Bibliography

WORKS BY CARLYLE

The Centenary Edition, edited by H. D. Trail, 30 vols. (London, 1896–1899; New York, 1896–1901) is the most complete edition of Carlyle's *Works.* Carlyle's correspondence, most notably with Goethe, Ralph Waldo Emerson, Mill, and John Stirling, is essential reading for anyone interested in Carlyle's thought or, indeed, in nineteenth-century intellectual history in general. See also *Correspondence of Emerson and Carlyle,* edited by J. Slater (New York: Columbia University Press, 1964).

WORKS ON CARLYLE

To date there exists no full-scale analysis of the whole range of Carlyle's thought. The best short account is given by Ernst Cassirer in *The Myth of the State* (New Haven, CT: Yale University Press, 1946), Chs. 15–16. J. A. Froude, *Thomas Carlyle 1795–1835,* 2 vols. (London: Longmans Green, 1882) and *Thomas Carlyle 1834–1881,* 2 vols. (London: Longmans Green, 1884) are still indispensable. Among the many important specialized studies are B. H. Lehmann, *Carlyle's Theory of the Hero* (Durham, NC: Duke University Press, 1928); C. F. Harrold, *Carlyle and German Thought: 1819–1834* (New Haven, CT: Yale University Press, 1934); René Wellek, "Carlyle and the Philosophy of History," *Philological Quarterly* 23 (1944): 55–76; and G. Holloway, *The Victorian Sage* (London: Macmillan, 1953), Chs. 1–3.

OTHER RECOMMENDED WORKS

Rigney, Ann. "Sublimity: Thomas Carlyle and the Aesthetics of Historical Ignorance." In *Imperfect Histories: The Elusive Past and the Legacy of Romantic Historicism*. Ithaca, NY: Cornell University Press, 2001.

Sussman, Herbert L. *Fact into Figure: Typology in Carlyle, Ruskin, and the Pre-Raphaelite Brotherhood*. Columbus: Ohio State University Press, 1979.

Vida, Elizabeth Maximiliana. *Romantic Affinities: German Authors and Carlyle: A Study in the History of Ideas*. Toronto: University of Toronto Press, 1993.

Michael Moran (1967)
Bibliography updated by Desirae Matherly Martin (2005)

CARNAP, RUDOLF

(1891–1970)

Rudolf Carnap was the philosophically most articulate member of the Vienna Circle in the 1920s and 1930s, and later of the movement that came to be known in the United States as logical empiricism. During his lifetime, he was respected among analytic philosophers as the proponent of a number of ambitious language projects, especially, in his later years, a system of inductive logic. The philosophical agenda underlying these technical projects, however, remained largely implicit; only disconnected fragments of this agenda, often reduced to superficial slogans, gained some currency. Subsequent generations, quite reasonably, discarded these fragments with some contempt. The coherent and powerful view that Carnap actually held (and partly articulated), of which the ambitious technical projects were manifestations and illustrations, but not explicit statements, has only begun to be unearthed. As a result, the view of Carnap held during his lifetime and since his death is under revision.

INFLUENCES AND EARLY AMBITIONS

Carnap was born on May 18, 1891, in the German town of Wuppertal At this time the region ("Bergisches Land") was known for its pietistical, even mystical, brand of Lutheranism, and the Carnap family was strongly imbued with this local tradition. Carnap's mother's family was more intellectual, in the German tradition of *Bildung*. Carnap's grandfather, Friedrich Wilhelm Dörpfeld, was a leading educational thinker and writer who championed the ideals of Johann Friedrich Herbart. When Carnap was eight, his father died. His mother taught him and his sister at home, following her father's educational program. Teaching was restricted to one hour a day, and the children were encouraged to work out the implications of what they had learned for themselves. His mother also emphasized the arbitrary nature of moral and linguistic conventions.

Carnap's mother was evidently the strongest influence on Carnap's early mental development. In many ways this influence probably derived from the religious and educational views of her father, of whom she wrote a biography. She was herself a highly literate person, at home in the German classics, who took a particular interest in the philosophical and religious writings of Theodor Gustav Fechner, the founder of psychophysics. When Carnap began to doubt the religious doctrines he had been brought up with, he turned first to Fechner's mystical pantheism as a more explicit and detailed version of the worldview embodied in the writings of Johann Wolfgang von Goethe. The ethical and practical convictions associated with the religion of his childhood never changed. Though he abandoned it, first for pantheism, then for atheism, this change was very gradual and took a long time. And it was an entirely doctrinal change; it did not affect his values. The pragmatist streak in educational Herbartianism allowed room for the replacement of its religious props by a scientific humanism of the kind Carnap imbibed from the popular writings of Hermann von Helmholtz, Ernst Haeckel, Wilhelm Ostwald, and others.

Ostwald in particular appears to have been an important early influence. A Nobel Prize–winning chemist, he had sketched in his popular writings a consis-

tent and comprehensive worldview firmly anchored in the nineteenth-century positivist tradition of Auguste Comte and Ernst Mach. His wide-ranging interests also encompassed the German classics, the history of science, visual art, politics, and much else. He was perhaps the archetypal embodiment, during the first decade or so of the new century, of a thoroughly and uncompromisingly "scientific worldview." He was unusually cosmopolitan for a German of his generation and had traveled widely, including to the United States, where he was instrumental in establishing physical chemistry as a discipline.

Carnap advocated pacifism and internationalism, and campaigned for the use of an international language such as Esperanto, both among scientists and more widely. Many of these aspects appealed to Carnap; he even became an Esperantist in his teens, while still at school. He was especially influenced by Ostwald's conception of a "system of science" (*System der Wissenschaft*), modeled on Comte's system of unified science. In this conception, there was no fundamental distinction between human and physical sciences, of the kind that the German idealists and neo-Kantians had advocated. All knowledge was part of a single system, whose basic concepts were those of physics. This system was needed as a blueprint, Ostwald thought, for optimizing the hitherto rather aimless and chaotic output of the scientific disciplines; it would give them coherence and enable them to cooperate.

When Carnap studied at the University of Jena, from 1909, he encountered Gottlob Frege and learned modern logic from him. Though he did not immediately see the wider philosophical applications of Frege's logic, he was enthused by Frege's Leibnizian ideal of a universal language that could tie all knowledge together and display its deductive interrelations. Comte and Ostwald, like other nineteenth-century positivists, had been vague about the precise nature of the relations among the various sciences in their proposed "system of science." In Frege's logic, Carnap saw a tool for making these relations completely transparent and explicit, and making the "system of science" into something much more than a vague ideal. Logic could serve as a central discipline for bringing order to the rather chaotic and spontaneous growth of knowledge. This "system of science" could thus be a tool for coordinating and *organizing* knowledge-production on a large scale, in just the way Ostwald had envisaged.

But Jena also subjected Carnap to a quite different kind of influence, one much more at odds with anything in his background up to that time: the German Youth Movement (*Jugendbewegung*). This was a Romantic, back-to-nature rebellion of middle-class German teenagers against the materialistic and socially complacent values of their parents. There was a strong emphasis on a healthy life, especially long walks in the wilderness and avoidance of the "bourgeois" drugs (alcohol, tobacco, caffeine), as well as an idealization of peasant life and the customs of premodern times. The movement took many different local forms. In Jena, the publisher Eugen Diederichs organized the "Sera Circle," a group of university students and other young people who undertook outings with elaborate, medieval-style costumes and rituals, some improvised and some traditional. The annual midsummer celebration was a high point, when the group, with its banners, costumes, and pageantry walked in procession to a mountain some distance from town, accompanied by horse-drawn carriages. There they built a bonfire, danced, feasted, sang, and jumped over the flames two by two until sunrise. In the years just before the First World War, Carnap became very active in organizing these and similar events.

For Carnap, the lasting effect of this involvement was to give him the sense that the basic forms of human life are within human control; they do not have to be accepted from tradition or from existing conventions. This attitude of "voluntarism" would prove to be of fundamental importance to Carnap's philosophy through all its phases. And though the Youth Movement "did not leave any externally visible achievements," Carnap later wrote, "the spirit that lived in this movement, which was like a religion without dogmas, remained a precious inheritance for everyone who had the good luck to take an active part in it. What remained was more than a mere reminiscence of an enjoyable time; it was rather an indestructible living strength which forever would influence one's reactions to all practical problems of life" (Carnap 1956/7, pp. B34–B35). Moreover, it was something he missed throughout his subsequent life:

> After the war … the same spirit was still alive in the life of my newly founded family and in the relationships with friends. When I went to Vienna, however, the situation was different. I still preserved the same spirit in my personal attitude, but I missed it painfully in the social life with others. None of the members of the Vienna Circle had taken part in the Youth Movement, and I did not feel myself strong and productive enough to transform single-handedly the group of friends into a living community, sharing the style of life which I wanted. Although I was able to play a leading role in the

> philosophical work of the group, I was unable to fulfill the task of a missionary or a prophet. Thus I often felt as perhaps a man might feel who has lived in a strongly religious [and] inspired community and then suddenly finds himself isolated in the Diaspora and feels himself not strong enough to convert the heathen. The same feeling I had in a still greater measure later in America, where the power of traditional social conventions is much stronger than it was in Vienna and where also the number of those who have at least sensed some dissatisfaction with the traditional forms of life is smaller than anywhere on the European continent. (Carnap 1956/7, p. B35)

Into this idyllic dawn of a new world erupted the unheralded disaster of August 1914 and the Great War. Carnap and his Sera friends dutifully enlisted and were not even unwilling combatants, at first. Only when they witnessed the scale of the slaughter did doubts arise. Like Wittgenstein on the eastern front, Carnap participated in many of the bloodiest engagements on the western front. Both young philosophers were profoundly alienated by the culture of the officer corps. Both were wounded and were decorated for bravery. But their reactions could not have been more different. Wittgenstein withdrew into an inner life of mystical contemplation, inspired by Leo Tolstoy. Carnap, in contrast, came to appreciate that it was precisely an over-emphasis on the contemplative life, and a lack of interest in public life, that had made the German intelligentsia complicit in the bloodshed, and had allowed it to stand idly by while the political elites had started a world war. The only answer, he now decided, was active involvement in politics. Accordingly, he joined the anti-war independent socialist party, sent clandestine circular letters to friends with excerpts from the foreign press, and wrote well-informed articles about world government for underground newsletters.

The general conception behind this new commitment was a natural extension of the positivist idea of a "system of science" inherited from Comte and Ostwald, combined with the voluntarism Carnap derived from the Youth Movement. For the human race to survive and avoid disasters like the Great War, Carnap thought, it needed to take its fate into its own hand. Conflicts among nations and classes could not be left to an anarchic state of nature, but had to be subordinated to consciously chosen forms of civic cohabitation. These, of course, required highest-level conceptual planning and organization of knowledge; this too was part of the "politics" Carnap now regarded himself as involved in. For all the various social functions to work together, it was essential to arrive at a "structure of community" (*Gemeinschaftsgestalt*) that could serve to coordinate them so as "to remove [these tasks] from the realm of chaotic whim and subordinate them to goal-oriented reason" (Carnap 1918, p. 18).

Carnap's intention immediately after the war was to realize this ambition through teaching and direct political involvement. Before the war he had intended to become a physicist; now his first priority was to obtain the teaching certificate for secondary schools. The papers he wrote to qualify for the certificate show him at work, both within physics itself and in philosophical reflection about the foundations of geometry, on the construction of an Ostwaldian-Comtean "system of science" with Fregean logicist tools. In the course of these projects, he evidently came to realize that his vision of a "system of science" was anything but obvious. Though there had been much talk, among positivists (like Mach) and some systematic philosophers (like Richard Avenarius) of the reducibility of all knowledge to an empirical starting point, much work was still to be done. Like Comte in response to an earlier revolution, Carnap now realized that the reconstruction of society along the lines he had in mind, with its *Gemeinschaftsgestalt* to coordinate all productive activities within it, required the reconstruction of *knowledge* as the first and indispensable step. Though social reform could go ahead meanwhile, it could not be put on a genuinely rational basis until a "system of science" was developed, a conceptual system that was adequate to the scientific and conceptual revolutions of the past decades *and* that afforded a vantage point from which the whole of knowledge could be surveyed and organized, allowing individual claims or theories to be rationally judged. It was to the development of such a conceptual system that Carnap now single-mindedly devoted himself.

EARLY WRITINGS AND PROJECTS

This change in priorities also brought with it a change in career plans. Carnap now decided to pursue an academic career after all, but was faced with the quandary that the kind of work he planned fell between academic stools. The first project he chose for a dissertation topic was, like his 1920 paper on space and geometry, intended to work out a partial "system of science" for a subrealm of knowledge. This time it was to be an axiomatization of relativistic space-time kinematics, and the question Carnap particularly had in mind was much discussed then: Precisely what is the *empirical content* of general relativity, and precisely what parts of it were conventional? Even

before the war, Carnap had read Henri Poincaré. Now he also encountered the "radical conventionalist" Hugo Dingler, who rejected relativity on the Poincaréan grounds that all the observations involved could be accommodated without giving up Euclidean geometry, whose axioms are much simpler. Carnap disagreed; the simplicity of the system as a whole should be maximized, he said, not just the simplicity of the axioms, though he admitted that this was itself a conventional decision.

However, his proposed project was rejected by the physics department in Jena as too philosophical, and the philosophers thought it was too scientific. So instead, he reworked his 1920 paper on space and geometry, and this was accepted. The result was Carnap's doctoral dissertation and first philosophical publication, *Der Raum* (Space; 1922). Here too the central question was the status of the empirical basis (*Tatbestand*) within our conceptions of space. The answer, Carnap said, depends on whether we have mathematical, intuitive, or physical space in mind. Formal or mathematical space, Carnap said, can be constructed from logic alone, in the way Bertrand Russell had suggested in *Principles of Mathematics*, and so it has no empirical content. Intuitive space is not constructed in this logicist way, but derives from axioms based on a pure phenomenological essence-perception (*Wesensschau*) of our spatial experience. These axioms concern not the metrical properties of space, as Immanuel Kant had thought, but only its topological properties. Physical space, finally, adds the empirical basis, which, however, as Carnap argued with the aid of an extended example, underdetermines the choice of metrical geometry (it fixes the choice only up to topological assumptions).

During this period, Carnap framed the basic epistemological questions in terms of an "idealistic conception" deriving from the "positivist idealism" of Hans Vaihinger, a neo-Kantian philosopher whose book *The Philosophy of As If* had generated a great deal of discussion after its publication in 1911. Vaihinger took an extreme positivist view of what we actually know: It is only the "chaos" of our immediately present sensations that we can rely on for certain. The "reality" we construct on this basis, whether in science or in everyday life, is not genuine knowledge but a tissue of useful *fictions* that we purposefully invent to get things done in the world and to serve our mental and social needs. These fictions include not just Kant's synthetic a priori propositions (the axioms of arithmetic, geometry, and mechanics, as well as the principles of causality and of the uniformity of nature), but also, for example, the fictions of religion, of natural justice and equal citizenship, of free will and moral reasons. This was essentially a pragmatist position, as Vaihinger himself recognized, though he thought William James wrong to make utility a *standard* of truth. There is genuine truth, Vaihinger maintained, however limited in scope, while the fictions, though useful, are *not* true. They are to be judged by practical results, not by cognitive standards.

Carnap sought to pursue his dream of a system of knowledge within the framework of such an "idealistic conception." He tried various ways of *deducing* aspects of physical "reality" from the "chaos" of experience, even using a makeshift fuzzy logic at one point, but these efforts led nowhere. It seemed impossible to break out of the phenomenal "chaos" convincingly. But amidst all his other projects, the preoccupation with this overall system did not let him go. "I worked on many special problems, always looking for new approaches and improved solutions," Carnap wrote of this period "But in the background there was always the ultimate aim of the total system of all concepts. I believed that it should be possible, in principle, to give a logical reconstruction of the total system of the world as we know it" (Carnap 1956/7, p. E4).

THE *AUFBAU* PROJECT AND VIENNA

In the winter of 1921/1922 Carnap read a book that showed him how to overcome the main obstacle to his project of a "total system of all concepts," Russell's *Our Knowledge of the External World as a Field for Scientific Method in Philosophy*. This book gave Carnap the crucial hint that the way to get from the chaos of experience to a "reality" was not by *analysis* of experience, but by *construction*, using what Russell called a "principle of abstraction": "When a group of objects have that kind of similarity which we are inclined to attribute to possession of a common quality, the principle [of abstraction] shows that membership of the group will serve all the purposes of the supposed common quality, and that therefore, unless some common quality is actually known, the group or class of similar objects may be used to replace the common quality, which need not be assumed to exist" (Russell, pp. 44–45). Experiences could be gathered into equivalence classes. For example, a series of experiences of "red," at a certain position in the visual field, could be defined as equivalent. For the purposes of constructing a "real" world, this class can be regarded as an objectand used in place of the quality. No actual quality, transcending momentary experience, need figure in subsequent steps to a "reality." The evanescence of "chaotic" experi-

ence is no longer a constraint. The problem of forcing the fluid character of lived experience into the straightjacket of deductive relations disappears.

Russell's principle also solved another problem. According to Vaihinger, the "chaos" of subjective experience has no structure; nothing is "given" but the undifferentiated chaos itself. No distinguishable "elements" present themselves as naturally discrete or isolable from the chaos, available unambiguously in themselves, without calling on externally imposed fictions. A somewhat less extreme version of this holistic starting point had just been articulated by a new school of "Gestalt" psychologists. Russell's principle of abstraction—his method of substituting "logical constructions for inferred entities" (such as qualities)—solved this problem as well. Instead of trying to isolate specific elements within the undifferentiated "chaos," Carnap could obtain the elements he sought by partitioning the entire "chaos" into just two sectors, which he called the "living" and "dead" parts of experience, corresponding essentially to David Hume's "impressions" and "ideas." This one distinction allowed Carnap to arrange experiences into a temporal sequence ("ideas" belong to the past; "impressions" are present), and thus made it possible to identify holistic "temporal cross-sections" of experience, in which the total experience of a given specious present remains intact as a momentary whole.

This chronological sequence of experiential time slices gave Carnap the basic framework he needed for identifying qualities as cross-temporal equivalence classes of particular aspects within certain time slices. The holistic time-slices of experience did not need to be *analyzed*. Rather, qualities and qualitative relations could be *constructed* by defining equivalence classes of sufficiently "similar" experience aspects (e.g., approximations to "red" at certain coordinates of the visual field) across a series of time slices. ("Similarity" could be defined as precisely as needed.) The result of this procedure—with "quality classes" standing in for qualities, and so on—was therefore essentially what empiricists (like Hume, John Stuart Mill, and Mach) had always hoped to achieve by analysis, but it was accomplished *without* analysis. Carnap called it "quasi-analysis." Once qualities had been constructed, physical objects could be constructed as classes of spatial relations among qualities, and the path to a "reality" was clear.

Carnap still followed Vaihinger in distinguishing sharply between the direct, genuine, first-hand knowledge of the "chaos" and the fictive, constructed nature of "reality." But he put the boundary between them in a different place. Phenomenology, Carnap thought, offered an escape route from Vaihinger's completely undifferentiated chaos. It gave certain basic distinctions *within* the chaos (such as that between "living" and "dead" experience) a degree of objectivity. These distinctions, then, were *not* "fictional" but actually extended the range of what could be genuinely *known*, even *without* fictions, just from the "chaos" itself. So Carnap put the boundary between the "chaos" and the fictions further out than Vaihinger had done. But fictions were still needed to get from this immediately known *primary world* (of "chaos" supplied with a minimal, phenomenologically justified structure) to a fictive *secondary world* of "reality"—be it the everyday world of physical objects and forces, the abstract scientific world of fields and space-time coincidences, or some other construction.

Carnap thought at this point that he could show on phenomenological grounds that the primary world was two-dimensional, in all sense modalities. So the stepping-off point from the fixed primary world up to a freely choosable secondary world was located at the point of ascent from two to three dimensions. Within the primary world, the construction proceeded entirely by explicit definition, beginning from the qualities obtained by quasi analysis. Secondary worlds are not uniquely determined by the one given primary world, so the construction of a secondary world proceeds by optimizing its "fit" to whichever fictions are chosen to guide the construction, subject to the constraint of the primary world.

Regarding the choice among fictions to guide this ascent, Carnap remained as radically pragmatist as Vaihinger. The choice of fictions was entirely a matter of what was practically useful for some purpose. To obtain the scientific secondary world, Carnap suggested, we need adopt only two fictions, corresponding roughly to Kant's categories of cause and substance: (1) a principle of induction or uniformity of nature and (2) a principle of "continuity" (as Mach had called it), the principle that a certain cluster of perceptions grouped into a physical object, say, remains constant while we are not perceiving it if it remains sufficiently similar (by defined standards) before and after the interruption.

It seemed then that the problems facing Carnap's dream of a "total system of all concepts" had been overcome. He could now go public with his grand plan to revolutionize the conceptual framework of knowledge. He immediately wrote up a sketch of the new "total system of all concepts" that he gave the Vaihinger-inspired title *Vom Chaos zur Wirklichkeit* (From the chaos to reality). He organized a conference for the following year (1923) to

discuss it—the first conference of "scientific philosophy." The participants, who previously had each been working alone, became a like-minded community. Carnap also talked to Hans Reichenbach and others about starting a new journal to propagate the new ethos. The program of "conceptual politics" was well under way.

Carnap continued to work on his "total system of concepts" and in 1928 published *Der logische Aufbau der Welt* (*The Logical Construction of the World*), which became the programmatic bible of the Vienna Circle (Carnap had joined it in 1926, when he became a junior lecturer at the University of Vienna). The *Aufbau* exemplified the Vienna Circle's goal of "rational reconstruction," the replacement of vague, informal concepts by precise ones defined within a standard logical language in which all of knowledge could be expressed. The concept rationally reconstructed in the *Aufbau* was that of "empirical content" (or "empirical meaning"), which had long been of central importance for empiricists but had never been made logically precise.

Though the germ of the *Aufbau* is already contained in "From the Chaos to Reality," there were also some important changes. In the 1922 system, three components had worked somewhat uneasily together: (1) the *basis* of momentary time-slices of total experience, distilled from a chaotic primary world by phenomenological reflection; (2) the *fictions* that guided the construction of a secondary world from the primary world; and (3) the *logic* that connected the constructional steps. As Carnap worked on the system after 1922, these three parts came to seem less compatible with each other. Though he had greatly reduced the number of fictions from Vaihinger's heterogeneous jumble, the two he had chosen still seemed somewhat ad hoc. And phenomenological reflection, though also a kind of "thought," did not operate mechanically, without mental assistance, as the logical system of Frege and Russell did. Logic and phenomenology seemed to be fundamentally different kinds of constructional procedure that could not be reduced to each other. If Carnap was to take seriously Russell's dictum that "logic gives the method of research," then everything that *could* be done by logic alone *had* to be done by logic alone. Accordingly, by 1925 Carnap gave up the distinction between "primary" and "secondary" worlds (between a single determinate "given" reality and optional constructed "realities"). Instead, he extended the logical construction *downwards* as far as possible to perform the tasks that had previously been left to phenomenology.

This displacement of phenomenology by logic led Carnap to minimize the number of relations required for the construction. By 1925 the number of basic relations had been reduced to five, and in the published *Aufbau* there is only a *single* basic relation—that of "remembered similarity" of qualitative aspects across temporal slices of experience. Indeed, the imperative to eliminate the subjective element altogether and make the construction *entirely* logical led Carnap to the extreme of suggesting that even this one remaining basic relation might be eliminated if we define it "implicitly," that is, define it simply as "whatever basic relation leads to our existing body of scientific knowledge" (1928/2003, sec. 153).

Carnap did not, however, give up Vaihinger's pragmatist orientation. To make the fictions of cause and substance that guided the construction less ad hoc, Carnap suggested that they could be deduced from some "highest principle of constitution," which might in turn be deducible from "whatever it is that knowledge contributes to the more comprehensive context of life purposes" (1928/2003, sec. 105). And he emphasized that the *Aufbau* construction was not the only possible one, but that quite different approaches might be appropriate for different purposes.

The *Aufbau* construction gave the Vienna Circle a standard by which to judge any statement and determine whether it has meaning. Carnap gave a popular lecture around this time in which he depicted human intellectual history since the Greeks as a struggle between "critical intellect" and "poetic imagination." In the ancient world, he said, critical intellect had dealt poetic imagination a major blow with its concept of a single, all-encompassing physical space. In response to any mythical creature or entity the imagination might dream up, critical intellect could now ask, "Where is it located in space?" or, "Tell me exactly how I can get there from here." Imagination took to hiding its goblins and spirits in remote, inaccessible places, but this was only a stopgap. Eventually, imagination struck back more forcefully by inventing *metaphysics*. It hit on the idea of a *nonmaterial* God and other nonmaterial entities. This was plausible, Carnap explained, because we often refer, quite legitimately, to nonmaterial items like numbers, relations, and so on. Many thinking people were taken in. But now, he said, critical intellect has found a tool to combat this maneuver. Just as the ancients had hit upon the idea of an all-encompassing *physical* space, so now we, here in Vienna, have developed a single, all-encompassing *conceptual* space: the *Aufbau* system. This system puts the burden on the poetic imagination to specify exactly how to get to any supposed non-material entity from "here"—from my own immediate experience. This was how the *Aufbau* sys-

tem provided the basis for the Vienna Circle's campaign against metaphysics and traditional obscurantism, and exemplified the circle's project of "rational reconstruction"—the piecemeal replacement of traditional, vague concepts by more precise and useful ones.

WITTGENSTEIN

When Carnap went to Vienna in 1926, the *Aufbau* was substantially complete. He assumed that its construction of physical objects and theoretical entities would all be of a piece, so that concrete and theoretical objects could also be cashed out again in terms of subjective experience. In 1926 he published the booklet *Physikalische Begriffsbildung* (Physicalconcept formation), in which he argued for the completely seamless intertranslatability of subjective experiences and the sets of 14-tuples of numbers in which, he said, the world could, against a set of background theories, be exhaustively described.

But on arriving in Vienna, Carnap was confronted with a new influence that disrupted this harmony. The Vienna Circle was just in the process of reading Wittgenstein's *Tractatus Logico-Philosophicus* line by line, and Carnap came to share their appreciation of it. The *Tractatus* solved what historically had been the severest problem for empiricism: its inability to account for mathematics. Frege's critique of empiricist efforts (by Mill, for instance) to found arithmetic on empirical generalizations had convinced members of the circle that a different approach was needed. But they also rejected Frege's and Russell's view that logic and mathematics were essentially like laws of nature, only of much greater generality, governing *everything*. Wittgenstein argued, rather, that logic and mathematics are about *nothing*; they are empty. They convey no information about the world, as they are "tautological" artifacts of the language itself and neither make nor exclude any assertions about anything that is or is not the case.

What gives a sentence meaning, Wittgenstein said, is that it is a logical "picture" of a fact. So all meaningful sentences have to be built up out of "atomic" sentences, picturing simplest facts, by truth-functional connectives. Since the number of observation sentences supporting a physical law can only ever be finite, this meant, to the Vienna Circle, that a *universal* law cannot, strictly speaking, have meaning. So in Wittgenstein's framework, a law could be nothing more than the body of evidence for it. This made theoretical science as it had been done for the past few centuries impossible, and it broke the seamless continuity Carnap had previously assumed between subjective experience and theoretical concepts. This was bad enough, but Wittgenstein's conception of meaning raised another problem for the circle. The very sentences expressing that conception fell victim to their own consequences. Wittgenstein confirmed this in the final sentences of the *Tractatus*, where he declared his own book meaningless. So although the Vienna Circle regarded the *Tractatus* as indispensable, they also realized that to do the job they relied on it to do, its conception of language would somehow have to be expanded to admit physical laws and metalinguistic "elucidations."

Carnap's first task, in this project, was an attempt to fit *axiomatic* concepts within Wittgenstein's constraints. During his first few years in Vienna, this was his main focus; he worked until 1930 on a large manuscripthe called *Untersuchungen zur allgemeinen Axiomatik* (Investigations in general axiomatics). Its main point was to show that David Hilbert's use of a "metamathematics" to prove the consistency of merely formal axiom systems, of which most mathematics consists, was ultimately not essential, but that only a single basic language would suffice. In the *Axiomatics*, Carnap takes a "foundation system" of logic, arithmetic, and set theory as the starting point, and stipulates that all axiom systems must be expressed in it; they derive their meaning from being anchored in this absolute system. Where does this "foundation system" itself come from? Carnaop gave a preliminary answer in a sketch entitled "Neue Grundlegung der Logik" (New foundation of logic), where he tried to expand the repertoire of what can be regarded as meaningful (and tautological) within Wittgenstein's picture theory by experimenting with arbitrarily long truth tables.

All this effort came to naught in early 1930 when Alfred Tarski visited the Vienna Circle. In private conversations, he convinced Carnap that the single-language approach of the *Axiomatics* did not really capture the metamathematical concepts that Carnap had wanted to account for in a single language. Later that year a young student of Carnap's, Kurt Gödel, showed that arithmetic was incomplete—that it contained sentences that, although true, could not be proved from its axioms. This contradicted one of the central theorems Carnap had arrived at in his *Axiomatics*.

By the end of 1930, then, the program of rational reconstruction had run aground. The efforts to expand Wittgenstein's restrictive conception of language to allow universal laws and axiomatic mathematics had come to nothing. And much of the damage had been done by mathematicians like Alfred Tarski and Kurt Gödel, who were using metalanguages in very precise ways, appar-

ently flouting Wittgenstein's claim that it was impossible to speak about language *in* language. Could the Vienna Circle's program somehow be rescued?

SYNTAX

On January 21, 1931, Carnap came down with a bad flu. He hardly slept that night. As he lay awake an idea came to him, in a flash, that solved all his problems. The Wittgensteinian conception of meaning went overboard. We can forget about meaning, he realized, at least in our statements *about* the scientific language—our metalinguistic "elucidations." Though the scientific language itself had empirical meaning (in a way that remained to be clarified—this became the subject of the "protocol sentence debate"), in our elucidations of it we are not talking about anything extralinguistic; we are talking *always and only about language*. In these metalinguistic elucidations, we must be careful not to talk about "facts" or about "things," but always confine ourselves to talking rather about "sentences" or "thing names." As Carnap would soon put it, we should in principle restrict ourselves to the "formal mode of speech" (sentences and names) and indulge in the "material mode of speech" (facts and things) only if we are sure we can translate our statements into the formal mode. Carnap adopted the metalinguistic viewpoint of Hilbert, Tarski, and Gödel, and applied this hitherto purely mathematical method to the whole of knowledge. Philosophy itself was to be reconstructed in the formal mode of speech. What remained of philosophy was the metalinguistic "logic of science" (*Wissenschaftslogik*) that could be expressed in the formal mode.

Carnap immediately threw himself into creating the language for the formal mode of speech. Taking his cue from Hilbert's metamathematics, Carnap sought to strip this standard metalanguage of all problematic assumptions. It would consist simply of strings of dots on a page, and the basic laws of arithmetic would arise unambiguously in the metalanguage from the immediately evident patterns of dots (the commutative law, for instance, is immediately evident from the perceptible equivalence of the number of dots counted from the left and from the right). A few months later, when he was preparing to present his new ideas to the Vienna Circle in June of 1931, Carnap found that he could not express certain essential concepts in this limited language, and turned instead to a more usual axiomatized arithmetic. This also had the advantage that, by using Gödel's trick of arithmetizing syntax, Carnap could now express the syntax of the language (its logic) in the language itself. So the syntactic metalanguage collapses into its object language, and there is after all only one language again.

Though some details still needed working out, Carnap was convinced he had what he needed: a canonical language for the formal mode of speech. This gave him a new and different way of eliminating metaphysics, superceding the previous, Wittgensteinian way. The previous criterion had been a criterion for *meaning*. The new criterion was not. It required that any statement either be straightforwardly factual or be translatable into the formal mode of speech. In other words, an acceptable sentence had to be statable in a "correct" language—the canonical language or an equivalent. Assuming that the kinks in his canonical language could be ironed out, Carnap thought it would be capable of expressing the entire language of physics, as well as its own syntax in a sublanguage. Since the Vienna Circle's "unity-of-science" program held that all knowledge was expressible in the language of physics, Carnap put his canonical language forward as a *universal* language (though not as *the* universal language) for all knowledge. So another way of putting the new criterion was this: An acceptable statement must be expressible in the language of physics. The new ideas of January 1931 flowed into the stream of Carnap's discussions in the circle, particularly with Otto Neurath, to produce this new doctrine of *physicalism*.

But the demands on the "correct" language were exorbitant. Though Carnap had wanted to keep it weak and uncontroversial, it also had to be capable of expressing all the mathematics needed for physics. On the other hand, its arithmetized syntax had to be capable of expressing the basic concept of "analytic truth," or there would be no way of saying whether a formal-mode statement "holds." Gödel had shown that provability was not a sufficient criterion for mathematical or logical truth; there are true sentences that are not provable. So a different criterion was needed, one that would identify the logically true sentences solely by means of the formation and transformation rules of the language. Carnap did attempt such a criterion for "analyticity" in the first draft of his syntax book *Logische Syntax der Sprache* (*Logical Syntax of Language*), written between late 1931 and the spring of 1932. He sent the typescript to Gödel, who pointed out that the new criterion was defective, and that it is *impossible* to give a correct definition of analyticity or logical truth in *any* metalanguage that can be faithfully represented in the object language (e.g., by arithmetization). (This is the indefinability of truth we now associate with Tarski.) So it turns out that Carnap's single-language approach will not work after all.

But although Carnap, with Gödel's assistance, would later develop a new definition of analyticity, in a metalanguage, this definition no longer enjoyed the privileged status that one in the *same language* (had it been possible) could have claimed. And indeed, there is no basis for singling out any particular metalanguage as more "suitable" or "natural" than any other. One option may turn out to be more *useful* than another, but there is no basis for privileging one of the many possible candidates as "correct." So the new definition of analyticity hardly seemed to matter any more. Carnap was more impressed with the *language relativity* of any definition of truth or analyticity. The disputes about protocol sentences within the circle merged in his mind with the disputes among intuitionists, logicists, and formalists in the philosophy of mathematics. All these disputes, it suddenly seemed to him in October 1932, really just revolved around the question how to set up the *language*, and there was no right or wrong answer to such questions. He no longer saw any basis for choosing one solution as "correct." One could only try out different ways and see which ones worked better. This new attitude, which completed Carnap's "linguistic turn" and first appeared in his reply to Neurath about protocol sentences in late 1932, received its definitive statement in the "principle of tolerance," enunciated in *Logische Syntax der Sprache* (The Logical Syntax of Language) in 1934.

SEMANTICS, LATER PROJECTS, AND THE IDEAL OF EXPLICATION

Carnap's syntax period was characterized by two successive major ideas. The first, from January 1931, had been the rejection of Wittgenstein's picture theory of meaning and its replacement by (a) a sharp distinction between a language (a calculus or purely formal symbol system) and its interpretation, and (b) the requirement that a language be entirely specified by explicit rules. The second major idea, from October 1932, had been the principle of tolerance: No language is inherently definitive or "correct"; there is no logical "reality" for a language to "correspond to." In the published *Logical Syntax of Language*, these two ideas were enmeshed with a third idea: the restriction to the "formal mode of speech" and the avoidance of meaning. But within a year of the book's publication, that third idea was dropped; Carnap accepted Tarski's new semantical accounts of designation and truth. The first two major "syntax" ideas (those of January 1931 and October 1932), however, survived unscathed, though, for the rest of Carnap's career (so it is actually a bit misleading to call them "syntactic"). What did *not* survive was the overreaction against "meaning" that accompanied the original insight. In distinguishing between a language and its interpretation, Carnap's first response had been to restrict extra-linguistic interpretation to the object language (and there to physicalistic interpretation), and dispense with it entirely in the "elucidatory" metalanguage. But this restriction was loosened when he saw that interpretation could be completely specified by explicit rules (governing satisfaction, designation, and truth).

The remaining thirty-five years of Carnap's career were largely occupied with technical work on a number of of not very successful language projects, of which the best known were these: (1) He tried, in a series of semantic works, to develop a general definition of "analyticity" that would distinguish analytic from synthetic sentences in a natural and obvious way. The shortcomings of these successive attempts were pointed out by W. V. O. Quine, and were often taken to undermine other parts of Carnap's view, for example, the principle of tolerance itself. (2) Carnap also tried unsuccessfully to specify a strict logical relation between observation sentences and theoretical sentences. After he abandoned the *Aufbau* effort to construct theories directly from subjective experience, he offered a series of progressively looser definitions of "empirical content" or "empirical reducibility." These attempts were also subjected to searching criticism, above all by C.G. Hempel. The lesson derived from this failure has generally been to abandon the question altogether, instead of confining the pessimism to Carnap's particular approach. (3) The last three decades of Carnap's life were largely devoted to the creation of an inductive logic. This was intended as a tool for practicing scientists, to give them a way of measuring the objective probability of a theory with respect to the available evidence. It was intended to make precise the informal usage, in everyday *and* scientific life, by which the evidence is taken to "make" one hypothesis "more likely" than another. Carnap's proposals attained some currency in the 1950s and 1960s and were considered by R. B. Braithwaite, for instance, to be the most promising route to a fundamental justification of John Maynard Keynes's theory of probability. But with a few exceptions, Carnap's work on probability has not been in the mainstream of discussion since the 1980s.

Even if these language projects are written off as failures, though, this would not discredit the larger vision or ideal of explication and language engineering that guided Carnap after 1935. He devoted little time to making this ideal explicit, so it must be gleaned indirectly from his

approach to the various language projects and from occasional statements, like the famous paper "Empiricism, Semantics, and Ontology" (1950), his replies to critics in the Schilpp volume, as well as unpublished papers and notes.

The basis of this ideal is the utopian conception of highest-level "conceptual politics" that never left him after 1918. He believed that those who are fortunate enough to be able to devote their lives to thought and reflection have a responsibility to devise conceptual frameworks for human knowledge (as a whole) that will maximize the usefulness of that knowledge for the human species—not for some particular use, but for the full spectrum of uses to which humans put knowledge, especially for the purpose of enlightenment, or liberation from unreflective tradition and conformity. In devising such frameworks we are constrained by certain obvious human limitations, but we should not allow ourselves to be overly constrained by the past—the languages handed down to us by our ancestors. Those give us a starting point, certainly, but we should not treat the puzzles and contradictions embedded in natural languages, or in historical languages of philosophy, with any undue reverence. In fact, we should liberate ourselves from them as far as possible when planning new and better frameworks of thought. Certainly our habitual ways of thinking and talking are deeply entrenched, and are hard for us to abandon, but in Carnap's view this is no reason to be constrained by them when we envision new ones.

In Carnap's mature conception, there are three levels of language engineering and language study: *Syntax* considers languages in isolation from anything extralinguistic that they might be thought of as indicating; *semantics* considers languages in relation to an extralinguistic world, but still in isolation from the actual uses of those languages by (human or machine) users; and *pragmatics* considers languages in relation to their use contexts and their users. Each of these three (syntax, semantics, pragmatics) can be considered as *engineering* activities (the creation or discussion of new or improved languages) or as *empirical* studies (of existing languages). The engineering activity Carnap called "pure" syntax, semantics, or pragmatics, while the empirical study he called "descriptive" syntax, semantics, or pragmatics. Linguists generally engage in the *descriptive* syntax, semantics, and pragmatics of already existing natural languages, while logicians generally engage in the *pure* syntax and semantics of constructed languages. Among the traditional sectors of philosophy, epistemology and methodology belong to pragmatics, while whatever remains of metaphysics and ontology belongs to semantics—though this now becomes a matter of *deciding* which entities to make fundamental to a language framework, given existing scientific knowledge, rather than *finding out* what those entities are or might be.

This voluntarist orientation remained fundamental for Carnap. The notion that something beyond the scope of science might actually *be the case* seemed to him a back door to the re-admission of traditional prejudices and conformities of all kinds. Certainly we need to make assumptions, he acknowledged, but we can *decide* on these and spell them out; they are not "out there" for us to *find*. On these grounds he deprecated Quine's preoccupation with ontology. It makes no sense to talk about "what there is," Carnap said, without specifying the language framework in which this is asserted; any such claim is intelligible only relatively to a language framework. It makes perfectly good sense to ask, *within* a framework that includes, say, the Zermelo-Frankel axioms for set theory, whether there are infinite numbers. Such "internal" questions have determinate answers. But it makes no sense, *outside* such a framework, to ask "just in general" whether "there are" infinite numbers. Not only is there no determinate answer, but there is no way to give such an "external" question itself any clear meaning. What we *can* ask instead is the *practical* question whether it is better (e.g., for use in science) to choose a linguistic framework that has infinite numbers or one that does not. But this is not a question of ontology or semantics; this is a question of pragmatics, a question of *which language* we *want*.

The process by which the human species upgrades its messy and imprecise inherited languages to newly built and more precise ones Carnap called *explication*. He acknowledged that this is a piecemeal process, not a revolutionary one. Humanity replaces its concepts a few at a time. Even the people working at the frontier of knowledge have to use a vernacular, a derivative of ordinary language, to discuss the application of the more precise calculi in which they frame their theories. Their vernacular will, of course, be cleaner and more precise than the vernacular of the society at large. In the scientific vernacular, all concepts used are intended in their scientifically rigorous meanings.

But many concepts even in this tidied-up vernacular have no such precise meanings. They may go on being used for generations before they are made precise. The mathematical concept of the derivative of a function, for instance, was put to good use for nearly two centuries before it was given a precise meaning by the work of Cauchy and Weierstrass. Another example Carnap often

cited was the replacement of our vague, subjective, intuitive sense of "hot" and "cold" by the precise, quantitative concept of temperature, which we can define intersubjectively by reference to measurement devices. This concept not only takes the place of the former vague concepts for many purposes; it also gave us many capabilities the vague concepts lacked. For instance, it can provide an outside, objective framework or standard against which to judge subjective feelings; instead of just saying "I feel hot" or "I feel feverish," I can take my temperature and find out exactly how much higher it is than its ordinary level. So explication also provides a framework of objectivity that enables us to escape from a merely subjective view of the world. But the replacement of the vague, informal worldview by a framework of more objective concepts is iterative and never complete; temperature is not an ultimate constituent of our theory of nature.

Explication, which in Carnap's view is the main task of conceptual engineering, consists in the *replacement* of a vague concept in need of explication—the *explicandum*—by a more precise one, the *explicatum*. The first step is the *clarification* of the explicandum, the establishment of some basic agreement among those using the vague concept what they mean by it. The next step is a proposal for its replacement, a proposed *explicatum*. This should have the most important uses agreed on in the clarification stage, but need not have all of them. It should, if possible, be expressed in a language framework that makes clear its relation to a wide range of other concepts. Above all, it should be more precise and more useful than the explicandum. The (provisional) acceptance of an explicatum is just its use by the specific community to which it has been proposed and, ultimately, its wider use by the community of those who use the tidied-up scientific vernacular.

Explication differs in one critical respect from the previous Vienna Circle program of "rational reconstruction." Rational reconstruction was a one-way street; vernacular concepts were to be replaced, piece by piece, with more precise ones. It was assumed that there was a single, definitive logical language in which this reconstruction could be done. But under the new regime of tolerance, there is no longer a single correct language. There is an infinity of possible languages for the community to choose from. Explication is therefore *dialectical*, as Howard Stein, a student of Carnap's, has pointed out, in a way that rational reconstruction was not. Knowledge has obvious and far-reaching effects on our practical life (more and more so, it seems, as history advances). It can tell us, among other things, about the likely consequences of various value systems and courses of action, far more than we could have known a few centuries ago. On the other hand, the way we represent our knowledge to ourselves is language-relative. We can only know what we know in a particular language, and the form in which it presents itself to us is relative to that language. The choice *among* languages, though, is not a choice we make *within* a given language framework. It is a practical choice, involving values (as is the choice among explications for a given explicandum, at the local, piecemeal level.). These are *external* questions, in Carnap's terms. So knowledge and values are in a constant feedback relation to each other, in this dialectical ideal of explication; knowledge shapes values and values shape knowledge.

See also Analysis, Philosophical; Logical Positivism; Positivism; Quine, Willard Van Orman.

Bibliography

WORKS BY CARNAP

P. A. Schilpp, ed., *The Philosophy of Rudolf Carnap*, Vol. XI in the Library of Living Philosophers (La Salle, IL: Open Court, 1963), is indispensable. This 1,100-page volume contains Carnap's illuminating intellectual autobiography, 26 critical essays on various aspects of his philosophy, his replies to the critics, and an exhaustive bibliography through 1963. The manuscripts of the original, longer version of the autobiography is held by the Carnap collection of the Young Research Library, UCLA and cited above as "Carnap 1956/7. Another manuscript item cited above (as "Carnap 1918") is a newspaper editorial Carnap planned to publish in October 1918; it is held by the Carnap Collection of the Archive of Scientific Philosophy, University of Pittsburgh.

Carnap's major works include *Der Raum: Ein Beitrag zur Wissenschaftslehre*. Berlin: Reuther & Reichard, 1922; *Physikalische Begriffsbildung*. Karlsruhe, Germany: Braun, 1926; *Der Logische Aufbau der Welt* (1928); English translation by R. George as *The Logical Structure of the World*, 2nd ed. LaSalle, IL: Open Court, 2003; "Überwindung der Metaphysik durch die logische Analyse der Sprache." *Erkenntnis* 2 (1931–1932): 219–241, translated by Arthur Pap as "The Elimination of Metaphysics through Logical Analysis of Language." In A. J. Ayer, ed., *Logical Positivism*. Glencoe, IL: Free Press, 1959: 60–81; "Die physikalische Sprache als Universalsprache der Wissenschaft," in *Erkenntnis* 2 (1931–1932): 432–465, translated by Max Black as *The Unity of Science* (London: Routledge, 1934) *Logische Syntax der Sprache*. Vienna: Springer, 1934, translated by Amethe Smeaton as *Logical Syntax of Language*, 2nd edition. LaSalle, IL: Open Court 2002; "Testability and Meaning." *Philosophy of Science* 3 (1936): 419–471 and 4 (1937): 1–40; *Foundations of Logic and Mathematics*, Vol. I, no. 3, of *International Encyclopedia of Unified Science*. Chicago: University of Chicago Press, 1939; *Introduction to Semantics*. Cambridge, MA: Harvard University Press, 1942; *Meaning and Necessity: A Study in Semantics and Modal Logic*, 2nd ed. Chicago: University of

Chicago Press, 1956; "Empiricism, Semantics, and Ontology." *Revue internationale de philosophie* 4 (1950), 20–40, reprinted in *Meaning and Necessity*, 2d ed., op. cit., 205–221; *Logical Foundations of Probability*, 2nd edition (Chicago: University of Chicago Press,1962); and "The Methodological Character of Theoretical Concepts." In Herbert Feigl et al., eds., *Minnesota Studies in the Philosophy of Science*, Vol. I, Minneapolis: University of Minnesota Press, 1956: 38–76; "The Aim of Inductive Logic." In Ernest Nagel, Patrick Suppes, and Alfred Tarski, eds., *Logic, Methodology, and Philosophy of Science*, Stanford, CA: Stanford University Press, 1962: 303–318.

WORKS ON CARNAP

The best overview of Carnap's work is the collection of essays *Carnap Brought Home: The View from Jena*, edited by Steve Awodey and Carsten Klein (LaSalle, IL: Open Court, 2004). Also essential is Michael Friedman, *Reconsidering Logical Positivism* (Cambridge, U.K.: Cambridge University Press, 1999), which focuses on the early works. A. W. Carus, *Carnap in Twentieth-Century Thought: Explication as Enlightenment* (Cambridge, U.K.: Cambridge University Press, 2006) cites a range of unpublished sources.

The *Aufbau* was subject to close technical analysis by Nelson Goodman, *The Structure of Appearance*, 3rd ed. Boston, MA: Kluwer, 1977, and from a very different viewpoint, focused on its neo-Kantian origins, by Alan Richardson, *Carnap's Construction of the World: The Aufbau and the Emergence of Logical Empiricism*. Cambridge, U.K.: Cambridge University Press, 1998.

The *Syntax* has attracted a great deal of attention since 1990. Among the most important contributions are Thomas Ricketts, "Carnap's Principle of Tolerance, Empiricism, and Conventionalism." In *Reading Putnam*, edited by P. Clark and B. Hale. Oxford: Blackwell, 1994: 176–200; Warren Goldfarb and Thomas Ricketts, "Carnap and the Philosophy of Mathematics." In *Science and Subjectivity: The Vienna Circle and Twentieth-Century Philosophy*. Berlin: Akademie-Verlag, 1992: 61–78.

The debate between Carnap and Quine has also generated much secondary literature. The classic statements are in the Schilpp volume, as well as Quine's famous "Two Dogmas of Empiricism." Richard Creath has edited their correspondence, together with some very interesting documents, in *Dear Carnap—Dear Van: The Quine-Carnap Correspondence and Related Work*. Berkeley: University of California Press, 1990, with an introduction that gives a lucid overview of the controversy. Important contributions to the debate since then include Howard Stein, "Was Carnap Entirely Wrong, After All?" *Synthese* 93 (1992): 275–295; G.H. Bird, "Carnap and Quine: Internal and External Questions," *Erkenntnis* 42 (1995): 41–64; and Richard Creath "The Linguistic Doctrine and Conventionality: The Main Argument in 'Carnap and Logical Truth,'" In *Logical Empiricism in North America*, edited by Gary L. Hardcastle and Alan Richardson. Minneapolis: University of Minnesota Press, 2003: 234–256.

Among other topics in the vast literature, the posthumously published critique of Carnap by Kurt Gödel ("Is Mathematics Syntax of Language?" in Kurt Gödel, *Collected Works, vol. III: Unpublished Essays and Lectures*, Oxford: Oxford University Press, 1995: 324–363, with an introductory note by Warren Goldfarb) has aroused much interest; see Goldfarb and Ricketts (above); also Steve Awodey and A.W. Carus, "How Carnap Could Have Replied to Gödel." In Awodey and Klein (above). Finally, Richard Jeffrey addresses a central feature of Carnap's philosophy, in the context of the inductive logic, in his paper on "Carnap's Voluntarism," in *Logic, Methodology, and Philosophy of Science IX*, edited by D. Prawitz, B. Skyrms, and D. Westerståhl. Amsterdam: Elsevier, 1994: 847–866.

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CARNEADES

(214–129/8 BCE)

Carneades became scholarch of the Academy (Plato's school) sometime before 155 BCE, when he was sent to Rome along with the leaders of the Stoa and the Peripatos (Aristotle's school) to represent the interests of Athens before the senate. It was during the embassy to Rome that the most notorious episode in his life took place. According to tradition, Carneades delivered public lectures on succeeding days, defending justice on the first and arguing that it is a form of folly on the second day.

He was renowned in antiquity above all for the argumentative virtuosity that he displayed in the skeptical examination of views of other philosophers. For this he was indebted to the example of Arcesilaus, who had inaugurated the skeptical turn in the Academy in the third century BCE, which saw the examination of other schools' theories, especially the Stoa's, replace the elaboration of its own positive doctrines as the school's principal occupation. By common consent, Carneades brought this practice to its highest level. Until the dissolution of the school, which probably occurred under the scholarch Philo of Larissa, who left Athens for Rome in 88 BCE, philosophy in the Academy and among the philosophers in its orbit was dominated by Carneades and his legacy. He also stimulated Stoics such as Antipater of Tarsus to modify and refine their positions.

CARNEADES AND THE ACADEMY

Like Arcesilaus and Socrates before him, Carneades wrote nothing, but exerted an influence on his students and contemporaries through his teaching and in-person practice of philosophical debate. What is known of him depends ultimately on works written by those who were in a position to observe him, especially Clitomachus, his student and, after an interval, successor as head of the Academy. None of these works have survived, but they