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The Political Organism: Carl Vogt on Animals and States in the 1840s and '50s

ABSTRACT

How do the discourses of biology and politics interact? This article uses the case of Carl Vogt (1817–1895), the notorious German "radical materialist" zoologist and political revolutionary, to analyze the traffic across these discourses before, during, and after the revolutions of 1848. Arguing that metaphors of the organism and the state did different work in the discourse communities of German political theorists and biologists through the 1840s, it then traces Vogt's life and work to show how politics and biology came together in his biography. It draws on Vogt's political rhetoric, his satirical post-1849 writings, and his scientific studies to examine the parallels he drew between animal organization and human social and political organization in the 1840s and '50s. Broadening back out, I suggest that the discourses of organismal and state organization, both somewhat transformed, would align more closely over the 1850s and thereafter—yet asymmetrically. Although the state metaphor became more attractive for biologists, the organism as state did not harden into a dominant concept in biology. On the political side, a new wave of political theorizing increasingly viewed the state as resembling a biological organism. These shifts, I speculate, brought the discourses closer together in the post-revolutionary era, and may be seen as contributing to a new configuration of mutual legitimation between science and the state.

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KEY WORDS: analogy and metaphor in science, Carl Vogt, revolutions of 1848, biological individuality, animal states, siphonophores

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In the German-speaking lands of the 1840s and 1850s, both state-makers and students of living nature found themselves on unstable ground. In 1848 and 1849, political reformers and academic revolutionaries sought to create a unified Germany under parliamentary rule. Propelled by Europe-wide calls to change the terms of states' governance to improve citizen participation, and with urgency gained from the hunger crises of the later 1840s, in the revolutionary Frankfurt Assembly they argued over the foundations, rights, and obligations of their proposed new state, even as others mounted the barricades. After its failure in 1849, German politicians and theorists alike had to regroup and assimilate to new realities. Biologists, meanwhile, were grappling with questions about biological parts, wholes, and individuality that promised (or threatened) to be no less profound, for such questions were understood to bear on the nature of life itself: was it purely physical or imbued with nonphysical qualities? Across the ruptures of these political and intellectual revolutions, the languages of nature and politics came together in new ways, particularly around "organisms" and "states." This paper examines the degree to which biologists and political theorists sought firmer footing in each other's language.

Based on well-developed ideas about the role of language in structuring thought, we might imagine the metaphorical traffic between "organisms" and "states" in this period to be reciprocal, each concept reinforcing attributes of the other to create a common discursive unit, and each taking on the other's characteristics. However, the literature on the transfer of concepts across scientific and social realms reminds us how complicated metaphor-making can be.[1] Evelyn Fox Keller has written, "The effectiveness of a metaphor . . . depends on shared social conventions and, perhaps especially, on the authority conventionally granted to those who use it. It also depends on other family resemblances already in place."[2] With respect to organisms and states, to biology and political theory, how much was shared in the 1840s and '50s? What family resemblances existed? Who held what sorts of authority?

1. On metaphor and analogy, see especially George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: University of Chicago Press, 1980); Nancy Leys Stepan, "Race and Gender: the Role of Analogy in Science," *Isis* 77 (1986): 261–77. On intellectual transfer across disciplinary realms, see I. Bernard Cohen, ed., *The Natural Sciences and the Social Sciences* (Dordrecht: Kluwer, 1994), esp. 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," 317–43; and Sabine Maasen, Everett Mendelsohn, and Peter Weingart, eds., *Biology as Society, Society as Biology: Metaphors* (Dordrecht: Springer, 1995).

2. Evelyn Fox Keller, *Refiguring Life: Metaphors of Twentieth-Century Biology* (New York: Columbia University Press, 1995), xii.

As this essay will argue, by the 1840s the idea of the state as an organism was well established in the community of German political theorists, but the place of "states" in biological discourse about organisms was less clear. A tradition of political-moral literature stretching back to the ancients held up certain forms of animal organization, especially the "bee state," as models (positive or negative) for human social organization and governance,[3] but naturalists and beekeepers generally used more neutral terms, such as "colony," "stock," or "hive," to describe the communal lives of these insects, and when they did use "state" language, this was typically where they interpolated political or moral comments.[4] As I argue, among biologists the destabilization of the concepts of "organism" and "individual" in the 1830s–1850s—along with the broader political context—opened new possibilities for them to consider organisms as "states." This shift in biological discourse was in sync with political theorists' turn to a newer form of state-organism theorizing in the 1850s, bringing the two discourses closer together.

A hinge figure in this complicated trajectory was the zoologist and political activist Carl Vogt (1817–1895). A man of oversized personality and physical proportions, whose multifaceted career as a scientist, popular writer, and politician made him exquisitely aware of the possibilities and limitations of language, Vogt challenged metaphor-makers in both political and biological realms.[5] An analysis of his stance on organisms and states offers an unusually concrete historical glimpse into the shifting relations of biology and politics in the mid–nineteenth century, and into the discursive disruptions such a meeting

3. See, e.g., Eva Johach, "Der Bienenstaat: Geschichte eines politisch-moralischen Exempels," in *Politische Zoologie*, ed. Anne von der Heiden and Joseph Vogl (Zurich: Diaphanes, 2007), 219–33.

4. Based on full-text search of "Bienenstaat" in HathiTrust books, 1750–1850, with follow-up searches of other terms.

5. On Vogt, see especially Jean-Claude Pont, Daniele Bui, Françoise Dubosson, and Jan Lacki, eds., *Carl Vogt: Science, Philosophie et Politique (1817–1895)* (Chene-Bourg, Switzerland: Bibliothèque d'histoire des sciences, 1998); Hermann Misteli, *Carl Vogt: Seine Entwicklung vom angehenden naturwissenschaftlichen Materialisten zum idealen Politiker der Paulskirche (1817–1849)* (Zurich: Leemann, 1938); Werner Bröker, *Politische Motive naturwissenschaftlicher Argumentation gegen Religion und Kirche im 19. Jahrhundert* (Münster: Aschendorff, 1973); Günther Klaus Judel, "Der Liebigschüler Carl Vogt als Wissenschaftler, Philosoph und Politiker," *Gießener Universitätsblätter* 37 (2004): 50–56; Judel, *Carl Vogt—Erinnerungen an die deutsche Nationalversammlung 1848/49* (Frankfurt am Main: Cornelia Goethe Literaturverlag, 2005); the introductory commentaries in Christoph Kockerbeck, ed., *Carl Vogt, Jacob Moleschott, Ludwig Büchner, Ernst Haeckel: Briefwechsel* (Marburg: Basilisken-Presse, 1999); and Nick Hopwood, *Haeckel's Embryos: Images, Evolution and Fraud* (Chicago: University of Chicago Press, 2015), esp. 45–52. Carl Vogt, *Aus meinem Leben: Erinnerungen und Rückblicke* (Stuttgart, 1896) covers only his early life; the biography by his son (William Vogt, *La vie d'un homme: Carl Vogt* [Stuttgart, 1896]) is plagued with uncertainties about what was said by the father and what by the son.

made possible. At the same time, this analysis suggests connections to a broader change in German discourses of the state in the 1850s, in which the natural scientist could take on new authority.

STATES AND ORGANISMS

Central to my argument about discursive exchanges involving organisms and states is that they did different metaphorical work in each direction. "Organism" and "state" each had a range of properties, from which certain ones might be selected for analogizing with the other. One could liken the state to an organism, or compare the organization of organisms to a state: two different analogies. At the most basic level, although both states and organisms were figured as wholes comprising multiple interacting parts, the likening of a state to an organism (used frequently by political and legal theorists) emphasized its functional integration into a single unit, whereas the use of state metaphors for organisms, typically bees and ants, emphasized comparisons to *human* social and political organization. Animal behavior was not a central task of German natural history in the first part of the nineteenth century. Over the 1840s and into the early 1850s, however, biologists became intensely engaged with questions about biological organization, both above and below the organism. At this point, the idea of the animal state was available, and it gradually became more deeply worked into the biological language of complex part-whole relations. Each state-and-organism metaphor performed real work, but to different ends. Let us consider the two in more detail.

The "state-as-organism" has a venerable place in German political philosophy, dating in its modern phase to the late eighteenth century. To be sure, the ancients had written of the state as the "body politic," and a long tradition viewed the state as a "corporate" entity involving parts coordinated into a larger metaphorical whole.[6] But the state-as-organism metaphor drew on features of both states and organisms that were new in the late eighteenth century.

First, as historian Tobias Cheung has noted, the term "organism" itself was changing its meaning at that time. In the seventeenth and eighteenth centuries,

6. For a succinct summary, see Mark Gosbee, "Body Politic," in *The Oxford Companion to the Body*, ed. Colin Blakemore and Sheila Jennett (Oxford University Press, 2001. *Oxford Reference Online*. Oxford University Press), accessed through University of Wisconsin–Madison, 19 Sep 2011 http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t128.e134. For a more detailed historical study, see Ed Cohen, *A Body Worth Defending: Immunity, Biopolitics, and the Apotheosis of the Modern Body* (Durham, NC: Duke University Press, 2009).

"organism" referred to a "principle of order" existing in certain kinds of beings that gave them vitality and resulted in the coordinated, system-like character of the interaction of parts into a whole. Thus eighteenth-century scholars spoke of "the organism of a body" in which "organism" was a property of living bodies, rather than a term for the bodies themselves. Cheung traces the shift in which "organism" came to refer to the living body itself to Kant and the proponents of *Naturphilosophie.* Kant focused attention on the mutual teleological relation between parts and wholes—the whole existed for the parts and the parts for the whole. In his schema, "organism" applied to this formal characteristic, not confined to individual living beings (our "organisms") but to anything that bore these part-whole relations. The *Naturphilosophen* attributed this characteristic to the "organism" of both the macrocosm and microcosm, allowing for a semantic slippage from the macrocosmic principle of order to a new microcosmic "organism," namely the living individual that possessed the organismal attributes. Following this mixed use of the "organism of" the macrocosm and microcosm, Cheung argues, one begins finally to see the term "organism" used in the plural, marking its new reference to individual living beings, rather than to a property of them. This appears to have become common in Germany in the early 1800s and in France a little later. Whereas Cheung treats the trajectory as a shift from a principle of order to a biological entity, it appears that the older locution persisted outside of biology, as we will see.[7]

German theories of the state in the period before 1848 sometimes viewed the state variously as a manifestation of the *Volk*, the nation, or civil society, but it is striking that organismal qualities in the political theory literature were assigned to the state itself. These, too, emerged in the eighteenth century—a second new feature shaping organism-state metaphors. As Gerhard Dohrn-van Rossum and Ernst-Wolfgang Böckenförde argued in the 1970s, the state was one exemplification of the Kantian conception of the "organic being" (*organisches Wesen*) in which the parts and the whole were co-determining cause and effect. Although Kant himself treated the state somewhat casually among his examples, Fichte and others took it up more rigorously. Hegel emphasized further the organismal

7. Tobias Cheung, "What is an 'Organism'? On the Occurrence of a New Term and Its Conceptual Transformations 1680–1850," *History and Philosophy of the Life Sciences*, 32 (2010): 155–94. See also Hubert Rottleuthner, "Biological Metaphors in Legal Thought," in *Autopoietic Law: A New Approach to Law and Society*, ed. Gunther Teubner (Berlin, New York: de Gruyter, 1987), 97–127; and Renato Mazzolini, *Politisch-biologische Analogien im Frühwerk Rudolf Virchows* (Marburg: Basilisken-Presse, 1988), 56–59.

attribute of development (mentioned by Kant, too), arguing that the state was an Idea that was developing through its history toward perfection, and that as the state became more perfect (which entailed its parts becoming more differentiated), its citizens would enjoy greater freedom—*through* the state. This German organismal concept of the state contrasted with older notions of the state as a necessary, if evil, consequence of human sociality, and also with the state as an extension of the monarch ("the king's body," "the imperial body"). It also differed from the state concept developed by Rousseau and further deployed in the French Revolution, in which the "body" of the state was organized from below and gained legitimacy through the aggregated will of the people.[8] The state long remained the primary focus of political and legal theorists. Only in the 1850s would strong new impulses come, from diverse directions, to present *society* in organismal terms, which raised many new possibilities for its relationship to the state—or the simple conflation of state and society.[9]

In the German rendition most fully developed by the 1840s, the state was an "ethical organism," not a biological one. It differed from a biological organism in being the product of the conscious action of free individuals, but it still shared the teleology of Kant's part-whole causal relations. For example, in 1839 Friedrich Schmitthenner, professor of history and state-theory at the University of Giessen, argued that the state, properly understood, was a threefold unit that addressed the person's physical well-being, his need for freedom and justice, and his intellectual growth. According to Schmitthenner, "each of these three systems mediates between the other two and is at the same time determined by them, so that one cannot exist without the other." They are, as he put it, "coagents" of each other in the production of the perfect state.[10] By

8. Gerhard Dohrn-van Rossum and Ernst-Wolfgang Böckenförde, "Organ, Organismus, Organisation, politische Körper," in *Geschichtliche Grundbegriffe*, ed. Otto Brunner, Werner Konze, and Reinhard Kosellek (Stuttgart: E. Klett, 1972–1997) vol. 4 (1978), 519–622, esp. 580–86 (on the German idealists) and 566–68 (on earlier ideals). See also Helmut Coing, "Bemerkungen zur Verwendung des Organismusbegriffs in der Rechtswissenschaft," in *Biologismus im 19. Jahrhundert*, ed. Gunter Mann (Stuttgart: Ferdinand Enke, 1973), 147–57; and (especially for France) John Pickstone, "How Might We Map the Cultural Fields of Science?" *History of Science* 37 (1999): 347–64.

9. See David Lindenfeld, *The Practical Imagination: The German Sciences of the State in the Nineteenth Century* (Chicago: University of Chicago Press, 1997), esp. ch. 4. The much lengthier discussion this topic deserves cannot be undertaken here.

10. Friedrich Schmitthenner, *Zwölf Bücher vom Staat, oder systematische Encyklopädie der Staatswissenschaften*. Vol. 1: *Grundlinien der Geschichte der Staatswissenschaften, der Ethnologie, des Naturrechtes und der Nationalökonomie*, 2nd ed. (Giessen: Georg Friedrich Heyer, 1839), 5–6.

the same token, because humans require other humans to satisfy their existential needs, they need the state to coordinate the satisfying of those needs, so that their modes of satisfaction do not conflict with one another. The state was thus an organism in the sense of a whole whose parts or organs were coordinated by an internal will (versus a mechanism, organized by an external will, or a disorganized aggregation). Schmitthenner argued that humans required the state in order to realize their potential for freedom, physical well-being, and cultivation of the mind. Explicitly claiming to follow Aristotle but implicitly echoing Hegel, he wrote, "In the state the human first becomes truly himself."[11]

Among nineteenth-century theorists of the state, such idealist state-as-organism concepts were most often used to defend a range of positions around a constitutional monarchy, for if the state were an organism, the reasoning went, the monarch was but an organ, just as the administration was another organ. Both served (with a greater or lesser degree of authority) the will of the people. The argument, then, was over how these organs were to be coordinated, what functions they were to have, and which would override which. In the Frankfurt Assembly of 1848–49, in which delegates from a number of German states met to propose a constitution for a newly united Germany, variations of this organicist concept of the state were prominent.[12]

As politicians and state reformers argued over how their organismal state would best work, physiologists, botanists, and zoologists were similarly rethinking the nature of their own objects of study. Kant's definition of the organism as an entity in which the parts and whole were mutually causal was often adhered to at a philosophical level, but by the 1840s it was meeting plenty of challenges.[13] These centered on the nature of biological individuality. Already in the eighteenth century, the traditional notion that individuality meant indivisibility was challenged, most famously by Trembley's polyp: cut into parts, each would each regenerate into a new whole. Conversely, the

11. Ibid., p. 14. For more on this attitude, see Leonard Krieger, *The German Idea of Freedom: History of a Political Tradition* (Chicago, University of Chicago Press, 1972 [originally 1957]); and Dohrn-Van Rossum and Böckenförde, "Organ," (ref. 8). On ethical organisms, see also F. W. Coker, *Organismic Theories of the State: Nineteenth Century Interpretations of the State as Organism or as Person* (New York: Columbia University, 1910).

12. Dohrn-Van Rossum and Böckenförde, "Organ" (ref. 8), 597–600; Mazzolini, *Politisch-biologische Analogien* (ref. 7), 83–85.

13. On various efforts to reconcile Kantian teleology and mechanism in this period, see Timothy Lenoir, *The Strategy of Life: Teleology and Mechanics in Nineteenth-century German Biology* (Chicago: University of Chicago Press, 1989 [original: D. Reidel, 1982]). Despite many legitimate critiques of his argument, Lenoir's insight about "teleomechanism" remains important.

classic conundrum set by bee colonies, expressed both by the old term *Bienenstaat* and the metaphor of the human as a bee-swarm (much discussed by the Montpellier vitalists of the mid-eighteenth century[14]), suggested the coordination of separate individuals to a common purpose that itself was individual-like. But major new challenges to assumptions about biological individuality were yet to come.

In 1838, the botanist Matthias Schleiden argued that the properties of life inhered not in the plant as a whole but in its cells: "every plant developed in any higher degree is an aggregate of fully individualized, independent, separate beings, that is, the cells themselves." These cells acted as individuals while also leading a "double life" as parts of a larger whole.[15] Here Schleiden was adding a new wrinkle to some old ideas among botanists—that plants were not single individuals but composites of individuals, and that these lower-level individuals were variants on a small number of themes, the leaves, petals, and sepals, for instance, being fundamentally the same. What sort of a whole was this, then? In extending Schleiden's ideas to animals a year later, his physiologist colleague Theodor Schwann argued that the cellular individuals "are not ranged side by side as a mere aggregate, but so operate together, in a manner unknown to us, as to produce an harmonious Whole."[16] Schwann's agenda, then, was to explore cell processes, especially the process by which development into tissues ensued and formed that harmonious whole. The cell theory of Schleiden and Schwann (along with a broader surge in microscopical research in the 1830s) lent greater autonomy to the cellular level and redirected scientists' attention to the actions of the parts.

The rapidly increasing attention to marine invertebrates in the late 1830s and 1840s challenged another assumed attribute of the organic individual: its physical unity. Among the many animals being investigated by zoologists newly

14. See, e.g., Charles Wolfe and Motoichi Terada, "The Animal Economy as Object and Program of Montpellier Vitalism," *Science in Context* 21, no. 4 (2008): 537–79.

15. Matthias Schleiden, "Beiträge zur Phytogenesis," *Müllers Archiv für Anatomie, Physiologie und wissenschaftliche Medicin*, 5 (1838): 137–76, on 137; English translation by Henry Smith, in appendix to Theodor Schwann, *Microscopical Researches into the Accordance in the Structure and Growth of Animals and Plants* (London: Sydenham Society, 1847; New York: Kraus Reprints, 1969), 231.

16. Schwann, *Microscopical Researches* (ref. 15), 2. Later in this book (p. 188), in presenting a teleological perspective, Schwann referred to the "autocracy of the organism" as possibly superseding the agency of the individual cells, especially evident in the role of suppuration and fever in fighting off foreign or diseased matter. For more on Schwann's agenda, see Vienne, this issue.

disposed to study non-economically valuable marine organisms, quite a few turned out to comprise smaller repeating yet varying parts. By analogy with plants, some lower marine invertebrates could be described not as whole individuals but as "colonies" of individuals or "composite" individuals. The justification for not thinking of them as single organic individuals was intensified by closer study of their life cycles, which revealed a striking autonomy in some of their parts during certain stages, as well as dramatic changes in form across those different stages, associated with different modes of reproduction. In 1842, the Danish biologist Johannes Japetus Steenstrup pulled together research on a number of different such organisms and called the overall phenomenon "alternation of generations." Although his version of it was widely disputed, it spurred research on the life cycles of a wide variety of marine creatures and lent weight to the idea that these beings were not single, closed organisms but compounds, multiples, communities, stocks, colonies—or in a few cases, "states."[17]

The question of whether the scientist should think of the object before him as an "individual" organism, or a composite of individuals into a larger, looser entity such as a colony or state, was no mere matter of semantics. What made an organism an organism, and not a mere mechanism, for many thinkers in the nineteenth century, was the mutual causation of the parts and the whole. What enabled this causation? Many scientists thought there must be a special structuring force peculiar to life, a *Bildungstrieb*. Whether this force was material or immaterial was a significant topic of debate throughout the first half of the nineteenth century.[18] Others rejected this sort of explanation altogether, arguing that physico-chemical causes sufficed to account for organization in the organic realm. Among these, some invoked God as the ultimate First Cause, while others were content to rest the explanation entirely in matter itself. Thus discussions of biological individuality touched the metaphysical heart of the sciences of life.

What difference did this biological work make to political reformers? And what difference did the political options make to biologists? In the 1840s, these

17. Lynn K. Nyhart and Scott Lidgard, "Individuals at the Center of Biology: Rudolf Leuckart's *Polymorphismus der Individuen* and the Ongoing Narrative of Parts and Wholes. With an Annotated Translation," *Journal of the History of Biology*, 44 (2011): 373–443; Nyhart and Lidgard, "Alternation of Generations and Individuality, 1851," in *Biological Individuality: Integrating Scientific, Philosophical, and Historical Perspectives*, ed. Scott Lidgard and Lynn K. Nyhart (Chicago: University of Chicago Press, 2017), 129–57.

18. Lenoir, *Strategy of Life* (ref. 13).

two areas of thought and their associated discourses were rather distinct. Students of the life sciences did not regularly refer directly to political writings, nor did the political historians and *Staatswissenschaftler* who wrote about the state-organism refer explicitly to biologists. Neither needed to. Each group could draw on its own, well-developed body of literature and ways of talking about organisms, and given that the organism of the *Staatswissenschaftler* did not pretend to be a biological organism, and the composite colony of the biologists was not a political one, the partial analogies were communicatively sufficient. If we are to dig beneath the *Zeitgeist* to articulate any specific historical interaction, a key place to look would be the life and work of Carl Vogt, for he was in a unique position to bridge the two communities and their discourses.

CARL VOGT, "POLITICAL" SCIENTIST

Vogt's life embodied the complex relations between the science and politics of his time. These were freighted with metaphysics. Controversies over materialism—the idea that the properties of inanimate matter sufficed to account for the activities of living things, making a soul or even teleological organization unnecessary—lay just below the surface of the biological sciences. Materialists generally aligned with an anti-Christian stance, and often connected in turn to the view that, if there is no afterlife, our obligation is to improve the physical lives of people now, in this lifetime. Among materialists, this was often coupled with a broader anti-authoritarian stance, providing multiple reasons for political activism from the left.[19] The "radical materialist" Vogt epitomized a nexus of radical politics, anti-clericalism, and materialist science that frightened some and energized others.[20]

Born in 1817 into a family of radicals in Giessen, he grew up an atmosphere that combined leftist political activism and an interest in science. His politically left-wing father was a professor of medicine at the University of Giessen

19. Frederick Gregory, *Scientific Materialism in Nineteenth Century Germany* (Boston: D. Reidel, 1977); Christian Jansen, *Einheit, Macht, und Freiheit: Die Paulskirchenlinke und die deutsche Politik in der nachrevolutionären Epoche 1849–1867* (Düsseldorf: Droste Verlag, 2000); Kurt Bayertz, Myriam Gerhard, and Walter Jaeschke, eds., *Weltanschauung, Philosophie und Naturwissenschaft im 19. Jahrhundert.* Vol. 1: *Der Materialismus-Streit* (Hamburg: Felix Meiner, 2007).

20. Biographical information is derived from sources in ref. 5.

until 1835, when, under pressure from the repressive duchy of Hesse, he moved to the university in Bern, Switzerland. His home there would become a well-known haven for political refugees, including Carl himself in 1849.

Vogt studied medicine at Giessen, but had to flee in the spring of 1835 because of his student political activities. He finished his medical studies in Bern in 1839 under the physiologist and microscopist Gabriel Valentin. From 1839 to 1844, he served as an assistant to the charismatic Louis Agassiz, then professor at the lycée in Neuchâtel. During this period Vogt established his scientific reputation by conducting his own scientific studies on a broad range of anatomical and physiological topics. He also published his first work for a popular audience, an account of mountains and glaciers that included lively stories from his research expeditions with Agassiz.[21]

In 1845, having split with the conservative Agassiz, he spent a year in Paris, where he lived by his pen and continued to pursue his scientific research, while hobnobbing with members of Paris's scientific élite and mingling with other émigré radicals.[22] In this stimulating (if divided) company, he produced a two-volume textbook of geology and paleontology that solidified his reputation as a professional geologist, and also published the first two parts of his popular yet authoritative *Physiological Letters for the Educated of All Levels*, which—before the most explicitly materialist discussions of part three appeared—accrued complimentary reviews in periodicals as disparate as the general-literature review *Leipziger Repertorium der Deutschen und Ausländischen Literatur* and the *Archiv für Anatomie, Physiologie und wissenschaftliche Medizin*, Germany's leading physiology journal.[23] Sojourns in coastal Normandy and Provence led to a longer stay in Nice in 1846 to conduct research on marine organisms.[24]

21. Carl Vogt, *Im Gebirg und auf den Gletschern* (Solothurn: Jent and Gassmann, 1843); Emil Yung, "L'Oeuvre scientifique de Carl Vogt" (1895), reprinted in Pont et al., *Carl Vogt* (ref. 5), 327–46.

22. Yung, "L'Oeuvre scientifique" (ref. 21), 333; Carl Vogt, *Ocean und Mittelmeer: Reisebriefe*, 2 vols. (Frankfurt am Main: Literarische Anstalt, 1848).

23. Carl Vogt, *Lehrbuch der Geologie und Petrefactenkunde* (Braunschweig: Vieweg & Sohn, 1846–47); Vogt, *Physiologische Briefe für Gebildete aller Stände* (Stuttgart: Cotta, 1845–47); *Leipziger Repertorium der Deutschen und Ausländischen Literatur*, vol. 15 (1846), 400; T. L. W. Bischoff, "Bericht über die Fortschritte der Physiologie im Jahre 1845," *Archiv für Anatomie, Physiologie, und wissenschaftliche Medizin* (Jahrgang 1846), 103.

24. Vogt, *Ocean und Mittelmeer* (ref. 22); Eva-Marie Felschow, Bernhard Friedmann, and Heiner Schnelling, "La vie de Carl Vogt, à la lumière de ses écrits autobiographiques et autres documents," in Pont et al., *Carl Vogt* (ref. 5), 355–75, on 357; George Woodcock, *Pierre-Joseph Proudhon: A Biography* (Montreal: Black Rose Books, 1987 [original 1952]), 89.

In December 1846, at the instigation of his former teacher Justus Liebig, Vogt was called to a newly founded chair of zoology at the University of Giessen. Vogt's politics had already aroused skepticism among conservative members of the faculty,[25] and the publication early in the summer of 1847 of the third and final part of his *Physiological Letters*, which contained his explicit discussions of sex and the physical nature of mind, could only have dismayed them, for it showed him to be not only a whole-hearted materialist, but a proselytizing one.[26]

Giessen's now notorious materialist and revolutionary settled ever-so-briefly into teaching through the early winter of 1847–48. Then in February 1848, prompted by events in Paris, Vogt became actively involved in the opposition movement in Hessen, as an open member of the "Democratic Union" and commandant of the city "people's brigade." He soon gained a seat in the National Assembly in Frankfurt, convened to form a united Germany and establish its constitutional principles. There Vogt aligned himself with a left-wing faction—not the most radical one, to be sure, but radical enough, advocating universal suffrage and the separation of church and state. When the Assembly was dissolved in May 1849, he was among those to suggest a continuation, known as the "rump parliament," in Stuttgart. Attended by only a tenth of the National Assembly delegates when it opened in June—among whom Vogt was one of the formal leaders—it was soon attacked by troops of the King of Württemberg, and Vogt fled again, taking a roundabout route to his parents in Switzerland. By that time, the University of Giessen had fired him.

Over the next few years Vogt would again live as a freelance writer, once more paying long visits to the Mediterranean and finding some refuge in his scientific research, but also mixing it with political writing. In 1850, he earned some money by translating the popular English work *Vestiges of the Natural History of Creation* into German, approving its populist science and potential to support materialism, while disagreeing with its evolutionism.[27] In 1852, he was offered the professorship of geology at the academy in Geneva. He would

25. According to Vogt, Liebig had had to threaten to leave in order to induce the conservative cultural minister Linde to hire him; Linde purportedly told Liebig he did not know what he was doing in returning this "devil's spawn" to Giessen. Vogt, *Aus meinem Leben* (ref. 5), p. 46. For an account based on the documentary record, see Felschow et al., "La vie de Carl Vogt" (ref. 24).

26. Vogt, *Physiologische Briefe* (ref. 23), on sex, 281–82; on materialism and the soul, 457–58.

27. For an elegant analysis, see Nicolaas Rupke, "Translation Studies in the History of Science: The example of *Vestiges*," *British Journal for the History of Science*, 33 (2000): 209–22.

work there for the rest of his life, helping to transform it into a university in 1873 and serving as its first rector in 1874–75. During these years and many others, even while continuing to publish important works in science, he served as a representative to Geneva's main political body, the Grand Council, and represented Geneva as a Conseiller d'Etat in the Federal Republic of Switzerland.[28]

As this overview of Vogt's life suggests, politics and the natural sciences were integral to his entire adult life—a rare combination matched in his time perhaps only by his younger contemporary, Rudolf Virchow.[29] Uniting the two realms in his biography and especially in his commitment to materialism, he was in a unique position to address organism-state analogies in both directions. This he did most fully between 1848 and 1852, especially in his writings on siphonophores.

VOGT ON SIPHONOPHORES: POLITICS AND BIOLOGY

Vogt first argued that marine creatures might be composite individuals in his popular work *Ocean and Mediterranean*. This book drew from his seaside sojourns between 1845 and 1847 in St. Malo on the Norman coast of France and in various villages on the Mediterranean, interspersing vivid descriptions of the local scenery with anecdotes about colorful local characters, political commentary, scientific gossip, and extensive descriptions of his investigations on marine organisms. Prominent among the latter were his examinations of invertebrates from the taxonomic group called siphonophores, fragile and beautiful forms with numerous distinctive parts—swimming-bells, tentacles, siphons, and little nubs attached to a common stem.[30]

Vogt observed that some of these parts looked like other creatures that lived autonomously and were identified as different species; moreover, they retained their vitality when separated from the whole. This observation, along with

28. Françoise Dubosson, "Carl Vogt, politician genevois: un parcours ignore," 31–45, esp. p. 31, and Marco Marcacci, "L'Université de Genève descend-elle de Carl Vogt?" 93–109, both in Pont et al., *Carl Vogt* (ref. 5). See also the very useful chronology in ibid., 315–16.

29. For a close assessment of how Virchow negotiated the combination of these two spheres, and how that negotiation changed over time, see Constantin Goschler, *Rudolf Virchow: Mediziner—Anthropologe—Politiker* (Cologne: Böhlau, 2002).

30. One possible reason for the great extent of the descriptions is that the book was not illustrated, probably to reduce cost. This contrasts with the many illustrations in his later *Zoologische Briefe* (Frankfurt am Main: Literarische Anstalt, 1851) and *Bilder aus dem Thierleben* (Frankfurt am Main: Literarische Anstalt, 1852).

comparison of several different kinds of these creatures, led Vogt to suggest that it was "simpler" to view the different parts as individuals in a "collection," "aggregate," or "colony" than as organs or parts of a single individual. The classificatory consequences were significant. The siphonophores had been classed with other jellyfishes as Medusae. But this kind of medusa was composite, whereas another kind of medusa was newly discovered to be merely a developmental stage of an organism with different features. The two organisms called "medusae" were not the same at all. Vogt was inclined to think that the entire class of medusae would have to be dissolved.[31] The organism as coordinated aggregate thus did important work for Vogt and had real consequences for his biology.[32] However, at this point in his writing, the term "state" did not appear.

Not long thereafter, he had occasion to weigh in on politicians' use of the state-as-organism metaphor. He disapproved, and said as much on the floor of the National Assembly, in February 1849, in the debate over a proposed franchise law that weighted votes according to income—a proposition that Vogt, as a staunch one man–one vote democrat, fiercely opposed. Drawing explicitly on his authority as an expert (*als Sachverständiger*) on organisms, he argued that the statesmen who endlessly spoke of the "state-organism" had in mind only "an organism with head, chest, belly, arms and legs," and were ignorant of other forms of organization that served life just as well. Moreover, he continued, they ignored the "deep gulf" between animal and human societies. Among humans,

> social community [*Zusammenleben*] and its regulation are the highest goal and the highest development of the human—and therefore of the state-organism; whereas in the animal world the social individual that lives in a society of necessity always stands lower than the individual that lives independently. Gentlemen! But in the animal world, too, the worst social forms are those in which privileged classes of individuals exist, just as in the human world. To create such is truly the goal of this election law.[33]

31. Vogt, *Ocean und Mittelmeer* (ref. 22), 304–23.

32. Similarly, in his discussion of the salp, he uses the terms "compound" (*zusammengesetzt*) and "aggregate," and says they are not integrated enough to be called "colonies." Ibid., 58–59.

33. Vogt in *Stenographischer Bericht über die Verhandlungen der deutschen constituirenden Nationalversammlung zu Frankfurt am Main*, vol. 7, ed. Franz Wigard (Frankfurt am Main, 1849), 5255. Quoted in Mazzolini, *Politisch-biologische Analogien* (ref. 7), 93–94. I owe much to Mazzolini's excellent discussion.

Vogt developed this argument at much greater length in his *Investigations into Animal States* (1851), originally published serially in 1850 in the short-lived left-wing periodical *Deutsche Monatsschrift für Politik, Wissenschaft, Kunst, und Leben*. Although its title suggests a work of natural history (and indeed, remarkably, it seems to have been treated as such by some previous commentators[34]), this work is actually three essays of biting political allegory, on bees, locusts, and siphonophores. Consistent with his focus on the siphonophore as a collection of animals that merely appeared to be a single organism, here he moved beyond the expanding terms of intermediate individuality—aggregate, composite, colony, or "stock"—to consider these as "animal states." In doing so, he joined the long tradition of moral-political literature around state-organisms to throw into satirical relief the broader habit of looking to nature for models of the ideal state.[35]

Reflecting the philosophically materialist, anti-idealist position for which he was already well known, he argued in the book's introduction that the principal task of the animal state was to supply the basic material wants of the individuals in it—especially food. "The professors," he said, tended to forget that social stability depended on satisfying these basic needs—something he said that animal states already "knew." He argued that no matter what form the animal state took—whether "absolute or constitutional monarchy, republic with or without caste differences, democratic or aristocratic socialism"—these different state forms were all solutions to the problem of satisfying material need.[36] But as his book would show, each solution had its limits—especially those imposed upon personal freedom. In this respect, he elaborated on a point he had made in the Frankfurt Assembly, with regard to degrees of perfection.

> There are animal states of varied levels of perfection—the lower they stand, the more they suppress the individual and recast its rights into duties toward the whole . . . through the curtailment and abasement of the individual. . . . The individual becomes the more perfect, the more it emancipates itself

34. As Christian Jansen notes in "'Revolution'—'Realismus'—'Realpolitik': Der nachrevolutionäre Paradigmenwechsel in den 1850er Jahren im deutschen oppositionellen Diskurs und sein historischer Kontext," in Bayertz et al., *Materialismusstreit* (ref. 19), 223–59, esp. 233, n. 15. The single review I have found of Vogt's *Thierstaaten* appeared in a general interest journal (*Deutsches Museum: Zeitschrift für Literatur, Kunst und öffentliches Leben*, 2 [1852]: 147–48); it criticized the satire as undermining the enjoyment of the natural history descriptions.

35. See Johach, "Bienenstaat" (ref. 3), and discussion below on satire.

36. Carl Vogt, *Untersuchungen über Thierstaaten* (Frankfurt am Main: Literarische Anstalt, 1851), 13–14.

> from the state. . . . Every living atom thirsts for anarchy, strives toward freedom. . . . The progress of mankind for the better lies only in anarchy, and the goal of our striving can only be anarchy.[37]

Here Vogt was both making a political statement and playing with a common topic of discussion among biologists: how to judge degrees of perfection in organisms. "Complexity" was usually the answer. Vogt personally knew the Parisian comparative anatomist Henri Milne-Edwards, and would have known that the latter sought increasing perfection in the degree of division of labor and functional integration to be found in an organism's tissues and organs. Compound marine invertebrates like salps were typically considered "lower" organisms because their parts were not highly differentiated and they had no brain to provide a centralized directing mechanism; siphonophores displayed a more differentiated division of labor, but still lacked morphological integration. Vertebrates had a highly differentiated set of tissues and organs that were complexly integrated into a whole. By the 1840s, the justification of vertebrates as "higher" organisms was regularly couched in these terms (which were themselves drawn originally from Adam Smith's idea that the division of labor was fundamental to increases in productivity and wealth).[38] What lent Vogt's argument its jarring humor was his upending of the usual hierarchy of perfection by seeing "differentiation and integration" not as the creation of a higher, more integrated whole but as a loss of freedom for the parts. The traditional hierarchy might work for cells, organ systems, and physiological functions in "lower" organisms, but not for humans and personal freedom.

Vogt wrote the essay on siphonophores in Nice, where his political allegory could draw its contents from the rich realm of the Mediterranean. He derived much satirical fodder from the ocean's inhabitants, even before arriving at the siphonophores. Consider his discussion of the salp—another compound marine invertebrate that received much attention in this period. He compared this form to "the true type of Louis Blanc's fraternal worker's association, founded on equality and brotherhood without freedom. . . . Indissolubly chained to one another, equal in size and shape, the individuals of these chains have only so much free will as is necessary never to exercise it," just as certain politicians had suggested it possible to give German workers a vote so restricted that they could never use it.[39]

37. Ibid., 28–30.
38. See Nyhart and Lidgard, "Individuals" (ref. 17); Limoges, "Milne-Edwards" (ref. 1).
39. Vogt, *Untersuchungen über Thierstaaten* (ref. 36), 180.

The siphonophores appeared at first glance to be the closest to an ideal state: their parts were so autonomous that they could still live independently if the colony was shaken apart, and they might be imagined to have come together "voluntarily" to form this whole. As Vogt put it, the parts are only "tacked onto the idea of the whole, but not subordinated to it, so that each organ, if not quite completely free and independent, nevertheless lives and acts as an isolated individual." Yet the siphonophores still did not achieve his ideal of "culture-anarchy" for, as he acknowledged (in a typical moment of self-directed irony), they displayed no culture and therefore no anarchy, either—indeed, it would appear that, once united, they were "forced" into remaining parts of the larger whole.[40]

Vogt was particularly interested in the siphonophore subgroup *Physophora*, commonly called *Blasenträger* (bladder-carriers) for the air-bladder the organism uses to regulate its depth in the water. Vogt had fun riffing on the idea that "a Nothing can play the most important role in an organism," and seeking the most appropriate functional analogy for a "constitutional air-bubble." He decided that the air bladder was best likened to "the state treasury, with its wealth made out of debts, which with its positive emptiness supports the entire body of the state, and the circulation of which feeds it internally."[41]

Over the next fifty-plus pages, Vogt worked his way through the entire anatomy of the siphonophore, drawing analogies with different aspects of human society and government, and finding occasion to skewer political figures through their resemblance to various polyp-parts. But the air-bladder remained the central feature, and he returned to it at the end. While acknowledging that he had been unable to observe the actual development of the siphonophore-state, he suggested that the air-bladder was primary to all else, the first part to be constructed. It was also the last part left intact when the organism died. The parts fell off one by one, until in the end, "there is nothing but the drawn-together stem with the air bladder. . . . Thus has the empty state treasury, which had marked the beginning of the whole organization, become in the same way its endpoint."[42] Driving home at once both his view of the corrupt nature of state governments and his commitment to materialism, he finished the work by carrying the air-bladder metaphor two steps further. It is the debts of the empty treasury that outlast the siphonophore-state—and these

40. *Ibid.*, 184.
41. *Ibid.*, 191.
42. The German suggests a tiny pun on arguments about teleological causation.

debts are also its immortal soul, which survives "when the body of the state-organism has sunk into dust and slime. Can one offer any better comfort to the owners of government bonds, than that nature has already discovered the eternity of state debts?"[43]

Clearly, this essay was not intended primarily as a contribution to knowledge about science, but as political commentary. (Apparently it was effective—enough, anyway, to get the book banned in Baden.[44]) It might readily be seen as part of the wave of satire that rose with political tensions and the popular periodical press in the late 1840s.[45] Yet Vogt's satire was different, for it came with the authority of science behind it. He was not only lampooning German political ideas; he was also accurately describing siphonophores, implicitly claiming a scientist's authority to expose the vulnerability of political theory that purported to know something about organisms.

It is worth noting that Vogt could have treated the siphonophore as a single individual and satirized the state-as-organism that way, or could have chosen a different sort of organism for his most integrated model, but he did not. Whether treating the beehive, the locust colony, or the siphonophore, he consistently presented the "animal state" as a collection of individuals—a coordinated social, political, and economic system, but not a single organism. Not only did this tap into the moral and satirical traditions of the animal state, but his own politics invited choosing this representation. As Virchow described Vogt's position in 1849, "The state is indeed not and never will be an organism, but only a complex of organisms."[46] The autonomy and rights of the individual within the state were Vogt's biggest political concerns, and they would not have been served by conceiving them as mere organs, or parts, of a single individual.

43. Vogt, *Untersuchungen über Thierstaaten* (ref. 36), 248.

44. *Würzburger Abendblatt* 12, no. 4 (5 Jan 1852), 14; https://books.google.com/books?id=2J5MAAAAcAAJ&pg=PA14&dq=Thierstaat&hl=en&sa=X&ved=0ahUKEwiT0d6Wne7TAhVM6GMKHaZFAs44ChDoAQgpMAE#v=onepage&q=Thierstaat&f=false (accessed 13 May 2017).

45. See, e.g., Ann Taylor Allen, *Satire and Society in Wilhelmine Germany: "Kladderadatsch" and "Simplicissimus," 1890–1914* (Lexington: University Press of Kentucky, 1984), 14–20 and bibliographic essay; and the summary discussion in Ursula E. Koch, "Power and Impotence of the Press in 1848: France and Germany in Comparison," in *Europe in 1848: Revolution and Reform*, ed. Dieter Dowe, Heinz-Gerhard Haupt, Dieter Langewische, and Jonathan Sperber, trans. David Higgins (New York: Berghahn, 2000), 585–616, on 612–14.

46. Rudolf Virchow, "Der Staat und die Aerzte," *Die medizinische Reform* 39 (30 Mar 1849), 221, quoted in Mazzolini, *Politisch-biologische Analogien* (ref. 7), 36.

In 1853, Vogt finally drew together all the research he had conducted since 1846–47 on the siphonophores of the Mediterranean into a large scholarly monograph. Now he was once more employed in an academic position, this time in the more politically compatible surroundings of Geneva. Emerging from his scholarly isolation in Nice, where he had fraternized with fishermen and political friends, he discovered that many other biologists were working on siphonophores and their close relatives as well—his monograph cites a score of authors on the genus *Velella* alone. The taxonomic reclassification of the medusae that he had suggested in 1848 had in fact been pursued by others (who did not wholly agree with one another). These included the young T. H. Huxley, who had become intrigued with these groups on board *H.M.S. Rattlesnake* in 1846–50 and had begun publishing on them in 1849; and, perhaps irritatingly closer to home, Rudolf Leuckart, Vogt's successor in the professorship of zoology at Giessen.[47]

Leuckart had blown onto the academic scene in 1847 and rapidly made a name for himself. In 1851, he published a pamphlet that ambitiously sought to resolve the convoluted connections between the alternation of generations, polymorphism in compound organisms, and the problem of organic individuality, using the division of labor as his fulcrum. In this scientific work, he explicitly defined the term "animal state" as part of a taxonomy of integration: animal states such as bees, ants, and termites "encompass a lesser or greater number of isolated individual beings, which are held together through the community of their interests and needs," and through significant division of labor "give the appearance of a well-ordered organism." Siphonophores and similar lower organisms with parts more physically bound together he called "animal stocks." These also contained multiple individuals performing different functions for the colony (a more general term of aggregation), but remained united into a single, physically contiguous body.[48] Nevertheless it was when writing about siphonophores (in his physiological classification, a kind of stock) that Leuckart mentioned political states, in perhaps the only such comment in his entire scientific corpus: "As in a communist state there are here no poor next to the rich, no hungry next to the sated—but also no lazy next to the industrious. Each contributes its own to the sustenance and health of the whole, each

47. Leuckart was a former student of the conservative Göttingen physiologist Rudolf Wagner, which must have helped his candidacy in Vogt's wake. Wagner would attack Vogt in print for his materialism, starting in 1851.

48. Rudolf Leuckart, "On the Polymorphism of Individuals," translation in Nyhart and Lidgard, "Individuals" (ref. 17), 320–21.

according to its powers."[49] It is not known whether Leuckart had read Vogt's *Animal States*, but the comment is strikingly out of place in the essay, and suggests the difficulty of loosing the term "state" from its political connotations to attach it to a particular biological category.

One might have expected Vogt to have praised Leuckart's seemingly radical analogy, but he did not pick up on it when writing for a scientific audience. Indeed, by his 1853 monograph, he expressed some impatience with the whole discussion over what constituted a "real" individual. Writing on the hydrozoan *Velella* (then grouped with the siphonophores), he stated that whereas it was important to recognize a *Velella* specimen as a colony of individuals, "I don't attach much importance to the discussion that could be raised on this subject. . . . Observations on other species of siphonophores show that it is almost impossible in such curious colonies to place a limit between the signification of the words 'individual' and 'organ.'"[50] Though specialist readers of the monograph would have known perfectly well that he was criticizing Leuckart, Vogt was remarkably circumspect. More significantly, this statement suggests that Vogt's attitude toward the animal state as a scientific category was at best lukewarm.

How does his pragmatic stance toward organisms and individuals here square with his flamboyant political writing? Although it might seem that he was backing away from the exuberantly metaphorical language of *Animal States*, I would suggest that the two writings are of a piece. Both reflect a well-developed consciousness of the constructed nature of the language humans use to describe organisms and society, and a keen sense of what was appropriate to different genres and audiences. As appealing as metaphorical language might be for political rhetoric, when writing *as a scientist* for scientific and even popular audiences, Vogt did not want to invest too much in such language.

This pragmatic, even belittling stance about words, I suggest, reflects deeper philosophical commitments about science. Scientists' knowledge of these marine creatures, Vogt had written in *Ocean and Mediterranean*, was extremely limited. They extrapolated from what they knew, as best they could, via comparison and analogy, conscious of the limits of their knowledge and knowing it was only provisional. Their terms would have to change as their

49. Ibid., 323.

50. Vogt, "Recherches sur les animaux inférieurs de la Méditerranée. Premier Memoire: Sur les siphonores de la mer de Nice," *Mémoires de l'Institut national genevois*, 1 (1853): 1–164, on 37; emphasis added.

knowledge changed.[51] While striving to find general laws, Vogt adopted a stance of epistemological modesty characteristic of many life scientists of his generation, still reacting to the extravagant speculations of *Naturphilosophie*.[52] In Vogt, this provisional stance was aligned with his materialism. Both were ways of undercutting overly "philosophical" ambitions and claims for science, especially associated with idealistic stances (including explicitly religious ones, but not limited to them).

Indeed, by 1859, Vogt recognized that materialism itself could be handled too "philosophically," as everyone declared their first principles and stuck fast to them. A leading player in the materialism debate of the early 1850s, he now declared himself tired not only of the wheelbarrowfuls of writings that it had engendered but also of the dogmatic tone it had adopted. Dogma on both sides was what he opposed, he now said, for dogma was the enemy of freedom. Where, then, lay truth? Truth lay in scientific investigation, which produced facts.[53]

But Vogt was not exactly retreating quietly into fact-collecting. Facts could provide the sort of bludgeon against his enemies that satire had previously offered. Theologians and jurists—the perpetuators of old dogmas—were "completely unable to grasp and value the worth of a naked fact." At the end of his 1859 reflections, Vogt argued for a "break with scholasticism" in the schools, and for putting education "on the foundation of the material facts."[54] Thus we have a direct linkage of science, facts, materialism, and freedom, on the one hand, contrasted to the authority of theology and the law, dogmatism, denial of the facts in favor of previous (idealist) belief, and repression, on the other. Science would speak truth to power, and to do so, its language would have to be the language of facts. Interpretations would come and go, and one must not invest too much in interpretive language, lest it become dogma. As we will see, this stance puts Vogt with other "realists" of the 1850s—political ones, as well as scientific ones.

51. Vogt, *Ocean und Mittelmeer* (ref. 22), 323.

52. See Nyhart, *Biology Takes Form: Animal Morphology and the German Universities, 1800–1900* (Chicago: University of Chicago Press, 1995), 23, 128–29 and 140.

53. Vogt, *Altes und Neues aus Thier- und Menschenleben*, 2 vols. (Frankfurt am Main: Literarische Anstalt, 1859), xv–xvi. Note that this stance did not preclude Vogt from holding fast to his most notorious analogy, that thoughts stand in the same relation to the brain "as the bile to the liver or urine to the kidneys." But this, he claimed, was an induction from the evidence! See his *Physiologische Briefe* (ref. 23), 206.

54. Vogt, *Altes und Neues* (ref. 53), xix.

STATES, ORGANISMS, AND SCIENTIFIC POLITICS IN THE 1850S

Vogt was perhaps the only German zoologist in the late 1840s and early 1850s in a position to bring the discourses of natural history and politics actively and authoritatively together. His seaside investigations with his radical friends, his interpolation of political commentary into his popular descriptions of those investigations, his relative neglect of writing for specialists in favor of presenting the results of his research in a form accessible to a broad audience (who would become better citizens by their simultaneous political and natural-historical education)—all these show him seeking a style of being committed at once to both science and politics, much like his younger contemporary, T. H. Huxley.[55] He nevertheless did not entirely erase the distinction between the two. Instead, he protected his authority with scientific audiences by careful word usage, avoiding the morally tinged "animal states" in his scientific work, while leaning on that same scientific authority in his objections to the state-organism as used by politicians.

What happened to those metaphors, then, in the 1850s? What can their further analysis tell us about the changing authority relations between politics and biology? In the life sciences, Vogt's biological politics served in certain cases as a positive model. Most directly, his emphasis on the autonomy of the parts relative to the whole, expressed in both the Frankfurt Assembly and in *Animal States*, would be taken up seriously in the 1850s by the liberal pathological anatomist Rudolf Virchow. Too young to have been eligible for the Frankfurt National Assembly, and too sober of temperament to aspire to Vogt's satirical style, in 1855 and again in 1859, Virchow earnestly proposed to represent the body as a "cell-state"—a state made up of cells that acted as republican, equal citizens. This position would shape his development of the new discipline of cellular pathology (though it is noteworthy that he did not view the political state in the same way).[56]

55. See Paul White, *Thomas Huxley: Making the Man of Science* (Cambridge: Cambridge University Press, 2002).

56. Rudolf Virchow, "Cellular-Pathologie," in *Archiv für pathologische Anatomie und Physiologie und für klinische Medizin*, 8 (1855): 3–39; 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; see the discussion of these and other aspects of Virchow's cell state metaphor in Goschler, *Rudolf Virchow* (ref. 29), 279–83; Mazzolini, *Politisch-biologische Analogien* (ref. 7); Eva Johach, *Krebszelle und Zellenstaat: Zur medizinischen und politischen Metaphorik in Rudolf Virchows Zellularpathologie* (Freiburg, Berlin, Vienna: Rombach, 2008).

In the zoological community, despite Vogt's own hands-off treatment, the state metaphor became embedded within the broad problematic surrounding biological parts, wholes, and individuality. Explicit discussions of organic individuality reached a peak in the early 1850s, continuing into the 1860s and beyond. These often involved taxonomies of integration and autonomy that included single- and multicellular organisms.[57] And here, in addition to the older terms "stock" and "colony," we see state-talk in line with both Leuckart's "animal state" and Virchow's "cell-state." Most famously, Virchow's former student Ernst Haeckel developed a formal hierarchy of individuality in which lower levels aggregated to form higher levels, rising from cells to organs and thence to "persons" (our usual individuals). A multicellular organism was thus a *Staat von Zellen* or *Zellen-Staat*. Whereas plants and some lower animals then formed higher, physically contiguous composites called "stocks," most animal "persons" maintained autonomy and grouped themselves into "states."[58] In the 1870s, Haeckel modified his version of Virchow's cell-state: now plants and lower invertebrates might be cell-republics, but higher organisms, especially vertebrates, were better described as cell-monarchies.[59]

Haeckel nevertheless shared Vogt's view about "organs" and "individuals" (along with his aim to reach a broad public): as he wrote, "the two concepts of the individual and the organ are in nature not nearly so distinct" as one might think. They were relative concepts, dependent on the scientist's questions and mode of analysis.[60] And indeed, within the broader ongoing discussion of organic individuality and part-whole relations, the state metaphor seems not to have hardened into a dominant concept, remaining largely confined to the organization of eusocial insects and questions about cellular autonomy. Biologists had other intellectual fish to fry. As the problem of individuality ramified into many different problems concerning generation, parasitism,

57. Rudolf Leuckart, a deeply interested party, highlighted such discussions in his reviews of the literature on the lower organisms between 1854 (covering 1848–53) and 1879, which appeared about every other year in the *Archiv für Naturgeschichte*, Part 2.

58. Ernst Haeckel, *Generelle Morphologie der Organismen*, 2 vols. (Berlin: Georg Reimer, 1866), vol. 1, 264 ("Staat von Zellen"), 270 ("Zellen-Staat"), 211 (states of autonomous animals); "Ueber Arbeitstheilung in Natur- und Menschenleben" (orig. 1868), in idem, *Gesammelte populäre Vorträge* (Bonn: Emil Strauss, 1878), 99–140.

59. 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, esp. 133–34.

60. Haeckel, *Generelle Morphologie* (ref. 58), 250–51. See Nyhart, *Biology Takes Form* (ref. 52), pp. 135–36. On Vogt as a model more broadly for Haeckel, see Hopwood, *Haeckel's Embryos* (ref. 5), 45, 50, 57.

symbiosis, the nature of species, and functional part-whole relations within individual organisms, scientists seem to have rarely chosen to compare explicitly the organization of animal individuals to states.[61]

What about the state-as-organism analogy, and the work done on the political side? Here Vogt's anti-idealist stance was more in tune with other political theorists and activists, and shows him contributing to the broad move in the 1850s toward what was known as "Realismus"—realism, in the meaning of the time that meant one focused on the real world rather than the ideal one. Politics and history, the natural sciences, and languages (versus philosophy and theology)—these were called the *Realwissenschaften*, understood to be the sciences that dealt with the real world and helped to run it. Just as physiology, interpreted as a *Realwissenschaft*, would deal with the actualities of the real, physical world, rather than seeking laws in the ideal one, so too, according to reformers, would history and politics—drawing on the "realistic" natural sciences as their models.[62]

Many liberal German political scientists and historians continued to use the organism as a model for the state in the 1850s[63]—only now, in contrast to the 1830s and '40s, they emphasized the "real"—that is, non-ideal—nature of this organism. Consider the liberal political theorist August von Rochau, who invented the term *Realpolitik* in 1853. Rochau is famous for asserting the existence of an ultimate "law of power" over the life of the state, a "realistic" perspective in more than one sense. Less often noted is that he opened his treatise by calling the state "the political organism of human society," an organism that followed natural laws like all other organisms. Here we might see recourse to the older Kantian concept of organism as a formal part-whole causal circle rather than a specifically biological organism, especially in the locution "organism *of*," but Rochau's stance was a little different. Drawing on recent work by August Comte, he elaborated on the characteristics of this organism in the distinctly physicalist, natural-scientific terms of the laws of force, as applied to physiology. The state-organism was characterized by the "interaction of various forces," and the study of these forces in forming the state was the proper foundation for understanding it. Indeed, Rochau framed an entire physiology of active and passive forces of the

61. This claim is based on a wide but impressionistic reading of the literature of the 1850s and requires further investigation. However, it does suggest that an undue focus on Virchow's views in the existing literature may have overemphasized the importance of the state metaphor in biology.

62. On this point, see Jansen, "'Revolution'" (ref. 34).

63. See Lindenfeld, *The Practical Imagination* (ref. 9), esp. 176–80.

state from these principles. Further, in suitably scientistic tones, he argued that the question should not be, Is this a good or the best constitution?, but rather, Which constitution "allows all the social forces to be expressed to their full extent through the state"? It was the job of the government to tinker with these real forces to achieve an appropriate balance. As he worked through seeking that balance, Rochau extended his metaphor to encompass the political organism's organs, its life activities, the problem of forces that are not incorporated into the body of the state, and so on.[64]

In this way, Rochau (among others) revived the analogy between organism and state, but on something more akin to the materialist basis pushed by Vogt. And here, biology—and more broadly, the natural world and its sciences—did indeed provide a source of legitimation for politics, especially liberal politics. If Vogt thus was in tune with his fellow liberals and radicals to move toward a more positivist, "realist" view of the state, he failed to head off analogizing the state to the organism.[65]

CONCLUSION

Both the state-as-organism and biological-individual-as-state metaphors persisted after the 1850s, albeit in somewhat new forms. The incorporation of the state concept into taxonomies of biological organization among biologists gradually naturalized it, such that by the 1870s and later, when Haeckel used (and

64. Ludwig August von Rochau, *Grundsätze der Realpolitik, angewendet auf die staatlichen Zustände Deutschlands*, ed. Hans-Ulrich Wehler (Frankfurt am Main: Ullstein, 1972; Part 1 originally published in 1853), esp. 25–37. Although often associated in America with late Cold War politics, *Realpolitik* had an important earlier history internationally: John Bew, *Realpolitik: A History* (Oxford: Oxford University Press, 2016). On Rochau's debt to August Comte's *Systeme de la politique positive* (1851), see Natascha Doll, *Recht, Politik und 'Realpolitik' bei August Ludwig von Rochau (1810–1873): Ein wissenschaftsgeschichtlicher Beitrag zum Verhältnis von Politik und Recht im 19. Jahrhundert* (Frankfurt am Main: Vittorio Klostermann, 2005); and Jansen, *Einheit, Macht, und Freiheit* (ref. 19), 260–65, esp. 260.

65. Jansen, "'Revolution'" (ref. 34) argues for a "paradigm shift" toward *Realpolitik* among left-wing political activists who remained in Germany in the 1850s, including Rochau. He argues that Vogt's materialism was coupled with an émigré political stance that remained more sharply oppositional than the *Realpolitiker* who stayed behind in Germany, and cautions against lumping natural-scientific "realism" together with Realpolitik (253). Nevertheless, even though Vogt himself would not be characterized as a *Realpolitiker*, the thrust of Jansen's argument is that the *Realpolitiker* did indeed base their new politics at least in part on a "realist" model of nature, of the kind supported by Vogt. My argument about the state-as-organism here thus offers further support for this aspect of Jansen's argument (though he does not discuss Rochau's use of the analogy).

re-used) it, it had lost much of its political-moral edge. Terms like *Bienenstaat* became widely used as neutral vocabulary.[66] Together with the claim among *Staatswissenschaftler* that the state now represented a "real" organism with a physiology, this brought the two professional discourses into closer alignment.

To be sure, the fates of the metaphors were asymmetrical. For biologists interested in problems of organization, the state became one tool among many for thinking about certain major questions concerning organismal part-whole relations—about the autonomy of parts in colonial invertebrates and of cells in metazoans, and about the locus of "governance" in the animal body.[67] But scientists still rarely alluded explicitly to political writings, and with the exception of Virchow, they do not appear to have drawn on particular state-theories to justify their theoretical positions on organismal organization. The state-as-organism metaphor, by contrast, explicitly structured discourse about the state, whether in its old idealist form or its new "realist" guise. The key difference between the latter two forms, with respect to legitimation, is that the older one drew on the authority of philosophy, whereas the newer leaned on the authority of natural science.[68]

An obvious reason for this asymmetry in the two metaphors lies in the authority of nature as an ultimate recourse. Nature continued to provide legitimacy for politics, but the opposite direction spelled illegitimacy for science: if politics too obviously shaped the scientist's views on nature, then he was no longer doing science. This is a complex topic, with many more ramifications than can be pursued here. But in the German states of the 1850s, holding politics at arm's length became the price the professional academic scientist had to pay to do science. This was true in a pragmatic sense: many academics, including Vogt, lost their jobs for their revolutionary activities, and others barely kept theirs: the activist Rudolf Virchow, after severe restrictions had been put on him to retain his position in Berlin, was expected not to undertake political activities as part of his appointment by the University of Würzburg in 1849, and only returned to the political realm later in his career.[69]

66. This observation is based on a Google N-Gram search of "Bienenstaat" and variants, 1850–1925, followed by examination of titles and dipping into a sample of texts.

67. Reynolds, "Haeckel and the Cell State" (ref. 59) and sources cited therein; for similar issues in Britain, see James Elwick, *Styles of Reasoning in the British Life Sciences: Shared Assumptions, 1820–1858* (London: Pickering and Chatto, 2007).

68. On the widespread and novel "paradigm-shift" to natural-scientific vocabulary by Staatswissenschaftler in the 1850s, see Jansen, "'Revolution'" (ref. 34) esp. 234, 237.

69. Goschler, *Virchow* (ref. 29), esp. 81–92, 152–61, 252–53.

The need for separation was not only pragmatic, however; it also spoke to the need of scientists to secure their legitimacy as truth tellers. Value neutrality was most clearly articulated as a virtue of science later in the nineteenth century, often bearing a retrospective hue.[70] One might speculate that this stance, connected with seeing the scientist as standing apart from politics, began to take shape as early as the 1850s. Making a virtue out of necessity, it coincided with both the repression of that era and the emergence of a distinctive role for the natural scientist, separate from the other *Wissenschaften*.[71] While limiting the legitimacy of the scientist's personal political activity, this stance buttressed the claims of natural science over the territory of nature. It thus both strengthened the "realistic" state-as-organism metaphor, which defended a "natural-scientific" basis for understanding the state, and gained strength from that metaphor. In so doing, I suggest, the discourses of biology and politics reinforced a particular configuration of mutual legitimation between scientists and the state.

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70. Robert Proctor, *Value-Free Science? Purity and Power in Modern Knowledge* (Cambridge, MA: Harvard University Press, 1991), 85–98, attributes its clear articulation to Max Weber and Ferdinand Tönnies in the early twentieth century. As these names suggest, the issue of value-neutrality in science has mainly been explored with reference to the social sciences, which have always felt an immediate tension between theory and practice. See also Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007).

71. On the dating of a significant form of *Wissenschaft*, *Naturwissenschaft*, to the 1840s, see Denise Phillips, *Acolytes of Nature: Defining Natural Science in Germany, 1770–1850* (Chicago: University of Chicago Press, 2012), esp. ch. 8. Andreas Daum notes that the hands-off, apolitical image of the mandarin natural scientist came to prominence in the 1850s, quickly turning into a stereotype. Daum, *Wissenschaftspopularisierung im 19. Jahrhundert: Bürgerliche Kultur, naturwissenschaftliche Bildung und die deutsche Öffentlichkeit, 1848–1914* (Munich: Oldenbourg, 1998), 422.