

The Advancement of *Science*:

James McKeen Cattell and the Networks of Prestige and Authority, 1894-1915

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The need for an authoritative and widely-accessible American scientific periodical was keenly felt by 1880, when the weekly *Science* was established in New York by the journalist John Michels, with the financial backing of scientific entrepreneur Thomas Edison. As the astronomer and mathematician Simon Newcomb had observed with regret in 1874, “The difficulty is not that our scientific men are indifferent to knowledge, but that they do not go through the laborious and thankless process of digesting and elaborating their knowledge and publishing it to the world.”<sup>1</sup> Some promising scientific publications had, in fact, emerged, ranging from the commercial *Scientific American* (established in 1846) and the specialist *American Naturalist* (established in 1867 and limited, as Newcomb noted, “entirely to biology”), to the more philosophically-inclined magazine aimed at a broadly-educated audience, *Popular Science Monthly* (established in 1872).<sup>2</sup> But the only periodical that met Newcomb’s high standards for the publication of new research was the venerable *American Journal of Science and Arts* (established in 1818), and even that title was restricted largely to the earth sciences at the expense of many new disciplines.<sup>3</sup>

Multiple efforts to cater to general scientific interests in a single periodical were made in the 1870s and 1880s, only for most to flounder after a few months or years, in line with the typical pattern for new magazines in this period.<sup>4</sup> The shorter-lived contemporaries of *Science* included the *Science Record* (1872-77), *Scientific Monthly* (1875-76), *Scientific Observer* (1877-87), *Science News* (1878-79), *Illustrated Scientific News* (1878-81), *Scientific Man* (1878-82), a second *Science Record* (1884-85), *Science Review* (1885-86), and *Science and Education* (1886-87), among still others.<sup>5</sup> By 1900, however, *Science* clearly

filled the gap felt by the likes of Newcomb. This article will identify the successful emergence of *Science* and the conduct of its most important early editor, James McKeen Cattell (1860-1944), as rooted in the social networks that sustained both the journal's existence and its intellectual authority. The social networks of print culture formed the backbone of what is often described as the "community" of scientific inquiry; membership in this community might be marked by a mere enthusiasm for science, by membership in an organization such as the American Association for the Advancement of Science (AAAS), or by recognized expertise in a particular discipline.<sup>6</sup> While the identification of this community of scientists calls attention to the strong personal ties between many members, however, the concept of networks more effectively situates scientific thought and activity in the increasingly anonymous professional groups, linked by institutions and print forums, that came to form the definitive social context for science during this period.<sup>7</sup> Achieving an ideal of communal inquiry in these circumstances was one of the key functions of new scientific periodicals. By both harnessing and enhancing the prestige and authority of its contributors and the institutions with which it had ties, *Science* helped to reshape modern American science while advancing its own status as a journal. This article will argue that the establishment of *Science* as an authoritative periodical was partly due to the creation of networks that transcended the sometimes-fractious personal and institutional rivalries of science and partly a result of Cattell's fusion of his editorial conduct with a cognitive ideal of scientific inquiry itself. The intellectual aspiration of abandoning personal bias motivated scientific inquiry in general; by embodying this aspiration in the pages of *Science*, the journal became the official record, and a rallying point for unity, in a growing and potentially fragmented community.

### **Cattell in the Scientific Community**

From 1880 to 1894, *Science* had a succession of editors and financial backers who consistently struggled—and failed—to sustain the kind of periodical that Newcomb had called for. After Edison pulled out of the venture in 1881, another business-minded scientist, Alexander Graham Bell, along with his father-in-law, Gardner G. Hubbard, purchased and financed the journal, allowing publication to continue in a new series starting in February 1883 with the entomologist Samuel H. Scudder as editor.<sup>8</sup> Scudder, who had worked with the famed naturalist Louis Agassiz at Harvard and was president of the Boston Society for Natural History, provided a reputable model for the scientist-editor, bringing his authority as an experienced researcher to bear on his editorial role. Yet, when the editorship was taken over in 1885 by N. D. C. Hodges, who lacked both a research reputation and Scudder's range of personal contacts, *Science* suffered a perceived decline in standards. In 1888, the journal's board expressed their dissatisfaction by resigning, and by 1891 *Science* was effectively a one-man operation.<sup>9</sup> After the financial crisis of 1893, the loss-making journal was brought to its knees, leading to the cessation of publication in March 1894.

James McKeen Cattell, a psychologist and Columbia University professor, bought the journal during its hiatus in 1894 and assumed the editorial role from a position founded on both inherited privilege and acquired prestige. He had the advantages of family wealth, connections provided by his father's position as president of Lafayette College, Pennsylvania, and his own considerable intellectual and professional ambition. Such factors aided in Cattell's attainment of a fellowship at Johns Hopkins University and supported several years' work in Germany and England, where the aspiring psychologist studied with Wilhelm Wundt, earned a doctorate at Leipzig, became a fellow-commoner at St. John's College, Cambridge, and entered the London intellectual circle of Francis Galton.<sup>10</sup> Through these institutional and personal ties, Cattell became a prominent figure in the tradition of

experimental psychology that was then gaining sway in university departments, as well as in the pages of leading journals in Europe and the United States.<sup>11</sup> Of his time teaching at Leipzig and Cambridge, Cattell said it was done “partly for the experience, partly for the prestige.”<sup>12</sup> Building on this solid foundation, Cattell secured a professorship at Columbia in 1891, where he remained until his controversial dismissal in 1917.

If Cattell’s elevation within the scientific community was aided by privilege, he nevertheless envisioned the creation and consolidation of cooperative and democratic scientific networks in the United States. Soon to be exemplified by the journal *Science*, this vision resonated with his fellow scientists. For these peers, the strength and vitality of the American scientific community was measured against the models found abroad. In Britain, there was the eminent example of the cross-disciplinary weekly *Nature* (established in 1869).<sup>13</sup> Many Americans viewed a subscription to *Nature* as quite adequate to keep them up to date with scientific news. The Cornell psychologist Edward B. Titchener noted in a letter to Hodges, “The only reason that makes me hesitate to subscribe [to *Science*] is the doubt which I have expressed to you before,—whether ‘Science’ can better ‘Nature’ on its own lines.”<sup>14</sup> Newcomb regretfully acknowledged *Nature*’s superiority to another American periodical: “the reader who wishes to learn what our [American] scientific men are doing here will find far more copious accounts of it in ‘Nature,’ an English periodical, than he will in the American magazine [*Popular Science Monthly*].”<sup>15</sup> Even in 1894, the community of American scientists lacked a collective commitment to a national periodical. Cattell, building on his experiences in the field of psychology, stimulated and channelled a greater sense of communal purpose when he re-launched *Science* in 1895.

Cattell’s success with *Science* derived from his evolving sense of effective editorial conduct; the vocation of the scientific journal editor was itself a relatively novel one in Cattell’s time, and his own varied experiences in scientific print culture informed his

habitation of the role. Before acquiring *Science*, Cattell launched the *Psychological Review*, which he co-edited with James Mark Baldwin from 1894 until 1904. That journal was itself in competition with G. Stanley Hall's *American Journal of Psychology*, established in 1887; the potential for conflict caused such eminent figures as William James to worry that "bad personal rivalries in scientific matters" might come to derail the young discipline. Facing the prospect of psychological journals being abused as vehicles for the professional advancement of their editors, James hoped "that individuals will sacrifice their own desires to the good of the greatest number" and suggested that what was needed was a "laboring and drudging chief editor," who should be "the most wide-awake and practical and sympathetic and unoriginal man."<sup>16</sup> For his part, Cattell insisted that "I should be only too glad if we could all unite on one Journal."<sup>17</sup> Yet, rather than ceding the field of editorial battle to Hall's title, Cattell continued to edit *Psychological Review*, alternating with Baldwin as editor on an annual basis. The pair established the journal's reputation by securing a prestigious group of "cooperating editors," including John Dewey and William James, as well as Europeans Alfred Binet, Carl Stumpf, and James Sully. High-caliber contributions were solicited from well-known scientists in both the United States and Europe, as well as from younger figures who would come to exert a significant influence in and beyond psychology.<sup>18</sup>

Despite *Psychological Review*'s success within its disciplinary field, however, the personal relationship between its co-editors was fractious. Baldwin and Cattell's partnership ended acrimoniously in 1904 when Baldwin bought out Cattell's share of the journal.<sup>19</sup> Immediately afterward, Cattell made clear his determination to start another periodical, a "'Centralblatt' [on the German model of a review of current literature] for philosophy, psychology and scientific methods." Although Cattell stressed to Baldwin that this new periodical "would not compete with the 'Review'," Baldwin viewed it as an incursion onto the territory of his journal and charged Cattell with unethical conduct.<sup>20</sup> Cattell, meanwhile,

saw his plan as consistent with long-standing ambitions he had previously advocated for all scientific disciplines.<sup>21</sup> A year before his split with Baldwin, Cattell had insisted that every science needed, “a ‘Centralblatt’ containing abstracts of the literature with a complete bibliography,” as well as a separate “journal for shorter articles, general discussions, critical reviews, etc.”<sup>22</sup> This vision of an integrated constellation of journals, alongside other institutions, including libraries, museums, universities, scientific associations, and academies, was an important component of Cattell’s scientific, as well as his editorial, outlook. A range of titles reviewing the current literature in each discipline, Cattell thought, would foster a more efficient and cooperative scientific community and was firmly in “the interests of psychology in America.”<sup>23</sup>

### **Consolidating the Networks of *Science***

*Psychological Review*’s intellectual credibility was based on networks of prestige made manifest in the journal’s contents. When Cattell’s field of vision expanded in *Science* to include all disciplines, the editorial approach remained the same. In the first issue of Cattell’s editorship, intellectual authority was signalled through its contributors and editors. Simon Newcomb was enlisted to provide the opening statement of intent, which gestured optimistically to the revitalizing work this new periodical might effect: “We need a broader sympathy and easier communication between widely separated men in every part of the country. Our journal aims to supply the want of such a medium, and asks the aid of all concerned in making its efforts successful.”<sup>24</sup> Newcomb not only provided the opening contribution but also led the masthead, listing the editorial committee of eighteen eminent representatives from the full range of scientific disciplines, including mathematics (Newcomb), astronomy (Edward C. Pickering), physics (T. C. Mendenhall), chemistry (Ira

Remsen), and anthropology (Daniel G. Brinton and John Wesley Powell). A supportive contribution by Daniel Coit Gilman, the influential president of Johns Hopkins University, also featured prominently.<sup>25</sup> The masthead radiated institutional as well as intellectual authority. Newcomb, for example, was, by 1895, well on his way to establishing a reputation as “the most influential American scientist of the late nineteenth century.” He had already served as president of both the AAAS and the Philosophical Society of Washington, vice-president of the National Academy of Sciences, and his principal professional role was superintendent of the U.S. Nautical Almanac Office. He had also edited the *American Journal of Mathematics* and held a professorship at Johns Hopkins University, while in 1890 he had been garlanded with the prestigious Copley Medal of the Royal Society of London.<sup>26</sup>

Cattell’s quick marshalling of an elite board at *Science* contrasted with Hodges’ failure to sustain a board of eminent contributing editors. Though Cattell politely referred to Hodges’s “faithful and untiring efforts on behalf of the journal,” he pointedly did not credit Hodges, as he did the earlier editor Scudder, for “the high standard maintained during his editorship.”<sup>27</sup> Under Cattell, *Science*’s editorial committee stabilized, with only occasional replacements and gradual expansion to bring in promising younger scientists. Some editors made frequent contributions to the journal, but many served a more symbolic purpose. The editor for chemistry, Ira Remsen, greeted two new editorial appointments in 1897 by coyly hoping that “the spirit will move them to do more work for the cause than some (most(?)) of the other members do,” and his guilty sense of inaction later prompted the offer of his resignation from the editorial committee. Yet, even if he offered little practical editorial assistance, Remsen was an important node in the networks of scientific prestige which Cattell was establishing at *Science*, and the chemist was persuaded to stay on the masthead.<sup>28</sup>

Others on Cattell’s committee provided valuable copy through the regular contribution of “Notes” on their subject. William Morris Davis for physiography and Daniel

Garrison Brinton for anthropology, for example, were among the most frequent contributors to *Science* in its early years, using the journal as a platform to proselytize for relatively new disciplines. From 1895 to 1900, while Remsen's signed contributions to *Science* numbered only six and Simon Newcomb's ten, Davis contributed 101 and Brinton 207. The connections fostered by the editorial committee built on but also expanded the social networks of American science and placed the journal so emphatically in the center of the scientific community that Cattell could boast, retrospectively, "the responsible editor has had the cooperation of practically all American men of science."<sup>29</sup>

One mark of the journal's success was the determination of younger editors to retain their positions on its masthead. If *Science* accrued esteem from the reputations of its most eminent supporters, it also conferred considerable prestige upon up-and-coming scientists. Henry Fairfield Osborn, editor for paleontology, was twenty-two years younger than Newcomb and joined Columbia as a professor in the same year as Cattell. When asked about possible changes to the editorial committee, Osborn responded, somewhat defensively, "It would hardly be fair to omit the names of [t]hose who are really helping you from time to time. I, for example, have been trying to do my duty of late toward the journal, and appreciate the printing of my name as one of your collaborators."<sup>30</sup> Cattell's efforts to maintain a stable and prestigious editorial committee while also seeking to refresh the journal's masthead from time to time with "younger men who can take an active interest in its work," as Edward Pickering put it, signalled the editor's commitment to the twin demands of the intellectual esteem fostered by tradition and the forward-looking relevance brought by emerging talents.<sup>31</sup> Cattell also faced the editorial problem of maintaining the standards expected of a leading scientific journal at a time before systematic peer review had been implemented. The editorial filters on the journal's contents operated informally, through consultation between Cattell, relevant members of his editorial committee, as well as other figures deemed authoritative.



Cattell thought an expansive and open network of expert contributors was preferable to a tight clique of friends, even though it depersonalized the virtual community of scientists. It was, Cattell asserted when vetting new submissions, “desirable to have our contributors [*sic*] come from as wide a circle of scientific men as possible, providing they are competent.”<sup>32</sup>

Cattell also sought an institutional alliance between *Science* and the largest scientific organization in the United States, the AAAS, though his plans were greeted skeptically by the Association’s executive committee. Some feared Cattell was attempting “to raid the treasury generally” to fund a magazine that had, notoriously, received past subsidies from the AAAS and had nevertheless twice collapsed due to insolvency. Furthermore, despite Cattell’s impulse to editorial inclusiveness, some in the AAAS leadership suggested that “*Science* was seen [to be] in the interests of Columbia,” the university that housed not only Cattell but three other editorial committee members as well.<sup>33</sup> In the face of opposition from the AAAS leadership, Cattell justified his plans for collaboration in terms of the larger interests of science in the United States. Both the AAAS and *Science*, Cattell insisted in a letter to the AAAS’s permanent secretary, “have exactly the same end,—the advancement of science in America—and are both contributing greatly and I think increasingly to this end. The question is whether they could do more by a definite plan of cooperation.”<sup>34</sup> This appeal, beyond the personal interests of individuals to the transcendent cause of science, was Cattell’s enduring refrain. It harmonized with his emphasis on the importance of open and accessible print forums as a means to that end. In an editorial timed to coincide with the 1897 annual meeting of the AAAS and distributed to the Association’s executives, Cattell stressed the weekly periodical’s capacity to strengthen the community of American scientists, writing that “the growth of specialization and the scattering of men of science over the whole area of America” only heightened “the need of cultivating intercourse between them.”<sup>35</sup>

A formal link between *Science* and the AAAS was finally effected in 1900, whereby, for annual dues of three dollars, AAAS members would also receive a full subscription to *Science* (with two dollars allotted to Cattell).<sup>36</sup> Hence, the journal became for many the most tangible symbol of membership in the American scientific community, “giving even those unable to attend the annual meetings an adequate return for membership.”<sup>37</sup> The results were impressive: AAAS membership increased from less than two thousand in 1894 to over five thousand by 1903. By the late 1920s, the Association boasted in excess of fourteen thousand members.<sup>38</sup> Cattell also expanded his investment in scientific publication with a growing list of titles. He acquired *Popular Science Monthly* in 1900, and *American Naturalist* in 1907, when it faced collapse, and established *School and Society* in 1915. Cattell went on to incorporate his own Science Press Printing Company in 1923, which extended his publishing empire to include monographs, reference works, and textbooks.<sup>39</sup> Even before the turn of the century, Cattell’s editorial and organizational efforts were welcomed by the community of American scientists. One of *Science*’s previous promoters and backers, Alexander Graham Bell, warmly told Cattell in 1899 that “Science has been very ably conducted since it passed into your hands,” now constituting “the representative American journal for which Mr. Hubbard and I worked.”<sup>40</sup> The social networks of the scientific community had been effectively transplanted into the print networks of *Science* and its extended family of editors, contributors, and subscribers. Given its pre-eminent role, however, the journal was continually forced to address disputes and controversies that bubbled up among the community of scientists; its task was to provide a forum for their clear presentation and resolution. A closer study of some of the disputes that made their way into the pages of the journal will highlight just how Cattell shaped his editorial practice to sustain his journal’s authority.

## **The Principle of Publicity and the Authority of *Science***

Not all forms of print held the same cognitive authority for scientists. William James privately dismissed one psychologist privately as “too newspaperly” to edit an academic journal, and his implied scorn for daily papers’ treatment of scientific issues was not uncommon.<sup>41</sup> The Harvard mathematician Benjamin Peirce was dogged by allegations of plagiarism by the amateur mathematician John Warner from the late-1850s; when those allegations were published in newspapers from the *Albany Argus* to the *New York Times*, Peirce refused to condescend to the judgment of the “incompetent tribunal” of the press, while Warner insisted that such exposure would mean, “The public could and would form a just opinion.”<sup>42</sup> The need for an authoritative public forum for the airing of scientific disputes was a delicate but urgent matter.

Wary of the sensationalism associated with newspaper reporting, Cattell protected the authoritative reputation of *Science* assiduously, adopting an editorial approach characterized by a principle of publicity which sought to ensure that any controversies or disagreements could be appraised from all sides. At the same time, as the interdisciplinary and international community of scientists became increasingly depersonalized and anonymous, intellectual authority and legitimacy faced threats from new sources. Lorraine Daston has argued persuasively that the “practice of well-nigh constant, impersonal communication” among scientific inquirers was itself a necessary condition of the cognitive ideal of “aperspectival objectivity.” Communicability was an essential component of legitimacy, and the periodical form bore a heavy burden in ensuring the open exchange of knowledge. Daston cites the example of the *Lancet*, which in 1881 published the recommendations of the American Army Surgeon John Shaw Billings, who would later become a member of Cattell’s editorial committee. Billings encouraged editors to keep in mind those vast ranks of readers who

“have no clue to the character of the author” appearing in their journal “beyond the fact that they find his works in good company.” Editors were duty-bound to identify and reject any contributors who were “constitutionally incapable of telling the simple, literal truth as to their observations and experiments.”<sup>43</sup> As Daston observes, periodical networks not only solved problems of communication among an expanding community of inquiry but also created new problems surrounding the legitimacy and reliability of scientific knowledge: “The distances and sheer numbers of writers and readers spanned by the new networks of scientific communication had undermined the old rules of trust and trustworthiness.”<sup>44</sup>

These dilemmas were exemplified in the case of Stephen H. Emmens, a little-known independent researcher, who had published in *Science* on technical questions relating to exact measurements of volume during Hodges’s tenure as editor. At that time, Emmens had been mildly rebuked by Thomas C. Mendenhall, who joined *Science*’s editorial committee after 1895.<sup>45</sup> Yet Emmens was not one to shy away from controversy, and, in response, he labelled Mendenhall a “keen-witted . . . controversialist” and accused this “eminent” figure of affecting “too donnish” a critique. Emmens aligned himself rhetorically with *Science*’s imagined subscribers, whom he suggested Mendenhall had derided in a “scornful allusion to easily-befogged readers.” Finally, Emmens cited the testimony of his own network of supporters, from an editorial in the *Engineering News*, a professor from the Stevens Institute of New Jersey, a scientist at an English steel works with a “world-wide” reputation, and Latimer Clark, a Fellow of the Royal Society.<sup>46</sup> Facing off in print, however, Emmens and Mendenhall were a mismatch: Mendenhall, as superintendent of the U.S. Coast and Geodetic Survey, was a powerful government scientist and an international authority on weights and measures while Emmens had no scientific reputation to speak of, nor even a clear institutional affiliation.

When Emmens reappeared in the pages of *Science* nearly four years later, once Cattell was editor, the fallout was to be even more fractious and forced the journal to exercise its authority as, simultaneously, the arbiter of open exchange and a protective screen safeguarding the scientific community from the incursions of pseudo-scientific eccentrics. By 1898, Emmens had crossed the line into the latter category, having turned to the practice of alchemy. Emmens enthusiastically promoted a new method for the transmutation of silver into gold by the means of “forty hours of intense cold and continued hammering” of a mixed silver-and-gold Mexican dollar. The process, Emmens reported, resulted in an increase in the gold content of the coin by over twenty per cent, and he claimed to have sold six gold ingots, produced in his secret laboratory, to the U.S. Assay Office for \$954.<sup>47</sup> These claims were publicized in Emmens’s self-published *The Argentaurum Papers* (1897), which was reviewed caustically in *Science*; yet the book was also advertised in the same issue with an apparent endorsement from Simon Newcomb. In the review by physicist and contributing editor Robert S. Woodward, Emmens’s whole approach was comprehensively dismissed as evidence of “the colossal impudence of those pseudo-scientists whose equipment consists of formal logic and a facile pen” rather than genuine knowledge and appropriate experimental methods.<sup>48</sup> Soon after, and responding to the appearance of his name in an advertisement for Emmens’s book, Simon Newcomb also weighed in, anxious to protect his own scientific authority: “I have never even seen Mr. Emmens’ book,” Newcomb made clear, before speculating that Emmens was “a victim” of some “special mental condition” which left him resistant to “reasoning or explanation.” Newcomb refused to engage Emmens in any direct correspondence, but he did make sure that his dissociation from the book was made clear in the scientific journal of record.<sup>49</sup>

Cattell himself felt compelled to add a footnote to Woodward’s review. The editor recognized that the acceptance of an advertisement for a book that the journal critically

savaged might appear hypocritical. He defended the decision on the basis of the ideals of “freedom of speech or of publication” and pointed to the fact that Emmens was “said to have done good scientific work, and it would doubtless seem . . . like persecution not to permit him to bring his book to the attention of men of science.”<sup>50</sup> The principle of publicity attested to here was itself a recurrent feature of Cattell’s scientific-editorial conduct. When the *London Journal of Botany* printed the charge that *Science* had suppressed an article due to bias, Cattell responded by publishing the charges at length, as well as an independent critical dismissal of the article in question from the *Botanical Gazette*, and strenuously asserted his editorial right to select or reject items based on their merit.<sup>51</sup> Shedding light on controversy helped to dispel it. The same principle of publicity without partisanship informed Cattell’s willingness to publish the appeals of individuals who felt they had been professionally wronged and sought to restore their position and reputation through the pages of *Science*. When the psychologist H. Heath Bawden argued he had been unfairly dismissed from the University of Cincinnati because of his unconventional views on marriage and divorce, Cattell allowed him to publish a statement but insisted that the journal could pass no judgment on his case; that should be a matter for the professor’s “peers in the faculty.”<sup>52</sup>

In Emmens’s case, Cattell’s pursuit of transparency through publication served to highlight the alchemist’s suspect position on the borders of the scientific community.<sup>53</sup> Though a marginal figure, Emmens nevertheless made what use he could of American scientific networks and vociferously defended his legitimacy in a response to Woodward’s review. It constituted, he wrote in a letter published by the scrupulous Cattell, “a personal attack upon myself in terms calculated to seriously injure me in the exercise of my profession as a scientific expert.” In “self-defense,” Emmens “commenced an action for libel against the ‘responsible editor’ of *Science* and Professor Woodward.”<sup>54</sup> The controversy thus had material implications: Cattell’s publisher at Macmillan passed on the legal bills incurred in

filing a defense, amounting to \$351, to Cattell as the journal's owner.<sup>55</sup> The incident also raised the more serious problem of how to maintain the authority of *Science* in the face of disputed claims and suspect contributions. Once again, Cattell found the answer in publicity: Emmens was given a right of reply, and, when he found that "the right to be heard in self-defense was not disputed by the editor of *Science*," the neo-chemist decided to drop his libel suit. Specific judgments on the merits of Emmens's competency and legitimacy had been left to the journal's readers: open publication was seen as a satisfactory solution to the problem of disputes over scientific authority, such that the full weight of criticism against Emmens was clear to all, and yet the policy of "permitting absolute freedom of criticism" had been retained.<sup>56</sup>

### **Editorial Disinterest and the Democratic Community of Inquiry**

Cattell summarized his editorial credo in a draft advertisement for his journal around 1909, referring with evident relish to the widely acknowledged status of *Science* as the ultimate court of arbitration for scientific disputes: "It is . . . a valuable safeguard to have a place where, within the limits of courtesy, complete freedom of speech is permitted for what the writer believes to be for the interests of science. Thus an editorial article in a recent issue of the *Independent* referring to the centralized and personal administration of our universities says: 'The liability to use such power is checked by the watchfulness of supervising boards and by the fact that an aggrieved party may appeal to Caesar, *i.e.*, *Science*.'"<sup>57</sup> Among the multiplicity of institutions that housed the scientific community, Cattell's *Science* held a pre-eminent position in the early-twentieth century. Despite the allusion to the absolute authority of a "Caesar," however, Cattell's editorial stance contributed to a self-consciously democratic "scientific ethos" that became increasingly widespread in the mid-twentieth century. This

ethos linked the collaborative and disinterested pursuit of scientific knowledge with the characteristic features of democratic society, including representative forms of government, a sense of social responsibility, and the right to free speech.<sup>58</sup>

Cattell used his journal to realize the ideal of communal inquiry. His relative success is anecdotally illustrated by the scientist and philosopher Charles S. Peirce, who was in later life largely estranged from the scientific community, with no job and few friends in the academic world. Cattell's print network, however, kept him in touch. In 1910 Peirce thanked Cattell for complimentary copies of the journal: "'*Science*' has of late come to me regularly; and I owe you more thanks for it than I could possibly express. . . . All this is my garrulous way of showing how much I value getting 'Science' weekly, as I do also the Pop. Sci. [*Popular Science Monthly*] for I get no word from the scientific world,—my only world,—except what the writers are so good as to send me."<sup>59</sup> Through the network of *Science*, Peirce retained some stimulation for his own ongoing project: a "theory of inquiry" for all of the sciences that, like Cattell's editorial vision, insisted on the pursuit of knowledge as a communal enterprise, or "the ideal of a practicing community of inquirers."<sup>60</sup> *Science* made this community tangible and self-aware but also transformed the scientific world of interpersonal relationships into an expanding network of increasingly anonymous collaborators, of which the journal formed the hub.

In establishing this network, Cattell sought to achieve a stance of editorial disinterestedness that was strikingly at odds with his fiercely opinionated personal positions on many issues of the day. Cattell held strong views on matters ranging from the merits of experimental approaches in psychology and the funding of scientific research to political issues such as the conscription of American troops to fight in the European war; indeed, it was Cattell's strident and public opposition to conscription that was the nominal cause for his dismissal from Columbia University in 1917.<sup>61</sup> Cattell even used *Science* to launch critiques



of the governance of American science which frustrated members of his editorial committee who bridled at being associated with Cattell's personal views.<sup>62</sup> In addition, Cattell reprinted articles from other publications in which he defended his position in the Columbia affair.<sup>63</sup> On top of his divisive opinions, Cattell was notoriously abrasive and difficult to work with. He has been characterized as “obnoxious” and “the prototype of the faculty buttinsky,” while Sokal has attributed the widely noted “long-term and unremittingly nasty and arrogant behavior” Cattell exhibited at Columbia, at least in part, to an apparent “personal cognitive deficit.”<sup>64</sup>

These aspects of Cattell's behavior did not diminish *Science's* authority because the editor had established his—and his journal's—position as the central node in the networks of the larger scientific community; furthermore, he had done so in part because he was able to navigate the jostling of egos, ideas, and institutions that was inherent to scientific discourse. Through his commitment to *Science* and his own ever-expanding range of other publishing ventures, Cattell personified the kind of industrious and laborious ideal editor Newcomb had imagined in the 1870s and James had wished for in the early 1890s. Peers and colleagues might suffer Cattell's “somewhat brusque manner” (or worse), but they were ultimately indebted to his editorial work.<sup>65</sup> When it looked as though he might resign the editorship of *Science* after being dismissed from Columbia, the anthropologist Franz Boas hoped that an expression of leading scientists' “appreciation of Cattell's services” might compel him to continue in his editorial role, which in fact he did until his death in 1944.<sup>66</sup>

To understand the importance of print culture for scientific inquiry, it is worth taking seriously Cattell's rhetorical fusion of the practical interests of his journal and the abstract ideal of science itself. “Both the journal and the association [the AAAS] are means to an end,” Cattell insisted in 1926, “namely, the advancement of science, which is the most fundamental concern of modern civilization.”<sup>67</sup> Cattell sustained an enduring communitarian

vision of human solidarity that withstood his own involvement in personal feuds, challenges to authority, and many other controversies. Tracing this vision back to the earliest days of *Science*, a statement of Cattell's from 1896 can thus be read as an expression of the mutually reinforcing credos of scientist and editor: "Men of science should unite and stand together, even though on occasion it may require self-sacrifice on the part of the individual. In every community, whether of men or of the lower animals, each member must be prepared to sacrifice something, and it may be everything to the general welfare. A community whose members are not ready to give and to take cannot survive."<sup>68</sup>

Within this idealized community, Cattell emphasized the particular importance of periodicals. Journals were "connecting links between the man of science in his workshop and the intelligent public outside" and served "to hold men of science in touch with each other."<sup>69</sup> Networks were not merely a background feature of the social landscape that defined the contours of the scientific community. In Cattell's *Science*, social and intellectual networks realized in print were a necessary condition for the "advancement of science." Such networks transcended personal antagonisms, helped correct errors, and policed the borders of scientific legitimacy. In doing so, they advanced the place of science in society and constituted a tangible mechanism for achieving social improvement. By realizing these grand aims, the periodical *Science* became not simply a conduit for the spread of knowledge but a precondition for that knowledge's very existence.

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## NOTES

<sup>1</sup> Simon Newcomb, "Exact Science in America," *North American Review* 119 (October 1874): 294.

<sup>2</sup> Newcomb, "Exact Science in America," 305.

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<sup>3</sup> Simon Newcomb, "Abstract Science in America, 1776-1876," *North American Review* 122 (January 1876): 110; Simon Baatz, "'Squinting at Silliman': Scientific Periodicals in the Early American Republic, 1810-1833," *Isis* 82 (June 1991): 223-44. On the decline of this journal, see Robert V. Bruce, *The Launching of American Science, 1846-1876* (New York: Knopf, 1987), 352-53.

<sup>4</sup> Frank Luther Mott has estimated that the number of new magazine titles increased at a rate of between one hundred and 150 per year between 1865 and 1885; nevertheless, the average life-span of any given periodical was around four years. See Frank Luther Mott, *A History of American Magazines: 1865-1885*, vol. 3 (Cambridge: Belknap Press, 1957), 5.

<sup>5</sup> Sally Gregory Kohlstedt, "Science: The Struggle for Survival, 1880 to 1894," *Science* 209 (1980): 34; Mott, *A History of American Magazines*, vol. 3, 109. See also Michael M. Sokal, "Promoting Science in a New Century," in *The Establishment of Science in America: 150 Years of the American Association for the Advancement of Science*, ed. Sally Gregory Kohlstedt, Michael M. Sokal, and Bruce V. Lewenstein (New Brunswick, NJ: Rutgers University Press, 1999), especially 52.

<sup>6</sup> Sally Gregory Kohlstedt describes the AAAS as establishing "a self-aware scientific community" by 1860. Sally Gregory Kohlstedt, *The Formation of the American Scientific Community: The American Association for the Advancement of Science, 1848-60* (Urbana: University of Illinois Press, 1976), 224.

<sup>7</sup> The formation of larger, increasingly impersonal, communities of science, most often in academic settings, is traced in countless studies; see, for example, Kohlstedt, *Formation*; Daniel J. Wilson, *Science, Community, and the Transformation of American Philosophy, 1860-1930* (Chicago: Chicago University Press, 1990); Julie A. Reuben, *The Making of the Modern University: Intellectual Transformation and the Marginalization of Morality* (Chicago: University of Chicago Press, 1996); Philip J. Pauly, *Biologists and the Promise of*

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*American Life: From Meriwether Lewis to Alfred Kinsey* (Princeton, NJ: Princeton University Press, 2000). On professionalization, see Paul Lucier, “The Professional and the Scientist in Nineteenth-Century America,” *Isis* 100 (December 2009): 699-732.

<sup>8</sup> Kohlstedt, “*Science*,” 34-35.

<sup>9</sup> Kohlstedt, “*Science*,” 39-40; Michael Sokal characterizes Hodges as a man who “lacked professional credentials and knew little of the American scientific community.” Sokal, “Promoting Science,” 52.

<sup>10</sup> Michael M. Sokal, “Baldwin, Cattell and the *Psychological Review*: A Collaboration and its Discontents,” *History of the Human Sciences* 10, no. 1 (1997): 60.

<sup>11</sup> On Cattell’s significance, see Michael M. Sokal, “Postscript,” in Cattell, *Education in Psychology*, 330-41; Kurt Danziger, *Constructing the Subject: Historical Origins of Psychological Research* (Cambridge, UK: Cambridge University Press, 1990), 54, 64, 78-79. On the wider history of psychology as a discipline, see also Daniel W. Bjork, *The Compromised Scientist: William James in the Development of American Psychology* (New York: Columbia University Press, 1983).

<sup>12</sup> Cattell to parents, December 4, 1888, in James McKeen Cattell, *An Education in Psychology: James McKeen Cattell’s Journal and Letters from Germany and England, 1880-1888*, ed. Michael M. Sokal (Cambridge, MA: MIT Press, 1981), 311.

<sup>13</sup> On the development of *Nature* in roughly the same period, see Melinda Baldwin, “The Shifting Ground of *Nature*: Establishing an Organ of Scientific Communication in Britain, 1869-1900,” *History of Science* 50 (April 2012): 125-54.

<sup>14</sup> E. B. Titchener to N. D. C. Hodges, October 2 1894, box 181, James McKeen Cattell Papers, Rare Books and Manuscripts Division, Library of Congress, Washington, DC. (Hereafter cited as Cattell Papers.) For a similar view, see Theodore D. A. Cockerell to N. D. C. Hodges, October 26, 1894, box 181, Cattell Papers.

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<sup>15</sup> Newcomb, "Exact Science in America," 307.

<sup>16</sup> William James to Hugo Münsterberg, July 29, 1893, Hugo Münsterberg Papers, Rare Books and Manuscript Collections, Boston Public Library, Boston, MA. (Hereafter cited as Münsterberg Papers).

<sup>17</sup> James McKeen Cattell to Hugo Münsterberg, August 23, [1893/94?], Münsterberg Papers.

<sup>18</sup> Sokal, "Baldwin, Cattell and the *Psychological Review*," 64-66.

<sup>19</sup> The breakdown in editorial and personal relations between Cattell and Baldwin is dissected in Sokal, "Baldwin, Cattell and the *Psychological Review*."

<sup>20</sup> James McKeen Cattell to James Mark Baldwin, December 7, 1903, box 3, Cattell Papers.

<sup>21</sup> Cattell's plans for a *Centralblatt* did materialize in the form of the *Journal of Philosophy, Psychology and Scientific Methods* (established in 1904), but, due to the controversy, Cattell declined its editorship, which went instead to his Columbia colleague, the philosopher Frederick J. E. Woodbridge.

<sup>22</sup> James McKeen Cattell, "The Academy of Sciences," *Science* NS 16 (December 19, 1902): 973.

<sup>23</sup> See James McKeen Cattell to James Mark Baldwin, May 14, 1904, box 3, Cattell Papers.

<sup>24</sup> Simon Newcomb, "To Our Readers," *Science* NS 1 (January 4, 1895): 2.

<sup>25</sup> D. C. Gilman, "Scriptoribus et Lectoribus, Salutem," *Science* NS 1 (January 4, 1895): 2-3.

<sup>26</sup> Albert E. Moyer, *A Scientist's Voice in American Culture: Simon Newcomb and the Rhetoric of Scientific Method* (Berkeley: University of California Press, 1992), 78-81.

<sup>27</sup> James McKeen Cattell, "'Science'," *Science* NS 1 (March 29, 1895): 352.

<sup>28</sup> Ira Remsen to James McKeen Cattell, September 10, 1897, October 20, 1898, November 7, 1898, box 35, Cattell papers; see also Charles D. Walcott to James McKeen Cattell, June 14, 1901, box 44, Cattell Papers.

<sup>29</sup> Cattell, "'Science'," 344.

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<sup>30</sup> Henry Fairfield Osborn to James McKeen Cattell, January 5, 1904, box 34, Cattell Papers.

<sup>31</sup> Edward C. Pickering to James McKeen Cattell, December 30, 1903, box 35, Cattell Papers.

On younger generations' influence on journals, see Baldwin, "Shifting Ground," 133-37.

<sup>32</sup> James McKeen Cattell to William Morris Davis, December 11, 1897, box 13, Cattell Papers.

<sup>33</sup> Robert S. Woodward to James McKeen Cattell, August 19, 1897, box 46, Cattell Papers.

<sup>34</sup> James McKeen Cattell to Leland O. Howard, September 23, 1899, box 21, Cattell Papers.

<sup>35</sup> [James McKeen Cattell], "The American Association for the Advancement of Science," *Science* 6 (August 6, 1897), 182; on the tactical distribution of this editorial, see Woodward to Cattell, August 19, 1897, Cattell Papers.

<sup>36</sup> Cattell, "'Science'," 345.

<sup>37</sup> [James McKeen Cattell], "The American Association for the Advancement of Science," *Science* 13 (June 21, 1901): 963.

<sup>38</sup> Macmillan Co. to James McKeen Cattell, 30 January 1903, box 182, Cattell Papers; James McKeen Cattell, "Book Reviews in Science," (1929), box 70, Cattell Papers.

<sup>39</sup> Cattell noted of the Science Press, "It is regarded as a real contribution to science that there has been established a printing plant specially equipped for scientific work." James McKeen Cattell, Untitled MS, n.d., box 70, Cattell Papers; see also Cattell, "The Journal 'Science'," 344-45.

<sup>40</sup> Alexander Graham Bell to James McKeen Cattell, February 6, 1899, box 4, Cattell Papers.

<sup>41</sup> James to Münsterberg, July 29, 1893, Münsterberg Papers; James was referring to Joseph Jastrow; see also the cautionary note in James H. Hyslop, "Newspaper Science," *Science* 10 (November 10, 1899): 696.

<sup>42</sup> Peirce and Warner quoted in George H. Daniels, *Science in American Society: A Social History* (New York: Knopf, 1971), 171.

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<sup>43</sup> Billings quoted in Lorraine Daston, "Objectivity and the Escape from Perspective," *Social Studies of Science* 22 (November 1992): 610-11.

<sup>44</sup> Daston, "Objectivity and the Escape from Perspective," 611.

<sup>45</sup> See Stephen H. Emmens, "Where is the Litre?—A Modern Scientific Puzzle-Picture," *Science* 21 (March 17, 1893): 141-44; T. C. Mendenhall, "Where is the Litre?" *Science* 21 (April 21, 1893): 219-20.

<sup>46</sup> Stephen H. Emmens, "Where is the Litre?" *Science* 21 (April 28, 1893): 234.

<sup>47</sup> Stephen H. Emmens, "The Revival of Alchemy—A Rejoinder," *Science* NS 7 (March 18, 1898): 389; H. Carrington Bolton, "The Revival of Alchemy," *Science* NS 6 (December 10, 1897): 862.

<sup>48</sup> "W." [R. S. Woodward], review of Stephen H. Emmens, *The Argentaurum Papers*, *Science* NS 5 (February 19, 1897): 315.

<sup>49</sup> Simon Newcomb, "An Ambitious Paradoxe," *Science* NS 5 (March 5, 1897): 400.

<sup>50</sup> James McKeen Cattell, footnote to "W." [R. S. Woodward], review of Emmens, 314n.

<sup>51</sup> James McKeen Cattell, "Alleged Suppression of Discussion," *Science* NS 2 (September 27, 1895): 411-12.

<sup>52</sup> H. Heath Bawden, "The Chair of Philosophy at the University of Cincinnati," *Science* NS 27 (June 19, 1908): 959; H. Heath Bawden to James McKeen Cattell, May 19, 1908, box 98; James McKeen Cattell to H. Heath Bawden, May 20, 1908, box 98, Cattell Papers.

<sup>53</sup> Emmens's alchemical views were by no means unique, yet, along with those of other "neo-chemists" discussed in *Science*, they were roundly dismissed; see Bolton, "The Revival of Alchemy," 853-63.

<sup>54</sup> Emmens, "The Revival of Alchemy—A Rejoinder," 389.

<sup>55</sup> George P. Brett to James McKeen Cattell, December 1, 1897, box 182, Cattell Papers.

<sup>56</sup> Emmens, "The Revival of Alchemy—A Rejoinder," 389.

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<sup>57</sup> James McKeen Cattell, “An Advertisement of *Science*,” MS [circa 1909], box 182, Cattell Papers.

<sup>58</sup> David A. Hollinger links Cattell to the democratic “scientific ethos” that emerged most emphatically in the 1930s in “The Defense of Democracy and Robert K. Merton’s Formulation of the Scientific Ethos,” in *Science, Jews, and Secular Culture: Studies in Mid-Twentieth-Century American Intellectual History* (Princeton, NJ: Princeton University Press, 1996): 80-96, see especially 89; Cattell advanced such principles as representative government and the social responsibility of science under democracy, in [Cattell], “American Association,” (1897), 183; [Cattell], “American Association,” (1901), 966.

<sup>59</sup> Charles S. Peirce to James McKeen Cattell, November 10, 1910, box 143, Cattell Papers.

<sup>60</sup> Joseph Brent, *Charles Sanders Peirce: A Life*, revised edition (Bloomington: Indiana University Press, 1998), 5.

<sup>61</sup> For a critical interpretation of Cattell’s conduct at Columbia, see Michael M. Sokal, “James McKeen Cattell, Nicholas Murray Butler, and Academic Freedom at Columbia University, 1902-1923,” *History of Psychology* 12, no. 2 (2009): 87-122.

<sup>62</sup> On Simon Newcomb’s opposition to Cattell’s published criticisms of President William McKinley see Simon Newcomb to James McKeen Cattell, February 15, 1898, box 33, Cattell Papers; on John Billings’s resignation from the editorial committee following Cattell’s assault on the Carnegie Institution see John S. Billings to James McKeen Cattell, January 31, 1903, box 4, Cattell Papers.

<sup>63</sup> [James McKeen Cattell,] “Columbia University and Professor Cattell,” *Science* NS 46 (October 26, 1917): 411-13.

<sup>64</sup> Louis Menand, *The Metaphysical Club: A Story of Ideas in America* (New York: Farrar, Straus and Giroux, 2001), 443; Robert A. McCaughey, *Stand Columbia: A History of Columbia University in the City of New York, 1754-2004* (New York: Columbia University



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Press, 2003), 242; Michael M. Sokal, "Scientific Biography, Cognitive Deficits, and Laboratory Practice: James McKeen Cattell and Early American Experimental Psychology, 1880-1904," *Isis* 101 (September 2010): 535.

<sup>65</sup> Franz Boas to Alexander Graham Bell, March 27, 1906, "Alexander Graham Bell" folder 1, Collection 1: Franz Boas Papers, American Philosophical Society, Philadelphia, PA. (hereafter Boas Papers).

<sup>66</sup> Franz Boas to A. A. Michelson, October 18, 1917, "A. A. Michelson" folder, Boas Papers; Sokal, "Scientific Biography," 548.

<sup>67</sup> Cattell, "The Journal 'Science'," 347.

<sup>68</sup> [James McKeen Cattell], "Science in America," *Science* NS 4 (August 21, 1896): 207.

<sup>69</sup> [Cattell], "Science in America," 207.