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Imaging Brains, Changing Minds: How Pain Neuroimaging Can Inform the Law

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IMAGING BRAINS, CHANGING MINDS: HOW PAIN NEUROIMAGING CAN INFORM THE LAW

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ABSTRACT

What would the law do differently if it could see into the black box of the mind? One of the most valuable things it might do is reform the ways it deals with pain. Pain is ubiquitous in law, from tort to torture, from ERISA to expert evidence. Yet legal doctrines grapple with pain poorly, embodying concepts that are generations out of date and that cast suspicion on pain sufferers as having a problem that is "all in their heads."

Now, brain-imaging technologies are allowing scientists to see the brain in pain—and to reconceive of many types of pain as neurodegenerative diseases. Brain imaging proves that the problem is in sufferers' heads: Long-term pain shrinks the brain and changes the way it functions.

This new science has immediate practical and theoretical applications for the law. This Article first proposes reforms to disability law doctrines and their judicial interpretation. It then proposes ways in which pain neuroimaging ought to be handled as a matter of expert evidence in state, federal, and administrative proceedings. Drawing on work in evidence theory, it considers black letter evidence law as well as normative practices that shape how decision makers weigh evidence and credibility. It also offers limits on the use of brain images.

In opening a window into how the brain generates subjective experiences, neuroimaging should lead to doctrinal and practice-based revisions that increase law's accuracy and fairness. So doing, brain imaging should change the law's mind about the nature of pain and may require the law to rethink its dualism between body and mind.

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INTRODUCTION

Pain is a legal, philosophical, and human conundrum. Pain is at once a physical state and an emotional experience, and thus exists at the nexus of body and mind; nowhere is the law's casual dualism between mind and body more uneasily maintained than in questions of pain. Legal rights, proscriptions, and statuses turn on the presence or absence of pain, and its amount: Questions involving pain span legal domains from tort to torture, from constitutional law to administrative regulation. Pain accounts for hundreds of billions of dollars of direct economic costs and lost productivity annually—and yet, pain is largely invisible, unquantifiable, and often grossly misunderstood, leading to unnecessary suffering on the part of people whose pain is not credited and to unnecessary expense when the legal and medical systems function inefficiently or the wrong claimants are compensated.

What would the law do differently if it could see pain, as is increasingly possible through new neuroimaging technologies?

In important legal domains, the imaging of pain ought to change the law a great deal. This Article is about where law ought to change because of innovations in pain science brought about primarily through structural and functional imaging of the brain in pain. In the last two decades, structural and functional brain imaging, along with other brain- and non-brain-based research modalities, have fundamentally transformed the way doctors and scientists understand chronic pain. From an elusive and speculative condition, often characterized by treating doctors and by the legal system as a form of hysteria, malingering, or fraud, researchers and

clinicians now understand many chronic pain conditions to involve neurological signaling disorders or to constitute brain disorders in themselves.

This revolution in brain-pain sciences ought to change the law in at least two important areas that are the subject of this Article: disability and evidence law. Chronic pain is the single largest category of disability under the Social Security Disability (SSD) regime.[1] Yet, the regulations about what constitutes disability are in places silent about pain and in other places confoundingly circular. Pain science, this Article argues, is now sufficiently developed for policymakers and scholars to improve the law's treatment of pain in important ways, including to revise the SSD regime relating to chronic pain.

If the current SSD regulations are lacking, judicial interpretations thereof have done little to improve them: In their efforts to gap-fill, circuit judges in federal courts across the United States, who hear appeals of administrative disability denials, have developed their own interpretations of when chronic pain can and cannot constitute a disability. These standards vary by circuit from under-defined and over-permissive to draconian. The same medical evidence leads to different outcomes based purely on where an appeal is taken, violating the principle of horizontal equity.

Some judicial interpretations of the regulations express a view of the chronic pain claimant as suspect, as seeking recognition for emotional wounds in the guise of physical complaints. Judges and other commentators who hold such views are channeling a deep cultural current, as the history of pain in law and medicine is one of doubt about pain's reality and of constructing the pain sufferer as hysterical. When apprised of new pain science, judges may choose a different approach to these cases: Circuit court judges are uniquely placed to change judicial interpretations of pain-related disability to conform with current science, so that their determinations can be more consistent and more fair, even before the Social Security Administration (SSA) revises its regulations.

Chronic pain is also at issue in many litigated matters. These matters may sound in tort law, ERISA, disability law, or workers' compensation. Accordingly, judges and jurors frequently need to evaluate evidence of chronic pain. Direct evidence relating to a claimant's medical condition is already common in these kinds of proceedings. This Article argues that expert testimony grounded in pain neuroimaging, and neuroimages themselves, ought to be admissible for certain limited purposes: to educate judges and jurors about the nature of chronic pain conditions and to inform

1. *See, e.g.*, 42 U.S.C. § 423 (2012).

them as to the causes, manifestations, and likely prognoses for these conditions.

Evidence, although notionally a rule-based enterprise, is highly normative. Determinations about what evidence is relevant and reliable, and thus admissible, take place against background expectations or schemas: How well does the evidence presented match what the decision makers expect to see and believe to be credible? Evidence embraces the narrative character of the trial and extends to the evaluative process of judges and juries. These "soft" aspects of evidence may be more influential than the rules themselves in shaping litigation and its outcomes. Background expectations or schemas may be informative; they also may mislead. In cases involving chronic pain, jurors and judges alike may hold mistaken beliefs about chronic pain's causes, presentation, and persistence. Introducing educative evidence about chronic pain could have a debiasing role, equivalent to steps some jurisdictions have taken to permit expert testimony debunking other common but erroneous beliefs, like the now-discredited beliefs about the infallibility of eyewitness identification.

Drawing on narrative theory, evidence theory, and behavioral economic accounts of decision making, this Article recommends ways in which neuroimaging evidence could improve accuracy in trials by changing the background or default expectations of judges and fact finders. Turning to black letter or "hard" aspects of evidence law, this Article argues that aggregate pain neuroimaging evidence ought to be admissible under the federal, state, and administrative evidence regimes for certain, limited purposes. However, brain imaging technology is not a pain-o-meter or a mind-reading machine. Rather, it is a tool for increasing the law's understanding about how the brain works and how the law can do better at adjudicating important questions that lie at the intersection of the brain, body, and mind.

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Part I of this Article describes three problems that legal regimes have in adjudicating claims relating to chronic pain: visual bias, the doctrine of "excess pain," and doctrines and norms that confuse chronic pain disorders with psychiatric hysterical disorders. These problems show the state of the law itself and also of legal culture and norms relating to chronic pain. Examining court opinions, legal doctrines, and other sources of legal culture, it shows how antiquated or mistaken notions about chronic pain affect legal decision making and lead to suboptimal outcomes. It points toward the ways in which the neuroimaging advances in pain science can begin to address these issues.

Part II presents current research on chronic pain as a set of neurologically involved disorders. Focusing on structural and functional magnetic resonance imaging (MRI), it surveys the field and incorporates information from interviews with leading pain researchers.

Parts III and IV turn to the ways in which this new science should change two key areas of legal doctrine and practice. Part III analyzes Social Security Disability regulations, showing how current neuroimaging research could resolve significant doctrinal and applied problems. It outlines proposals to reform regulations that define when chronic pain constitutes disability, to modify judicial interpretations of the regulations, and to educate adjudicators about pain science.

Part IV turns to evidence law. Exploring evidence law theory, it shows how narrative expectations, culturally received norms, and cognitive predispositions like confirmation bias contribute to poor outcomes for chronic pain claimants and shows how pain neuroimaging could be used to modify decision makers' beliefs and perceptions. Going beyond the black letter law, the normative analysis in this section has implications for proceedings in tort, ERISA, and a range of other types of claims. The section concludes by proposing where neuroimaging should, and should not, be admissible.

I. THREE PROBLEMS OF PAIN IN LAW

Pain arises as a problem, and problematically, in some of the most important and ubiquitous areas of the law: federal and state administrative law, particularly Social Security Disability and workers' compensation regimes; federal and state disability law; the Employee Retirement Income Security Act (ERISA);[2] and tort. Claimants come to the legal forum to allege that their pain disables them partially or totally from working, that their insurer has wrongfully misclassified them as not disabled or denied them coverage for needed pain treatments, that their employer has failed to make a reasonable accommodation for their condition, or that a defendant's negligence wrongfully caused the claimant to suffer ongoing and possible future pain. Pain is not only legally pervasive but staggeringly costly: Chronic pain costs the U.S. economy $635 billion each year in medical costs and lost productivity;[3] government disability benefits, including benefits to people disabled by pain, amount to approximately $130 billion;[4]

2. Employee Retirement Income Security Act of 1974, Pub. L. No. 93-406, 88 Stat. 832 (codified as amended at 29 U.S.C. §§ 1001–1461 (2012)).

3. INSTITUTE OF MEDICINE OF THE NATIONAL ACADEMIES, RELIEVING PAIN IN AMERICA: A BLUEPRINT FOR TRANSFORMING PREVENTION, CARE, EDUCATION, AND RESEARCH 91 (2011).

4. *Disability Insurance Benefit Payments*, SOCIAL SECURITY ADMINISTRATION, http://www.ssa.gov/OACT/STATS/table4a6.html (last visited May 8, 2014). This figure represents all

and pain and suffering damages in tort, although hard to estimate reliably,[5] may amount to $50 billion per year.[6]

These kinds of cases present the usual difficulties that the legal system faces in adjudicating any matter: Decision makers must assess the strength of the parties' claims, including the weight of their evidence and their credibility. Yet, cases involving claims of pain also present unique problems, problems embedded in the fabric of the law and also in the norms, expectations, and practices of legal decision makers relating to questions of pain.

This Part focuses on three problems relating to pain in the law: courts' emphasis on the wrong kinds of evidence of pain; the doctrine of "excess pain" and its implicit or shadow notion of reasonable pain; and the notion that chronic pain, particularly pain that is not linked to obvious tissue damage or anatomical abnormalities, is the product of psychiatric illness. These problems, significant in themselves, point more generally to the kinds of problems that recur throughout black letter law and legal culture in cases involving claims of pain. These illustrative issues are interrelated in that they individually and collectively show the law's interest in visual corroboration of pain; its struggle to understand seemingly inexplicable variation in pain across individuals; and, at times, a suspicion of pain claimants as a category.

A. Doubt About Pain and the Search for Visual Evidence

Courts struggle with questions relating to the reality and verifiability of chronic pain and appear to struggle in particular with the invisibility of pain. Pain's invisibility is its famous problem: As the seminal scholar on pain, Elaine Scarry, explained, pain "may seem to have . . . no reality because it has not yet manifested itself on the visible surface of the earth."[7] Adjudicators may reject well-substantiated claims where the claimant does not offer visual medical evidence like X-rays or MRIs, even though such technologies are often irrelevant to pain diagnosis.[8] Conversely, when adjudicators look at X-rays, MRIs, and other visual evidence that does

payments to qualifying people with disabilities; this is not a figure for payments exclusively to people disabled by chronic pain. Breakdowns of benefits payments by disability type are not available.

5. *See* Neil Vidmar, *Empirical Evidence on the Deep Pockets Hypothesis: Jury Awards for Pain and Suffering in Medical Malpractice Cases*, 43 DUKE L.J. 217, 235–37 n.84 (1993) (asserting that "all of the published empirical studies of pain and suffering awards should be viewed with great suspicion as to their reliability, validity, and meaning"). Vidmar analyzes the factors that make rigorous estimates difficult in this area and that contribute to the inaccuracy of existing ballpark estimates.

6. John Fabian Witt, *The Political Economy of Pain*, *in* MAKING LEGAL HISTORY: ESSAYS IN HONOR OF WILLIAM E. NELSON 235, 237 (Daniel J. Hulsebosch & R.B. Bernstein, eds. 2013).

7. ELAINE SCARRY, THE BODY IN PAIN 3 (1985).

8. *See infra* notes 63–71 and accompanying text.

not—and cannot—show pain, they use these images as corroboration for their intuition that pain not tied to a visible problem does not exist: If the image does not show it, it must not be real.

In *Minor v. Commissioner of Social Security*, the claimant alleged disability due to lifelong chronic headaches exacerbated by a closed-head trauma sustained in a high-speed car accident.[9] She underwent dozens of hospitalizations, several spinal and brain surgeries, and the implantation of a spinal pain modulator.[10] She also submitted evidence of some thirty diagnostic tests supporting her diagnoses.[11] The administrative law judge denied her claim, and the district court affirmed, with both courts noting that Minor's claims of crippling headache and back pain were not credible because she did not present MRIs or "venograms" showing gross brain damage.[12] However, as the appellate court noted, MRI and venogram data would be irrelevant to demonstrating the kinds of pain the claimant alleged, a fact to which the Agency's own examining expert testified.[13] Similarly, in *Ketelboeter v. Astrue*, the court rejected the claimant's assertion of severe chronic pain because X-rays did not "corroborate[] the claimed increase in [chest] pain that [the claimant] reported over time," although it would be the rare form of chest pain that would show up on an X-ray.[14]

Judges' findings that claimants did not have disabling pain because they had no abnormal X-rays or similar imaging shows their search for the smoking gun (a crushed pelvis, a bulging disc), the visible thing that causes the pain. This manifests an attachment to the superseded "peripheral injury model."[15]

This emphasis on visual proof stems, too, from an aspect of our visual culture, a kind of "naïve visual realism" in which, "[i]f seeing is believing, having something to look at offers a reliable ground for belief, so visual evidence is the best sort of evidence there is."[16] Professor Neil Feigenson explains that, in areas where judges or jurors review visual evidence, they become "overconfident in their [own] interpretations . . . and less receptive to alternative viewpoints"; further, reviewing such evidence—or the absence of such evidence where the evidence is expected—serves to "entrench the effects of other, first-order biases."[17]

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9. 513 F. App'x 417, 418–22 (6th Cir. 2013) (reciting history below).

10. *Id.*

11. *Id.* at 425.

12. *Id.* at 431, 433 (reversing holding below).

13. *Id.* at 435–36.

14. 550 F.3d 620, 625 (7th Cir. 2008).

15. *See infra* Part II.A (discussing peripheral and central models of chronic pain).

16. Neal Feigenson, *Visual Common Sense*, *in* LAW, CULTURE AND VISUAL STUDIES 105, 108 (Anne Wagner & Richard K. Sherwin eds., 2014).

17. *Id.* at 105.

Put more simply, judges or jurors will see what they expect to see when visual evidence is presented, consistent with prior beliefs ("first-order biases");[18] and if they expect to see visual evidence that is not forthcoming, they will draw adverse inferences that are also consistent with those prior beliefs. A judge or juror may believe that most back pain is caused by spinal abnormalities (it is not). If a claimant alleges disabling back pain, that decision maker would expect to see X-rays or MRIs showing a deformed spine. If the claimant's evidence shows normal spinal anatomy, the decision maker will not be "receptive to" alternative explanations for the pain and may dismiss other supportive (but not visual) medical evidence.[19]

Neuroimaging may help by showing brain alterations and atrophy associated with chronic pain. This is not to say that brain imaging can prove chronic pain in the same way that an X-ray can prove a broken leg. Neuroimaging is *not* a pain-o-meter and is not suitable as individual proof of pain. Rather, as discussed in Parts II and III, imaging can show decision makers that pain has a brain-based, biological reality independent of peripheral damage, giving a visual basis to believe in the reality of pain while taking away the expectation that a "pain picture" will correlate the degree of pain to the degree of damage.

B. The Reasonable Pain Standard and the Problem of "Excess Pain"

"Excess pain" is the legal term of art decision makers apply when they find that a claimant is alleging more pain than is thought to be typical for the claimant's disease or injury and, further, that the level of pain is not supported by objective medical tests like X-rays.[20] No source of law defines the ostensibly correct or non-excessive amount of pain for each condition; indeed, the SSA itself explicitly recognizes that pain can be subjective and variable.[21] Thus, in the absence of concrete guidance about reasonable or typical pain, initial and reviewing judges are left to make the

18. *Id.*; *see also* Jennifer L. Mnookin, *The Image of Truth: Photographic Evidence and the Power of Analogy*, 10 YALE J.L. & HUMAN. 1, 17 (1998) (describing the definitive history on the conflicted early acceptance and ultimate triumph of photographic evidence in the courtroom).

19. Visual culture in evidence law is an area of study in its own right. In addition to the Wagner & Sherwin volume, *supra* note 16, interested readers should see generally Mnookin, *supra* note 18, and Christopher J. Buccafusco, *Gaining/Losing Perspective on the Law, or Keeping Visual Evidence in Perspective*, 58 U. MIAMI L. REV. 609 (2004).

20. Ann K. Wooster, Annotation, *Standard and Sufficiency of Evidence When Evaluating Severity of Claimant's Pain in Social Security Disability Case Under § 3(a)(1) of Social Security Disability Benefits Reform Act of 1984, 42 U.S.C.A. § 423(d)(5)(A)*, 165 A.L.R. FED. 203, § 3 (2000) (defining "excess pain" as "pain that is unsupported by objective medical findings," such as X-ray); *see also, e.g.*, Cotton v. Bowen, 799 F.2d 1403, 1407 (9th Cir. 1986) (defining "excess pain" as pain beyond the level typically associated with a particular medical condition) (internal citation omitted).

21. SSR 88-13, 1988 WL 236011 (July 20, 1988).

determination of whether a claimant's pain is unreasonable in relation to the claimant's injury or disease. They make this determination based in part on medical evidence submitted in the case, but also based on their own judgment against the background of what they know or believe about the degree of pain caused by different conditions.[22]

Judges vary tremendously in what they consider to be excess pain for particular conditions. While some judges do credit that different people experience pain very differently, others suspect that high levels of alleged pain implicitly raise a presumption of exaggeration, fraud, or even psychiatric problems.[23] This leads to heightened scrutiny of evidence corroborating the claimant's alleged level of pain and, frequently, adverse credibility determinations about the claimant.

Garcia v. Colvin illustrates the discretion vested in judges to determine whether pain is reasonable or excessive in relation to the claimed conditions.[24] It also shows the uncertainty and suspicion adjudicators may bring to cases they characterize as involving excess pain. In *Garcia*, the claimant presented with lupus, colitis, sickle cell disease, Hepatitis C, abdominal hernia, and terminal cirrhosis of the liver.[25] He had been taken off the liver transplant list because doctors determined that he could not survive transplant surgery.[26] Garcia's doctors and an Agency-appointed examiner concluded Garcia was completely disabled.[27]

An ALJ determined that Garcia was complaining of "excess pain" because, in the judge's view, his pain exceeded typical levels for his various conditions.[28] On that basis, the ALJ concluded that Garcia was "not credible," and further dismissed Garcia's partner's testimony that Garcia frequently awoke screaming from pain as "self-serving."[29] The court concluded that claimant "*must* have been exaggerating" because he did not consistently seek pain-relief treatment; however, Garcia, an unemployed laborer, only failed to seek treatment during the times when he lacked health insurance.[30] After Garcia exhausted his administrative appeals, a federal district court affirmed.[31]

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22. Wooster, *supra* note 20, at § 3 (describing judicial process).

23. *See infra* Part I.C.

24. 741 F.3d 758 (7th Cir. 2013).

25. *Id.* at 759.

26. *Id.*

27. *Id.*

28. *Id.*

29. *Id.* The ALJ further concluded Garcia's pain could not be as severe as Garcia claimed because Garcia could "rise . . . to a standing position, . . . and [] walk heel to toe" in a brief examination. *Id.* at 761.

30. *Id.* (emphasis in original).

31. *Id.* (citing the district court opinion).

The Seventh Circuit eventually reversed, severely criticizing the judgment exercised by the lower courts.[32] This case might be viewed as a one-off; there are occasional mistaken outcomes in every area of law. However, the Court of Appeals for the Seventh Circuit, per Judge Posner, used *Garcia* as an opportunity to criticize what the court described as a general problem with excess pain cases: that of administrative courts dismissing claims of excess pain with "boilerplate language" and of failing to credit well-substantiated and independent evidence of pain because the adjudicators found the level of pain claimed to be unreasonable.[33]

Garcia is an extreme case,[34] but not an isolated one.[35] It demonstrates general problems with the doctrine and the concept of excess pain: First, there is no general or typical amount of pain that particular conditions produce. As presented in Part II, pain scientists and clinicians forcefully reject the notion of a typical or standard pain experience; the same injury can heal completely in one individual while producing lifelong pain in another.[36] The legal standard regarding "excess pain" invites decision makers to decide for themselves how much pain is legitimate for any given condition, turning a medical determination into a normative and credibility determination. This opens the door to a wide range of judicial perspectives and degrees of knowledge about the subjective variability of pain and perhaps to view individuals who claim unreasonable pain (a medically nonsensical concept) as unreasonable people.

C. Pain as Mental Disorder in Sources of Legal and Cultural Authority

Numerous legal regimes treat mental and physical disorders differently, privileging physical disorders. In some cases, courts have held that chronic pain that lacks an obvious, visible cause (like bulging discs in the spine) is not physically real but instead is a "mental disorder."[37] Aspects of disability doctrine also construe this kind of pain—pain not linked to a visible cause

32. *Id.* at 758.

33. *Id.* at 765.

34. On review, the appellate court described itself as "astonished" at the lower courts' determinations, and "surprised that the [Justice Department] would defend such a denial." *Id.* at 762–63, 765.

35. *See, e.g.*, Selian v. Astrue, 708 F.3d 409 (2d Cir. 2013) (reversing the district court's conclusion claimant had "excess" pain; noting adjudicator may not substitute own judgment about how much pain is appropriate for a particular injury); Shavin v. Comm'r of Soc. Sec. Admin., 488 F. App'x 223 (9th Cir. 2012); Hensley v. Astrue, 573 F.3d 263 (6th Cir. 2009); Hawkins v. First Union Corp. Long-Term Disability Plan, 326 F.3d 914 (7th Cir. 2003).

36. *See infra* at notes 67–71 and accompanying text (explaining that some people who sustain a peripheral injury will develop central nervous system sensitization that causes chronic pain).

37. Lang v. Long-Term Disability Plan of Sponsor Applied Remote Tech., Inc., 125 F.3d 794, 799 (9th Cir. 1997).

or lesion—to be psychiatric in nature.[38] The conclusion that pain is a "mental disorder" can make it not compensable under ERISA, as in the case of *Lang v. Long-Term Disability Plan of Sponsor Applied Remote Technology, Inc*.[39] The judicial conclusion that certain forms of chronic pain are mental disorders leads to other problems as well: adjudicators have held that chronic pain patients whose pain arises from mental disorder are "flamboyant" exaggerators whose pain can only be credited if one believes in a "medical fantasyland" where the unreal is magically real.[40]

Practice guides, too, perpetuate these negative characterizations. Writing for *The Social Security Reporter*, an important journal of administrative law, an ALJ advises other judges hearing cases involving chronic pain to consider first the possibility of "converted mental conflict."[41] Whether a claimant suffers from "organic" pain versus "psychogenic" pain "should influence adjudication of entitlement quite differently."[42] In this judge's view, psychiatric pain should not be compensable; "rewarding" the claimant for the psychiatric condition only perpetuates the person's disability rather than forcing him or her to confront and fix the disability's emotional causes.

Other authoritative sources reinforce these views. Treatises like *American Jurisprudence* play an important role as repositories of legal culture and sources of norm transmission. Current editions continue to repeat nostrums about chronic pain that are a half-century or more out of date. Among the first things that *American Jurisprudence Proof of Facts* has to say in its section entitled "Modern physiopsychological concepts of pain sensations" is that "the subconscious needs of the plaintiff-patient" can cause him or her to "exaggerate pain"[43] out of a subconscious "desire" to be a victim.[44] Chronic pain conditions that do not arise from an obvious injury, it states, may indicate major mental illness.[45] Complaints of chronic pain may, it states, be the way that an emotionally afflicted individual "call[s] for help."[46]

A judicial determination that pain is psychiatric has important legal, social, and practical implications. Tort law, among other areas of law, treats

38. *See infra* Part III.A.2.

39. 125 F.3d at 799.

40. Carradine v. Barnhart, 360 F.3d 751, 770–71 (7th Cir. 2004) (Coffey, J., dissenting).

41. Patrick D. Halligan, *Credibility, Chronic Pain, and Converted Mental Conflict: Some Distinctions for Adjudicators*, 38 SOC. SEC. REP. SER. 859, 859 (1993) (containing the advice of an administrative law judge of the SSA serving in Wisconsin).

42. *Id.* at 859.

43. I. Alfred Breckler, *Whether a Plaintiff Has Sustained Pain & Suffering*, *in* 23 AM. JUR. 2D *Proof of Facts* § 3 (2007).

44. *Id.* § 10.

45. *Id.* § 3, at 11.

46. *Id.* at 12.

mental and physical disorders differently, privileging physical disorders.[47] The conclusion that pain is a "mental disorder" can make it not compensable under ERISA, as in the case of *Lang*, where the employer's insurance plan provided coverage for physical but not psychiatric disability.[48] It can cause a claimant to be denied certain medical treatments that would be indicated for physiologically generated pain but not for pain that is the product of psychiatric conversion. Finally, there is the social stigma of being labeled as mentally ill. The message is chronic pain may be a manifestation of major mental illness, or at least of a neurotic enjoyment of victimhood.

This view that people who suffer (or complain of) chronic pain are malingering or neurotic, or enjoy victimhood, although represented in legal culture, does not originate in legal culture. Legal culture has received such views from earlier work in various branches of medicine, particularly from psychoanalysis. Under the psychoanalytic view, chronic pain exists because the hysterical subject unconsciously produces symptoms as an expression of his or her psychological need. The subject has some emotionally painful conflict that she cannot confront; the repressed conflict manifests itself as a physical symptom, through a process called "somatization" (literally, embodiment).[49]

Chronic pain and psychoanalytic theory are intimately linked: Indeed, the famed Anna O. sought treatment with Josef Breuer in part to help resolve her chronic pain symptoms.[50] Breuer and Sigmund Freud made her case the centerpiece of their foundational work *Studies on Hysteria*, tracing

47. GUIDO CALABRESI, THE COSTS OF ACCIDENTS 217–20 (1970) (discussing the relative treatment of physical versus emotional harms in tort); *see also* Stanley Ingber, *Rethinking Intangible Injuries: A Focus on Remedy*, 73 CAL. L. REV. 772, 778–80 (1985).

48. 125 F.3d 794, 799 (9th Cir. 1997).

49. The definition of somatization is itself in a state of flux and controversy. The traditional definition emphasizes its psychiatric character as well as the flamboyant presentation of people who receive this diagnosis: "Somatization disorder is a psychiatric condition marked by multiple medically unexplained physical, or somatic, symptoms. . . . [Patients] often use impressionistic and colorful language to describe their symptoms. . . . While many symptoms resemble those associated with genuine diseases, some of the symptoms reported by people with somatization disorder are not." *Somatization disorder*, ENCYCLOPEDIA OF MENTAL DISORDERS, http://www.minddisorders.com/Py-Z/Somatization-disorder.html#ixzz2vVhL8JZY (last visited Mar. 3, 2014). The National Institutes of Health offers a more contemporary and less disparaging description of somatization, stating that somatization is a "condition in which a person has physical symptoms that involve more than one part of the body, but no physical cause can be found." It describes somatization as currently undergoing a reappraisal in which clinicians are identifying disorders of pain perception that lead to the diffuse and nonspecific pain claims typical of patients labeled as somatizers. *Somatization Disorder*, MEDICINE PLUS, http://www.nlm.nih.gov/medlineplus/ency/article/000955.htm (last visited Mar. 3, 2014).

50. Bertha Pappenheim, described as Anna O. in Breuer's case study, sought treatment for paralysis, head and neck pain, and fugue states. The case has "bedeviled the history of psychiatry ever since and has been the object of every conceivable diagnosis." Edward Shorter, *What Was the Matter with Anna O.?*, *in* FREUD UNDER ANALYSIS 23, 24 (Todd DuFresne & Paul Roazen eds., 1997). We may never know "what was the matter with Anna O.," but we may still explore the influence of this document on the history of medicine, law, and culture.

her chronic pain to repressed psychic conflict.[51] The Anna O. case also embodies the magic trick of the talking cure: Breuer claimed that once Anna O. identified and articulated her emotional conflicts, her physical symptoms disappeared. Breuer's claim was false: The real patient, named Bertha Pappenheim, continued to suffer for many years but ultimately learned to live with her pain.[52] She went on to do important work, in spite of great physical pain, in progressive politics, advocating for greater rights for workers and children.[53] Few remember Bertha Pappenheim, while the literary construction known as Anna O. remains famous.

Part of the legacy of the Anna O. story is the enduring construction of pain, particularly female pain,[54] as fantasized and hysterical. It tells decision makers to view the person who complains of pain as suspect and emotionally disordered and cautions them not to fall into the trap of "rewarding" the claimant by believing the pain is real, as this reinforces the "syndrome."

Although the notion that psychological conflict could produce physical symptoms did not originate with Freud and his school,[55] it found its fullest expression and broadest acceptance through Freud's writings.[56] Early members of Freud's school asserted that a patient would convert psychic distress into a bodily ("somatic") symptom, relabeling what Freud originally called "conversion hysteria."[57]

Somatic disorder and conversion disorder remain psychiatric diagnoses, although of steeply declining popularity: The DSM-IV-TR cautions that these are uncommon conditions that ought not to be diagnosed unless all non-psychiatric medical causes can be ruled out and only where the pain anatomical distribution or symptoms do not follow any known

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51. JOSEF BREUER & SIGMUND FREUD, STUDIES ON HYSTERIA 21 (1957).

52. *Bertha Pappenheim, "Anna O" (1859–1936)*, SCIENCE MUSEUM, www.sciencemuseum.org.uk/broughttolife/people/berthapappenheim.aspx (last visited Feb. 18, 2015).

53. Marion A. Kaplan, *Bertha Pappenheim: Founder of German-Jewish Feminism*, *in* THE JEWISH WOMAN: NEW PERSPECTIVES 149, 150–53 (Elizabeth Koltun ed., 1976).

54. *See generally* Sónia F. Bernardes & Maria Luísa Lima, *On the Contextual Nature of Sex-Related Biases in Pain Judgments*, 15 EUR. J. PAIN 950 (2011) (studying bias in perceiving female pain and finding that in certain cases women's pain was perceived as less credible than men's pain).

55. ANNE HARRINGTON, THE CURE WITHIN: A HISTORY OF MIND-BODY MEDICINE 54–60 (2009) (describing the work of Jean-Martin Charcot, a teacher of Freud's, on the development of the idea of the unconscious); Malcolm MacMillan, *Jean-Martin Charcot*, *in* The FREUD ENCYCLOPEDIA: THEORY, THERAPY, AND CULTURE 75, 75–80 (Edward Erwin ed., 2002).

56. Describing the hysterical invalid, Freud asserts: "Her state of ill-health will have every appearance of being objective and involuntary—the very doctor who treats her will bear witness to that fact; and for that reason, she will not need to feel any conscious self-reproaches . . . ." *The Clinical Picture*, *in* VII THE STANDARD EDITION OF THE COMPLETE PSYCHOLOGICAL WORKS OF SIGMUND FREUD, 44–45 (1954–73).

57. Harold Merskey, *The History of Pain and Hysteria*, 8 NEUROREHABILITATION 157, 159 (1997) (describing history of the term "somatization").

medical criteria.[58] This represents a marked shift from DSM-III, which did not express any caveats or cautions; the transition from DSM-III to DSM-IV shows the trend in psychiatry and general medicine to resist describing most forms of chronic pain as "all in the patient's head."[59] New neuroimaging technologies now enable researchers to understand chronic pain as "in the patient's head" in a much more literal and less dismissive way: As a set of pathologies grounded in central nervous system processing, as described in Part II.

II. CURRENT PAIN SCIENCE AND THE POTENTIAL OF NEUROIMAGING

Brain science can now begin to show why certain relatively trivial injuries may give rise to what looks like "excess" pain, why injuries that have apparently healed may result in lifelong pain, and why some people develop primary chronic pain disorders in the absence of any injury at all. Structural imaging of the brain in pain shows that particular chronic pain conditions result in the reshaping of certain brain structures, with the degree of brain difference (or damage) correlating with the amount and duration of the sufferer's pain. Functional imaging shows reorganization in the brain's default network, how the brain engages in unconscious activity. Moreover, these observed structural and functional changes are explanatory: The regions affected map onto the symptomatology that researchers observe and of which patients complain. Chronic pain is, as its sufferers have known all along, painfully real. This section describes the state of pain science and points toward the proposals for its legal application that will be described in Parts III and IV.

A. Chronic Pain: An Overview

The myriad varieties of physical pain all fall into two categories: acute or chronic. Acute pain is sudden in onset and relatively brief in duration.[60] It follows the familiar nociceptive model: the body experiences an injury or insult (a sprained ankle, a burst appendix); nerves in the affected area relay signals to the spinal cord and brain; and the brain sends back the message "pain!" This kind of pain is adaptive: It signals that the organism needs to pay attention to something *right now*. Because acute pain is caused by peripheral input to the spinal cord and brain, once the peripheral injury

58. AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS, DSM-IV-TR 446 (4th ed. rev. 2000).

59. Harold Merskey drove the change from DSM-III to DSM-IV. *See* Harold Merskey, *Pain Disorder, Hysteria or Somatization?*, 9 PAIN RES. & MGMT. 67, 71 (2004).

60. K.P. Grichnik & F.M. Ferrante, *The Difference Between Acute and Chronic Pain*, 58 MT. SINAI J. MED. 217 (1991).

resolves, the pain goes away. Most physical pain is acute pain, and most acute pain resolves relatively quickly.

Chronic pain is fundamentally different. Even though chronic pain is typically defined as pain lasting three to six months or more,[61] it is not just long lasting acute pain. Rather, chronic pain often has "a life of its own":[62] it often does not depend on continued peripheral input. It may endure long after any injury has healed, may be entirely out of proportion to the original (sometimes trivial) injury, or may arise in the absence of any injury.

Many severe chronic pain disorders are "primary," meaning the pain is itself the disease; it does not derive from (is not "secondary to") any other condition or injury. Primary chronic pain conditions include some of the most common sources of work absenteeism, doctor visits, and general misery: chronic lower back pain and headache. While some chronic back pain is traceable to mechanical issues like impinged nerves or spinal abnormalities, most abnormal findings are merely incidental; correcting bulging discs, for example, frequently does nothing to alleviate the pain.[63] Similarly, most headache conditions are not symptoms of "something else," like a tumor or vascular abnormality. The abnormality is in the central nervous system—a kind of "always on" setting in the brain or a hypersensitivity to ordinary signals.

Other chronic pain syndromes may originate with a peripheral injury, but the pain then "chronifies." In pain chronification, the peripheral injury heals or appears to heal completely but severe pain persists.[64] Common forms of chronified post-injury pain include post-surgical pain, complex regional pain syndrome, and phantom limb pain. If a patient is fortunate, his or her pain may be amenable to peripheral intervention.[65] But for the most part, interventions at the location where the person experiences the pain make the pain worse, not better, because the brain itself is generating the false sensation of local pain.[66]

Some chronically painful conditions, like irritable bowel syndrome or advanced arthritis, are associated with ongoing peripheral disease. But

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61. JUDY FOREMAN, A NATION IN PAIN: HEALING OUR BIGGEST HEALTH PROBLEM 3 (2014).

62. Peter Croft et al., *Chronic Pain as a Topic for Epidemiology and Public Health*, *in* CHRONIC PAIN EPIDEMIOLOGY: FROM AETIOLOGY TO PUBLIC HEALTH 3, 5 (Peter Croft et al. eds, 2010).

63. Such pain may be managed or, in some patients, resolved; however, manipulations or interventions in the back itself often have no impact on the pain condition.

64. David Borsook et al., *Neuroimaging Revolutionizes Therapeutic Approaches to Chronic Pain*, 3 MOLECULAR PAIN art. no. 25, at 2 (2007).

65. A. Lee Dellon et al., *Treatment of the Painful Neuroma by Neuroma Resection and Muscle Implantation*, 77 PLASTIC & RECONSTRUCTIVE SURGERY 427, 434 (1986).

66. *See, e.g.*, Ronald Melzack et al., *Central Neuroplasticity and Pathological Pain*, 933 ANNALS N.Y. ACAD. SCI. 157, 162–63 (2001) (discussing denervation hypersensitivity; reporting that surgical nerve resection can lead to increased pain due to neuronal activity in the somatosensory system). *Cf. id*. at 163–67 (noting that improved surgical techniques, including administration of local anesthesia to nerves to be resected, may improve such outcomes).

peripheral input causes only part of patients' pain: Patients with these conditions develop neurologically altered pain perception, leaving them with both peripheral disease and a central pain-processing disorder.[67]

Chronic pain, whether primary or secondary, both causes and results from a phenomenon called "central sensitization," in which the brain reorganizes its upward and downward modulation of pain signals.[68] Over time, over-activity in these neural regions reshapes the brain, a process called "neuroplasticity." Chronic pain sufferers develop atrophy and hypertrophy in brain regions involved in pain signal transmission and in the affective processing of pain.[69] The longer a person suffers chronic pain, and the more intense the pain, the greater the degree of volume loss (atrophy) is observed in these brain regions. This time-dependent, pain-dependent atrophy leads some researchers to speculate that chronic pain is a neurodegenerative disease.[70] Although the mechanisms underlying pain-related neuroplasticity remain under investigation, researchers agree that chronic pain changes the brain and does so progressively over time.[71]

This model of chronic pain as a central nervous system disorder is quite new. In Kuhnian fashion, it marks a paradigm shift away from the prior peripheral injury model.[72] It is puzzling that the peripheral injury model endured for so long, in light of its general failure to explain the distress and match the symptomatology of many forms of chronic pain. It may have been able to endure so long because studies of the central nervous system were not developed enough to provide an alternative account for the symptoms doctors encountered. It also may have endured in part because the theory of psychogenic pain, and background norms relating to hysteria, allowed physicians to explain away apparently anomalous cases.[73] The

67. Sean C. Mackey & Fumiko Maeda, *Functional Imaging and the Neural Systems of Chronic Pain*, 15 NEUROSURGERY CLINICS N. AM. 269, 269–70 (2004) (identifying chronic low back pain, irritable bowel syndrome, and complex regional pain syndrome as having significant centralized involvement); *see also* Stephen E. Gwilym et al., *Psychophysical and Functional Imaging Evidence Supporting the Presence of Central Sensitization in a Cohort of Osteoarthritis Patients*, 61 ARTHRITIS CARE & RES. 1226 (2009).

68. *See generally* Melzack, *supra* note 66; *see also Chronic Pain Medical Treatment Guidelines*, CAL. DEP'T OF INDUS. REL. 3–4 (2009), http://www.dir.ca.gov/dwc/DWCPropRegs/MTUS_Regulations/MTUS_ChronicPainMedicalTreatmentGuidelines.pdf ("[C]hronic pain . . . involve[s] changes in central pain processing mediated through mechanisms of neural plasticity and ultimately leading to hyper-excitability of central structures . . . .").

69. Arne May, *Chronic Pain May Change the Structure of the Brain*, 137 PAIN 7, 8–9 (2008).

70. Borsook et al., *supra* note 64, at 2 (stating that chronic pain "must be considered as a chronic degenerative disease . . . producing an altered brain state") (citing A. Vania Apkarian et al., *Chronic Back Pain Is Associated with Decreased Pre-frontal and Thalamic Gray Matter Density*, 24 J. NEUROSCI. 46 (2004); A. Kuchinad et al., *Accelerated Brain Gray Matter Loss in Fibromyalgia Patients: Premature Aging of the Brain?*, 27 J. NEUROSCI. 15 (2007)).

71. Melzack et al., *supra* note 66, at 167–69.

72. *See* THOMAS S. KUHN, THE STRUCTURE OF SCIENTIFIC REVOLUTIONS 118 (3d ed. 1996).

73. *See supra* notes 49–59 and accompanying text.

peripheral injury model required—to state the obvious—a causal peripheral injury. When physicians found no injury or no relationship between a peripheral injury and the complained-of pain, they came to the (apparently) ineluctable conclusion that the patient's pain resulted from no physical cause.[74] This conclusion, in turn, was buttressed by the readily-available theories of hysteria and conversion.[75]

The contemporary model that gives priority to brain-based processes may not be the last word in pain science, and the field continues to evolve; but, it has vastly more explanatory and predictive power than the prior model. The sections below detail particular neuroimaging technologies and what they currently show (and cannot show) about chronic pain conditions.

B. Structural Neuroimaging Shows Changes in Pain Sufferers' Brains

1. Overview of Structural Neuroimaging

Magnetic resonance imaging generates a three-dimensional, highly detailed representation of hard- and soft-tissue bodily structures.[76] MR images can show whether there are structural abnormalities within the imaged area; many readers will have direct experience of this through having had an MRI of the knee or lower back. MR images also show the volume of particular areas, allowing for the volume of the same structure to be compared across subjects.

This volumetric comparison of different brain regions shown on an MRI is performed using a mathematical technique known as "voxel-based morphometry," or VBM.[77] Just as a flat screen is comprised of pixels, locations within the three-dimensional MR-image space are designated by volumetric pixels, called "voxels."[78] Standardizing a voxel map over brain images allows researchers to compare the volumes of brain regions across subjects or within one subject over time.[79]

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74. Rollin M. Gallagher, *Secondary Gain in Pain Medicine: Let Us Stick with Biobehavioral Data*, 3 J. PAIN 274, 274 (1994) (describing physicians' tendency to fall back on explanations of somatization and secondary gain, "[t]he concept behind the use of the term seemed simple: without a known biomedical cause, the symptom must be psychiatric").

75. *See supra* notes 49–59 and accompanying text.

76. Despite the verisimilitude of the MR image, an MR image is a computer-generated composite constructed from data. DONALD W. MCROBBIE ET AL., MRI FROM PICTURE TO PROTON 1 (2003).

77. Arne May & Christian Gaser, *Magnetic Resonance-Based Morphometry: A Window into Structural Plasticity of the Brain*, 19 CURRENT OPINION NEUROLOGY 407, 408 (2006).

78. Nikos K. Logothetis, *What We Can Do and What We Cannot Do with fMRI*, 453 NATURE 869, 871 (2008).

79. The typical voxel in an MR brain image is about nine cubic millimeters. *Id.*

Studying the shape and size of brain regions—the brain's "morphometry"—using voxel-based comparisons enables a range of studies exploring the impact of various conditions on brain size and structure.[80] "Neuroplasticity"—the way the brain remodels itself response to experience—has practically become a household word over the last decade, in part because VBM can now show, noninvasively, how people's brain regions grow, shrink, or reorganize.[81]

2. Brain-Based Changes Reflect Duration, Severity, and Type of Pain

Three decades ago, Elaine Scarry famously wrote in *The Body in Pain* that "physical pain" seems to have "no reality because it has not yet manifested itself on the visible surface of the earth."[82] She described pain's invisibility as causing it to be "that which cannot be denied and [yet] that which cannot be confirmed."[83] Structural neuroimaging now shows that distinct chronic pain conditions produce characteristic patterns of structural brain alteration, with the degree of visible brain alteration correlating with the duration, severity, and kind of chronic pain. These findings lend reality and specificity to chronic pain conditions: Although the sensation of pain remains invisible, pain creates visible traces in the body. Through these technologies, pain now *is* "visible [on the] surface of the earth";[84] it is now "that which cannot be denied and that which ~~cannot~~ [*can now*] be confirmed."[85]

The groundbreaking work that first showed the relationship between chronic pain and regional brain atrophy was conducted by Vania Apkarian, a professor of neuroscience at Northwestern University. In 2004, Apkarian showed that chronic back pain is associated with decreased grey matter density in the prefrontal cortex and thalamus of the brain.[86] The core finding of this paper appeared to be: Chronic pain equals brain loss; more pain equals more brain lost.[87]

Numerous prominent researchers have confirmed and extended these findings. Professor Arne May, one of the world's leading researchers on the structural neuroimaging of headache pain, reports that VBM studies show

80. May & Gaser, *supra* note 77, at 407.

81. *Id.* at 408–09.

82. SCARRY, *supra* note 7, at 3–4.

83. *Id.* at 4.

84. *Id.* at 3.

85. *Id.* at 4 (alteration and emphasis added).

86. A. Vania Apkarian et al., *Chronic Back Pain Is Associated with Decreased Prefrontal and Thalamic Gray Matter Density*, 24 J. NEUROSCIENCE 46 (2004).

87. *See, e.g.*, A. Vania Apkarian et al., *Pain and the Brain: Specificity and Plasticity of the Brain in Clinical Chronic Pain*, 152 PAIN S49, S55 (2011); Borsook et al., *supra* note 64, at 2 (stating chronic pain "must be considered as a chronic degenerative disease").

significant changes in grey matter in patients with chronic headache, chronic back pain, and phantom limb pain.[88] The more grey matter a person has lost, the more sensitive he or she becomes to pain.[89] In a meta-review of the burgeoning research on structural pain imaging, May reports that chronic pain most frequently leads to atrophy in the frontal lobes, followed by atrophy in the cingulate cortex and the insula.[90] Similarly, David Borsook, a Harvard-based pain researcher, has reported characteristic structural, functional, and molecular changes in brain regions in patients with chronic neuropathic pain, complex regional pain disorder, and fibromyalgia.[91] This ability to determine which parts of the brain are compromised by specific chronic pain conditions "revolutionizes therapeutic approaches to chronic pain" by helping achieve diagnostic specificity and pointing toward neurological targets for intervention.[92]

C. Functional Neuroimaging in Chronic Pain

Distinct chronic pain conditions correlate with distinct structural brain changes, as described above. Researchers are exploring whether particular types of chronic pain correlate with specific functional patterns of activity in sufferers' brains. The answer, preliminarily, is yes: Functional neuroimaging shows that different pain conditions are associated with characteristic patterns of brain activity. This section introduces how functional brain imaging works and then describes how functional imaging studies contribute to understanding chronic pain disorders.

1. Overview of Functional Neuroimaging

The main technology for imaging the brain in pain is functional magnetic resonance imaging (fMRI). This revolutionary technology allows researchers to glimpse and approximate in real time the activity of the brain that corresponds to varied kinds of action and experience. Using fMRI, researchers can start to understand which regions of the brain are involved

88. Arne May, *Neuroimaging: Visualizing the Brain in Pain*, 28 NEUROLOGICAL SCI. S101, S104 (2007).

89. Nichole M. Emerson et al., *Pain Sensitivity Is Inversely Related to Regional Grey Matter Density in the Brain*, 155 PAIN 566 (2014).

90. Arne May, *Structural Brain Imaging: A Window into Chronic Pain*, 17 NEUROSCIENTIST 209, 212 (2011) [hereinafter May, *Structural Brain Imaging*]; *see also* Arne May, *New Insights into Headache: An Update on Functional and Structural Imaging Findings*, 5 NATURE REVS. NEUROLOGY 199, 205 (2009) [hereinafter May, *New Insights into Headache*] (reporting volumetric changes in the insula, brain stem, and hypothalamus as characteristic of various primary headache syndromes).

91. Borsook et al., *supra* note 64, at 4.

92. *Id.* at 1.

in perceiving and experiencing acute pain, and in experiencing and generating chronic pain.

fMRI works by indirectly indicating where the brain is using more energy.[93] The brain is constantly active, and certain regions of the brain preferentially become active when a person engages in a particular task or thought process.[94] Usually, many regions become active together, because the brain is a highly interconnected system.[95] When brain regions become more active, their metabolic demands go up: they need more oxygen and glucose, which are delivered by increased blood flow.

When an MRI machine sends magnetic pulses through the subject's brain, it can detect these changes in blood flow.[96] The magnetic pulses are not distorted by oxygen-rich blood, but deoxygenated blood distorts the magnetic wave slightly.[97] This creates the "blood oxygenation level-dependent," or BOLD, signal.[98] Researchers generate a composite picture of which regions in the brain show increased or decreased blood flow during a task or experience.[99] It is important to understand that fMRI is not a photograph of brain activity. Instead, it is like looking at a map of where a city uses energy, which can indicate where the city is bustling and where it is sleepy.

In investigating acute pain and chronic pain conditions, fMRI has proven revelatory. Irene Tracey, an Oxford University-based scientist, was the first to use fMRI to image the brain in pain. She has shown not only which regions of the brain process acute pain, but also that subjective self-reports of acute pain correlate with the degree of activity in the subjects' brains.[100] That is, the phenomenology of pain matches the physiological degree of response to pain, a fascinating empirical contribution to philosophical debates on perception. Researchers have used fMRI to show functional brain reorganization in patients with chronic pain,[101] and have

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93. *See, e.g.*, Nikos K. Logothetis, *The Underpinnings of the BOLD Functional Magnetic Resonance Imaging Signal*, 23 J. NEUROSCIENCE 3963, 3963 (2003).

94. *Id.*

95. John T. Cacioppo et al., *Just Because You're Imaging the Brain Doesn't Mean You Can Stop Using Your Head: A Primer and Set of First Principles*, 85 J. PERSONALITY & SOC. PSYCHOL. 650, 651 (2003); *see also, e.g.*, Matthew Brett et al., *The Problem of Functional Localization in the Human Brain*, 3 NATURE REVS. NEUROSCIENCE 243, 243 (2002) (detailing problems with using fMRI to localize complex and interconnected brain functions).

96. John A. Detre, *Clinical Applicability of Functional MRI*, 23 J. MAGNETIC RESONANCE IMAGING 808, 808–09 (2006).

97. *Id.*

98. *Id.*

99. *Id.* at 809.

100. Irene Tracey & Patrick W. Mantyh, *The Cerebral Signature for Pain Perception and its Modulation*, 55 NEURON 377, 383 (2007).

101. May, *supra* note 88, at S104–05 (showing functional reorganization in headache syndromes; degree of reorganization correlates with degree of pain and impairment).

even shown that particular types of functional reorganization are characteristic of distinct chronic pain conditions.[102]

fMRI has important limitations, however. First, it has temporal limitations: Blood flow may precede neural activity—or it may lag behind.[103] Spatially, the signal from blood vessels may not be precisely where the neural activity is taking place.[104] Third, there is a great deal of normal variation in brain response in a single subject (person) across different trials, and lots of variation between subjects.[105] An fMRI showing the response to a particular stimulus like pain is an average—an average of many trials of one subject and an average of many trials across different subjects. The composite fMRI showing what "the brain" does in response to, say, a painful heat stimulus may not look exactly like any single scan of any subject's brain in that experiment.[106]

2. fMRI as Objective Measure of Pain?

When fMRI studies have created a robust composite of average brain activity in response to a particular stimulus (say, acute pain), then researchers can use software to compare an individual brain scan to the composite and make an educated guess about whether the individual is experiencing the same thing.[107] Could fMRI pattern classification provide a "pain-o-meter" to help legal actors improve trial outcomes and better manage systems at risk for fraud?

A team of researchers led by Sean Mackey at Stanford University have developed an fMRI protocol that can determine in most cases whether a subject in an fMRI scanner is experiencing acute pain.[108] In a paper tantalizingly entitled, *Towards a Physiology-Based Measure of Pain: Patterns of Human Brain Activity Distinguish Painful from Non-Painful Thermal Stimulation*, the authors assert that their findings demonstrate that fMRI "can assess pain without requiring any communication from the

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102. May, *Structural Brain Imaging*, *supra* note 90, at 211, Figure 2 (reporting functional imaging findings of headache syndromes; showing distinct brain regions become active during pain attacks in the various syndromes).

103. Nikos K. Logothetis & Josef Pfeuffer, *On the Nature of the BOLD fMRI Contrast Mechanism*, 22 MAGNETIC RESONANCE IMAGING 1517, 1524 (2004).

104. *Id.*

105. Laurence R. Tancredi & Jonathan D. Brodie, *The Brain and Behavior: Limitations in the Legal Use of Functional Magnetic Resonance Imaging*, 33 AM. J.L. & MED. 271, 275 (2007).

106. *Id.*

107. Justin E. Brown et al., *Towards a Physiology-Based Measure of Pain: Patterns of Human Brain Activity Distinguish Painful from Non-Painful Thermal Stimulation*, 6 PLOS ONE e24124, at 2 (Sept. 13, 2011), http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0024124 (describing machine learning paradigm, developed in the Mackey lab at Stanford).

108. *Id.* at 7.

person being tested."[109] This work has been refined and extended by Tor Wager, whose recent work in the New England Journal of Medicine showed that fMRI could detect acute pain in normal, healthy subjects with ninety-five percent accuracy.[110]

This major research accomplishment looks like a pain-o-meter, but it is not.[111] Even if this protocol worked perfectly in predicting acute pain (and it currently has a relatively high rate of error), it would be of limited use relative to chronic pain, as these conditions present themselves very differently neurologically. Further, acute pain can be produced in the lab; chronic pain may or may not be present—and may be present at varying intensities—at the time of a test. Apart from pain detection, though, fMRI can detect changes in the "default-mode network," or patterns of background activity, of chronic pain sufferers' brains.[112] This finding helps explain perceptual, cognitive, and affective impairments that occur in these conditions.[113] Perhaps in the future, fMRI of the default network may have diagnostic potential, helping categorize patients, plaintiffs, or claimants.

III. NEUROIMAGING SHOULD INFLUENCE DOCTRINE AND INTERPRETATION IN DISABILITY LAW

The new science of chronic pain, particularly neuroimaging of chronic pain, should lead to modifications to the Social Security Disability regulations and, in the near term, to judicial reinterpretation of the existing regulations. This Part first presents the SSDI regulations and the 1984 Amendment to those regulations, which were intended to provide adjudicators with greater guidance on how to evaluate claims grounded in chronic pain.

While regulatory reform may proceed slowly, federal judicial interpretation of the existing regulations could evolve without delay to incorporate new scientific knowledge. After exploring the regulations, this section turns to how judges in different circuits interpret and apply the SSDI regulations. Judicial interpretations vary considerably from circuit to circuit, incorporating a range of understandings of chronic pain—some of which are loose and unbounded, while others are unrealistically narrow and

109. *Id.* at 1.

110. Tor Wager et al., *An fMRI-Based Neurologic Signature of Physical Pain*, 368 NEW ENG. J. MED. 1388, 1388 (2013).

111. Brown et al., *supra* note 107, at 5 ("We are still very far from a physiology-based pain assessment tool that could be used in clinical, forensic, and other applied settings.").

112. Marwan N. Baliki et al., *Beyond Feeling: Chronic Pain Hurts the Brain, Disrupting the Default-Mode Network Dynamics*, 28 J. NEUROSCIENCE 1398 (2008) (using fMRI to show default-mode network changes in chronic pain).

113. *Id*.

restrictive. The variability not only fails to comport with pain science but violates horizontal equity, as similarly-situated claimants may receive different outcomes depending only on the circuit in which their cases proceed. And, it imposes costs on the system: Circuits that use an under-defined standard may increase the likelihood of fraud and abuse, while those that use a harsh and unrealistic standard may frustrate the purposes of the Act. This Part proposes ways in which judicial interpretation of the existing regulations ought to change to incorporate new scientific knowledge about chronic pain.

A. Social Security Disability Doctrine and Practice Relating to Chronic Pain

Disability, under the Social Security Disability Insurance program (SSDI), often turns crucially on pain—whether the claimant is in pain, and whether that pain is intense, constant, and traceable to an objectively identifiable medical condition.[114] Although only about one in five Social Security claimants receives benefits pursuant to the Disability program, determining whether claimants in fact are disabled "now constitutes *the* major part of [the SSA's] workload."[115] The SSA receives about 600,000 hearing requests annually, a large percentage of which involve claims of chronic pain.[116]

Yet, the disability law regime has struggled with the problem of pain since its inception. Despite its prominence as a cause of disability, "chronic pain" is not defined within the Social Security Administration's regulations. As a result of the Act's silence on pain, early cases litigated under the Act held as a matter of law that pain could not be disabling.[117] This principle changed in 1961, when the Fifth Circuit held in *Butler v. Flemming* that chronic pain could constitute a disability under the Act.[118] The *Butler* principle spread rapidly; eventually, every circuit recognized that pain could render a person disabled within the meaning of the Act.[119]

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114. *See* Social Security Disability Benefits Reform Act of 1984 § 3, 42 U.S.C. § 423(d)(5)(A) (2012).

115. Administrative Review Process for Adjudicating Initial Disability Claims, 71 Fed. Reg. 16,424, 16,424 (Mar. 31, 2006) (emphasis added); *see also* Frank S. Bloch, *Medical Proof, Social Policy, and Social Security's Medically Centered Definition of Disability*, 92 CORNELL L. REV. 189, 191 (2007) (describing the toll on administrative resources of adjudicating disability claims).

116. Bloch, *supra* note 115, at 192 (providing figures).

117. *See, e.g.*, Adams v. Flemming, 276 F.2d 901, 904 (2d Cir. 1960); Coomes v. Ribicoff, 209 F. Supp. 670, 672 (D. Kan. 1962); Littleton v. Ribicoff, 210 F. Supp. 711, 714 (E.D. Ky. 1962).

118. 288 F.2d 591, 595 (5th Cir. 1961).

119. I.J. Schiffres, *Pain as "Disability" Entitling Insured to Disability Benefits Under § 103 of the Social Security Act (42 U.S.C. § 423)*, 23 A.L.R.3d 1034, § 5[b] (2014) (describing *Butler* precedent; collecting cases).

Such pain must arise from a "medically determinable physical or mental impairment."[120]

This double-edged recognition of pain as disabling, but only when it arises from a distinct or determinable impairment, endures today. Chronic pain cannot serve as a valid category of disability unless the pain is caused by some condition separate from the pain itself—such as rheumatoid or osteoarthritis giving rise to pain, or back injury giving rise to pain, and so forth. Claimants who cannot point to a known medical condition capable of giving rise to pain cannot be found disabled based on pain—with one exception. That exception is psychogenic or somatized pain.

Since the disability regime's inception, the drafters of the disability regulations and the judges who interpret them have recognized that disabling pain does frequently occur independently of a disabling injury or obvious disease. To provide compensation to claimants who appeared to demonstrate genuine suffering but who could not show evidence of a distinct injury or disease, ALJs and federal judges arrived at the work-around of finding such claimants psychiatrically disabled. Claimants with chronic pain thus could qualify as disabled if they could receive a diagnosis and a finding of a psychiatric pain condition, generally either psychogenic pain, "somatoform pain disorder," or "conversion disorder." This allows for financial recovery in some cases. However, it also reinforces the notion that chronic pain is hysterically generated—and it affords no recovery to people suffering from chronic pain who do not also demonstrate the symptoms necessary for a suitable psychiatric disorder. The rest of this section explores in detail these issues under the regulations.

1. Legal Framework: Statutory and Regulatory Regime

Under the Social Security Disability Act (the Act), disability insurance (DI) is available to any person with a "disability" who is an "insured" under the Act and who is under the age of 65.[121] Similarly, under the Social Security Insurance (SSI) program established in the same Act, benefits are available to people who are both indigent and disabled. The Act defines disability as the "inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment."[122] The impairment, further, must "be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than 12 months."[123]

120. 42 U.S.C. § 423(d)(1)(A) (2012).
121. § 423(a)(1).
122. § 423(d)(1)(A).
123. *Id.*

Within the meaning of the Social Security Act, a condition (like pain) can be "disabling" if it results from "a medical impairment" that could "reasonably be expected" to cause the kind and degree of impairment alleged.[124] Medical proof is built into the statutory regime: The claimant must provide "[o]bjective medical evidence"[125] showing a "medically determinable" impairment,[126] and the associated disability must "result[] from anatomical [or] physiological . . . abnormalities" that are "demonstrable by medically acceptable clinical and laboratory diagnostic techniques."[127] The Act is implemented through federal regulations that require a claimant to provide objective evidence of a condition, "which could reasonably be expected to produce the pain or other symptoms alleged."[128]

Neither the Act nor its implementing regulations define disabling pain nor list disabling pain conditions.[129] In the absence of such guidance, administrative and Article III courts have struggled over time to determine how to adjudicate an increasing caseload of pain-based claims. Courts have found particularly challenging the subjective and variable nature of chronic pain, as well as claimants' assertions that they suffer chronic pain in the absence of an obvious, ongoing injury.[130]

2. The Problematic 1984 Regulations: Pain as Symptom of "Something Else"

As a result of ongoing judicial confusion and inconsistency, Congress revisited the question of DI/SSI pain evaluation guidelines in the early 1980s.[131] In 1984, Congress issued new guidelines amending the Act that ostensibly instructed courts how to proceed in evaluating chronic pain claims.[132] The 1984 Amendment lays out a three-part inquiry, codified and elaborated in SSA regulations. Under the Amendment and the regulations

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124. § 423(d)(5)(A).

125. *Id.*

126. *Id.*

127. § 423(d)(3).

128. 20 C.F.R. § 404.1529(a) (2014); *see also* § 416.929(b).

129. Schiffres, *supra* note 119, § 5[b]. As a result of the Act's silence, early decisions under the Act held that pain could not be disabling. *Id.* (collecting cases).

130. SOCIAL SECURITY ADMINISTRATION, SOCIAL SECURITY BULLETIN, REPORT OF THE COMMISSION ON THE EVALUATION OF PAIN 26 (1987) (discussing congressional action, noting and describing "the diversity of court rulings" on this point); *see also, e.g.*, Holmstrom v. Massanari, 270 F.3d 715, 721–23 (8th Cir. 2001) (reversing ALJ's finding that the record did not corroborate subjective complaints of pain); *see also* Schiffres, *supra* note 119, § 9 (discussing how the trier of facts should evaluate subjective pain).

131. SOCIAL SECURITY ADMINISTRATION, *supra* note 130, at 26.

132. Social Security Disability Benefits Reform Act of 1984 § 3, 42 U.S.C. § 423(d)(5)(A) (2012).

derived from it, the claimant first must show by "by medically acceptable . . . diagnostic techniques" that he suffers a "medical impairment that results from anatomical, physiological, or psychological abnormalities."[133] This showing of medical causation is "a threshold requirement; a sine qua non" of any valid claim.[134] Second, the fact finder must determine that the abnormalities could "reasonably be expected to produce the pain" to the degree complained of.[135] If the pain is more severe or longer lasting than would be typical for the underlying impairment, then the ALJ is instructed to examine other evidence bearing on the degree of the claimant's pain and his resulting impairment. Third and finally, the medically-demonstrable pain must reasonably "lead to a conclusion that the individual is under a disability,"[136] meaning that the pain must preclude the claimant from engaging in "any substantial gainful activity."[137]

The Amendment and related regulations attempt to define when pain is legally disabling. Yet, when read narrowly, these provisions do not define pain as a legally disabling condition at all. Rather, the SSA recognizes as disabling any underlying medical impairments that reasonably and actually cause severe pain, not pain itself. The first step of the inquiry is a threshold showing of some "anatomical, physiological, or psychological abnormalit[y]," and the second step is the determination of whether such abnormality could be "reasonably [] expected to produce the pain."[138] Pain is thus conceived of as the output of the disease state or abnormal condition. Thus, under the Act, pain cannot itself be the basis of a claim of disability.

This distinction between pain as a symptom versus pain as a disease in itself might seem recondite. But it has enormous importance: The Act perpetuates the conception of pain-as-symptom, pain as derivative. Instead, as discussed in Part II, chronic pain often is a disease in itself. Chronic pain without lesion may be associated with abnormal biomarkers and brain states, yet currently there is no known cause for many chronic pain conditions or for why apparently healed peripheral injury can continue to be associated with pain. This matters legally because it means that chronic

133. *Id.*

134. Bloch, *supra* note 115, at 234 (citing 20 C.F.R. §§ 404.1529(a), 416.929(a)); *see also, e.g.*, Lingenfelter v. Astrue, 504 F.3d 1028, 1035–36 (9th Cir. 2007) (internal citation and quotation marks omitted) (stating that the initial consideration must be whether there is "objective medical evidence of an underlying impairment which could reasonably be expected to produce the pain"); Johnson v. Barnhart, 434 F.3d 650, 657 (4th Cir. 2005) (stating the same).

135. 42 U.S.C. § 423(d)(5)(A); *see also* SOCIAL SECURITY ADMINISTRATION, *supra* note 130, at 14.

136. 42 U.S.C. § 423(d)(5)(A).

137. § 423(d)(1)(A).

138. § 423(d)(5)(A).

pain often is not—as required by the Act—demonstrably the product of another impairment or condition.

If under the guidelines the pain must be "produced by" another condition, then adjudicators face the problem of seemingly uncaused chronic pain, where the suffering is obvious but its sources are not. Many judges have tried to interpret the requirement that pain arise from another condition generously, so that it comports with their general intuition that chronic pain can be real in the absence of an evident injury or with their particular assessment of a claimant as sincere in his or her suffering.[139] What judges have fallen back upon in the absence of a convincing mechanism to explain chronic pain has been the notion that chronic pain is a real disorder, but of psychiatric origin.[140]

Following the 1984 amendments, many judges started to do what some handful of them had done before: find that claimants are disabled by "psychogenic pain" or by the closely related psychiatric diagnosis of "somatoform pain disorder" (SPD), the modern heir to the old diagnosis of hysteria.[141] Psychogenic pain and SPD have been the savior and the nemesis of chronic pain claimants: savior, because these diagnoses provides legal and medical recognition and financial compensation for unexplained pain; nemesis, because shoe-horning chronic pain into these psychiatric diagnoses carries several negative consequences. First, the claimant has to meet the burden of producing convincing evidence of psychogenic pain or SPD, which he may not be able to offer if his condition is not psychiatric in origin. Second, a claimant's categorization as suffering from psychiatric pain may limit his or her access to medical interventions that would be contraindicated for psychiatric pain. Treatment flows from diagnosis: If the diagnosis is that a person's chronic pain arises from repressed emotion, then an insurer might reimburse comparatively inexpensive psychiatric medication but might deny coverage for interventional procedures like nerve blocks. Finally, if the claimant is successful, he or she then labors not only under the disability of pain but also the stigma of a psychiatric diagnosis.

B. Improving SSDI Regulations with New Pain Science

Although a claimant need not provide courts with "objective evidence of pain," she must (reasonably enough) provide "objective evidence of a

139. *See, e.g.*, Carradine v. Barnhart, 360 F.3d 751, 754–55 (7th Cir. 2004).

140. *See, e.g.*, Davis v. Califano, 599 F.2d 1324, 1326–27 (5th Cir. 1979) (remanding for further factfinding to determine if the claimant's pain was "psychosomatic").

141. *See, e.g.*, Sanders v. Sullivan, 983 F. 2d 822 (8th Cir. 1992); Farris v. Sec'y of Health & Human Servs., 773 F.2d 85, 86 (6th Cir. 1985).

medical condition which could cause the pain alleged."[142] Yet, if current descriptions of pain chronification mechanisms are accurate, then much chronic pain will occur in the absence of any separate or distinct "condition" that "produce[s] the pain," other than the chronic pain condition itself.[143] At least as currently discernible by medical science, there may be no obvious anatomical abnormality, no peripheral smoking gun.

It sounds circular to say that pain is the symptom of the disease of pain, which reasonably can be expected to produce pain. But the appearance of circularity is merely semantic. It disappears if the relationship between the experience of pain and the condition giving rise to it is reconceptualized like this: Chronic pain may be produced and maintained by neurological alterations, which modify the brain's functional patterns and structure. This type of central nervous system sensitization may arise in conjunction with a peripheral injury or disease; it may endure after a peripheral injury heals; or it may arise in the absence of any peripheral cause, as with primary headache syndromes.[144]

To bring the regulations in line with the current state of medical knowledge about pain chronification, 20 C.F.R. §§ 416.929(b) and 404.1529(b) should be amended to recognize that chronic pain can persist after an initial trauma, injury, or disease has actually or apparently resolved. There are several ways that this amendment could be implemented. I suggest that the language of the regulations be amended to read: "objective evidence of a medical condition, *including chronic pain conditions*, that could cause the pain alleged . . . ." This language would incorporate into the regulations the reality that chronic pain is a medical condition—a neurological disorder of diverse etiology but fairly uniform mechanism—characterized by abnormal activation of areas of the brain related to pain perception and generally independent of any peripheral input.

Alternatively, the language of the regulations could remain as it is, but an advisory committee or other body within the Social Security Administration ("SSA") could promulgate an interpretive memorandum that defines chronic pain as an independent medical condition that satisfies the definition set forth in the regulations. This memorandum should communicate the contemporary medical-scientific model of chronic pain as involving both peripheral and central nervous system alterations in pain transmission and perception. It should emphasize that such central nervous system sensitization may arise in conjunction with a peripheral injury or

142. Craig v. Chater, 76 F.3d 585, 594 (4th Cir. 1996).

143. 20 C.F.R. §§ 416.929(b), 404.1529(b) (2013).

144. *See supra* Part II.B, notes 86–92 (describing pain conditions).

disease or in the absence of a peripheral cause. This is consistent with the requirement that claims be supported by objective medical evidence, as numerous diagnostic tests and criteria exist for the medical diagnosis of chronic pain conditions.

C. Revising Judge-Made Disability Standards in Light of New Pain Science

To account for contemporary pain science, the ways judges adjudicate disability cases at the administrative and federal level similarly must evolve in concert with amendments to the regulations or independently. The regulations functionally may be changed through new judicial interpretations: Courts have the authority to recognize medical evidence that chronic pain can be an independent and distinct medical condition under the regulations as they currently exist. In this way, courts could simply incorporate evidence of pain chronification as a distinct neurological disorder into the existing disability framework that requires objective evidence of a medical condition that reasonably could lead to the degree of pain alleged.

This avenue of constructive judicial amendment of the regulations is attractive because it does not require time-consuming administrative or legislative action. However, it ought to be a second-line alternative to revision of the regulations: It relies on diffuse bodies, ALJs and Article III judges, independently becoming aware of contemporary pain science and then crafting appropriate interpretive and evidentiary standards. Given the range of cases that judges must handle on a daily basis, it is not realistic to expect that more than a few of them will come to the scientific literature on their own and develop new standards. Moreover, district court judges, who are the more likely sources of innovation, are constrained by the standards already established by the appellate courts of their circuits. However, until SSA does act on this—and recall that SSA has been stalled since 1984—individual judges may use their courtrooms as "laboratories of innovation."[145]

This short section first describes the different and conflicting judge-made standards that circuits employ to interpret the SSDI regulations. These varying standards reflect a continuum from leniency to harshness, yet none reflects contemporary pain science. These varying standards also lead to radically different outcomes for similarly-situated claimants. After exploring the case law, this section suggests how courts could use pain science to revise their circuits' interpretations of these regulations.

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145. *See* New State Ice Co. v. Liebmann, 285 U.S. 262 (1932) (Brandeis, J., dissenting) (popularizing the idea that the fifty states serve as "laboratories of democracy").

1. Judge-Made Disability Law and Its Vagaries

Even though ALJs and federal courts continue to engage faithfully in the regulations' prescribed inquiries, they reach wildly divergent conclusions and have established inconsistent standards across federal circuits. Courts do share a basic consensus that pain must be severe to qualify as disabling; also, they agree that a person is not disabled merely because he or she cannot work pain-free. Beyond that foundation, courts across the United States apply three quite distinct pain evaluation standards. Although the courts that articulate these standards all cite the SSA regulation, nothing in that regulation sets forth any one of the elements of these requirements, much less all of them. These inconsistent and often vague standards leave adjudicators in the position of needing to fall back on their personal judgment about what pain looks like and whose pain they believe to be real.

The most permissive standard provides that, to be disabled by pain, a claimant may be capable of gainful employment but that engaging in such employment would cause the claimant "great pain."[146] This is a minority standard, perhaps because it is in some tension with the SSD regulation providing that a claimant must be incapable of performing any "substantial gainful activity."[147]

Courts in a majority of jurisdictions apply an intermediate standard. This standard provides that a person's pain must be so severe as to preclude gainful employment entirely, rendering work impossible.[148] Under this standard, a person who would experience "great pain" from his or her work duties, but who was not entirely "preclude[d]" from performing them, would not qualify as disabled.[149]

The most draconian pain standard is that developed by the Fifth Circuit. According to the case law of that circuit, to qualify as disabling, pain must not only preclude the claimant from any significant gainful employment; it also must be "*constant*, *unremitting*, and *wholly unresponsive to therapeutic treatment*."[150] This standard is not grounded in

146. *See, e.g.*, Musto v. Halter, 135 F. Supp. 2d 220 (D. Mass. 2001); Williams v. Halter, 135 F. Supp. 2d 1225 (M.D. Fla. 2001); Morin v. Sec'y of Health & Human Servs. 835 F. Supp. 1414 (D. N.H. 1992).

147. 42 U.S.C. § 423(d)(1)(A) (2012).

148. Courts in the Second, Third, Fifth, Sixth, Seventh, Eighth, and Tenth Circuits have used the impossibility standard, although not uniformly. *See, e.g.*, House v. Shalala, 34 F.3d 691 (8th Cir. 1994); Bogle v. Sullivan, 998 F.2d 342 (6th Cir. 1993); Anthony v. Sullivan, 954 F.2d 289 (5th Cir. 1992); Hargis v. Sullivan, 945 F.2d 1482 (10th Cir. 1991); Smith v. Schweiker, 671 F.2d 789 (3d Cir. 1982); McCaskill *ex rel*. Harris v. Massanari, 152 F. Supp. 2d 270 (E.D.N.Y. 2001); Rajt v. Sec'y of Health & Human Servs., 859 F. Supp. 275 (E.D. Mich. 1994).

149. *See Smith*, 671 F.2d at 794 n.6; *Hargis*, 945 F.2d at 1489.

150. Hames v. Heckler, 707 F.2d 162, 166 (5th Cir. 1983) (establishing this standard in the Fifth Circuit) (emphasis added).

the language or substance of any disability statutes or regulations and is flatly contrary to the biology of chronic pain diseases. Chronic pain conditions remit and relapse. Many people with lifelong chronic pain conditions may have pain-free days. A person also may have pain every day, but the level of pain will vary from day to day, and often from morning to night.[151] Indeed, a claim that one's pain is absolutely invariable is more likely to be a marker of an inartfully fabricated claim than of an actual chronic pain condition. Moreover, fortunately, almost all chronic pain conditions can be at least partially treated, whether interventionally, pharmacologically, or behaviorally. Thus, this standard's requirement that the condition be "wholly unresponsive to therapeutic treatment" is as misguided as its insistence that the pain be constant in its level.[152]

It is ironic that a judicial interpretation of the disability regulations, perhaps inspired by judges' desire to reduce fraudulent claims, instead would articulate criteria more likely to reward the fraudster than the legitimate claimant, while enshrining the notion that claimants who do not meet this fictitious characterization of pain are frauds. This problem-fraught standard might be of limited interest beyond the Fifth Circuit, except that it is spreading to federal courts in the Second, Third, Sixth, Seventh, and Eight Circuits, as well as to some ALJs.[153] Because of its legal significance and the instructive depth of its manifold error, it is worth analyzing this standard and its history closely.

The story of this standard dates back forty years to an opinion issued by an ALJ against claimant Chaney, holding he was not disabled because he did not have any "significant signs" consistent with chronic pain.[154] Chaney appealed and, in *Chaney v. Califano*, the Fifth Circuit affirmed.[155] In considering the ALJ's finding that the claimant was not disabled, the court quoted the ALJ's statement that:

> [P]ain is a subjective symptom that is not measurable, and it is recognized that there are many disorders in which . . . pain . . . is *constant, unremitting, and wholly unresponsive to therapeutic measures*. Generally, when an individual has suffered severe pain

151. Variability in pain level is highly characteristic of chronic pain conditions. Jennifer M. Foss et al., *Dynamics of Pain: Fractal Dimension of Temporal Variability of Spontaneous Pain Differentiates Between Pain States*, 95 J. NEUROPHYSIOLOGY 730 (2006) (finding that fluctuations in pain level are characteristic neurobiological features of different chronic pain conditions); *see also* A. Vania Apkarian et al., *Towards a Theory of Chronic Pain*, 87 PROGRESS IN NEUROBIOLOGY 81 (2009) (describing neurological bases of pain variation in chronic pain conditions).

152. *Hames*, 707 F.2d at 166.

153. *See generally* Torres-Rosas v. Bowen, 678 F. Supp. 420, 424 (S.D.N.Y. 1987); Summers v. Colvin, No. 12CV22WMC, 2013 WL 6564451, at *4 (W.D. Wis. Dec. 13, 2013).

154. Chaney v. Califano, 588 F.2d 958, 960 (5th Cir. 1979).

155. *Id.*

> for a long time, there are observable signs. . . . In the instant case, there are no such significant signs or circumstances.[156]

Highlighting this language from the ALJ's opinion, the court in *Chaney* did not hold against the claimant because his pain was not "constant, unremitting, and wholly unresponsive to therapeutic measures."[157] Nor did it state that only pain rising to that level constitutes statutory disability. Rather, the court affirmed the lower court's ruling against Chaney because he showed "no . . . significant signs" of suffering "severe pain for a long time."[158] The disability standard the ALJ actually employed, and that adopted by the circuit, was simply "severe pain for a long time," not pain "constant, unremitting, and wholly unresponsive to therapeutic measures." Effectively, the court held quite reasonably and unremarkably that a disability claim must be supported by evidence of the disability.

Yet several years later, in *Hames v. Heckler*, a different panel of the circuit seized on that dicta from *Chaney* to hold that "[p]ain, in and of itself has been recognized as a disabling condition under the Act, but *only* where it is constant, unremitting, and wholly unresponsive to therapeutic treatment."[159] *Heckler* thus established in the Fifth Circuit a pain evaluation standard that is: (1) not present in the Act or any of the SSA's regulations, (2) based on an apparent misreading of the circuit's own prior case law, and (3) wholly inconsistent with the biology of chronic pain.[160]

More than one-third of other circuit courts now employ the Fifth Circuit's standard in some cases.[161] Although none of these circuits has adopted the standard across the board, each employs it selectively. Courts' selective use of this harsh and restrictive standard in some cases, but not in others, could result from any variety of factors from judges' beliefs about the appropriate scope of social programs to variable research quality among law clerks. It may also reflect judges' personal responses to a claimant, or type of pain syndrome, or a general skepticism toward pain claimants.

2. Normative Dimensions of Judge-Made Standards

The Seventh Circuit case *Carradine v. Barnhart* is just one case of many that illuminates the normative, rather than doctrinal or medical, values that play into mobilizing the "constant, unremitting, and totally

156. *Id.* (emphasis added).

157. *See id.*

158. *See id.*

159. Hames v. Heckler, 707 F.2d 162, 166 (5th Cir. 1983) (emphasis added).

160. *See supra*, Part II.A.

161. *See* Torres-Rosas v. Bowen, 678 F. Supp. 420 (S.D.N.Y. 1987); Summers v. Colvin, No. 12CV22WMC, 2013 WL 6564451 (W.D. Wis. Dec. 13, 2013).

unresponsive to therapeutic treatment" standard.[162] In *Carradine*, a panel of the Seventh Circuit reversed the finding of the ALJ that the claimant was not disabled due to chronic back pain.[163] The plaintiff had endured several spinal surgeries, had a morphine pump implanted in her spine, and had severely curtailed her daily activities, but reported that she occasionally could take short walks or do some shopping.[164] She did not have a history of mental illness.[165] However, she lacked evidence of spinal abnormality or other visible causes of the alleged severe chronic pain.[166]

Working within the constraints imposed by the regulations that a claimant cannot be disabled due to chronic pain without providing evidence of an objective medical condition that could produce the pain, Judge Posner penned a majority opinion finding Carradine disabled due to psychogenic pain, "somatoform pain disorder."[167] Carradine's case presented no evidence of psychiatric disability independent of her persistent back pain.[168] Yet, because Carradine did not have evidence of gross abnormalities or a disease independent of back pain itself, the court was constrained by the regulations either to find that she was not disabled or that Carradine's disability originated in a psychiatric disorder. Crediting the record that Carradine had endured risky and painful surgeries to find relief from her pain and that she increasingly withdrew from pleasurable life activities, the majority was unwilling to find that she was not both experiencing pain and disabled by it.[169] Accordingly, it crafted a remedy through relying on the psychiatric diagnosis available under the regulations.

The majority holding engendered a blistering dissent, written almost entirely in *italics* with **bold for emphasis**, mobilizing the "constant, unremitting, and wholly unresponsive to therapeutic treatment" standard.[170] What makes the dissent remarkable beyond its typography is that it baldly asserts that chronic pain in the absence of evident peripheral injury simply does not exist—and that any claim to the contrary is pure fakery. The dissent berates the majority for failing to apply the "constant, unremitting, and wholly unresponsive to therapeutic treatment" standard.[171] It notes that Carradine admitted that, on good days, she could take a short walk with her

162. Carradine v. Barnhart, 360 F.3d 751 (7th Cir. 2004).
163. *Id*. at 756.
164. *Id*. at 755–56.
165. *Id.* at 761 (Coffey, J., dissenting).
166. *Id*. at 760.
167. *Id*. at 756 (majority opinion).
168. *Contra id*. at 760 (Coffey, J., dissenting).
169. *Id.* at 755–56 (majority opinion).
170. *Id*. at 762 (Coffey, J., dissenting).
171. *Id*.

daughter; this, the dissent emphasizes, shows that the pain is not "constant and unremitting" and, therefore, not disabling.[172] It goes on to assert that any pain without a clear peripheral cause, like Mrs. Carradine's back pain, is either imagined or faked.[173]

While the majority employs the psychiatric route as a way to compensate a claimant, the dissent argues the reverse: that people with psychogenic pain should not be rewarded.[174] Such rewards, the dissent argues, just encourages what is, in effect, bad behavior—like giving a child an ice cream for a temper tantrum. In this manner, the dissent reinforces the stereotype that chronic pain patients are self-indulgent malingerers or hysterics and that the only remedy they deserve is the sharp admonition to snap out of it.

The *Carradine* dissent is exemplary in tipping its normative hand: An adjudicator in the Fifth Circuit would be constrained to apply this standard, which is part of that jurisdiction's precedent. Yet, in jurisdictions like the Seventh Circuit, where this standard is uncommon, an adjudicator must make an affirmative choice to adopt it as an expression of a negative perception of pain-based disability. Further, although the *Carradine* dissent stands out in its vitriol toward the claimant and chronic pain claimants generally, it is not substantively an aberration. Certain judges across the country selectively apply the "constant, unremitting, and wholly unresponsive" standard, and two lower courts have held consistently with this appellate dissent.[175]

Ironically, the majority's need to rely on the psychiatric diagnosis to support its disability finding feeds into the very stereotypes that animate the dissent. The majority, however, took this route because it was constrained by the regulations to find a psychiatric cause of disability. This means that the regulations themselves, in their attempt to provide a compensable category of disability for chronic pain without lesion through the somatoform diagnosis, undermine their purpose by misdescribing many chronic pain syndromes and by marginalizing chronic pain sufferers as mentally ill. Perhaps with greater medical knowledge and objective proof of the mechanisms that cause chronic pain, prevalent norms of skepticism and hostility toward chronic pain claimants can be supplanted.

172. *Id*. at 772 n.19.

173. *Id.* at 771.

174. *See id.* at 764.

175. *See* Moore v. Colvin, 743 F.3d 1118, 1126 (7th Cir. 2014); Ormon v. Astrue, 497 F. App'x. 81 (1st Cir. 2012); Goodhart v. Astrue, No. 4:08CV82ASAPR, 2009 WL 1952019, at *5 (N.D. Ind. July 6, 2009).

IV. NEUROIMAGING SHOULD CHANGE "SOFT" AND "HARD" EVIDENTIARY PRACTICES

This Part explores neuroimaging evidence in light of the "hard" and "soft" practices of evidence law—that is, relative to the text of the rules as well as in light of the arguably more important norms and expectations that decision makers use to give content and meaning to those rules. These norms and expectations shape not only judges' evidentiary calls but also their statutory interpretation practices and, thus, the creation of doctrine. This section will argue that neuroimaging currently ought to have some impact on both hard and soft practices, but far more on the latter.

Evidence practice at trial consists of more than the application of the rules; it embraces the narrative character of the trial and extends to the evaluative process of judges and juries. These "soft" practices shape the trial process from the earliest stages of case building through to the appellate process, as decision makers at each stage evaluate evidentiary relevance, weight, and prejudice in light of their cultural and narrative expectations. Partly rooted in fear of fraud, partly in Freudian misconceptions of "hysteria," soft practices of evidence relating to pain claimants may reflect entrenched biases. Judges and juries' norms and expectations about chronic pain claimants and about the type of evidence required to make the claims credible should and likely will change in light of the new neuroscientific model of chronic pain.

Neuroimaging evidence likely will find its way into the "hard" practices of evidence. In some cases, it likely will be appropriate to admit some neuroimaging studies of chronic pain into evidence under the federal and state evidence rules. Aggregate data about the average impact of pain conditions can inform doctrines relating to pain claims and expectations about the likely presentation and life course of a typical pain sufferer. Currently, however, neuroimaging should not be introduced to support or attack an individual's claim relating to chronic pain.[176] This is because of certain limitations of neuroimaging technologies and the medical variability of chronic pain conditions.

This Part will look first at how "soft" evidentiary practices may be shifted by pain neuroimaging. It explores several evidentiary theories to explain how existing background expectations—whether called narratives, scripts, or another of the myriad terms scholars use for like phenomena—about chronic pain distort the legal process. It offers specific suggestions for how new scientific models can change social and legal constructions in this arena, thus affecting evidence admissibility and weight and, ultimately, the outcomes of cases. It then turns to "hard" evidence practices,

176. *See infra* Part V.B.

considering how pain neuroimaging evidence should be evaluated under federal, state, and administrative evidence regimes. It concludes that pain neuroimaging and related research ought to be admissible in appropriate cases at the aggregate level but not to prove pain in any individual case.

A. "Soft" Evidentiary Practices Shape the Litigation Process

1. Narrative, Norms, and the Meaning of Proof: The Soft Side of Evidence Law

The kind and degree of proof that satisfies a reasonable person relates to his or her understanding of the nature of the problem under consideration. Claims about expected or common events seem relatively plausible; these might be called "confirming" claims because they agree with the average decision maker's lived experience and expectations. Claims about rare or unexpected events, conversely, invite relative skepticism; these might be called "confounding" claims because they confound the average decision maker's experience, expectations, or beliefs. Confirming claims require less, and less specialized, evidence than confounding claims, which may require extraordinary proof or even strike the relevant decision maker as unprovable.

Chronic pain presents confounding claims because most decision makers have little direct experience of such conditions; further, they are likely to hold common but mistaken beliefs about chronic pain's causes, presentation, and persistence. Indeed, there is active disinformation about chronic pain; a dominant cultural narrative depicts chronic pain conditions as expressions of neurosis or hysteria, and legal doctrines, like those in disability law, directly incorporate this narrative into law.

Whether a claim is confirming or confounding—whether it accords with background norms and expectations—has implications for the entire legal process and for evidence law in particular. Evidence scholarship must attend not only to the ways in which background expectations generally influence the fact-finding process but to instances where specific, erroneous expectations distort the legal process. These distortions can affect evidence admissibility determinations, the degree of weight that decision makers give to admitted evidence, the ways in which decision makers evaluate evidence against the relevant legal standard, and the conclusions that they reach in the matter.[177]

177. Lisa Kern Griffin, *Narrative, Truth, and Trial*, 101 GEO. L.J. 281, 315 (2013) (noting that background expectations or narrative assumptions present "procedural issues from end to end in the process of adjudication").

The role of cultural expectations and scripts, or "narratives," is central to numerous theories of evidence law and, indeed, to theories of the construction of law itself. Preeminent legal scholars of the latter part of the twentieth century, like Robert Cover, put narrative at the center of the legal academy's agenda with articles like *Nomos and Narrative*, in which he argued that legal actors create a shared normative world—a *nomos*—through operative narratives and that all legal production and interpretation takes place within the *nomos*.[178] Narrative studies within law advanced the project of excavating contestable narratives and then of crafting counter-narratives and counter-histories to challenge them.[179] More contemporary theories of judicial and juror decision making have moved away from the literary emphasis of narrative theory, drawing instead on fields ranging from logical philosophy to behavioral economics.[180] These contemporary theories and older narrative-based theories share a central insight: Decision makers impose order on the teeming facts of the world by screening in evidence that is confirming and screening out evidence that is confounding, consistently preferring the interpretation that conforms to their expectations.

2. Confounding Claims and the Quantum of Proof Needed to "Prove"

Degrees of doubt often inversely shadow degrees of understanding and acceptance. Thresholds of proof track cultural narratives and evolve as those narratives evolve. Up through the mid-twentieth century, when it was commonly believed that women lied about consensual sex to protect their reputations for chastity or fabricated a rape claim entirely, more evidence of rape was necessary to render credible a complainant's allegation.[181] Statutes requiring independent corroboration of the rape victim's complaint, which have their roots in biblical law, were in force in jurisdictions in the United States through the 1970s.[182] Other formal

178. Robert M. Cover, *Nomos and Narrative*, 97 HARV. L. REV. 4, 4 (1983) [hereinafter Cover, *Nomos*]; *see also* Robert M. Cover, *The Folktales of Justice: Tales of Jurisdiction*, 14 CAP. U. L. REV. 179, 180 (1985) [hereinafter Cover, *Folktales*].

179. Narrative studies are not a single movement but a methodology engaged in by legal scholars working in various domains, particularly in critical race studies and in law and literature. For foundational works emphasizing the role of narrative in constructing law's *nomos*, see Cover, *Nomos*, *supra* note 178; Cover, *Folktales*, *supra* note 176; LON FULLER, THE LAW IN QUEST OF ITSELF (1940).

180. *See infra* notes 187–202 (discussing work by Pardo, Allen, Kahneman, Slovic, Tversky, and others).

181. Vivian Berger, *Man's Trial, Woman's Tribulation: Rape Cases in the Courtroom*, 77 COLUM. L. REV. 1, 4–9 (1977).

182. *See* Note, *The Rape Corroboration Requirement: Repeal Not Reform*, 81 YALE L.J. 1365, 1367–68 (1972); Irving Younger, *The Requirement of Corroboration in Prosecutions for Sex Offenses in New York*, 40 FORDHAM L. REV. 263, 264–67 (1971); *see also* Berger, *supra* note 181, at 9 (describing the history of the corroboration statutes).

sources of evidence practice, like pattern jury instructions, also embodied the doubt and skepticism facing rape complainants. Even into the 1980s, pattern jury instructions stated that failure to promptly report a claim of rape supported an inference of fabrication.[183] Another jury instruction, derived from Lord Hale, cautioned jurors that a rape accusation '"is one which is easily made. . . . [T]he law requires that you examine the testimony of the [alleged victim] with caution."[184]

Evidence law and practice in this area emerged from and reinforced norms of suspicion about women's veracity, especially as to matters of sex.[185] They incorporated, too, a concern about fraud: Fraudulent claims are easy to make and hard to disprove. In these areas, subsequent dialogue between research data and normative change has altered the landscape of proof—not so much through changes in law itself as through changes in the default expectations of the participants in the system.[186]

Chronic pain is not equivalent to crimes of sexual assault, and chronic pain claimants are not viewed in a manner directly equivalent to rape victims. But the former is an illustrative parallel to the latter for several reasons. Chronic pain affects both men and women but affects women disproportionately; background concerns about the unreliable female narrator thus affect pain claimants, too.[187] Chronic pain claims, like claims of sexual victimization, have long invited doubt and even presumptions of fabrication. And the hysterical or secondary gain theories of chronic pain share an origin with some of the psychoanalytic theories suggesting that women fantasize sexual violence, specifically because they enjoy the status of victimhood or the subjective feeling of victimization itself.[188] Further, and perhaps most importantly, the history of change in evidence law related

183. Berger, *supra* note 181, at 10 n.72; *see also* Dawn M. DuBois, *A Matter of Time: Evidence of a Victim's Prompt Complaint in New York*, 53 BROOK. L. REV. 1087 (1988) (describing the continued vitality of this rule in New York and other jurisdictions through the late 1980s).

184. Berger, *supra* note 181, at 10 (citing as an example a then-common jury instruction, California Jury Instructions, Crim. (CALJIC) No. 10.22 (3d ed. 1970)).

185. *Id.* at 11 (arguing that these features of rape evidence law "stem[] mainly from a deep distrust of the female accuser. Indeed, the quoted jury instructions all but make the point explicit.").

186. This is not to suggest that the reform project in these areas is complete. Despite formal changes, scholars argue that the legal process continues to be shaped by these troublingly persistent norms. Martha Chamallas, *Deepening the Legal Understanding of Bias: On Devaluation and Biased Prototypes*, 74 S. CAL. L. REV. 747, 778 (2001).

187. *See* Michael Finch, *Law and the Problem of Pain*, 74 U. CIN. L. REV. 285, 287 (2005); Diane E. Hoffmann & Anita J. Tarzian, *The Girl Who Cried Pain: A Bias Against Women in the Treatment of Pain*, 29 J.L. MED. & ETHICS 13 *passim* (2001).

188. *See* CHARLOTTE KRAUSE PROZAN, FEMINIST PSYCHOANALYTIC PSYCHOTHERAPY 160–62 (1992) (describing work of Helene Deutsch and Marie Bonaparte in developing early psychoanalytic theory of the female character as masochistic and thus prone to seeking and enjoying suffering). *Cf.* PAULA J. CAPLAN, THE MYTH OF WOMEN'S MASOCHISM (1985) (challenging characterization of the female character as masochistic).

to rape shows how evidence incorporates and reinforces background expectations or schemas about particular kinds of claimants.

Reliance on narratives and background expectations may conflict with "the truth-seeking goals of trial" and "risk distortions in fact-finding."[189] Several scholars have pointed to these risks and flaws in decision making as opportunities "to increase analytic processing" by nudging trials away from the narrative model.[190] It is likely that aspects of narrative are inescapable in the legal process; indeed, narrative may be essential to all legal endeavors, given that the structures and forms of the legal systems have emerged from human cognition. The purpose here would not be to remove narrative itself, but to change the narrative expectations and content.

Contemporary models offer a range of alternative accounts of how judges and jurors weigh diverse facts to reach a verdict or judgment. Like the narrative model, these models also rely heavily on decision makers' background assumptions about the world—that is, their norms and expectations. Michael Pardo and Ronald Allen have advanced a decision-making model that they call the "explanation-based model."[191] In their account, jurors engage in a technique of "inference to the best explanation," (known formally in logical philosophy as "abductive reasoning"), to arrive at a conclusion that reconciles the facts of the case in a way that is "simple" and "coherent."[192] By "coherent," Pardo and Allen mean a story that "better accords with background beliefs . . . ."[193] As in the narrative model, the abductive or explanation-based model describes and predicts that decision makers discount or outright reject facts that do not comport with their background beliefs. Thus, background beliefs do a large share of the work in both explaining how decision makers weigh evidence and in constituting what counts as legal proof.

Evidence scholarship that draws on behavioral economics also supports the role of background expectations or culturally received stories. Several of the key heuristics and biases identified by behavioral economics support the conclusion that decision makers prefer confirming stories and resist confounding stories. Following the influential work of Amos Tversky and Daniel Kahneman, prominent scholars like Dan Simon have explored the

189. Griffin, *supra* note 177, at 285.

190. *Id.*; Michael S. Pardo & Ronald J. Allen, *Juridical Proof and the Best Explanation*, 27 LAW & PHIL. 223, 225 n.3 (2008).

191. Pardo & Allen, *supra* note 190, at 225.

192. *Id.* at 226.

193. *Id.* at 230; *see also* Nancy Pennington & Reid Hastie, *A Cognitive Theory of Juror Decision Making: The Story Model*, 13 CARDOZO L. REV. 519, 521 (1991).

implications of a "two system" method of decision making.[194] The "two system" hypothesis posits that people engage functionally (albeit not neurologically) distinct cognitive systems for making different kinds of decisions.[195] People mobilize System 1 for rapid, intuitive decision making; they mobilize a functionally distinct System 2 for more considered or "rational" decisions.

Decisions achieved via one system are not necessarily better than those achieved by the other; both forms of decision making have strengths and weaknesses. However, empirical research demonstrates that rapid System 1 decisions are highly *in*accurate when subjects rely on intuition about subjects in which they do not have deep experience.[196] This is troubling because most daily decision making could be described as System 1; yet, most of the decisions one must reach in a legal context are outside of the ordinary experience of decision makers. Where intuitive decision making is not grounded in experience or expertise, but instead informed by received cultural stories and "common sense," it tends to recapitulate misinformation and stereotype. Such research suggests, depressingly, most people's intuitions are wrong most of the time—even though, to the decision maker, the intuitive decision feels so right.[197]

Mobilizing the language of narrative theory and of behavioral economics, Professor Griffin argues that behavioral economics research confirms the ways in which narrative has a significant effect on fact finding.[198] Narrative expectations, she argues, "provide[] a deep structure inside the courtroom just as [they do] outside of it . . . ."[199] This is because judges and jurors exhibit "confirmation bias"—that is, the tendency to "interpret evidence in a fashion that supports existing preferences, beliefs, expectations, and theories."[200] Further, in "moments of uncertainty," judges and jurors (like all people faced with complex or uncertain decisions) display "belief perseverance," which makes them "more likely to doubt evidence that conflicts with a preexisting paradigm and to interpret what is

194. Dan Simon, *The Limited Diagnosticity of Criminal Trials*, 64 VAND. L. REV. 143, 184 (2011).

195. *Id.* at 184–85.

196. And even some kinds of expert intuition can be highly inaccurate. *See* DANIEL KAHNEMAN, THINKING, FAST AND SLOW 234–44 (2011) (discussing when expert opinions are, and are not, reliable).

197. *Id.*

198. Griffin, *supra* note 177, at 291.

199. *Id*. at 293.

200. *Id*. at 313 (citing D. Michael Risinger et al., *The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 CAL. L. REV. 1, 7, 15 (2002)). For the foundational work in behavioral economics, including work on confirmation bias, see JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES (Daniel Kahneman, Paul Slovic & Amos Tversky eds., 1982).

ambiguous as consistent with that belief."[201] Yet, such decision makers *feel* that they have come to accurate, factual decisions, rejecting that "implicit emotional response[s]" could affect them as "source[s] of prejudice."[202]

These accounts—narrative, abductive, and behavioral economic—about how cognitive processes shape evidence law and trial process share a fundamental premise.[203] Background expectations about the nature of the world and people's behavior shape what decision makers credit as proof, how they weigh such proof, and the conclusions that they draw from such proof. These theories are all formalized ways of stating that people (a) reject as implausible that which conflicts with what they believe they know and (b) seek to construct accounts from evidence that comport with their beliefs "about what typically happens in the world."[204] And rightly so; it would be impossible to navigate the world without relying on background expectations. Yet, unstated background expectations can also lead to systematic prejudices and errors, as the next section will explore.

B. "Soft" Practices of Evidence Law Encode Bias

While reliance on story and archetype are not inherently objectionable and may be unavoidable, it is important to attend to where narrative operates and to its particular content. "[A]djudication produces institutionalized meaning from evidence"; thus it is important to examine "constructs and procedures" that facilitate or inhibit the accuracy of the legal process.[205] Indeed, evidence law and practice is rife with examples of the ways in which background expectations distort the fact-finding process and lead decision makers astray. Just a few include the common bias in favor of the reliability of—and, hence, both admissibility and weight accorded to—eyewitness identifications,[206] the correlation between a

201. Griffin, *supra* note 177, at 312–13 n. 178 (citing Charles G. Lord et al., *Biased Assimilation and Attitude Polarization: The Effects of Prior Theories on Subsequently Considered Evidence*, 37 J. PERSONALITY & SOC. PSYCHOL. 2098, 2099 (1979) ("[J]udgments about the validity, reliability, relevance, and sometimes even the meaning of proffered evidence are biased by the apparent consistency of that evidence with the perceiver's theories and expectations.")).

202. Griffin, *supra* note 177, at 314.

203. *See id.* at 294 (noting that these several "theories contemplate that jurors will draw upon their own backgrounds to construct and evaluate explanations for the evidence").

204. Pennington & Hastie, *supra* note 193, at 522, 589.

205. Griffin, *supra* note 177, at 290.

206. *See* Tanja Rapus Benton et al., *Eyewitness Memory Is Still Not Common Sense: Comparing Jurors, Judges and Law Enforcement to Eyewitness Experts*, 20 APPLIED COGNITIVE PSYCHOLOGY 115, 119–20 (2006); *see also, e.g.*, United States v. Smithers, 212 F.3d 306 (6th Cir. 2000) (reversing district court's exclusion of expert testimony on reliability of eyewitness identification); United States v. Downing, 753 F.2d 1224 (3d Cir. 1985) (holding expert testimony on eyewitness reliability to be admissible).

witness's confidence in a memory and the accuracy of that memory,[207] and the disproportionate credibility decision makers assign to forensic sciences (the so-called "CSI effect").[208]

The chronic pain claimant currently faces high degrees of skepticism—she is "the girl who cried pain."[209] But this, too, is likely to change as greater understanding of the facts of chronic pain diseases spread through legal and general culture. Judicial and continuing legal education, and the use of expert witnesses to educate juries (and judges) within the courtroom, can change the normative and factual expectations of the participants within these systems.

Adjudicators' skepticism of, or hostility toward, chronic pain claimants may arise in some part from a pre-scientific vision of pain as emotional dysfunction, which emerged from a historical literature that few readers today would recognize as medical or scientific: the "anecdata" of the psychoanalytic case history, like the Anna O. case discussed in Part I, which are an often highly unreliable narrative form. These tropes continue to be peddled today; even a cursory Amazon.com search reveals dozens of popular books extoling the premise that a person who adjusts her attitude and acknowledges her emotions will free herself of persistent chronic pain—in as little as one day.[210] Similarly, there is an industry of defense experts that supports this relationship.[211]

Contemporary pain researchers acknowledge the essential interrelationship of one's emotional life and the life of the body, but not in this magical, mind-over-matter manner.[212] Along with rejecting hysteria as the etiology of chronic pain, mainstream pain scientists similarly make short shrift of previously popular ideas like "secondary gain," the increasingly-discredited notion that people with long-term, unexplained chronic pain unconsciously exaggerate or manufacture their pain because

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207. Jules Epstein, *The Great Engine That Couldn't: Science, Mistaken Identifications, and the Limits of Cross-Examination*, 36 STETSON L. REV. 727, 739, 745 (2007); 35 AM. JUR. 3d *Proof of Facts* § 46 ("[I]n study after study, it has been demonstrated that one's confidence in the accuracy [of] the recollection of an event is not a good predictor of the actual accuracy of the recall."); United States v. Stevens, 935 F.2d 1380, 1400 (3d Cir. 1991) (approving testimony of the low correlation between confidence and accuracy "[t]o rebut the natural assumption that such a strong expression of confidence indicates an unusually reliable identification").

208. *See* Evan W. Durnal, *Crime Scene Investigation (As Seen on TV)*, FORENSIC SCI. INT'L, June 15, 2010, at 1.

209. *See* Hoffmann & Tarzian, *supra* note 187.

210. John E. Sarno publishes bestsellers promising that people can be free of chronic pain by letting go of perfectionism and repressed anger. *See, e.g.*, JOHN E. SARNO, HEALING BACK PAIN: THE MIND-BODY CONNECTION (2010); JOHN E. SARNO, MIND OVER BACK PAIN (1999).

211. *See* Finch, *supra* note 187, at 301 n.115 and accompanying text (collecting cases, with examples).

212. *See infra* notes 214–217 and accompanying text.

they enjoy the status, attention, or other intangible benefits that come to them by virtue of being disabled.[213]

Emotion and pain are related in important ways. First and foremost, pain creates a negative emotional experience (if we perceived it as a positive experience, it would be pleasure).[214] Chronic pain has emotional consequences as sufferers miss out on living the lives they had or wish they could have; social isolation, loss of work, loss of income, and, of course, constant suffering, lead to understandable emotional distress.[215] Chronic pain compromises the brain's cognitive and affective functioning, creating cognitive and emotional difficulties as a side effect of the pain syndrome.[216] Depressed mood and stress can augment the experience of pain, while pleasurable and distracting activities, and strong social support, can moderate pain.[217]

Yet, the one way in which emotion and chronic pain most frequently are *not* related is the one embedded in our legal system: that chronic pain is predominantly a form of hysteria in which emotionally-disturbed people unconsciously generate the experience of pain. The next section proposes ways in which this new understanding of chronic pain, and of the relationship between chronic pain and emotion, should reform evidentiary doctrines and practices related to chronic pain.

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213. David Servan-Schreiber et al., *Somatizing Patients: Part I. Practical Diagnosis*, 61 AM. FAM. PHYSICIAN 1073, 1075 (2000) ("[T]he somatizing patient seems to seek the sick role, which affords relief from stressful or impossible interpersonal expectations . . . and, in most societies, provides attention, caring and sometimes even monetary reward . . . ."). *See* Rollin M. Gallagher, *Secondary Gain in Pain Medicine: Let Us Stick with Biobehavioral Data*, 3 AM. PAIN SOC'Y J. 274, 274 (1994). *See generally* David A. Fishbain, *Secondary Gain Concept: Definition Problems and Its Abuse in Medical Practice*, 3 AM. PAIN SOC'Y J. 264 (1994).

214. Ronald Melzack and P.D. Wall formalized the relationship between physical and affective in the experience of pain in their landmark 1965 paper *The Gate Control Theory of Pain*. *See* Ronald Melzack & P.D. Wall, *The Gate Control Theory of Pain: A Re-Examination and Re-Statement*, 101 BRAIN 1 (1978) (updating and augmenting the 1965 paper that proposed the original model). Since 1979, the standard medical definition of pain has described pain's dual composition as "[a]n unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." INTERNATIONAL ASSOCIATION FOR THE STUDY OF PAIN, PAIN TERM: A CURRENT LIST WITH DEFINITIONS AND NOTES ON USAGE (2011), *available at* http://iasp.files.cms-plus.com/Content/ContentFolders/Publications2/ClassificationofChronicPain/Part_III-PainTerms.pdf (defining "pain").

215. David A. Fishbain et al., *Chronic Pain-Associated Depression: Antecedent or Consequence of Chronic Pain? A Review*, 13 CLINICAL J. OF PAIN 116, 137 (1997) (meta-analysis of research assessing the relationship of chronic pain and depression; concluding that most chronic pain patients develop depression subsequent to and resulting from chronic pain).

216. A. Vania Apkarian et al., *Chronic Pain Patients Are Impaired on an Emotional Decision-Making Task*, 108 PAIN 129, 129, 136 (2004) (finding "that chronic pain is associated with a specific cognitive deficit, which may impact everyday behavior especially in . . . emotionally laden[] situations"; hypothesizing that pain interferes with affective processing, leading to reduced affective decision-making performance).

217. Katja Wiech & Irene Tracey, *The Influence of Negative Emotions on Pain: Behavioral Effects and Neural Mechanisms*, 47 NEUROIMAGE 987 (2009) (surveying literature on point).

C. New "Soft" Evidentiary Norms for Adjudicators and Fact Finders

A new set of norms about chronic pain ought to be incorporated into the legal system to unseat the pejorative and medically outmoded premises built into the SSDI regime, judicial interpretations of SSDI regulations, and decisions makers' presumptions in non-SSDI cases. This section presents a new, suggested set of default norms.

From a rebuttable presumption of hysteria or fraud to a neutral presumption. The first and most important normative shift around chronic pain starts with baseline presumptions. Although not universal, a common presumption is that the chronic pain claimant is mentally ill or is fabricating the claim. In place of this pejorative norm, with its lingering Freudianism, there ought to be a neutral presumption that the pain claimant, like any other disability or tort claimant, may or may not be credible and needs to prove her case.

Chronic pain is not a form of mental illness. Chronic pain is not a mental illness and typically does not result from mental illness. Depressive illness and cognitive impairment more often follow the development of a chronic pain condition than precede it. In a subset of chronic pain patients, a history of trauma may have created a biological predisposition to develop chronic pain in response to an injury. Whether a claimant had this latent predisposition does not make the condition the claimant's fault, nor does it mean that he or she can fix the subsequently-developed pain condition through addressing the emotional issue. Rather, it makes these individuals the classic vulnerable victims or "glass jaw" plaintiffs.

Psychogenic pain conditions do occur. However, as the DSM-IV cautions, these conditions are rare and unusual. According to the DSM-IV, psychiatrists (and others) should be reluctant to diagnose psychogenic pain or somatoform disorder in the absence of clear indicators that the chronic pain condition does not result primarily from a non-psychiatric medical condition.[218]

Chronic pain cannot be braved away with a positive attitude. Culturally-received stories of people being miraculously cured of their chronic pain through identifying and resolving an emotional conflict are just that—stories. They may in some cases be true stories, just as some religious believers in fact experience remission of disease symptoms through faith healing. Yet, such anecdotes do not prove that chronic pain can be talked away through psychotherapy or braved away through positive thinking any more than faith healing experiences suggest that most hospitals should be converted into churches.

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218. TASK FORCE ON DSM-IV, AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS, DSM-IV-TR 490, 503 (4th ed. rev. 2000).

Chronic pain fluctuates, and chronic pain conditions can be relapsing-remitting. People with chronic pain conditions have good days and bad days. These good days and bad days may relate to the lifecourse of the disease or to patient-specific or external factors, including degree of social support, physical therapy, medical treatment, financial and other pressures, and overall mood.[219] In an otherwise medically well-substantiated case, decision makers should understand that the presence of good days does not mean the person is faking it on the bad days, nor should they see the positive impact of social and emotional support as a sign that the pain condition is emotional in origin. This understanding of chronic pain as inherently variable, relapsing/remitting, and affected by life circumstances, is contrary to the Fifth Circuit standard that, to be legally disabling, chronic pain must be "constant, unremitting, and wholly unresponsive to therapeutic treatment."[220]

Paternalism toward chronic pain patients is inappropriate and anti-therapeutic. Decision makers adjudicating chronic pain claims at times adopt a questionable paternalism toward chronic pain claimants. One such notion is that attention and compensation perpetuate the claimant's pain by "rewarding" the pain behavior. This belief leads to the conclusion that chronic pain claimants need to be denied compensation as a kind of "tough love" that will help them move on with their lives. There are three problems with this approach, one of which is factual and two of which are legal. The factual issue is that there is no evidence that the reward theory is true, and a lot of evidence that it is not.[221] The first legal issue is that this approach violates horizontal equity: As to no other condition or category of claimants do decision makers argue that they ought to withhold otherwise merited compensation for the good of the claimant. The second legal-theoretical problem with the reward theory relates to the institutional role of the decision maker. Judges have an important and appropriate role in interpreting law and regulations and in developing the common law. Doing so is not judicial activism, it is judicial performance. However, if a law or regulation provides that a disability is compensable, or tort law provides that a negligently caused impairment is compensable, then it is inappropriate activism for the judge to treat differently one category of disabilities or impairments based on beliefs about what would be good for the plaintiff/claimant.

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219. Decision makers should understand that, although low mood can exacerbate pain, depressed mood itself generally does not cause chronic pain. *See supra* notes 214–217.

220. *See supra* Section III.C.1.

221. Nicholas Shenker, et al., *Developing Concepts in Allodynic Pain*, 8 CLIN. MED. 79, 79 (2008) (dismissing secondary gain as medically unsubstantiated, blaming "legal profession" for perpetuating the concept).

V. CHRONIC PAIN NEUROIMAGING AND "HARD" EVIDENCE PRACTICES: THE CASE FOR LIMITED ADMISSIBILITY OF PAIN NEUROIMAGING

Moving on from "soft" evidentiary considerations involving norms and narratives, this Part considers "hard" or black letter legal questions about the admissibility of expert evidence concerning chronic pain that emerges from pain neuroimaging studies. Neuroimaging, and testimony about such neuroimaging, concerning the ways chronic pain changes the brain ought to be admissible in suitable cases. Such evidence will not be relevant in every case involving a chronic pain claim. The best and most valid uses of such evidence will be to inform the fact finders' and adjudicators' understanding of what chronic pain is and to assist them in their evaluation of the rest of the evidence. Aggregate neuroimaging evidence showing how chronic pain changes the brain can educate the fact finder, first, about the reality of chronic pain diseases and, second, about how a particular chronic pain condition may *on average* affect sufferers' brains and behaviors. It should not, however, be admitted to prove or disprove the presence of chronic pain in any individual claimant, as neuroimaging techniques are not sufficiently reliable at the individual level.

Claims involving chronic pain may arise in federal, state, or administrative proceedings. This Part opens by briefly describing the federal, state, and Social Security administrative ("SSA") standards for admitting expert medical and scientific evidence. These evidentiary regimes differ in important ways; they vary as to whether they prescribe specific tests for the qualifications of experts and expert evidence, and if so, as to the tests they prescribe. Yet the touchstone of admissibility across all of them is the same: whether the evidence is relevant and whether its relevance outweighs its potential to mislead or confuse the finder of fact. Thus, while recognizing the ways in which these evidentiary regimes vary, this Part offers largely consistent proposals for what types of pain neuroimaging evidence should, and should not, be admitted in federal, state, or SSA proceedings.

A. Federal, State, and Administrative Admissibility Standards

Federal, state, and SSA rules for the admissibility of expert scientific and medical evidence are designed to admit evidence that is relevant and helpful to the fact finder, and to exclude evidence that is not. These three regimes may be characterized as falling on a continuum, on which the SSA is the most liberal in admitting medical and scientific evidence, the Federal Rules of Evidence occupy a middle ground, and state evidence laws modeled on the *Frye* standard are the most restrictive. Despite their differences, however, relevant neuroimaging evidence offered to educate

the finder of fact about various pain conditions ought to satisfy each of these admissibility standards. This short section describes standards for expert evidence under each of these regimes and then applies these standards to evaluate the admissibility of this type of evidence.

1. Federal Rules of Evidence

Federal Rules of Evidence 401 and 702 govern the admissibility of expert evidence, including scientific and medical evidence.[222] Rule 401 provides that all relevant evidence is admissible, unless it is subject to some special exclusion; evidence is not admissible if it is not relevant.[223] Once a court has determined that proffered expert evidence is relevant, it evaluates its admissibility under Rule 702, which governs expert evidence. The touchstone of admissibility under Rule 702 is whether the expert evidence will "help the trier of fact to understand the evidence or to determine a fact in issue."[224] If a matter is within the experience and understanding of jurors, expert evidence on that matter is not admissible because of the concern that the expert will usurp the function of the jury. If a matter is outside of the understanding and experience of the typical juror, and it is material to the determination of some aspect of the case, a court may admit expert testimony to enable jurors to come to an informed conclusion about the matter.[225]

After a court determines that expert evidence may aid the jury, the burden is on the proponent of the evidence to demonstrate that it satisfies threshold requirements set forth in Rule 702. Rule 702, which incorporates standards that the Supreme Court developed in *Daubert v. Merrill Dow Pharmaceuticals*,[226] requires that the expert testimony be "based on sufficient facts or data" and that it be "the product of reliable principles and methods."[227] Finally, the expert must have "applied the principles and methods [reliably] to the facts of the case."[228] Even evidence based on reliable principles and methods, though, must be excluded if "there is simply too great an analytical gap between the data and the opinion proffered."[229]

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222. FED. R. EVID. 401, 702.

223. FED. R. EVID. 401.

224. FED. R. EVID. 702.

225. FED. R. EVID. 702(a) (expert witnesses may testify as to matters of opinion if the opinion "will help the trier of fact to understand the evidence or to determine a fact in issue").

226. 509 U.S. 579 (1993).

227. FED. R. EVID. 702.

228. *Id.*

229. Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997) ("[C]onclusions and methodology are not entirely distinct from one another. . . . A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered.").

The precise meaning of these requirements has given rise to a large body of literature and some significant dispute.[230] The rule itself offers no guidance on what makes a principle or method "reliable," or on what makes facts and data "sufficient." Further, the rule is entirely silent on how a court ought to determine whether the principles and methods—even if reliable and sufficient—are adequately related to the expert's conclusion. *Daubert* lists a few illustrative factors that a trial judge may consider to assess the reliability and sufficiency of expert evidence. These include whether the "the theory or technique . . . has been subjected to peer review," whether it has a "known or potential error rate," and "whether it has attracted widespread acceptance within a relevant scientific community."[231]

As Professor Eleanor Swift has noted, this standard grants wide latitude to trial judges as gatekeepers of scientific evidence.[232] Scholars and judges agree that it tends toward liberal admissibility: Many judges engage in limited independent evaluation of medical, scientific, or other expert evidence and instead trust the adversary process to test evidence through a "battle of [the] experts."[233]

2. State Rules of Evidence

State evidence codes, like the Federal Rules of Evidence, also condition the admissibility of any evidence on its relevance: Relevant evidence is presumptively admissible while irrelevant evidence is not.[234] However, many states apply a standard to expert evidence that is more restrictive than the federal standard, excluding otherwise-relevant evidence if it has not gained "general acceptance" within the relevant expert community.[235] This general acceptance standard, first articulated in *Frye v.*

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230. Julie A. Seaman, *Triangulating Testimonial Hearsay: The Constitutional Boundaries of Expert Opinion Testimony*, 96 GEO. L.J. 827 (2008); Thomas A. Mauet, *The New World of Experts in Federal and State Courts*, 25 AM. J. TRIAL ADVOC. 223 (2001).

231. *Daubert*, 509 U.S. at 580.

232. Eleanor Swift, *One Hundred Years of Evidence Law Reform: Thayer's Triumph*, 88 CAL. L. REV. 2437 (2000).

233. Neil Vidmar & Shari Seidman Diamond, *Juries and Expert Evidence*, 66 BROOK. L. REV. 1121, 1125–26 (2001) (surveying scholarly and judicial opinion).

234. State evidence codes have provisions that are analogous or identical to Rule 401. *Compare* FED. R. EVID. 401 ("Evidence is relevant if: (a) it has any tendency to make a fact more or less probable than it would be without the evidence; and (b) the fact is of consequence in determining the action."), *with* CAL. EVID. CODE § 210 (West 2014) ("'Relevant evidence' means evidence, including evidence relevant to the credibility of a witness or hearsay declarant, having any tendency in reason to prove or disprove any disputed fact that is of consequence to the determination of the action."), *and* TEX. R. EVID. 401 (West 2014) ("'Relevant evidence' means evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable than it would be without the evidence.").

235. Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

United States nearly a century ago,[236] remains in use to some degree in many states.[237] Different states, however, apply *Frye* somewhat differently: Some adhere to *Frye* strictly, while others merely consider general acceptance as one factor in the admissibility determination. In many states that ostensibly follow *Frye*, judges engage in a broader reliability inquiry similar to the inquiry under Federal Rule of Evidence 702.[238]

To determine whether expert evidence has gained general acceptance under *Frye* or a *Frye*-like test, courts principally look at whether the evidence itself, or the techniques and methods from which it is derived, have achieved particular status in the relevant expert community.[239] Courts may look at whether the evidence is considered uncontroversial within the research field, or whether the evidence or methods on which it is based appear in textbooks and major treatises. This inquiry is significantly more conservative than under the federal rule, because scientific and medical consensus can take decades to achieve, if consensus emerges at all. Additionally, the *Frye* test provides a different role for the judge: Under the federal rule, the judge must determine the reliability of expert evidence; under *Frye*, the judge must delegate that determination to experts in the field by establishing whether they would find the evidence acceptable.

3. SSA Administrative Proceedings

In administrative proceedings, the administrative law judge (ALJ) is both trier of law and finder of fact, much like a state or federal judge in a bench trial.[240] All agency proceedings are governed by the Administrative Procedure Act (APA).[241] The APA authorizes agencies to take evidence in their proceedings; yet, it does not provide rules of evidence. Instead, agencies promulgate their own evidentiary rules and practices. This short section focuses exclusively on the evidentiary rules and procedures of the

236. *Id.*

237. States still following *Frye* include: California, Illinois, Kansas, Maryland, Minnesota, New Jersey, New York, Pennsylvania, and Washington. People v. Leahy, 882 P.2d 321, 323 (Cal. 1994); *In re* Commitment of Simons, 821 N.E.2d 1184, 1188 (Ill. 2004); State v. Shively, 999 P.2d 952, 955 (Kan. 2000); Burral v. Maryland, 724 A.2d 65, 70 (Md.1999); Goeb v. Tharaldson, 615 N.W.2d 800, 803 (Minn. 2000); State v. Harvey, 699 A.2d 596, 621 (N.J. 1997); People v. Angelo, 666 N.E.2d 1333, 1335 (N.Y. 1996); Commonwealth v. Arroyo, 723 A.2d 162, 170 (Pa. 1999); Washington v. Copeland, 922 P.2d 1304, 1310 (Wash. 1996).

238. Edward K. Cheng & Albert H. Yoon, *Does* Frye *or* Daubert *Matter? A Study of Scientific Admissibility Standards*, 91 VA. L. REV. 471, 478–79 (2005) ("[I]n criminal cases, the adoption of the *Daubert* test, whether in state or federal court, had no statistically significant effect on admission rates.").

239. *Id.* at 476.

240. 20 C.F.R. § 405.1 (2013) states that "[a]ll adjudicators . . . have the authority to find facts and, if appropriate, to conduct a fair and impartial hearing in accordance with section 205(b) of the Act."

241. 5 U.S.C. § 556(d) (2012).

Social Security Administration because of that agency's role in adjudicating disability claims.

In SSA disability determinations, ALJs' evidentiary determinations are governed by a flexible, general standard rather than by a code equivalent to the Federal Rules of Evidence.[242] Title 20 C.F.R. § 405.350 states that the claimant has "[t]he right to appear and present evidence"[243] and that "[t]he administrative law judge may receive any evidence at the hearing that he or she believes relates to your claim."[244] Section 405.331 of the same title instructs the claimant to "submit with your request for hearing any evidence that you have available to you."[245] Evidence "must be complete and detailed enough" for an adjudicator to determine the existence of the disability and its duration and severity.[246] Additionally, section 405.1(c)(2) states that the SSA "also will consider any relevant information that we have in our records."[247]

Beyond these very general evidentiary provisions set forth in the federal regulations, the SSA has promulgated guidance for claimants in its Bluebook. The Bluebook instructs claimants that a disability claim requires medical evidence from treating physicians,[248] but that the SSA also accepts and reviews medical evidence from other "'acceptable medical sources.'"[249] An "acceptable medical source" includes a "nonexamining source," meaning a "physician, psychologist, or other acceptable medical source who has not examined you but provides a medical or other opinion in your case."[250] The Bluebook indicates in broad terms the kinds of expert evidence that a claimant may submit. Yet, unlike the federal and state rules, it does not establish any criteria relating to the quality of the expert evidence. These provisions constitute the entirety of the SSA regulations concerning the admissibility of evidence in disability proceedings, a stark contrast to the detailed federal and state rules of evidence and all their resulting interpretive case law.

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242. Title 20 C.F.R. § 405.1 (2013) sets forth the SSA's "procedures for adjudicating the disability portion of initial claims for entitlement to benefits based on disability under title II of the Social Security Act. . . ."

243. § 405.350(a).

244. § 405.350(b).

245. § 405.331(a).

246. 20 C.F.R. § 404.1513(d) (OASDI); 20 C.F.R. § 416.913(e) (SSI).

247. 20 C.F.R. § 405.1(c)(2).

248. *Disability Evaluation Under Social Security: Part II - Evidentiary Requirements*, SOCIAL SECURITY ADMINISTRATION, http://www.ssa.gov/disability/professionals/bluebook/evidentiary.htm (last visited Mar. 3, 2014).

249. *Id.*

250. 20 C.F.R. § 404.1502.

4. Common Features of These Regimes: Relevance and Reliability

Despite the formal differences between these regimes,[251] evidence determinations under all of these regimes share a common foundation: They are grounded in relevance, and to varying extents, they require reliability and helpfulness to the finder of fact.[252] Because of these similarities, the admissibility of neuroimaging evidence ought to be substantially similar in federal, state, and administrative proceedings.

All of these regimes depart from the presumption that all relevant evidence is admissible. Federal and state practice, although balanced in favor of the admissibility of all relevant evidence under Rule 401, do permit some relevant evidence to be excluded: Relevant evidence may be excluded if it is unfairly prejudicial, cumulative, or has the tendency to mislead or confuse the jury.[253] Relevant evidence also may be excluded if it constitutes impermissible hearsay or if it violates constitutional requirements, like the right of confrontation.[254] The SSA regime admits relevant evidence more liberally, as it has no special exclusions equivalent to the federal and state exclusionary rules.[255] Finally, the regulations impose an affirmative obligation on the SSA to search its own records for any relevant evidence and to bring such evidence forward in a proceeding.[256]

Federal and state evidence law specifies criteria designed to assist the judge in determining whether proffered expert evidence is reliable. The SSA regime appears to differ from the federal and state rules in that it does not set forth criteria for evaluating the reliability of expert evidence. Yet it, too, implicitly contains a reliability requirement: Evidence that is not at reliable cannot be relevant, since that which is false, misleading, or of indeterminate reliability cannot aid the search for truth.

Beyond relevance and reliability, to the extent that those criteria differ, federal and state rules also limit expert evidence to that which is "help[ful] [to] the trier of fact" by informing them on subjects outside of jurors' ordinary competence.[257] As with reliability, the SSA standard appears to be

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251. The evidentiary rules are relatively informal because the administrative proceeding is defined as "non-adversarial." 20 C.F.R. § 405.1(c)(1).

252. *See* William H. Kuehnle, *Standards of Evidence in Administrative Proceedings*, 49 N.Y.L SCH. L. REV. 829, 831 (2005).

253. FED. R. EVID. 403; *see also, e.g.*, MD. R. 5-403 (2013); NEB. REV. STAT. § 27-403 (2013); WIS. STAT. § 904.03 (2013).

254. *See* FED. R. EVID. 801 *et seq*.; U.S. CONST. amend. VI.

255. Hearsay evidence that would be excluded in a federal or state proceeding may be admitted in an SSA proceeding. Richardson v. Perales, 402 U.S. 389, 390 (1971).

256. 20 C.F.R. § 405.1(c)(2).

257. FED. R. EVID. 702(a) (expert witnesses may testify as to matters of opinion if the opinion "will help the trier of fact to understand the evidence or to determine a fact in issue"); Mukhtar v. Cal.

silent on this point yet implicitly mirrors the federal and state rules. Title 20 C.F.R. § 405.350 states in the conditional form that the "[t]he administrative law judge *may* receive any evidence . . . that he or she believes relates to your claim."[258] Since the judge is vested with discretion to determine what relevant evidence to include or exclude, this suggests he or she may determine which evidence will help to adjudicate the claim.

The broad similarity between these three evidence regimes argues that expert neuroscientific evidence, including evidence derived from pain neuroimaging, ought to be similarly admissible in federal, state, and SSA proceedings. States that follow *Frye* closely will apply the most restrictive standard. Yet, rigorous pain neuroimaging evidence offered for aggregate or educative purposes ought to pass even the *Frye* test in many cases.

Although there are differences between evidence regimes that will lead to admissibility differences at the margin, under all three regimes, aggregate neuroimaging evidence of chronic pain ought to be admissible if offered for a relevant purpose. The following section will propose use-cases in which pain neuroimaging could be relevant and in which it likely ought to be admissible under each evidence regime. It also sets forth the case for why neuroimaging currently ought to be admissible only for aggregate purposes, while pointing to a future in which scans of individual claimants may be sufficiently rigorous to merit admission.

B. Recommendations on the Admissibility of Pain Neuroimaging Evidence

This section first proposes the major categories in which neuroscience-based evidence about chronic pain conditions may be relevant. It then suggests what kinds of neuroscience evidence may be sufficiently reliable to gain admissibility under all three evidence regimes and what kinds of evidence, or what claims relative to chronic pain neuroscience evidence, may not be sufficiently reliable to pass one or more of the federal, state, and SSA evidentiary thresholds. This focus on relevance first, and then reliability, mirrors the architecture of the Federal Rules, whose drafters logically suggested that relevance precedes all other considerations.

State Univ., Hayward, 299 F.3d 1053, 1065 n.9 (9th Cir. 2002) (quoting United States v. Vallejo, 237 F.3d 1008, 1019 (9th Cir. 2001)) (expert opinion should "address an issue beyond the common knowledge of the average layman"); New Jersey v. Torres, 874 A.2d 1084, 1096 (N.J. 2005) ("[E]xpert's testimony must be restricted to those areas that fall outside the common knowledge of jurors.").

258. 20 C.F.R. § 405.350(b) (emphasis added).

1. *Pain Neuroimaging Is Sufficiently Reliable to Be Admitted for Some Purposes*

Pain neuroimaging evidence should be admissible in certain cases to help the finder of fact understand the nature of chronic pain diseases, to demonstrate general features of chronic pain diseases, and to show the average impact of such diseases on the neurological function of sufferers. Testimony grounded in structural and functional neuroimaging of chronic pain, when offered for these limited purposes, should satisfy the federal *Daubert* and state *Frye* standards (with some exceptions), as well as the more permissive relevance and reliability standards in SSA proceedings.

There are several strong uses-cases for aggregate neuroimaging evidence in cases where chronic pain is at issue, all of which fall into the category of expert-as-educator. Neuroscience-based evidence relating to chronic pain could be offered as relevant to matters within the following three general categories: (a) the biology of chronic pain; (b) the cognitive and affective effects and implications of chronic pain; and (c) general debiasing, that is, correcting implicit biases or mistaken inferences adjudicators or jurors may draw from their own experience. Given the nearly limitless variety of facts in the world, and advocates' creativity in working with them, these categories do not capture all potentially relevant uses of such evidence. The arguments in this section draw on and incorporate the scientific material presented in Part II, *supra*; accordingly, the supporting research is not repeated here.

a. Relevance Case: General Biology of Chronic Pain

Evidence grounded in neuroimaging, including brain images themselves, could help explain to ALJs and to jurors features of chronic pain that may be puzzling or counterintuitive to the non-expert. There are four major concepts about chronic pain that decision makers should know because they may be important to adjudicating a case. These four concepts are outside of the experience of lay jurors and ALJs; indeed, they likely are outside the experience even of physicians who do not practice in the chronic pain area. These concepts track those introduced in Part III.C, concerning the role of neuroimaging in changing norms, but here are not limited to disability and apply to any case involving chronic pain claims.

First, experts may inform decision makers about how brain-based processes modulate pain experience, so that two different individuals with the same or similar peripheral injury may experience markedly different degrees and durations of pain.[259] Such evidence would go to explaining the

259. *See supra* Part II.A.

"excess" pain that some individuals experience. Evidence of central sensitization can also aid decision makers in understanding how pain may persist after the apparent resolution of the original injury or disease.[260]

Second, brain-based processes can cause a pain condition even in the absence of a discernable peripheral injury, that is, "pain without lesion."[261] The existence of this kind of pain is the most counter-intuitive to non-specialists and may be likely to be adjudged as fraudulent or as a form of factitious disorder.[262] Expert testimony can explain the neurological mechanisms that give rise to such pain. It can also help construct a clinically realistic portrait of these kinds of diseases to aid the decision maker in coming to an accurate assessment of a particular claimant or plaintiff.

Third, although all chronic pain conditions will share some neurological features, distinct chronic pain conditions present distinct patterns of brain involvement.[263] Evidence on this point can aid decision makers in understanding the reality of pain conditions. If an opposing party introduces testimony to the effect that certain pain conditions, like fibromyalgia or chronic headache, lack a biological basis, rebuttal testimony about the specific neurobiology of such conditions would become relevant.

Finally, chronic pain results in structural remodeling of the brain, although permanence or reversibility of these changes remain under investigation. Testimony on the degree and duration of impairment could go to damages in a tort case.

b. Relevance Case: Cognitive and Affective Effects of Chronic Pain

Findings from neuroimaging, along with more traditional kinds of evidence, can help instruct the finder of fact about the cognitive and emotional impacts of chronic pain. These impacts are not ephemeral nor epiphenomenal: They are part of the pain disorder.[264] Cognitive and affective issues arise directly from the brain-based impairments of chronic pain conditions.[265] Pain neuroimaging and related research show how specific cognitive and affective regions of the brain involved in pain processing become functionally and structurally altered by pain. As discussed *infra*, in Part III.B., research suggests that, when a chronic pain

260. *Id*.
261. *See supra* Part III.A.
262. *See supra* Part I.B.
263. *See supra* Part II.C.
264. *See supra* notes 214–218 and accompanying text.
265. See *supra* notes 214–218 and accompanying text.

sufferer and a typical person perform the same task in the lab, the pain sufferer needs to recruit different and additional brain regions to do the same work; the total "load" becomes higher for him or her. By analogy, chronic pain impairs performance on a decision or task similarly to how texting interferes with driving. The difference is that the chronic pain sufferer cannot "put down the phone."

Cognitive impairments may affect a claimant's ability to work at the pre-illness cognitive level. The affective impairments may constitute a compensable harm in tort, as part of the overall evaluation of damages. Affective impairments also go to the question of hedonic adaptability.[266] Unlike many other forms of disability, chronic pain is unfortunately non-adaptable: The famous behavioral economist Dan Ariely, who had an accident that left him with third-degree burns over most of his body, has written eloquently about the non-adaptability of chronic pain.[267] The reasons for pain's low hedonic adaptability are multiple, including that pain *hurts*. Neuroimaging revealing how pain commandeers portions of the brain's emotional systems may provide an additional explanation: Mood cannot fully recover where the condition itself interferes with mood regulation. This could be relevant in a tort case to show future damages or to rebut a defense argument for limited damages grounded in hedonic adaptability.

c. Relevance Case: Debiasing

The experience of at least some degree of pain is universal. Pain thus would seem to be within the knowledge and experience of the ordinary juror. However, this very experience may mislead jurors. Chronic pain is not like acute pain. Jurors who have experienced acute pain thus may reason wrongly about chronic pain specifically *because* they are likely to try to understand chronic pain based on their own experience of acute pain. This creates a role for the expert witness as an educator about the nature of this misunderstood set of conditions.

Courts have been mixed in their reception of experts as pure educators, as in the case of experts who testify about the fallibility of eyewitness

266. Hedonic adaptation is the notion that people adjust to illness or injury, returning relatively quickly to pre-injury levels of happiness. DAN GILBERT, STUMBLING ON HAPPINESS 151–53, 227–28 (2006); John Bronsteen el al., *Hedonic Adaptation and the Settlement of Civil Lawsuits*, 108 COLUM. L. REV. 1516 (2008). Some scholars thus have argued that tort recoveries should be adjusted downward because the injured plaintiff is likely to fare better than jurors imagine. Bronsteen et al., *supra*. *But cf.* Peter H. Huang, *Emotional Adaptation and Lawsuit Settlements*, 108 COLUM. L. REV. SIDEBAR 50 (2008).

267. Dan Ariely, *Painful Lessons* (Jan. 30, 2008), http://web.mit.edu/ariely/www/MIT/Papers/mypain.pdf.

identification.[268] Some courts have permitted experts to teach the jury about the fallibility of eyewitnesses, reasoning that such testimony is necessary to debias jurors who otherwise will give too much weight to eyewitness identification evidence.[269] Other courts have held, conversely, that scientific evidence concerning visual recall and identification is not a proper subject for expert testimony because it is within the ordinary experience of jurors.[270]

Testimony educating the jury about general features of chronic pain or specific chronic pain conditions could face similar skepticism among courts. However, expert testimony about chronic pain is readily distinguishable from education about visual identification and recall. Although, as with visual recall, every juror will have had experience with pain, most will not have had experience with serious chronic pain. This places chronic pain further outside the scope of juror competence than eyewitness identification. If the jury does contain a member who has had serious chronic pain, it would be more appropriate for the rest of the jury to be educated by parties' experts than for there to be, in effect, a covert expert in the jury room who has not been subject to adversarial examination.

2. Neuroimaging Should Not (Yet?) Be Admissible to Prove Individual Pain

Neuroimaging techniques, particularly fMRI, should not be admissible at this point under federal or state standards to prove or disprove the presence of a chronic pain condition in any individual. The major concerns that render such evidence currently inadmissible are identical to those that must be resolved in order to allow for future admissibility. Moreover, these problems currently are common to all individual, non-aggregate evidentiary uses of all fMRI and much structural brain imaging, not just the neuroimaging of chronic pain. These are, in this author's view, the problems of: baseline norming;[271] reverse inference problems; [272] inter- and

268. Suedabeh Walker, *Comment*, *Drawing on Daubert: Bringing Reliability to the Forefront in the Admissibility of Eyewitness Identification Testimony*, 62 EMORY L.J. 1205, 1222 n.118 (2013) (note and accompanying text surveying jurisdictions admitting or excluding educative testimony on the accuracy of eyewitness identifications).

269. *Id.* at 1222 n.118 and accompanying text; *see also Eyewitness Misidentification*, INNOCENCE PROJECT, http:// www.innocenceproject.org/understand/Eyewitness-Misidentification.php (last visited Sept. 18, 2013); Brandon L. Garrett, *Judging Innocence*, 108 COLUM. L. REV. 55, 78 (2008) (discussing the role of eyewitness error in wrongful convictions).

270. Walker, *supra* note 268, at 1222 n.118 and accompanying text.

271. Craig E.L. Stark & Larry R. Squire, *When Zero Is Not Zero: The Problem of Ambiguous Baseline Conditions in fMRI*, 98 PNAS 12760 (2001) ("[T]here is no inherent baseline associated with the blood oxygen-level-dependent (BOLD) signal . . . that is measured in traditional functional MRI (fMRI) studies . . . .").

intra-subject variation;[273] high cost;[274] and counter-measures ("tricking the scanner").[275] Each of these problems relating to the validity of scans for individual pain diagnosis is scientifically nontrivial. However, the breathtaking pace of innovation in neuroscience and in information processing would make it foolhardy to say "never."

Even if future neuroimaging protocols reduce the risk of these interpretive pitfalls, the legal system still should not develop a default expectation that parties introduce such evidence in all chronic pain cases. Such evidence is costly relative to other evidence that might adequately resolve the case. A preference for scans might prejudice decision makers against claimants who cannot afford the technique or whose condition cannot reliably be discerned that way. This could create a CSI effect, wherein jurors or adjudicators expect a party to produce a type of scientific evidence simply because it exists,[276] and draw an adverse inference against the party if such evidence is not offered.[277] Currently and in the foreseeable future, it would be undesirable for scientific, economic, and normative reasons for adjudicators and fact finders to develop an expectation that neuroimaging should be introduced to prove pain.

CONCLUSION

At the same time that chronic pain is pervasive across important areas of law, the law incorporates deep bias and confusion about what chronic pain consists of and even whether it is "real." Generations of patients and courtroom claimants with chronic pain have been told that their condition is "all in their heads." Legal doctrines, including judge-made law interpreting the Social Security Disability regulations, encode these pejorative characterizations, which are grounded in part in skepticism about pain, an invisible and largely unverifiable condition, and in part in a Freudian-

272. Russell A. Poldrack, *Can Cognitive Processes Be Inferred from Neuroimaging Data*, 10 TRENDS COGNITIVE SCI. 59, 59 (2006) ("This is a 'reverse inference', in that it reasons backwards from the presence of brain activation to the engagement of a particular cognitive function.").

273. Henry T. Greely & Judy Illes, *Neuroscience-Based Lie Detection: The Urgent Need for Regulation*, 33 AM. J.L. & MED. 377, 382 (2007) ("Inter-subject variability is also a consideration. . . . [T]wo independent subjects [may] show different patterns of activation while their behavioral performances are comparable.").

274. National Research Council, *The Polygraph and Lie Detection*, NAT'L ACAD. PRESS (2003), *available at* http://www.nap.edu/catalog.php?record_id=10420. ("fMRI is not presently useful" for studying individual differences because "fMRI analysis is expensive and time-consuming").

275. Greely & Illes, *supra* note 273, at 404–05 ("Simple movements of the tongue or jaw will make fMRI scans unreadable. . . . simply thinking about other things during a task may activate other brain regions in ways that interfere . . . .").

276. Durnal, *supra* note 208, at 1.

277. *See id*. at 5.

inflected construction of the chronic pain sufferer as the modern-day hysteric.

Although not providing a pain-o-meter that will separate the honest pain sufferer from the malingering fraudster, neuroimaging and other technologies can play a positive role in helping to change norms, to inform interpretation of existing laws and regulations, and contribute to establishing new legal standards. These technologies may never produce definitive measurements of pain and its and associated distress. And, they may not fully surmount the problem of pain's incommensurability across subjects. Yet, they can shed light on pain's mechanisms and neurological bases. This should allow fact finders and decision makers to recognize chronic pain in the courtroom, should allow judges to better interpret regulations and doctrines relating to chronic pain, and should lead to the revision of relevant regulations to provide greater guidance on when a person may be disabled by chronic pain.

The ability to partially measure and objectify pain both will and will not resolve difficult legal questions that turn on pain's presence and intensity in individual cases. This is because, even if neuroimaging could validate pain's presence and severity perfectly, legal actors still would need to determine when pain, and what kinds of pain, constitute a legally-redressable impairment. Further, although new pain science and pain imaging are powerful, they are not a panacea for every legal doctrine or issue that appears to involve pain. Certain legal doctrines and statuses appear to be framed in terms of pain's presence and amount, yet cannot be understood fully through better measurement of pain. Debates carried out in part through competing statements about pain—like whether a pre-viable fetus feels pain, or whether certain execution protocols are so painful as to violate the Eighth Amendment's proscription on cruel and unusual punishment—may in large part be coded conversations about values; not, as they purport to be, primarily about physical facts. Thus pain imaging and measurement would misdirect rather than illuminate, allowing decision makers to dodge fundamental normative issues about the relationship between citizen and state, person and person.[278]

As neuroimaging develops, the law will confront challenging questions that emerge from pain, such as whether it can sustain its different treatment of physical pain and emotional pain. Physical pain is always also an emotional experience, and emotional pain is always produced by and experienced in the body. All subjective states emerge from neural substrates and have physiological correlates. In providing a window into the subjective experiences the brain generates in pain, the neuroimaging of

278. A.C. Pustilnik, *Pain as Fact and Heuristic: How Pain Neuroimaging Illuminates Moral Dimensions of Law*, 97 CORNELL L. REV. 801 (2012).

pain should lead to doctrinal and practice-based revisions that increase law's accuracy and fairness. Beyond that, understanding pain may require the law to rethink its current dualism between physical and emotional states, and its privileging of the body as real and valid over the emotions as excessively inchoate and soft, allowing the law to begin to comprehend the mind in the body and the body in the mind.