Fin de Siècle Theories of Invention: Originality and Chance

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Genius caught the attention of fin de siècle thinkers. Extraordinary will power defined genius according to some observers. It allowed men such as Columbus and Napoleon to change the world.[1] For others, originality set geniuses apart. Michelangelo, Newton, and Mozart saw what no one else could.[2] According to widely-accepted theories, in both cases they owed their exceptional powers to divine inspiration or to a special instinct. Wary of such ethereal explanations, fin de siècle French medical and social scientists looked instead to biology. Those influenced by Jacques-Joseph Moreau de Tours and later by Italian anthropologist Cesare Lombroso saw degeneration at work.[3] An inherited flaw, the same one responsible for born criminals, could equally well produce geniuses, they contended. Resisting that theory, others saw genius as an expression of abnormally elevated intellect.[4] Some aberration, they believed, catapulted geniuses to a higher evolutionary stage. Whatever caused genius, it affected a rare few. Only exceptional minds turned society in new directions or surprised society with new ideas.

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[1] Nordau, *Psycho-physiologie du génie.* See also Nordau *Degeneration*. Jefferson, *Genius in France*, summarizes modern French interpretations of genius.

[2] Regnard, "Génie et folie."

[3] Moreau, *De la folie raisonnante,* 49-50 notes that "it's absolutely and certainly by the same psychological mechanism that the mental elements that create illustrious talents, great generous or evil passions, great vice, sublime virtue and all the disorders of insanity take form and grow." All translations are mine unless otherwise indicated. Lombroso, *Genio e degenerazione*; Lombroso, *L'Uomo di genio*; Lombroso, "La pazzia ed il genio in Cristofaro Colombo." He drew on the pioneering work of Moreau, *La psychologie morbide*.

[4] Regnard, "Génie et folie," challenged Moreau and Lombroso. See, for example, vol. 7, 10-11, 13; vol. 9, 22-23.

Exactly how invention happened, however, eluded doctors, psychologists, and philosophers. In fact, they paid little attention to the mechanics of creativity. Or so eminent French psychologist Théodule Armand Ribot asserted when he set out to answer the question: "what makes the human mind capable of invention?"[5] In the previous twenty-five years, Ribot reported, very few monographs or articles addressed invention, while treatises on psychology ignored the question or assigned it a few cursory pages.[6] With little to go on, Ribot decided to take up the process of invention. His attempt or *essai* on the creative imagination appeared in 1900. The following year, Frédéric Paulhan published *Psychology of Invention* (*Psychologie de l'invention*). It appeared with other titles related to experimental psychology in a series devoted to contemporary philosophy.[7]

Committed empiricists, Ribot and Paulhan embarked on a treacherous inquiry. Like other scientific investigators of the time, they sought verifiable patterns and reliable causal connections. The body, they thought, developed and operated according to discernible laws. It worked in largely predictable ways. Creativity, though, appeared to break rules. It sparked, it flamed, and then it disappeared. No amount of mental effort or will power produced originality. It arrived unbidden, apparently emerging largely out of the unconscious, a terrain resistant to direct observation. When creativity did hit, it favored the aesthetic realm, an area remote, or so convention had it, from the reach of science. Mysterious forces inspired artists, composers, and poets, and most psychologists left it at that.

Ribot and Paulhan hypothesized that creativity, like all other mental activities, operated in the brain rather than the spirit or soul. But they and other investigators still knew too little about the brain's structure and operation to assign invention a specific place. Nor did they understand the brain's evolution well enough to identify when the capacity to invent appeared in the human species. They could not confidently sort out the relationship between reason and creativity either. To fill in these blanks, Ribot and Paulhan built on prior research on the brain, including their own well-known contributions to the field. Like other French scientific psychologists of the time, they favored the pathological method, examining the abnormal to understand the normal. That approach relied heavily on case studies. Although the creative imagination could take pathological turns, neither Ribot nor Paulhan looked to its extreme manifestations for insight. They did not reach into themselves for evidence about invention either. Instead they cautiously considered the many first-hand accounts that scientists, composers, and writers left of how they came to their discoveries. Their experience might, Ribot explained, shed some light on the process of invention.[8] So, he believed, did the study of primitives and children.[9] Although not experimental enough to qualify as genuinely scientific now, their methods conformed to common practice among psychologists at the time.[10]

Recent accounts of the origins of current theories of creativity pay some attention to the late nineteenth century. These analyses reflect a resurgence of interest in the phenomenon of creativity after 1950.[11] By the late 1990s creativity had lost its status as one of "psychology's orphans" as

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[5] Ribot, *Essai*, 261.
[6] Ibid., v.
[7] Paulhan, *Psychologie.*
[8] Ribot, *Essai*, 129.
[9] Ibid., 99-100.
[10] Carroy, Jacqueline and Régine Plas, "The Origins of French Experimental Psychology," 74. The experimental in Ribot and Paulhan's time did not exclude "the *invoqué* [the adduced], nor the singular, nor the unpredictable."
[11] Sternberg and Lubart, "The Concept of Creativity," 3-4. They note that there was very little published on the question until 1950 and only a modest increase in attention between 1974 and 1995.

research exploded and the media and popular press took up the topic.[12] Current ideas about the mechanics of invention, Madelle Becker argues, build on nineteenth century discoveries. Investigators now use updated experimental methods, but they ask the same questions that their predecessors did.[13] Moreover, their answers "say essentially the same thing", according to Colin Martindale. Scientists at the end of the nineteenth century attributed creativity to the appearance of novel combinations of ideas or images and to a "sudden insight" rather than to reason.[14] Current researchers agree. But, Martindale specifies, they now can pinpoint the mental conditions likely to promote these creative breakthroughs with a precision beyond the reach of earlier scientists.

Ribot and Paulhan were among the few in late nineteenth-century France to pursue the biological roots of creativity. Martindale acknowledges Ribot's contributions, but not Paulhan's. Becker does the same. Both Ribot and Paulhan contributed to the emerging field of physiological psychology. They examined several distinct aspects of the brain's operation, creativity among them. Despite his influence at the time, Paulhan remains largely unstudied, while Ribot has received more scholarly attention. Studies of his life, of his role in establishing scientific psychology in France, and of his treatises on pathologies of the mind contribute to an expanding literature attesting to his importance.[15] An analysis of Ribot's study of creativity appeared in 1993. Its authors, Mara Meletti Bartolini, Franca Oetheimer, and Sylviane Onken, focus on his efforts to reconcile creativity with determinism.[16] Ribot, they observe, claimed that his mechanistic view of the mind's operation accounted for creativity. In reality, however, he took "a giant theoretical leap" from determinism to spontaneity, from intellect to emotions, and from the mechanistic to the biological.[17] But in the end, they contend, Ribot pulled back and concluded his treatise by presenting a "much more complex mechanical model", one that reconfirmed determinism.[18] That move, the three believe, shows that metaphysical theories about the mind continued to direct his thinking. Despite his denials, Ribot remained as much a philosopher as a scientist, in their view.[19]

Their assessment has the merit of acknowledging the fluidity of the boundaries between philosophy and psychology at the time. However, the idea that Ribot ended up reasserting the sway of mechanistic laws over the creative process minimizes his acceptance of contradictions. It was the dissonance between invention and determinism which drew Ribot and Paulhan to the subject of creativity, and they incorporated the tension between the two into their theories. They asked how the brain invented, and both answered that unfamiliar and random experiences prompted invention. Their interest in the brain's response to contingency arguably registered contemporary preoccupations with change. Historians describe the anxieties generated in late nineteenth century France by Sedan and

[12] Ibid, 40. See also Albert and Runco "A History of Research on Creativity," 17.
[13] Becker, "Nineteenth-Century Foundations of Creativity Research."
[14] Martindale, "Biological Bases of Creativity," 149.
[15] Nicolas and Murray, "Théodule Ribot (1839–1916), Founder of French Psychology" and Nicolas and Charvillat, "Introducing Psychology as an Academic Discipline in France," for example.
[16] Meletti Bartolini, Oetheimer, and Onken, "Imagination créatrice et connaissance selon Théodule Ribot," 13.
[17] Ibid., 15-17.
[18] Ibid., 18.
[19] Ibid., 20-25.

the Paris Commune and by the effects of modernization. In her study of French and Italian culture at the end of the century, Luisa Mangoni, for example, asserts that after 1870 ideas of "degeneration, regressive evolution, fatal hostility among the races, inevitable decadence of civilized peoples" appeared in positivist thinking, but in the 1890s "they became the common points of reference".[20]

Concerns about the intensities of modern life affected how scientists such as Jean-Martin Charcot understood the body, historian Mark S. Micale emphasizes. They examined trauma and tried to explain the vertiginous expansion of neurasthenia and the striking incidences of railway brain. "Individually and collectively", Micale asserts, "French men and women construed social, political, and economic modernization as a shock that was best accounted for by medical science and best ministered to through clinical therapeutics".[21] A similar interest in assessing how the mind processed the shocking and unfamiliar shaped Ribot and Paulhan's understanding of creativity. Normally the brain assimilated novel sensations by creating new connections. Too many strange experiences or too much of a jolt could exhaust or overpower the brain's absorptive capacities, leading to trauma. Usually though, its propensity for order managed contingency, and sometimes unexpectedly its response turned into a creative act, object, or idea.

Théodule Ribot (1839-1916) came to psychology via philosophy. Over a career of almost forty years, he published several studies on how the mind worked, and at the invitation of the Sorbonne in 1885, he taught the first university course on scientific psychology offered in France. Four years later, he accepted the new chair in experimental and comparative psychology at the Collège de France, a position he held until 1901.[22] A succession of publications in the 1870s and 1880s reinforced Ribot's reputation as a scientific psychologist. His works, including studies on the diseases of the memory (1881), will (1883), and personality (1885) and on the psychology of attention (1889), appeared in multiple editions well into the twentieth century.[23] Largely due to Ribot's efforts, scientific psychology found its place in France between the strongly-entrenched tradition of philosophical psychology and the increasingly influential field of psychiatry.

After a stint as librarian in Nimes, Frédéric Paulhan (1856-1931) moved to Paris in 1896 where he began his career as a public intellectual. A philosopher with strong interests in the physiology of the mind, Paulhan wrote on a broad range of topics. These included character, language, will power, and the emotions.[24] His treatises spanned four decades, and several appeared in multiple editions. Paulhan also contributed to the journal that Ribot founded and edited: *The Philosophical Review* (*La Revue philosophique de France et de l'étranger)*. On Ribot's recommendation, he joined The Academy of the Moral and Political Sciences (L'Académie des sciences morales et politiques) in 1902, a sign of his growing influence.

Ribot and Paulhan's theories of invention intersected and diverged in significant ways.[25] The similarities begin with what they both rejected. They challenged three well-established ideas: the equation of originality with genius; the restriction of creativity to aesthetics; and the association of invention with inspiration. Neither believed that inspiration, divine or otherwise, spontaneously

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[20] Mangoni, *Una crisi fine secolo*, 8.

[21] Micale, "Jean-Martin Charcot and *les névroses traumatiques*," 138.

[22] Brooks, "Philosophy and Psychology," 128. He notes that Ribot did "as much as anyone" to advance scientific psychology. See also Nicolas, "L'introduction de l'enseignement."

[23] Ribot, *Les Maladies de la mémoire*; *Les Maladies de la volonté*; *Les Maladies de la personnalité*; *Psychologie de l'attention*. Translations in several languages, including English, German, and Italian, appeared soon after publication.

[24] Paulhan, *Les phénomènes affectifs*; *L'activité mentale*; *Les caractères*; *Les transformations sociales*; *La double function* among others.

[25] Paulhan, *Psychologie*, 165-6, read an edited version of Ribot's *Leçons sur l'imagination creatrice* given at the Collège de France and said that he agreed with some ideas but not with others. In *Essai*, Ribot refers to an earlier version of Paulhan's study, published as an article in the *Revue philosophique de France et de l'Étranger*. Paulhan, "L'Invention."

provoked new ideas. What a "chimeric, empty" notion, Ribot railed.[26] They looked instead to the organic roots of invention. Neither one, however, accepted the idea that a creative instinct explained originality. Said Ribot flatly: "There is no instinct behind invention".[27] Nor did they embrace the notion that either superior or especially insistent reasoning produced new ideas. Rather, invention engaged the emotions and the intellect, and it operated mainly unconsciously. Paulhan found invention in "all the psychological phenomena… that are not absolutely automatic, that is, in all of them without exception, just as there is routine in all of them".[28] The capacity to create did not, then, belong to the favored few, or to artists alone, nor did it result from a happy accident, a flaw, or a degenerative disorder. "Everyone", Paulhan specified, by their natures "demonstrates some power of invention".[29]

It remained to determine how that power operated, and here they found fewer theories to contest or to follow.[30] They started with the psyche. It contained, they both asserted, a mix of elements formed in response to external and internal stimuli. Accepting the main tenets of associationist theory, they believed that these elements then joined in shifting combinations, some of them entirely new. The new associations made invention possible. If they solidified, they could turn into a eureka moment, a new tool, or a painting. That transformation occurred rapidly, or in fits and starts, or not at all. Sometimes individuals felt something brewing, and they tried to coax the sensation of novelty into concrete form. In other cases, they experienced a flash of insight. Mozart, Paulhan noted, insisted that his compositions just came to him. More likely, Paulhan argued, the elements floating about in his head fell into new patterns and then slowly crystallized into a melody without him realizing it.[31] Whatever the type of creativity — aesthetic, philosophical, scientific, or mechanical — all followed the same basic trajectory.[32] A new synthesis appeared; it gained form; then it expressed itself in some product. Every phase of the process invited Ribot and Paulhan's attention. If they understood the stages and the mechanisms behind them, they thought that they could unlock the mysteries of invention.

The first step to invention required two things: new material and an impetus to use it, or as Ribot succinctly put it: "simple sensations plus emotions".[33] The nerves and sensory centers, Ribot specified, registered outside stimuli as sensations. Once they reached the brain, the imagination took over. Using a process of association and disassociation, it converted the initial sensations into images.[34] Those images, in turn, led to perception. They allowed a person to see the object that produced the sensation. For perception to occur, Ribot specified, "you have to feel, then perceive

[26] Ribot, *Essai*, 262. See also 50.
[27] Ibid., 43; Paulhan, *Psychologie*, 102.
[28] Ibid., 58. See also, 27: "Everywhere there is invention, just as everywhere there is routine."
[29] Ibid., 59.
[30] Souriau, *Théorie*, was an important early treatise on the psychology of invention. Both refer to it in their book-length studies.
[31] Paulhan, *Psychologie*, 96-99.
[32] Ibid., 15; Ribot, *Essai*, 36-7.
[33] Ibid., 9.
[34] Ibid., 13-15.

badly, in order finally to see well".[35] Incoming sensations typically attached to networks of other similar or well-remembered images. When that happened, the object appeared clearly, although never completely so. Unusual sensations, in contrast, found no ready partners, so they forced realignments or floated unattached.[36] In this case, the object blurred and faded. Internal stimuli also disrupted the associations of images, putting the brain in continual motion as networks of images dissolved and re-formed.

Looking into the psyche, Paulhan saw a similar scene. What Ribot identified as images, Paulhan referred to more generally as "psychological elements".[37] These elements operated the same way that Ribot's images did. Generated by outside stimuli, they entered the brain and joined combinations of similar counterparts. Those too odd to fit into existing alliances provoked new syntheses or circulated freely. Just as Ribot's images never settled into static patterns, Paulhan's elements sought order but never found it. They merged and diverged, producing the "free play of psychic elements" that permitted invention.[38]

Both, then, made psychic volatility the quid pro quo for invention. Imagination, Ribot contended, managed the ever-changing mix of images. The most active and the best understood type of imagination brought similar images together. By connecting same with same, the "reproductive" imagination, as Ribot called it, produced memory and allowed imitation. It formed the most durable packages of images. But the brain also generated original combinations; it did not just reproduce, it produced. When it did, Ribot saw the "creative" or "constructive" imagination at work. Drawing from freewheeling and weakly-attached images, it formed new alliances based on resemblance rather than similarity. Analogy, Ribot argued, supplied "an almost inexhaustible engine of creation".[39] These novel alliances coalesced as if by chance, although new experiences increased the likelihood of shaking up the psychic mix, especially in already image-rich brains.

Paulhan recognized a similar process, but traced it to a different source. A strong urge to organize — he called it an instinct — drove the brain to combine stimuli whether they came from the outside or from within.[40] Intelligence acted as the agent. It reinforced existing constellations, redesigned others, and sometimes stimulated entirely new ones, enabling invention.[41] Usually the novel syntheses appeared when an unexpected experience introduced a dissonant element into the mix. Since everyone experienced the unfamiliar, everyone generated original syntheses, thanks to the brain's urge for harmony.[42] Society, though, rarely recognized these innovations as genuinely new, and when it did, Ribot commented, it labeled the authors geniuses and great inventors.[43] Realizing that everyone showed "some power of invention", Paulhan identified genius more with scale than with novelty.[44] It was the "amplitude, power, and fertility" of their natural inventiveness that set geniuses apart.[45] For his part, Ribot attributed genius to the psyche's efficiency. What distinguished Caesar and Michelangelo and their like was the "unity, stability, and power" that their "perfectly coordinated" psyches gave them.[46]

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[35] Ibid., 89.
[36] Ibid., 14-15.
[37] Paulhan, *Psychologie,* 3.
[38] Ibid., 4.
[39] Ribot, *Essai,* 22.
[40] Paulhan, *Psychologie,* 102. He referred to the "esprit" and the "intelligence" as the agents.
[41] Ibid., 4.
[42] Ibid., 59, noted that everyone "demonstrates some power of invention."
[43] Ribot, *Essai,* 129.
[44] Paulhan, *Psychologie,* 59.
[45] Ibid., 61.
[46] Ribot, *Maladies de la volonté,* 173.

Strange and random sensations cast into the psychic mix supplied the occasion for invention. But it took something else to transform that initial movement into an innovation. Galileo's fellow Pisans saw the lamp inside the cathedral sway, Ribot explained, but only he took the theory of isochronic motion from that sight.[47] That something else, Ribot explained, was emotion. It supplied the "ferment".[48] A need or desire turned a chance and largely unconscious alignment into an original idea, object, or action.[49] Paulhan seconded the importance of emotion, explaining that emotions such as love, ambition, and a passion for truth, sparked new syntheses and focused the mind on formulating new ideas.[50] As the new associations crystallized, Ribot argued that intellect joined emotions to power the process. It focused the operation, pushing the imagination to build analogies and extend connections until they produced a conscious break through.[51]

Paulhan also insisted that inventing occurred step by step and mostly unconsciously. A new insight might seem to appear suddenly, fully blown, but in fact it always came out of "preexisting formations".[52] Getting from the "psychic seed" to some new idea depended on multitudes of small inventions accumulating and interacting.[53] Out of this "play of ideas and images", a "directing idea" appeared, and it reinforced the emergence of a single new synthesis.[54] In the transition from inchoate to finished invention, reason played the role Ribot assigned to the intellect, Paulhan thought. It focused the germination process, but never completely. Because so much of the process occurred in the unconscious, inventing always escaped reason's control. People, he emphasized, "neither willed nor fully experienced their creativity".[55] Each step multiplied possibilities, making any outcome "somewhat arbitrary and incomplete".[56]

Paulhan identified three versions of the process. The evolutionary model proceeded in a coherent, although not predetermined way. It linked each small invention to the last and all of them to an emerging whole. In another formula, a secondary association came to the fore. It could alter the form the invention took (a mural or a miniature, for example), or it could change the driving idea. But the result still contained something of the original synthesis.[57] A third pattern featured deviation. A minor spin-off from the initial base developed independently. It did not get absorbed or sidelined, as usually happened, Paulhan explained. The deviation might overpower the original idea; it might delay its realization. Sometimes it reinforced it.[58]

The creative process followed these basic patterns despite evident variations in tempo. While simple ideas might emerge quickly and fully formed, Paulhan specified, anything complicated

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[47] Ribot, *Essai*,137.
[48] Ibid., 26.
[49] Ibid., 37.
[50] Paulhan, *Psychologie*, 28-39.
[51] Ribot, *Essai*, 71.
[52] Paulhan, *Psychologie*, 73.
[53] Ibid., 74-75.
[54]Ibid., 45.
[55] Ibid., 97.
[56] Ibid., 87.
[57] Ibid., 122-30.
[58] Ibid., 135-37.

developed unevenly and hesitantly. Ribot agreed. Some people tried hard to solve a problem, set it aside, and then one day experienced a flash of insight. They seized on the discovery and deliberately developed it. Others followed unconscious paths, and a bright idea surfaced suddenly, as if by chance. The first, "combinatory" model moved laboriously from detail to unified idea, while the second "intuitive" form began with the full idea and worked out details. The first favored larger ideas, the second produced limited creations — a scrap of song, lines of a poem, a widget. Effective inventors typically used both types, Ribot concluded.[59]

Ribot and Paulhan agreed, then, on certain fundamentals. While geniuses got the credit for new ideas, everyone invented, and when they did, the brain did similar things in the same order. The seed of something new sprang up unbidden, determined by no laws or prescribed set of factors. Once it appeared it could develop into a concrete idea or object, following general, though chaotic patterns evident to the discerning empirical eye. But nothing in the process or in the original impetus, they agreed, determined what, if anything, eventually resulted. Where their theories diverged was on the origins of inventiveness. When did the capacity to create develop? It evolved, Ribot argued. No need to ask the question, Paulhan concluded, because humans always invented.

Ribot's *Essay on the Creative Imagination* (*Essai sur l'imagination créatrice*) included a section on the evolution of imagination from animals to civilized humans.[60] Like animals, the earliest humans used reproductive imagination. They could connect similar images, but they could not manipulate them. In the next stage, primitives acquired creative imagination, the highest level of their mental development. In this, creative imagination's golden age, humans centered their thinking on analogies.[61] Everything took on human characteristics, as animism powered the myths that primitives constructed to understand the world and to survive. When, as Ribot said, "the more gifted peoples" gained the ability to think abstractly, the world became an object to know by using reason.[62] At this point rational thought supplanted creative imagination, and, Ribot claimed, civilization began.

Accepting a theory identified with German biologist Ernst Häeckel and current at the time, Ribot contended that individuals repeated the trajectory of the species as they grew from embryo to adulthood. Infants used reproductive imagination, and out of this ability to remember and to imitate, creative imagination gradually emerged. Children practiced animism. Not yet able to think abstractly, creative imagination determined their fanciful understanding of what they experienced.[63] When children learned to reason, they left such fantasies behind, just as "primitives" eventually did. But never completely behind. In civilized societies, myth-making survived in literature and in the collective "popular legends" that surrounded historical figures and events.[64] Adults also continued to use their childlike creative imaginations within the limits imposed by reason.

In modern societies, creative imagination in its primitive form operated on the artistic sidelines. But, Ribot insisted, it continued to evolve, and in its "superior" form, it served modern society in significant ways. He identified two main types of creative or constructive imagination. "Diffluent imagination" built on weak associations and diffuse distinctions. It occupied the territory between the concrete and the conceptual, between the material imagination and reason. Coming mainly from within, it responded more to inner feelings than to external sensations.[65] Dreams,

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[59] Ribot, *Essai* 130-32.
[60] Ribot, "The Nature," 648-675; 1-25. He analyzed the components of the creative imagination, areas of basic agreement with Paulhan. He said he left its evolution and its concrete manifestations to a longer work, the *Essai*.
[61] Ribot, *Essai*, 100.
[62] Ibid., 111-12.
[63] Ibid., 95-98.
[64] Ibid., 114-15.
[65] Ibid.,163-65.

illusions, fantastic stories, most myths and religions bore its marks. So did symbolist art. Because of its affinity for limitless space and time, it also sparked the science of vast magnitudes and cosmic numbers. More strikingly, diffluent imagination explained the "genius composers, born musicians" who wove their melodies out of pure subjectivity.[66] In the second type, in contrast, the image stuck close to perception, whether visual, tactile, or motor. Artists, sculptors, and architects used this plastic or material form of imagination. So did the inventors of machines and tools.[67] Here, in the realm of the practical, where moderns least expected to see it, creative imagination mattered the most. Despite what most people thought, science also depended on it. Scientific discoveries built on hypotheses or conjecture, Ribot explained, and conjecture relied on new combinations of images.[68] The empirical method went only so far. It could test hypotheses, but it could not invent them. Without imagination, Ribot asserted, science only affirmed what it already knew.

Because Paulhan did not frame invention in evolutionary terms, he accepted its ubiquity in modern society. Like Ribot, he believed that the brain organized sensations; unlike him, he argued that the ordering impetus provoked it to produce new associations and syntheses from the start. Along with habit, routine, and imitation, it managed internal and external stimuli. As society got more complicated and the barrage of stimuli more intense, the brain just got busier and more inventive as it harmonized the dissonant elements. Habit and routine continued to help the evolved psyche adapt and unify, according to Paulhan, while Ribot assigned reason that role.[69]

Their theories of invention coincided on the basics. They asked a similar question — what went on in the brain when it invented — and they came at it from a scientific, and in particular a psychological perspective. They participated in a vigorous, ongoing international debate about the mind's properties and behaviors, and they built their theories on previous research, their own and that of others. Their thinking also registered the period's ambivalence about change. On the one hand, natural and social scientists asserted that biological and historical laws governed change. These laws powered a process of development judged beneficial, on the whole, for humans. Europeans emerged as forerunners — the most highly evolved and the most civilized. On the other hand, experience indicated more tumultuous, random, and uncontrollable changes. Although Europeans stood on top, the "stresses of triumph" appeared to be cracking the pedestal. The hectic pace assaulted their senses and taxed their nerves. Overwhelmed by the intensity of change, and by its unpredictability, people felt confused and disoriented. They sought reassurance about the limits of the tumult and about its positive direction.

Micale suggests that the trauma theories surfacing at the end of the century expressed an unsettled, negative response to signs of modernization. "In a broader sociological sense, the modern here becomes an open, mass, secular, dynamic, heterogeneous, capitalist, and liberal-democratic

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[66] Ibid., 177. Other more specialized forms of imagination, including the mystical, scientific, mechanical, commercial, and utopic, derived from these main types.
[67] Ibid., 230. See also 156-60; 224-25.
[68] Ibid., 205.
[69] Paulhan, *Psychologie*, 61, 62.

culture with all of its confusions, complexities, and incoherences".[70] What scientists such as Charcot described as trauma both informed doctors and carried a wider message, Micale argues. Diagnoses of neurasthenia and railway brain provided "a kind of social and cultural commentary on the troubled, traumatized world of the early French Third Republic".[71] Ribot and Paulhan addressed troubling changes in another, less negative way. They emphasized that new sensations unsettled the brain, but they theorized that it responded by generating new, unifying connections. A few of these novel combinations developed into the original ideas, scientific theories, works of art, and inventions that signaled human progress.

Ribot and Paulhan registered the two faces of change in their theories of invention. When they addressed creativity, they assumed that determinism governed the body, and it was in part that contradiction which initially attracted their interest. They were not the first to tackle the dilemma. Two decades earlier, Paul Souriau addressed invention in his study *Theory of Invention* (*Théorie de l'invention*). He centered his theory on the assertion that "the real principle of invention is chance". By chance, he specified, he meant the "determinism of natural causes".[72] No matter how fine the reasoning, or systematic the logic, or earnest the application of how-to blueprints, no one came up with original ideas intentionally, he insisted. After all, old ideas could not determine new ones, and invention by definition meant novelty. If conscious effort did not produce new ideas, they must appear by accident, Souriau concluded.

If new ideas happened by chance, they did not happen for no reason. Invention originated in the mind, and as a part of the body, laws governed its operation. Nothing in the body or in the natural world happened gratuitously; everything had a cause and a consequence, Souriau contended. It might not seem so, because the complexity of the causal networks usually obscured the connections. But retracing the chain of effects and causes revealed that "the series that now seem to us to be independent were determined, maybe centuries ago, by a common cause".[73] Like anything else, invention responded to laws, specifically to the law of association. It organized the psyche and, were it not for external stimuli, it would, Souriau speculated, create "a very closed circle", causing us "to endlessly run through the same series of ideas".[74] Sensations from the outside, however, provoked continual adjustments, and these caused invention. "External determinism … tends to continually modify the order and the nature of our ideas".[75] Of that Souriau felt confident. He admitted that by reducing genius to its physical roots, he stripped it of the miraculous but that, he claimed, made it no less exceptional.[76]

Souriau claimed to write with future psychologists in mind, setting out the facts they needed to explain invention. Ribot and Paulhan knew and referred to his work — Paulhan in particular. They accepted what Souriau felt compelled to establish: that invention occurred outside thought.[77] Like Souriau, they recognized that chance affected invention. But rather than winding chance into a universal law of determinism, as Souriau did, they assigned the two distinct and limited roles. Random and unfamiliar events spurred invention. On that all three agreed. But Paulhan and Ribot emphasized that internal forces also continually disturbed psychic alliances and that chance affected

[70] Micale, "Jean-Martin Charcot and *les névroses traumatiques*," 139.
[71] Ibid., 138.
[72] Souriau, Théorie, 101.
[73] Ibid., 34.
[74] Ibid., 55.
[75] Ibid., 57.
[76] Ibid., 101.
[77] Ribot, Essai, 135. He quoted Souriau's comment that you have to think around a new idea to get at it when he (Ribot) argued that the likelihood of creative ideas increased with more knowledge and experiences.

whether and what sort of innovation rose out of the turmoil. “It is incontestable, whatever has been said”, that chance affects “this unexpected synthesis of ideas”, Ribot argued.[78]

The eminent French mathematician, Henri Poincaré, seconded Ribot’s notion. Speaking before the General Institute of Psychology (Institut Général Psychologique) in 1908, he reflected on his process of discovery. His analysis would, he ventured, interest psychologists and contribute to the controversy over genius. His personal account reinforced what Ribot and Paulhan proposed. Poincaré reported trying to solve a mathematical problem and getting nowhere. When he gave up and thought about something else, he experienced a flash of insight when he least expected it. Invention, he concluded, must occur in the unconscious beyond the reach of his will and his reason. Although he did not credit Ribot or Paulhan with influencing his thinking, he explained that new ideas rose out of a tumultuous mix of psychic associations. The subliminal self, Poincaré observed, “forms in a short time more different combinations than a person consciously could in a life time”.[79] Out of the myriad possibilities, somehow his unconscious chose those most useful to him and pushed them to the surface. How it did that intrigued him. His unconscious, Poincaré speculated, possessed a sensibility attuned to order and connections and found examples in mathematics. It appreciated the beauty and harmony of certain mathematical principles and brought the combinations with that quality to his attention. The unconscious, Poincaré observed, deserved most of the credit for inventions. Reason, perhaps, helped at the outset and at the conclusion of the process. Possibly he alerted the unconscious to look out for relevant syntheses when he started to investigate a problem. Certainly, once the insights came to him, he convened reason to appraise their potential and to develop the most promising.

Poincaré lent his personal authority to the profile of invention that Ribot and Paulhan developed. Their theories of invention did not challenge the grand laws governing changes in the species and in society over time. The change they tracked occurred within and around those patterns. It occurred constantly and naturally in individuals, as their psyches generated new associations. Some associations took shape in new ideas or actions occasionally recognized by society as breakthrough illuminations. Left at that, their theories accounted for what seemed to be continual and positive invention. Shifting from the effects of invention to the process brought tumult, chance, and conflict into the picture. Inventiveness might eventually congeal into an original thought, thing, or act, but on the way there, disruption and contingency reigned. Invention itself involved movement. Its engine, imagination, Ribot insisted, was above all else a motor activity”.[80] Or, in Paulhan’s terms, the psychic elements were always shifting. Creativity, Paulhan insisted, “almost always results from a struggle, more or less evident, more or less prolonged, but quite necessary”.[81] Any unfamiliar stimulus disturbed the connections that ordered the psyche. The healthy brain responded by generating new combinations and networks in order to restore harmony. It managed disruption by innovating. Each new association, spawned others, and they in their turn still others, so that internal drivers added to

[78] Ibid., 136.
[79] Poincaré, “L’Invention,” 185. See also, Livingston, “Poincaré’s Delicate Sieve.”
[80] See for example, Ribot, *Essai*, 1, 85, 94.
[81] Paulhan, *Psychologie*, 167.

the tumult in the psyche. Seen through the lenses of invention, the brain registered the world as continual, disruptive change, and it responded with persistent and transient efforts to restore order.

When Ribot and Paulhan looked for the sources of invention, they found its seeds in dissonance and its fruition in confusion. As an invention emerged from the chaotic matrix, it left, Paulhan observed, "a lot of destruction, the death of established systems, deviations and aberrations" along the way.[82] "There is disorder at the root of invention and in its development."[83] Unpredictable at its start and in its outcome, the solidification of new associations into recognizable innovations appeared to follow rough paths rather than set laws or rules. Not only did random experiences initially create the impetus for a new synthesis, an unexpected event could bury an original idea as it took shape or, conversely, hasten its crystallization. Every step in the emergence of an invention spawned still different associations that required more adjustments. Once formulated, new ideas could make people feel tense and uneasy. The bigger inventions, Paulhan clarified, almost always caused distress and anxiety.[84]

Mental health, Ribot and Paulhan both asserted, depended on managing the disparate sensations coming from outside and inside. The more alien the stimulus, the more important invention's role. In the body's encounter with a chaotic world, invention had an important ally: the will. Ribot published *Pathologies of the Will* (*Les maladies de la volonté*) in 1883, well before his study of invention. Paulhan took on invention first and then the will, publishing *The Will* (*La volonté*) in 1903. What invention did for ideas, will power did for actions, both contended. "The mechanism is the same", Paulhan observed, "The circumstances and the conditions of their emergence are, from an abstract perspective, identical".[85] Stimuli not only produced images, they also triggered reflexes, instincts, and desires, and when these conflicted, as they often did, the will intervened. By curbing some impulses and authorizing others, it permitted motor activity. Without will, people either froze or acted on impulse; lacking creative imagination, their psyches tied up every loose end or went every which way. While the two mental powers produced different syntheses, Ribot and Paulhan assigned willing and inventing equivalent tasks: to mediate the internal tumult generated by floods of diverse stimuli. They acted as agents of control, working to maintain harmony and balance in a context of incessant and disruptive motion.

The body literally took in the world. In the context of modern society, that meant imbibing a measure of mayhem. Memory, imitation, and habit absorbed the familiar. To what did not fit, the brain responded creatively, constructing new stabilizing syntheses. Inside the psyche, Ribot and Paulhan explained, invention, despite its own volatility, secured order — momentarily. Outside it invention produced startling concepts, heavenly melodies, striking images, and ingenious machines. These gains exhibited the power of individuals to produce positive change. That everyone naturally invented made that prospect virtually inevitable. Out of modern society's dynamism and discord, the psyche built new unities and these occasionally and unpredictably crystallized into the inventions central to progress. To Ribot and Paulhan creativity signaled the constructive interplay of dissonance and order, chance and determinism.

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[82] Ibid., 182.
[83] Ibid., 171.
[84] Ibid., 43.
[85] Ibid., 66. Ribot, *Essai*, 6, wrote: "Imagination is to the intellect what will is to movement." Paulhan's work on the will, *La volonté*.

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