daubert v. Merrell Dow Pharmaceuticals (1993) and Kumho Tire Co. v. Carmichael (1999). The Daubert decision required that trial judges assess the validity of scientific evidence before it could be admitted into court (Foster and Huber 1999). Validity could be shown by general acceptance by the scientific community, including peer review and publication of techniques, plus standardized practice, the provision of error rates, and the ability to test or falsify claims made with evidence. Critics noted, for example, that fingerprint evidence could only be held to the requirement of general acceptance and even the peer review practices used by the field were incomplete and lacking in rigor (Epstein 2001; Cole 2007; Haber and Haber 2007).

If this is a problem for fingerprint evidence, it is even more so for other techniques of pattern matching, with shorter histories of forensic study and with more complex patterns to identify and match. If we turn to Peirce's well-known distinction between icon, index, and symbols, then pattern recognition operates most obviously along the axis of the iconic sign: the skull looks like the photograph; the print looks like the friction ridges that made it. It is this similitude that most immediately conjures their evidentiary power. Indeed, Ubelaker remarks that craniofacial superposition makes a forceful statement "simply by virtue of its visual drama: the display of such comparisons provides maximum impact in a courtroom setting" (Ubelaker and Scammell 1992, 190). Keenan and Weizman illustrate this through their arresting sequence of images showing photographs of Josef Mengele superimposed on a skull presumed to be his (2012, 39–52).

The visual argument presented by overlaid images of a skull and a missing person placed side by side in a courtroom presentation might seem at first to

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express the ostensive "fighting force, or self-assertion of fact." Just as with fingerprints, the similarity may be seen by all, with apparently little interpretation needed to determine that one image resembles the other. However, this is the end point of a chain of observation and inference that is, it turns out, fraught with difficulties (Dror and Cole 2010). In the case of friction ridge traces, Thompson and Cole observe that instances of false positive identifications have been documented since the 1920s but that these were normally ascribed to poor training or incompetence on the part of the examiner (2005, 42). Two recent high-profile cases have led to a critical reassessment of the reliability of friction ridge evidence and for calls for rigorous proficiency tests to be developed alongside techniques to evaluate the factors that may influence misidentifications (Mnookin 2008).

In the first case, police detective constable Shirley McKie was identified as responsible for a thumbprint found at a murder crime scene in Scotland in 1997 (Specter 2002; McKie and Russell 2012). McKie had been an investigating officer on the case but denied both that she had been at the scene and that the print was hers; in 1999 she was tried on a charge of perjury based on the fingerprint analysis carried out by multiple experts at the Scottish Criminal Record Office. McKie was eventually acquitted based on the testimony of other fingerprint experts that she had recruited from Scotland Yard and from the US. However, her arrest and trial pointed to some of the ambiguities and inadequacies of fingerprint evidence (Cole 2001, 283). The McKie case shows that a relationship of similarity is more complex than it may at first seem. First, the question arises of how much variation from the original is permissible for a fingerprint to be identified as a match. A relationship of similarity must always be constituted on the basis of some difference from the original—the trace of the fingerprint can never be identical to the finger that made it. It is made in ink or blood or sweat and is flattened or incorporates other features of the surface that it adheres to. It may also disguise or exclude elements that may be observed to be present in the ridges of the finger. Given these differences, how is an evaluation of similitude made? Different police forces have taken different approaches, and Simon Cole (2001) has contrasted the practices used in the US and UK. The accepted method used in the UK at the time of the McKie case was to identify a minimum of sixteen points of similarity between crime scene trace and the ridge patterns of a suspect's fingerprint (Evett and Williams 1996). Cole outlines how this differed from the approach in the US, where there was an emphasis on the discrimination of the expert, whose comparison would also encompass features such as pores, creases, or scars (Cole 2001, 260–61). Iconicity was recognized differently

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in both cases, but what was not fully articulated was the flexibility in what was defined as the same. These iconic comparisons were drawn between selected features and could not fulfill the promise of a one-to-one match.

Another important aspect of the iconic sign is revealed by the case of Oregon attorney Brandon Mayfield, who was charged by the FBI with being a material witness to the Madrid terrorist bombing of March 2004. A number of respected fingerprint examiners had confirmed that a latent print found at the scene was his, but this identification was subsequently shown to be wrong (Spinney 2010). William Thompson and Simon Cole note that while there was a possibility that the prints matched purely through coincidence (because of the vast number of prints now searchable through digital databases), there was another factor at play. Any suggestion that the match was a coincidence ignored contextual information that had likely made Mayfield a suspect: he was a Muslim convert with an Egyptian wife and had "represented (in a child custody case) one of the 'Portland Seven,' a group of Muslim men convicted of terrorist conspiracy" (Thompson and Cole 2005, 42). Following these cases and the highly critical report of the National Academies of Science (NRC 2009), forensic researchers have initiated studies to assess the rigor of fingerprint analysis and other forensic practices. It has become clear that the assessment of fingerprint matches is not a straightforward task and can be influenced by contextual factors (Dror et al. 2005, 2006; Charlton et al. 2010; Kassin et al. 2013). As with the McKie prosecution, the Mayfield case illustrates the variability in what is recognizable as the same, and reveals the potential fragility of judgments made on such evidence. There are degrees of similarity and no certainty of exactitude (Saks and Faigman 2008).

A forceful argument is made through the similarity between two patterns, whether skull and photograph or finger and fingerprint, but what endows forensic evidence with power to convince and to convict is the indexical relation of a sign with its object. Peirce observes that an iconic sign brings its interpreter "face to face with the very character signified," but it "gives no assurance that any such object as it represents really exists." The index, in contrast, contributes the evidence of an existential relation with the referenced object "actually bringing to the interpreter the experience of the very object denoted" (*EP* 2:307). That is to say, what is at stake is not simply that a print *resembles* a finger, but that *this* print was made by *that* finger. It was this dimension of the fingerprint that so entranced colonial officials, as Christopher Pinney outlines (1997), forming the ground for forensic evidence as it developed conceptually and practically. For forensic science the key issue is how to demonstrate indexicality—how to show that the marks did not resemble each other through chance, fraud, or wishful

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thinking, but rather that crime-scene prints are in an actual existing relationship to the supposed perpetrator. And yet, to establish indexicality, iconicity must be relied upon. Peirce commented that without an iconic dimension, an index is "quite wanting in signification" (*EP* 2:307). As Michael Taussig observes, here we are "caught . . . in sticky webs of copy *and* contact . . . a complexity we too easily elide as nonmysterious, with our facile use of terms such as identification, representation, expression, and so forth" (Taussig 1993, 21). In the work of forensic fact, indexicality cannot be easily separated from iconicity.

Reflecting on the powerful nature of signs in which indexes are tied to icons, Peirce noted that when an index forces something to be recognized as an icon, the two elements together make an assertion and form a proposition (*EP* 2:307). To show how such propositions work, Peirce provided the example of a portrait with a legend under it—the portrait illustrates the characteristics of the individual portrayed, but the label denotes who is represented and makes a claim to an existing connection between the portrait and the individual who sat for it. This is an example where the two elements are clear and distinct. But usually in such propositional signs, neither element is prescinded from the other but rather fuse together to foster an immediately experienced perceptual judgment. Pattern matching makes a similar assertion of identity through the same powerful combination of index and icon. In the case of craniofacial superimposition, it is the assertion of an indexical link between photographic face and skull—the one denoting the other—that gives this forensic sign its evidential authority. But to make an identification using this method, a relation of similitude must be relied upon; the photograph shows us the missing person, putting flesh onto bones via a claim that the photographic image is like the cranium in significant ways. What seems a simple matter turns out to be a complex twofold problem of indexicality built on iconicity. Further complicating the proposition formed jointly by icon and index is the way in which it seems to present a kind of argument that may be quickly intuited without the intervention of language. When composite images of Mengele's face and skull were presented by forensic specialists to the world's press, the reaction was immediate. The display of this "previously unseen image . . . produced the potential for conviction" (Keenan and Weizman 2012, 38). The superpositioning of face over skull made a forceful statement, even if it had the potential to be wrong. Indeed, the popular judgment that this was a perfect match was considered premature by many forensic specialists; the question of identification was not resolved until a sample was later sent for DNA testing (Jeffreys et al. 1992).

When forensic evidence is treated as fact that speaks for itself, this privileges the iconic-index and ignores the full evidential relation, which must always in-

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corporate another interpreting element of some sort, as a judgment is formed around the proposition offered. Because the perceptual judgment made on such facts is immediate and prediscursive, it seems to come from the evidential object itself. Framed in the context of the courtroom, such evidence mobilizes a kind of agency, not simply in the way that it prompts an immediate response, but also because it is part of a broader world of sense-making that itself shifts and grows. A fingerprint is already a trace of an earlier moment, itself part of life's continuum. It must first be recognized and interpreted in order to be acknowledged and converted into iconic-indexical diagrams—further propositions—to be presented to a jury. The jury in turn seizes upon these traces of traces to make further judgments and actions based upon them. This chain continues until brought to a halt (perhaps provisional) by a judgment of guilty or innocent. Outside the courtroom, the same evidence may continue to live, perhaps being redeployed as part of an appeal or reanalyzed to better understand the claims made around it (e.g., Dror et al. 2006). Just as testifying speech is directed to an end, so the semeiotic proposition, when taken as evidence, is interpreted as part of a broader enchainment of signs. In this way, fingerprints and human bones continue to have effects, which grow and spread into new yet related forms of evidential life. In this sense, there is a continuing animacy to such traces, as they continue to circulate in changing formations. This is not meant as a metaphor. Instead I want to take this semeiotic life seriously as something that exists in the world, tracing how the life of evidence pays little attention to the imagined boundaries of nature and culture or object and subject. Peirce argued that sign processes were fundamental to life, suggesting that a semeiotic perspective could provide insights into the problem of how life itself emerged (*CP* 6.322). The potential of Peirce's semeiotic for understanding biological life processes has been explored by a number of scholars, notably Thomas Sebeok (1975, 1989, 1990), together with more recent developments in biosemiotics (notably Hoffmeyer 2009; Emmeche and Kull 2011; Stjernfelt 2014), archaeology (Barrett 2013; Creese 2017), and anthropology (Deacon 2011; Kockelman 2011; Kohn 2013). Peirce emphasized that life cannot be reduced to the mechanistic, rather falling into patterns or habits of practice, while also demonstrating novel emergent properties (cf. Bergson 1911).

This talk of the propositions enfolded in the life of forensic evidence brings us back to Latour's discussion of the speaking fact. In a number of texts, he suggests redistributing the power to speak and to act across the collective of humans and nonhumans (Latour 1999, 2004, 2005), which he describes as composed of differently articulated propositions: "a river, a troop of elephants, a

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climate, El Niño, a mayor, a town, a park, have to be taken as propositions to the collective" (2004, 83). The question thus reframed, he argues, is no longer of the relationship of fact to value or nonhuman to human, but rather of how well articulated these different propositions are. In his 2004 book *Politics of Nature* Latour makes the case that language cannot remain on one side of the nature-culture divide, "with reference in between, establishing a more or less exact correspondence between these two incommensurable entities" (2004, 84). Instead, the whole collective is composed of propositions that may or may not have effects on other arrangements of propositions, and in which the questions of who is speaking, who is acting, and who is able are relevant to all, whether human or nonhuman (2004, 87). Latour therefore views the collective as an "an assembly of beings capable of speaking" (2004, 62) For Latour, such actants are propositions: matters of concern that are articulated in a variety of different ways. In some ways this view is consistent with a Peircean perspective in the sense that the relationships articulated by propositions are not confined to language. Rather than constituting the only site of passage between natural fact and humanly constructed value, semeiotic propositions may also be found operating within the nonhuman world. However, Peirce's view of propositions is precise in its identification of the conjunction of icon and index and does not generalize the concept of speech as a model for nonlinguistic domains. Rather than "beings" or "actants," the interwoven entities of the forensic evidential relation are material signs, their referent-objects and the interpreting judgments through which they are brought into view. How can we think about the interpreting response to forensic evidence without recourse to the dualism of the fact-value distinction, or falling into the conventions of object and subject? In the next section I explore this question through another dimension of evidential life: the work of forensic entomology.

Forensic Entomology

In his book *Natural Propositions*, which explores Peirce's discussion of such iconic-indexicality, Frederik Stjernfelt observes that the proposition when interpreted as such "makes a truth claim due to its double involvement—denotative and descriptive—with the same object" (2014, 1). Following Peirce and in conversation with recent work in biosemiotics, he suggests that propositions may be traced "deeply into biology on the one hand and widely into human forms of expression on the other" (2014, 2). This may be seen in the way that forensic entomologists make sense of insect action on the corpse, revealing how forensic work also stretches into the world of insect and animal semeiosis. Forensic entomology is a broad and growing field, in which specialists are

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brought in to study insects when they pertain to a range of legal cases. As with forensic anthropology, the field has seen a number of mass market accounts written by practitioners (Goff 2000; Erzinçlioglu 2013). The most high-profile area of research is centered on medico-criminal forensic entomology, which deals with the investigation of felony crimes, including death investigations (Catts and Goff 1992). The central area of inquiry for such investigations is the identification and description of species that converge on the corpse after death. This is done both to understand the depositional conditions and to estimate the minimum time since death. As different insects arrive and lay eggs or larvae, the changing profile of the insect community inhabiting the corpse offers an index of the time that has passed (Catts and Goff 1992). To understand the constitution of the community of insects that arrives after death, entomologists must recognize and identify the different life stages of insects that are present at the corpse, as well as the order of successive arrivals (e.g., Rodriguez and Bass 1983; Anderson and Cervenka 2002).

Blowflies (Calliphoridae) provide a good example of the interaction of forensic experts and insects. Forensic entomological research has shown that they tend to arrive early at the corpse, the females attracted to the relatively fresh corpse as a site to lay eggs (Archer and Elgar 2003). These and other early-arriving insects such as fleshflies (Sarcophagidae) and houseflies (Muscidae) are then followed by their predators, including wasps and ants (Richards and Goff 1997; Archer and Elgar 2003). Over time more wasp and ant species arrive together with omnivorous beetles, attracted to both the corpse and its insects as a food source. Finally, in an outdoor environment, as decomposition slows, the corpse will become more integrated into the local ecology, with other invertebrates including centipedes, spiders, and woodlice wandering onto it or using it as a site of shelter (Smith 1986). As blowfly eggs develop into maggot larvae they pass through two molts, shedding their exoskeleton and leaving characteristic traces of the stages that they have passed through. They then develop into pupae and finally into adult flies. The forensic entomologist assesses the living community as well as dead insects and discarded exoskeletons and collects a sample of the different insects and growth stages present at the corpse. These are preserved as evidence of the time that has passed since death. It is not always possible to determine the species or age of larvae in the field, so a sample may also be taken and reared in the laboratory to establish this more definitively (Rivers and Dahlem 2013, 222–29).

To understand how the succession of insects and life stages acts as an indexical sign of the postmortem interval requires a kind of bracketing off of the world of human meaning-making, and a foray in to the semeiotic worlds of bac-

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teria, insects, and other nonhuman animals. Peirce developed the insight that significance or meaning is not the exclusive province of humans. This was also explored by Jacob von Uexküll in the early twentieth century: he argued that we all live in our own worlds or *umwelten*, attuned to different sensory cues. But our worlds intersect with those of others to different degrees insofar as we recognize the same or similar signs (2010). The work of forensic entomologists articulates this same insight, working with insect signs as the common ground around which partial understanding of the insect *umwelt* can be constructed. This means not only thinking about the corpse as an appealing source of food and site for insect reproduction, but also suppressing the more usually expected human responses of horror and disgust at the decomposing corpse. As gases are released and putrefaction sets in, the corpse usually becomes a site of revulsion and shock for people, particularly for those who were familiar with the deceased. In perceiving these irreversible changes they realize with dismay that the life they recognize has ended, and the corpse is becoming part of lifeworlds that now ignore the boundaries of the body and the scale of the living human. And yet the decomposing forensic body cannot be described under the terms of abjection alone—that which should be thrust aside in order to maintain the integrity of the self and other, as Julia Kristeva has described it (1982). Rather, it constitutes a site of meaning-making in and through the very processes that are usually situated by theorists such as Kristeva as on the constitutive outside of human life. Yael Navaro-Yashin suggests that much may be learned from understanding how the abject is managed and enfolded within human worlds, and the possibilities that this generates (2009). Entering into the world of the insect semeiosis, forensic entomologists embrace the abject in order to deploy a kind of naturalist perspectivism (cf. Viveiros de Castro 2012), in which they temporarily place themselves in the position of the insect, such as the blowfly. This entails understanding that although for most people the processes of corpse decay and putrefaction assault the senses and the emotions, for a mature female blowfly the dead body offers a more attractive prospect. Needing a place to oviposit, she seeks out a corpse in the early stages of decomposition. The odors of ammonia and sulfide compounds are signs that this is a desirable site for her to lay her eggs (Ashworth and Wall 1994). Entomologists call such volatile organic compounds "semiochemicals," recognizing their status as signs through which insects can learn about the presence and status of a body (LeBlanc and Logan 2009). A case for microbial semeiosis can also be made (Hoffmeyer 2009; Deacon 2011; Stjernfelt 2014). After death the body's microbiome changes as endogenous bacteria migrate out of the intestine, and new bacteria arrive and mul-

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tiply. These microbes respond to physical and chemical changes in the body, as well as to the presence of other bacteria with the overall composition of the microbiome shifting in concert with decomposition (Statheropoulos et al. 2007; DeBruyn and Hauther 2017). Research is underway to understand bacterial community composition and succession as signs of interval since death, both within the body (Damann and Carter 2013; Finley et al. 2015; Hauther et al. 2015) and in the surrounding grave soil (Cobaugh et al. 2015; Finley et al. 2016). As with insect semeiosis, this takes a "bacteriocentric perspective" to the decomposition of the human corpse (Damann 2017, 155). Key to understanding these semeiotic worlds, whether of microbes or insects, is the interplay of iconic-indexical signs and how they are acted upon.

The insects that sense the decomposition volatiles released by the corpse also sense a proposition to which they respond: a food source is located over there. Anticipating the insect response to the smell of decomposition, forensic entomologists take advantage of insect semeiosis when, for example, they create carrion traps to study the composition of particular insect communities (Shubeck 1984). The smell of decomposition is both an index of the location of the corpse (as smoke is an index of fire), but it is also in some way *like* the corpse. Its smell offers a description of what is there and of the status of the body, its chemical composition reflecting the state of decay (Vass et al. 2008). Flies therefore rely on the iconic characteristics of the gases released during decomposition to detect and recognize a corpse, but it's the indexicality of the sign of gas that means that they will be able to locate a corpse via these iconic signs. The ambiguity of reference that characterizes the iconic sign can be taken advantage of. Blowflies can be attracted to a synthetic odor of decomposition that does not index the presence of a body but rather a bait trap (Ashworth and Wall 1994), and various plants also simulate the semiochemical sign to attract insect pollinators (LeBlanc and Logan 2009, 216). Conversely, if weather conditions or postmortem treatment of the body radically affect the process of decomposition, then the semiochemical index may not be recognizable as a food source, and insects may fail to attend to the corpse. So the iconic and indexical elements together prompt an interpreting response to congregate at the body at different moments.

In working toward an understanding of the signs that an insect is oriented toward, forensic entomologists also recognize how the insect itself is an embodied and interpreting sign that can be mobilized in a forensic narrative. The entomologist shifts here between taking an insect perspective on the corpse and a forensic perspective on the insect, first attempting to align their interpretation

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of the dead body's signs with those of the insects that inhabit it, then moving outside the frame of insect semeiosis to interpret the presence of insects as an iconic-indexical sign of time passing. As with the semeiotics of crime-scene pattern recognition, the assessment of insect evidence is tied indexically to the specifics of time and place. It relies upon an intact and undisturbed semeiotic chain that travels from the onset of autolysis immediately after death, through the action of endogenous and exogenous bacteria and fungi on the body's tissues, to the insect response to the gases produced by the body and the thanatomicrobiome (Javan et al. 2016), to the work of collecting and recording the insects present. As with pattern recognition, it also has an iconic dimension, the record of insect succession describing the gradual disintegration of the human. The work of forensic entomologists and microbiologists finds a way to spatialize time, to translate the emergent becoming of the corpse into a map of time unfolding (cf. Bergson 2014). Such evidence must be carefully situated within a careful assessment of local environmental conditions, including those of the corpse itself, in order to be sure that the iconic-indexicality of the insect succession is properly understood (Rivers and Dahlem 2013, 193–214). This includes local weather patterns and temperature and also the even more localized environment of the corpse, which is affected by burial or wrapping and will change over time as decomposition takes place (Tibbett 2008). The presence of maggots themselves raises the temperature of the corpse and can not only affect how the corpse decomposes and how long this takes (Payne 1965; Putman 1978), but also the species of maggots that survive and thrive (Williams and Richardson 1984). The measurement of the postmortem interval is therefore not a straightforward matter and is influenced by a range of different variables in a nonlinear fashion (Baqué and Amendt 2013).

As with forensic techniques of pattern recognition, forensic entomologists are developing studies to assess error rates and to express truth claims in terms of likelihood rather than certainty (e.g., Tarone and Foran 2008; Tomberlin et al. 2012). This is a more probabilistic evidential regime than the one that grew up around fingerprints. A concern with the probability that a forensic trace correctly points to its referent has been with forensic science since its outset (e.g., Galton 1892), but in the context of police investigation and the need to identify a suspect, this focus shifted over the course of the twentieth century to a search for absolute certainty, particularly with respect to friction ridge analysis (Saks and Faigman 2008). Yet the increasing recognition of the lacunae within forensic evidence and the example of forensic entomology show that this is work that does not posit a clear separation of natural fact and human value. Instead

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it acknowledges the semeiotic work of insects and the forensic specialist's ability to shift her perspective as she follows the lines of semeiotic inquiry. Here we have an emerging form of forensic expertise that seems more comfortable with relative uncertainty and that acknowledges that estimating the index of the time since death relies upon particular semeiotic habits of insects and microbes in response to particular environmental conditions. As life processes, such habits are not mechanistic or entirely predictable but shift and change in ways that can be approximated but not completely controlled for. In acknowledging the possibility of failure, space also opens up for error on the part of the analyst. Rather than this being understood as work that must stave off subjectivity or risk polluting the privileged relation between expert and data, questions can be asked about what might affect the work of interpretation—of both insect and expert, and how collateral information may or may not enter into the analysis.

Concluding Thoughts

Recognition of propositional signs is distributed through the world and is a component of perception. In this sense, propositional signs are a fundamental part of life processes. Stjernfelt suggests that a kind of argument is made when a person or an insect takes a semeiotic proposition as a truth sign (2014). That is to say, that insects have the habit of acting on some semiochemicals because a perceptual judgment is made based on the doubling of icon and index, which describes and denotes, offering the promise of a connection to a referent. It is through such signs that we encounter the real and act upon it. The responses prompted by propositional signs in turn give rise to a variety of feelings, actions, and arguments, some of which stabilize into habits of thought and practice. This is to move away from a view of a reality as a subterranean world that lies beneath discourse, masked by language as much as it is revealed. Instead, the reality of an entity is disclosed through the ways in which different beings identify its signs.

And although propositions may be a part of life processes, distributed through the world and offering humans and other animals a seemingly trustworthy basis to act, the impressions they offer can always be wrong. The propositional sign offers a first approximation that allows living creatures to act with some confidence based on previous interpretive habits, but it also always carries the possibility of error. A fingerprint can look like one from a crime scene on another continent; a bait trap can smell like a food source. What we're working with here is a probabilistic evidentiary world in which certainty remains out

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of reach, but where semeiotic habits can elicit some confidence in what will be found. In this respect it is useful to compare what Hoffmeyer (2009) terms the degrees of semiotic freedom of microbes, insects, and forensic scientists. In responding to the cues of their environment, microbes seem to have little possibility for different potential pathways; insects appear to be less constrained, working from a range of semiochemical cues including those of other insects. Forensic scientists are able to take account of a great deal of contextual information in trying to make sense of their signs. The question here is what contextual information is relevant and permissible within the evidential regime that specifies forensic truth claims.

Returning to the speaking corpse, a semeiotic perspective on its propositional speech provides avenues to explore different forms of agency and animacy, and to find a language to distinguish between living and inert matter without drawing a hard line between them. Fingerprints have their own forms of semeiotic life, but these differ in how they are embodied in signs and take on habits from insect or microbial semeiosis. This allows us to think about the grain and texture of agency itself, and to acknowledge that there are differences between the emergent semeiotic agency of fingerprints, insects, and humans, something that Latour has little room for, despite his shift toward exploring different modes of existence (2013). Latour's flattened ontology gives us a powerful starting point for disarticulating the recalcitrant nature-culture divide. His insistence on treating all elements under analytical consideration as ontologically equal provides a way to decenter the human and to foreground the relationships at play between elements within any assemblage. As Graham Harman puts it, this ontological starting point means that "any distinctions between them must be intellectually earned rather than smuggled in from the seventeenth century as purported self-evident truths" (Harman 2017, 98). A Peircean semeiotic offers another route to think with a flattened ontology, one that allows us to explore diverse forms of life and nonlife and their variable effects in the world.

So, how can we conceptualize the afterlives of the forensic dead? What, finally, is recognized in the figure of the speaking corpse? I started this article by drawing a contrast between two perspectives on the dead body's self-evident speech. If on the surface such speech has no expectation of an audience, hiding beneath this is another figure of the witness. This recognizes that evidential speech reports back from somewhere else and needs to be received to have any efficacy. In pointing us toward the real (no matter how erroneously) the iconic-indexical signs of forensic practice connect us with something outside themselves. They have an immediacy that elicits a feeling for their agency, of their

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independent existence aside from how they are taken forward. But to privilege this dimension alone is to efface the relationships through which they are articulated and disseminated. It is in these relationships that evidence and the dead find continuing life. This kind of claim may seem to deny the very reality of death. Certainly from a human perspective the capacity to self-reflexively enact change in the world shifts decisively with death. And yet the capacity to act is always distributed as Latour reminds us, and is never a simple property of a person. Even within the bounds of the individual we are composite creatures made up of a rich bacteriological microbiome (Human Microbiome Project Consortium 2012), to say nothing of the bacteria involved in the evolution of the eukaryotic cell (Margulis 1981). In a person's transition from living to dead, there is a qualitative change that means more to us as humans than it does to other forms of life that dwell within and with us. The self-reflexive ability to act shifts its center of gravity away from the person who has died and into more diffuse postmortem habits, finding its way into bequests and directives, as well as the humans and animals that surround the corpse. Despite the rupture of death, continuity persists. The dead are not only incorporated into a variety of other meaningful worlds, human and animal alike, but they also impact how those worlds unfold. Whether it is in the ways in which the corpse provides for new life to develop and grow, or in the way in which the dead and their insect communities are not only folded into forensic semiotic work but actually structure its unfolding, the dead continue to act as long as they remain part of these burgeoning semiotic processes. This insight undermines a simple opposition between the object world of death and the agentive world of life. The key question is therefore less one of whether the dead have afterlives, and more one of what forms of life are recognizable. Equally, in thinking about forensic evidence, the corpse may be understood as an entity whose reality is disclosed and acted upon through the signs that different beings perceive inhering in it. It is in this embodied sensuous semeiosis that the life of evidence continues. In recognizing the forms of life that continue after death, we can also see how evidence stretches across the divide of people and nature, interpretation and facts, pointing to the hidden depths and complexities of modernity's forensic traces.

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