

Introduction to Special Issue: Revolutionary Politics and Biological Organization in Nineteenth-Century France and Germany

Nineteenth-century Europe was riven with revolutionary and reformist movements in both politics and science. Politically, such movements ranged from moderate to radical, and always battled strong forces of reaction: tensions peaked across Europe in the simultaneous revolutions of 1848–49 and their brutal repression, which lasted well into the 1850s. But the story of the nationalist and democratic movements in Europe and the reshaping of state borders extends significantly in both chronological directions, going back to the French Revolution, with important punctuation points in the 1810s and the 1830s, and continuing dynamically, with considerably military involvement, until reaching a new (if temporary) equilibrium in the 1870s with the unifications of the German and Italian states and the emergence of the French Third Republic. In science, the decades across the middle of the century are famous for their own, intellectual, revolutions: the cell theory, conservation of energy, evolution. Yet the relations between these intellectual revolutions and the political dynamics of the period in continental Europe have received surprisingly little attention.¹

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1. Some important exceptions are: Erwin H. Ackerknecht, “Beiträge zur Geschichte der Medizinalreform von 1848,” *Sudhoffs Archiv für Geschichte der Medizin* 25 (1932): 61–183; Everett Mendelsohn, “Revolution and Reduction: The Sociology of Methodological and Philosophical Concerns in Nineteenth-century Biology,” in *The Interaction between Science and Philosophy*, ed. Y. Elkana (New York: Atlantic Highlands, 1974), 407–26; Toby A. Appel, *The Cuvier–Geoffroy Debate: French Biology in the Decades Before Darwin* (New York: Oxford, 1987); John Pickstone, “How Might We Map the Cultural Fields of Science?” *History of Science* 37 (1999): 347–64.

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This special issue of *HSNS* is devoted to three inquiries into the multifaceted relations between political activity and investigations into biological organization in nineteenth-century French- and German-speaking Europe. Collectively we focus on a small number of historical actors—François-Vincent Raspail, Theodor Schwann, Carl Vogt, Auguste Comte, and Charles Robin—chosen because they were both significant in the history of ideas about biological organization and politically engaged, yet have been neglected in the dominant historiography. Our aims are not exclusively biographical, however. Rather, in analyzing the interrelations among their writings and actions in political, philosophical, and scientific arenas, we seek a broader understanding of changing ideas about biological organization from the late 1820s through the 1870s, and the way these ideas connected to different political stances.

Our analyses of these scientists extend our knowledge of the relations of politics and science beyond the very few leading biologists, particularly Rudolf Virchow and Ernst Haeckel, whose political views and their relations to their science have been closely examined.² But beyond the mere addition of different historical actors, we seek to shift and broaden the historiographic terrain. By collectively examining biologists in both francophone and germanophone settings (France, the German-speaking states, Belgium, Switzerland), we question traditional French and German historiographies of biology that—despite their different national orientations—have long treated the emergence of biology as an outcome of the Enlightenment, and that have associated further progress in this field with the left-leaning ideas of nineteenth-century biologists.³ Our examinations suggest instead that novel and important views on biological organization were associated with a diversity of political positions, including

2. On Virchow, see esp. Renato Mazzolini, *Politisch-biologische Analogien im Frühwerk Rudolf Virchows* (Marburg: Basiliskens-Verlag, 1988); Constantin Goschler, *Rudolf Virchow: Mediziner—Anthropologe—Politiker* (Cologne: Böhlau, 2002); Eva Johach, *Krebszelle und Zellenstaat: Zur medizinischen und politischen Metaphorik in Rudolf Virchows Zellulärpathologie* (Freiburg, Berlin, Vienna: Rombach, 2008). On Haeckel, see esp. Robert J. Richards, *The Tragic Sense of Life: Ernst Haeckel and the Struggle over Evolutionary Thought* (Chicago: University of Chicago Press, 2008); and Andrew Reynolds, “Ernst Haeckel and the Theory of the Cell State: Remarks on the History of a Bio-Political Metaphor,” *History of Science*, 46 (2008): 123–52.

3. See Wolf Lepenies, *Das Ende der Naturgeschichte: Wandel kultureller Selbstverständlichkeiten in den Wissenschaften des 18. und 19. Jahrhunderts* (München: Hanser, 1976); Georges Canguihelm, *Knowledge of Life*, trans. Paola Marrati and Todd Meyers (New York: Fordham University Press, 2008); Ackerknecht, “Beiträge” (ref. 1); Mendelsohn, “Revolution” (ref. 1). Indeed, Reynolds, “Ernst Haeckel” (ref. 2), has already pointed to the limits of Haeckel’s liberalism as expressed in his views of cell-organism-society analogies.

reactionary ones. Further, by considering historical actors who operated in different revolutionary contexts—the French July Revolution of 1830, the German revolutions of 1848–49 and their aftermath, and the French Third Republic—we provide important further specificity to the pairing of biology and politics. In particular, we emphasize that, well beyond the much better-studied case of evolution, religious and metaphysical questions of the organization of life were also deeply political. Finally, the temporal coverage of our stories from the late 1820s to the 1870s helps us understand more fully the increasing power of analogies between biological and social forms of organization in the later nineteenth century. After orienting the reader briefly to the three articles, the rest of this introduction develops these broader collective themes and insights in more detail.

Florence Vienne compares the views of two cell theorists: the French republican⁴ scientist François-Vincent Raspail (1794–1878) and the German physiologist Theodor Schwann (1810–1882), usually celebrated as half of the “Schleiden-Schwann” pair famous for “their” cell theory. Vienne’s analysis of Raspail and Schwann shows the payoff of symmetrical analysis of science, metaphysical commitments, and political positions. What puts the two men in the same story is their having arrived independently at very similar conceptions of the cell as the basis of plant and animal organization, Raspail in 1827 and Schwann in 1838. Yet the politically and religiously radical Raspail and the conservative Schwann had virtually nothing else in common. Vienne draws on little-studied scientific works by Raspail (whose political activities are better known) to flesh out how his political commitments—to transformative progress and to decentralized governance—ran parallel to his science, both in his biological theorizing and his hopes for a liberalization of scientific institutions. In her analysis of Schwann, which draws on previously underexplored archival materials, she insists that we must decouple Schwann’s reputation from that of Schleiden, and break with his biographer Marcel Florkin’s division of his life into his early period of “important scientific work” in the 1830s and his lapse into religious “mysticism” thereafter (which effectively dismisses him as a subject of the history of science). Instead, we must take seriously how his metaphysical commitments shaped even his most revolutionary science of the 1830s. Those commitments took a new turn by the early 1860s, one in which his religious views now supported a “moderate monarchy,” which in turn reflected

4. “Republican” is understood here in the European sense of advocating for a form of government based on votes by citizens.

a new vision of the relations of cells within the body. It is only in this later, unpublished work that a fundamentally political conception of social and organismal organization emerges clearly. The comparison of Raspail and Schwann underscores how careful one must be not to assume that similar biological theories must derive from or be linked to similar political and metaphysical positions.

Lynn Nyhart concentrates on the discourses of biology and politics in the German revolutions of 1848 and their aftermath. Focusing especially on the work of the notorious German “radical materialist” zoologist and revolutionary Carl Vogt (1817–1895), she argues that, though we may think of “state-organism” as a single, two-way analogy, in fact, the state-as-organism and the organism-as-state emphasized different features in the nineteenth century. These did different work in the different discourse communities of political theorists and biologists, who were concerned, respectively, with justifying the legal and theoretical foundations of the state and understanding the complex, multilevel organization of living things. Whereas Vogt is best known historically for his engagement in the “materialism debate” of the 1850s, he was also a productive zoologist and geologist, and previously a leader of the left wing in the Frankfurt National Assembly (convened to form a constitutional plan for a united Germany). He was thus perhaps unique among Germans active in 1848 in his ability to bring these two discourses authoritatively together. Drawing on his political rhetoric, his satirical post-1849 writings, and his scientific studies, this article examines the parallels he drew between animal organization and human social and political organization in the 1840s and ’50s. Despite the limits Vogt ultimately imposed on the use of such parallels in scientific writing in the 1850s, other scientists writing about biological organization gradually incorporated the state concept, further naturalizing it. Conversely, we can see his “realistic” materialist stance as participating in a new wave of state-theorizing that increasingly viewed the state as resembling a biological organism. Thus the two discourses drew closer together in the 1850s and after, on a new ground of “realism” that granted new authority to nature in justifying the state, and to the scientists who spoke for it.

Finally, Marion Thomas moves our picture of biology-politics relations forward in time, focusing on the 1850s to 1870s in her study of the Paris histology professor Charles Robin (1821–1885). Robin is known as a chief representative of the French opposition to the cell theory of Schleiden and Schwann; perhaps as a result, he has been less fully studied than is due to

someone so influential in biology in his time and place.⁵ Thomas shows how Robin's commitment to Comte's original positivism (before it became the Religion of Humanity), his materialism, and his anticlericalism shaped both his biology and his ideas about educational reform. These commitments illuminate his rejection of the cell as the fundamental unit of life and his alternative view, which combined a commitment to a chemical-molecular unit of life with a vision of the organism as the unit that regulates its parts through its "internal milieu" (a term he used before Claude Bernard). Thomas's analysis extends to Robin's proposal for expanding women's education—showing how this was not a full-out feminist proposal by any means, but rather, consistent with his anticlericalism and his Comtean view of subordination of parts to the whole, a plan to wrest women away from the Church and increase their utility to society as mothers. This paper thus shows forcefully how the politics of nineteenth-century biology were intertwined with both religion and the "woman question."

As these short summaries suggest, each paper takes a different analytical angle on the relations of biological understanding and investigation to political action, yet collectively they offer many cross-connections. To begin with, they show that when considering the politics of biological organization, we have to distinguish between a narrow and a broader meaning of "politics." Nearly all of the central actors discussed here were politically active, working in the public sphere to address matters of governance. Raspail and Vogt were revolutionaries who got into trouble with state authorities for their rabble-rousing and publishing activities. Raspail was imprisoned in 1831–32 for his active opposition to France's July monarchy (put in place in July 1830) and would move to Belgium as a political refugee in the wake of 1848; Vogt fled to Switzerland ahead of the police, first in 1835 as a student radical in Giessen, in the Grand Duchy of Hessen, and again in 1849, as a member of the revolutionary "rump" parliament following the failed Frankfurt National Assembly. Robin served as a senator in the early French Third Republic in the 1870s. Of the scientists we concentrate on here, only Schwann was not "political" in this narrow and somewhat literalist sense of the term.

But "politics" must also be understood more broadly, especially when thinking about organisms and societies. Biologists, social theorists, state-makers, and political activists were all concerned with the relations between

5. But see Laurent Loison, "Pourquoi refuser la théorie cellulaire? Le projet d'une anatomie chimique chez Charles Robin (1821–1885)," *Revue d'histoire des sciences* 68, no. 1 (2015): 23–45.

parts and wholes, and especially with how the whole was governed. In theories of society and the statecraft with which they were often conflated, questions about appropriate governance were couched in terms of freedom, justice, democracy, the well-being of citizens/subjects, and the naturalness of different forms of rule, whether radically republican, monarchical, parliamentary, or some combination of these. In biology, scientists hoping to understand the nature of life sought to establish its fundamental units and expressions. In developing their varied vocabularies of organization, they often drew on social and political metaphors.⁶ But the biological and social-political metaphors do not line up uniformly, instead showing a diversity of associations—especially evident if we add in the best-studied cases of Virchow and Haeckel.

A few examples will illustrate this diversity. Raspail and Virchow both articulated a decentralized model of the organism and of the state made up of lower-level entities. But for the republican Raspail, the basic unit of society was the “commune” (already a collective entity); for the liberal Virchow, the basic unit was the “individual,” whether the individual cell in the organism or the individual person in a society. Second: for both Virchow and radical democrat Vogt, the autonomy of the parts with respect to the whole was fundamental, yet this commitment was situated within two distinct systems of value. Virchow emphasized the role of cellular individuals and individual citizens working together to create a healthy body or state.⁷ Vogt’s starting point was different. In his post-1849 rendering of animal and human societies, neither equality nor fraternity (so central for Raspail) was critical; instead, the freedom of the individual overrode all other considerations—indeed, the freedom of the individual not just within the state but *from* the state. He became an anarchist. Finally, Andrew Reynolds has shown that, although Haeckel started out by drawing on Virchow’s “republican” cell-state model in 1866, by 1875 he had shifted to the more conservative model of a “cell-monarchy” to describe higher animals such as vertebrates. The conservative Schwann offers a final case: from the 1850s on he drew on the model of the army for explaining

6. On the mutual borrowings among political, social, and natural-scientific ideas about organization in organisms, societies, and states see: Camille Limoges, “Milne-Edwards, Darwin, Durkheim and the Division of Labour: A Case Study in Reciprocal Conceptual Exchanges between the Social and the Natural Sciences,” in *The Natural Sciences and the Social Sciences*, ed. I. Bernard Cohen (Dordrecht: Kluwer, 1994), 317–43; and Sabine Maasen, Everett Mendelsohn, and Peter Weingart, eds., *Biology as Society, Society as Biology: Metaphors* (Dordrecht: Springer, 1995).

7. On Virchow, see Mazzolini, *Politisch-biologische Analogien* (ref. 2), esp. ch. 3.

the interaction of elementary parts in the body. He was convinced that an organizational form based on inequality and the subordination of its individual parts conformed to a natural order.⁸

Biologists also contended with a further issue: could the nature of life be fully explained by recourse solely to its material elements and their relations? This problem was central to biological investigation and theorizing through most of the nineteenth century. Even when it didn't appear directly in empirical work, assumptions about materialism or how to negotiate non-material aspects of life lay just beneath that work. Such concerns were not merely (!) metaphysical. The nineteenth-century trends of secularization and loss of belief, on the one hand, and countervailing conservative religious reactions, on the other, had deep political ramifications.⁹ In an era in which official state religions and religious authorities held considerable power, especially over education systems, the politics of religion were central, not only with respect to questions of political governance but also with respect to science.¹⁰ Thus scientists who were outspokenly materialist, such as the atheists Vogt and Robin, also opposed state-sanctioned religion (or religion in general); those like Schwann, whose life and science were guided by his Catholic belief, allowed more authority to monarchs and religious institutions. Yet even Raspail, as radical politically as he was, was not an atheist, as Vienne shows. So we must be careful of too-easy generalizations. The range of positions relating political and biological organization were in fact diverse, and, at least for the nineteenth century, must always take into account this third term of religion/metaphysics, without reducing religion to politics. Conceiving new orders of nature and politics in this context required addressing the role of religion in

8. See Nyhart, this issue; Reynolds, "Ernst Haeckel" (ref. 2); Vienne, this issue.

9. Manuel Borutta, *Antikatholizismus: Deutschland und Italien im Zeitalter der europäischen Kulturkämpfe* (Göttingen: Vandenhoeck & Ruprecht, 2010); see also Jürgen Osterhammel, *Die Verwandlung der Welt. Eine Geschichte des 19. Jahrhunderts* (München: Beck, 2009); Lisa Dittrich, *Antiklerikalismus in Europa. Öffentlichkeit und Säkularisierung in Frankreich, Spanien und Deutschland (1848–1914)* (Göttingen: Vandenhoeck & Ruprecht, 2014); Todd H. Weir, *Secularism and Religion in Nineteenth-Century Germany: The Rise of the Fourth Confession* (Cambridge: Cambridge University Press, 2014).

10. This situation is well-recognized for the British case, especially regarding evolutionary theory. See, e.g., Adrian Desmond, *The Politics of Evolution: Morphology, Medicine and Reform in Radical London* (Chicago: University of Chicago Press, 1989); Desmond, *Huxley: The Devil's Disciple* (London: Michael Joseph, 1994); James Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of Vestiges of the Natural History of Creation* (Chicago: University of Chicago Press, 2000).

science and society, whether as formal institution, belief system, or spiritual practice.¹¹ Thus “biology and politics” must become “biology-politics-religion.” This has become well established in the literature on evolution, especially in nineteenth-century Britain, but it remains underexplored for other areas of the history of biology on the European continent.¹² Especially for the history of biology in the German context, the question of religion has long been neglected, though there are signs this is changing.¹³

But there are further conclusions as well. Regarding the intellectual history of science, these papers show that the history of nineteenth-century ideas about biological organization at the level of the individual organism and below, and especially the critical topic of cell theory, must be rethought. This historiography has been dominated by literature that largely reproduces French-German rivalries stemming from the time and is weakly grounded.¹⁴ Thus with respect to the history of cell studies, a standard narrative revolves around a larger or smaller parade of German-speaking cell theorists led by Matthias Schleiden, Theodor Schwann, and Rudolf Virchow, with the Frenchmen

11. On proposed spiritual practices outside of formal state-sanctioned religion, see John Tresch, *The Romantic Machine: Utopian Science and Technology after Napoleon* (Chicago: University of Chicago Press, 2012).

12. For sources on Britain, see ref. 10 above. For France, literature on religion and biology has also been focused on transformism/fixism and evolutionism. See Appel, *The Cuvier–Geoffroy Debate* (ref. 1); Cédric Grimoult, *Évolutionnisme et fixisme en France: histoire d'un combat (1800–1882)* (Paris: CNRS, 1998); Yvettes Conry and Dominique Lecourt, *De Darwin au darwinisme, sciences et idéologie* (Paris: Vrin, 1983). Most of the European literature touching on this triad concerns materialism, and is older and/or philosophically oriented, e.g.: Owsei Temkin, “Materialism in French and German Physiology of the Early Nineteenth Century,” *Bulletin of the History of Medicine* 20 (1946): 322–27; Frederick Gregory, *Scientific Materialism in Nineteenth-Century Germany* (Boston: D. Reidel, 1977); Annette Wittkau-Horgby, *Materialismus: Entstehung und Wirkung in den Wissenschaften des 19. Jahrhunderts* (Göttingen: Vandenhoeck und Ruprecht, 1998).

13. Kurt Bayertz, Myriam Gerhard, and Walter Jaeschke, eds., *Weltanschauung, Philosophie und Naturwissenschaft im 19. Jahrhundert*. Vol. 1: *Der Materialismus-Streit* (Hamburg: Felix Meiner, 2007); Bernhard Kleeberg, *Theophysis: Ernst Haeckels Philosophie des Naturganzen* (Köln: Böhlau, 2005); Todd H. Weir, ed., *Monism: Science, Philosophy, Religion, and the History of a Worldview* (New York: Palgrave Macmillan, 2012). See also Andreas Daum, *Wissenschaftspopularisierung im 19. Jahrhundert: Bürgerliche Kultur, naturwissenschaftliche Bildung und die deutsche Öffentlichkeit, 1848–1914* (Munich: Oldenbourg, 1998), which reveals the investment of popular natural history in religion in post-1848 Germany; and Daum, “Science, Politics, and Religion: Humboldtian Thinking and the Transformations of Civil Society in Germany, 1830–1870,” in *Science and Civil Society*, ed. Thomas Broman and Lynn K. Nyhart (*Osiris* 17) (Chicago: University of Chicago Press, 2002), 107–40.

14. Henry Harris, *The Birth of the Cell* (New Haven, CT: Yale University Press, 2000), 23–24.

Henri Dutrochet and François-Vincent Raspail (and perhaps a few others) treated as French “forerunners”¹⁵ and (sometimes) a belated uptake of cell theory in France following Claude Bernard’s “conversion” to a Virchowian version in the 1860s.¹⁶ In this conventional historiography, Auguste Comte and Charles Robin are portrayed as backward thinkers who misunderstood German cell theory and missed its significance.¹⁷ For an area so central to the history of biology, it is dismaying that this linear historiography still holds. We need a history of cell studies that does not simply recapitulate the lineages leading to the “winners,” but that replaces genealogical stories with broader, more even-handed accounts that identify the philosophical, religious, and political stakes at play, and recognizes a greater diversity of positions. A differentiated and contextualized picture of nineteenth-century cell research will also have to pay further attention to convergences and divergences of the scientific approaches and experimental practices involved.

Exploring alternatives to the hegemonic narrative of cell theories might lead us in two directions. First, greater attention must be paid to the role of chemistry in the scientific understanding of nineteenth-century biologists concerned with material organization and processes.¹⁸ Though not developed in these papers, chemistry was important to Raspail, Robin, and Schwann, and more generally from at least the 1820s forward, even the most form-oriented physiologists in Europe paid some attention to the chemical components of living matter. This may have been critical to whether or not materialist explanations were understood to hold. Second, the analyses presented here underscore, in unexpected ways, how studies of development, evolution, and paleontology in the pre-Darwinian period were all related by fundamental ideas about organization. Raspail was in the camp of Lamarck and Geoffroy in his commitment to evolutionary progress; Vogt believed that in nature,

15. See, e.g., *ibid.*; François Duchesneau, *Genèse de la théorie cellulaire* (Montreal: Bellarmin, 1987).

16. Duchesneau, *Genèse* (ref. 15), p. 13.

17. See André Stanguennec, “Le scalpel contre le microscope, Auguste Comte et la théorie cellulaire,” *History and Philosophy of the Life Sciences* 6, no. 2 (1984): 171–92; Laurent Loison, “Un Français contre la théorie cellulaire,” *La Recherche*, no. 489 (2014): 92–94.

18. An important start in this direction was made by Timothy Lenoir, *The Strategy of Life: Teleology and Mechanics in Nineteenth-Century German Biology* (Chicago: University of Chicago Press, 1982); see also François Duchesneau, “Laws of Organization and Chemical Analysis: Blainville and Müller” in the topical collection “Organic-Organization-Organism: Essays in the History and Philosophy of Chemistry and Biology,” *History and Philosophy of the Life Sciences* 38, no. 20 (2016)h. <https://doi-org.ezproxy.library.wisc.edu/10.1007/s40656-016-0122-1>.

progress proceeded by revolution, as testified by geology, and humans must be subject to the same laws.¹⁹ Thus even an ostensibly narrow focus on living organization quickly opens into broader themes, if we allow ourselves to look beyond cell theory alone.

What, finally, do these papers collectively allow us to say about the history of ideas about political and biological organization in France and Germany from the 1830s to the 1870s? Given the diversity of views we have insisted on, seeking to channel them into a single schema of bio-political relationships is not an option. It is exactly in drawing out the contestation and diversity of connections between the politics and biologies of organization that our collective contribution lies. Nevertheless, one important through-line may be glimpsed via the sum of our analyses: in the second half of the nineteenth century, political justifications of state and social organization were increasingly set on naturalistic foundations, grounded via biological argumentation.

We can begin to see the traces of this trajectory by pulling together various strands of our stories, along with a few others. Vienne shows that in the 1830s, Raspail saw unity across the kingdoms of life, as expressed through the universal principle of formation in cells, and thought that processes of transformation via environmental change applied both to organisms and human social organization. Nevertheless, he also argued for a sharp break between humans and animals, based on the nature of human sociality (which was also the basis of governance).²⁰ Nyhart's article indicates that ca. 1850, Vogt was not wholly different: although he was a materialist who set humans on the same biological footing as animals, he lampooned the notion that human and animal states were of the same kind, insisting through his satire that for humans, the state was a form of voluntary collective social organization. Later in the decade, Virchow used political analogies to think anew about the body. But for him, too, state and society did not belong to the organic realm, and he rejected the back-transfer of models of nature onto politics and society.²¹

However, even in the 1850s, things began to change. Nyhart calls attention to the shift from the state being treated as an "ethical organism" in moderate

19. Carl Vogt, *Ueber den heutigen Stand der beschreibenden Naturwissenschaften*. (Giessen: J. Ricker, 1847), 39–44.

20. Vienne, this issue, 640–41.

21. Cf. Rudolf Virchow, "Atome und Individuen. Vortrag gehalten im wissenschaftlichen Vereine der Singakademie zu Berlin am 12. Februar 1859," in *Drei Reden über Leben und Kranksein*, ed. Fritz Kraft (München: Kindler, 1971), 33–77; Goschler, *Rudolf Virchow* (ref. 2), 282–85; Johach, *Krebszellen* (ref. 2).

German political theory of the 1830s and '40s to its being treated in far more explicitly biological terms in the 1850s, by newly "realist" political analysts, including Ludwig von Rochau, the coiner of *Realpolitik*. (Vogt himself argued for a retreat from religio-political polemics to facts by the end of the 1850s.) Even the conservative Schwann, otherwise so at odds with this movement, in the 1860s "suspended the division between organic nature and society" by formulating a law of formation common to organisms and groups of organisms in animals and humans. By the 1870s, German social and political theory was rife with organicism, while within biology the metaphors of the "cell state" and the "cell republic" also became more common.²²

In France we see a similar shift. As Thomas notes in her essay, Robin himself never muddled the borders between the political and the natural in his writings. Nevertheless, he advocated the founding of a sociology that should be anchored in biology, for Robin, like Vogt a materialist and anticlericalist, was also a Comtean positivist. And it is after Comte in the 1850s (also a source for the German Rochau) that we see a new case being made in France for the "essential similarity" between biological and social organisms.²³

The close links established in France between biology and socio-political thought during this period are reflected in the spread of the concept of solidarity, used to refer to the harmonizing of parts into a whole through their mutual interplay. Comte introduced this concept in the 1830s and 1850s to explain the relationship between the individual elements and the whole in the organism as well as in society. In the 1870s, Robin regarded "solidarity" as a basic problem of biology.²⁴ In social theory and politics, the French

22. See F. W. Coker, *Organismic Theories of the State: Nineteenth Century Interpretations of the State as Organism or as Person* (New York: Columbia University, 1910); Gunter Mann, ed., *Biologismus im 19. Jahrhundert* (Stuttgart: Ferdinand Enke, 1973); Paul Weindling, "Theories of the Cell State in Imperial Germany," in *Biology, Medicine and Society 1840–1940*, ed. Charles Webster (Cambridge: Cambridge University Press, 1981), 99–155. On Schwann, see Vienne, this issue.

23. Claude Blanckaert, *La Nature de la société. Organicisme et sciences sociales au XIXe siècle* (Paris: L'Harmattan, 2004); François Vatin, "À quoi rêvent les polypes? Individuation et sociation d'Abraham Tremblay à Émile Durkheim," in *Trois essais sur la genèse de la pensée sociologique. Politique, épistémologie et cosmologie* (Paris: La Découverte/M.A.U.S.S., 2005), 123–217 (especially, "VII. Edmond Perrier, Claude Bernard et Ernst Haeckel: l'atelier et ses ouvriers," pp. 174–84); Emmanuel d'Hombres and Soraya Mehdaoui, "On what condition is the equation organism-society valid? Cell theory and organicist sociology in the works of Alfred Espinas (1870s–80 s)," *History of the Human Sciences* 25, no. 1 (2012): 32–51.

24. Interestingly, "psychic solidarity" was a central concept of Schwann's cell theory of the early 1860s. He assumed that the existence of common affective connections between the

Solidarists of the 1870s and '80s made much of such analogies, influentially expressed by the zoologist Edmond Perrier (who also used the “cell republic” metaphor) and, moving toward the turn of the twentieth century, by sociologists such as René Worms and Émile Durkheim.²⁵

The threads drawn together here point to a trend over the second half of the nineteenth century toward increased borrowing across biological and socio-political discourses, perhaps based on greater acceptance that naturalism demanded continuity between human society and the laws of the organic world.²⁶ This may not be a surprising outcome: as several authors have noted, in Germany after the failed revolutions of 1848, democrats saw in natural science a hope to achieve long-term changes.²⁷ Similarly, Nyhart follows Christian Jansen, a leading historian of the German revolutions of 1848, in regarding the post-1848 adoption of a new, “realistic” attitude among German liberal and left-wing political theorists as drawing directly on nature for legitimacy of a more democratic form of government.²⁸ But to attribute the broader trend to the German revolutions is perhaps too narrow: the parallels with France are striking, despite a different history of 1848 and its aftermath.

Our work presents just a first stab at reaching across the French and German histories and historiographies of biology and politics to show, in a few detailed case studies, how this trend was instantiated. A broader synthesis would require shifting to a different level of analysis from the largely biographical and intellectual history approaches taken here. One such approach would be to extend the comparisons across Europe more broadly; the case of cell biology in Italy

elementary parts in organic nature and between the members of society enabled the formation of organisms or communities such as the family, the commune or the nation. (See Vienne, this issue). The question of the source for Schwann's use of the term remains open.

25. Thomas, this issue (on Robin and solidarism); Vienne, this issue (on Schwann). See also Dominique Guillo, *Sciences sociales et sciences de la vie* (Paris: Presses universitaires de France, 2000), esp. 99–116 (on Durkheim). Michael A. Osborne, “Parasitology, Zoology, and Society in France, ca. 1880–1920,” in *Biological Individuality: Integrating Scientific, Philosophical, and Historical Perspectives*, ed. Scott Lidgard and Lynn K. Nyhart (Chicago: University of Chicago Press, 2017), 206–24.

26. Such naturalism might or might not have been evolutionary, and if based on evolution, might or might not have been Darwinian. The role of evolution in later nineteenth-century discussions of biology and society should not be assumed but rather investigated.

27. Kurt Bayertz, Myriam Gerhard and Water Jaeschke, “Einleitung,” in Bayertz et al., *Der Materialismus-Streit* (ref. 13), 10; Weir, *Secularism* (ref. 9).

28. Nyhart, this issue; Christian Jansen, “‘Revolution’—‘Realismus’—‘Realpolitik’: Der nachrevolutionäre Paradigmenwechsel in den 1850er Jahren im deutschen oppositionellen Diskurs und sein historischer Kontext,” in Bayertz et al., *Der Materialismus-Streit* (ref. 13), 223–59.

and its truncation in 1848 would be especially valuable to bring in.²⁹ Another approach would be to situate these individual lives and writings more fully within larger structural contexts, such as the rise of the nation-state since the late eighteenth century and its justifications; the evolution of the social role of the statesman-scientist and its relation to other scientific roles such as the “pure” academic and the scientist-popularizer; or the larger shifting of academic disciplines that marked the rise of the sciences of society. These would offer further avenues for exploring how the nineteenth-century revolutions in conceptualizing biological, political, and social organization were intertwined. The participants in this special issue hope that our articles will stimulate others to join us in that work.

29. As a starting point, see Ariane Dröscher, *Die Zellbiologie in Italien im 19. Jahrhundert*. (Halle [Saale]: Deutsche Akademie der Naturforscher Leopoldina, 1996) (*Acta historica Leopoldina*, 26).