three are not independent choices. He briefly considers the possibility that one might regard the form of hierarchy (*Stufenform*) as corresponding to the term 'category' (this would make *class* and *relation* the two categories).[11] But since the 'manifold of experience' in the constitution system consists of the basic elements, he thinks it better to take the basic relations – which also fix or constrain the object and system forms – as corresponding to categories. This is illustrated by the 1925 form of the constitution system (ASP 1925a, 1925b), whose five basic relations can be seen as corresponding, Carnap says, to the traditional categories of equality, similarity, intensity, spatiality, and temporality. In the present system, he says, it seems these may in fact be reducible in turn to a single basic relation ('Er', recollection of similarity), which would mean that '*the number of* (genuine) *categories is very small, perhaps there is only a single category*'. This, it seems to Carnap, is revealed by the greater power of modern logic; the over-complexity and over-crowdedness of traditional '*tables of categories* from Aristotle to Driesch' is due to 'the inadequacy of the tools they employed' (§156, p. 210; PT p. 243).

The older conception of 'category' from 1922 is not mentioned at all in §83, even as a rejected possibility. But it is still present in other passages of the *Aufbau* – this is just what gives the impression that it is a vestige from the earlier system. This impression is no less misleading, though, than the impression that §126 is a vestige of the transition from 'primary' to 'secondary' world. Carnap had begun the project with Vaihinger's idea of a category as a pragmatic principle or 'fiction' in mind (as the 'tendencies' of substance and cause that guide the construction of 'secondary' worlds from the 'chaos'). What seems to have occurred is that some time around 1925–6,[12] it no longer seemed right to include such *pragmatic* principles as his equivalents to the Kantian or Aristotelian 'categories' within the system of *cognitive* 'fictions'. When logic pushed aside phenomenological discernment of 'structure', it also exiled pragmatic principles from the realm of the cognitive (which might be understood here as a kind of explication of Kant's 'understanding [*Verstand*]', as opposed to a wider system of cognitive *and* pragmatic principles, which could be seen as corresponding to Kant's 'reason [*Vernunft*]'). In the *Aufbau* itself, though, it seems Carnap was not quite sure *how* to classify (or what status to give) these formerly categorical 'fictions', now practical principles. So it is hardly surprising that the parallel with the traditional categories of substance and cause is still occasionally suggested, even though their status has now changed. In §135, for instance,

[11] Klein (2004) considers this sense of 'category' in Carnap.
[12] The Vienna talk Carnap gave in January 1925 is still entitled 'Thoughts on the Category Problem: Prolegomena to a Constitution Theory' (ASP 1925a).

the visual world constructed in the previous sections is extended by means of the other senses to obtain the 'perceptual world [*Wahrnehmungswelt*]'. But, Carnap remarks, this extension is intuitively rather different when it is undertaken temporally (requiring a principle of induction or temporal extrapolation) from when it is undertaken spatially (requiring a kind of Machian 'principle of continuity'): 'In a certain sense the first kind of application of *ascription by analogy* can be regarded as an application of a *causality postulate*, the second as an application of a *substance postulate*'. But when these traditional categories are translated into the terms of the constitution system, they seem more like special cases of the same underlying principle: '*the two categories of causality and substantiality amount to application of the same analogy constitution along different coordinate* axes' (1928a, §135, p. 180; PT p. 208). There is no attempt to carry out this 'structural' reduction of the categories of cause and substance in any detail, but the general strategy is reasonably clear; the guiding principles of the attribution of qualities to physical space-time positions are to be expressed as formal variants of a single principle.

What this principle might be is hardly explored, except in a remarkable passage in §105, which discusses 'the problem of deducing the constitution rules [*der Deduktion der Konstitutionsregeln*]'. General constitution rules of the kind he has listed in the previous section might be deducible, Carnap speculates, from some single principle (as hinted in §135), on the analogy of a 'world formula' (of the kind imagined by Laplace[13]) from which all the laws of physics might be deducible. 'In the present case, as in that one, the highest principle is not known, but in the first instance provides rather a goal or direction for research, a goal whose attainability is not even assured' (1928a, §105, p. 146; PT pp. 165–6). This in itself is remarkable enough, as there is no indication how such a 'highest principle [*oberstes Prinzip*]' might relate to the principles of logic or the cognitive realm more generally. But Carnap goes further:

If the highest principle of construction were already known, a further task would consist in determining how it can be understood as necessarily resulting from the *point* of knowledge, or more precisely, *from the contribution of knowing to the more*

[13] Laplace's idea that an omniscient spirit could predict every event, with a comprehensive 'world formula', if it knew the position of every particle at some initial time, is of course rooted in the mechanical hypothesis. It had become the subject of widespread discussion after Emil Dubois-Reymond's (1872) argument that if all knowledge is of mechanical processes (which he assumed), then there are ineluctable limits to our knowledge; there is, as he said, an *ignorabimus* beyond which we cannot penetrate. Carnap knew, of course, that the mechanical assumptions could no longer be upheld, but as Howard Stein has pointed out to me, Gustav Mie had proposed a 'world function' for the post-mechanical 'field-theoretic ideal of unity', as Hilbert suggested it be called (Hilbert 1924, pp. 258–60), and Carnap may also have had this in mind in 1928.

comprehensive context of human life purposes [*für den umfassenderen Zweckzusam-menhang des Lebens*], that the shaping of experiences into objects occurs precisely in the way it is represented to do in the constitution system, in the way it is given expression by the general constitution rules, and finally in the way it is summed up most concentratedly in the highest constitution principle. (1928a, §105, p. 146; PT p. 166)

Envisaged here, it seems, is not so much an ultimate *foundation* of knowledge construction in the overall purpose-context of life, but a dialectical interplay between them, as the purposes of human beings are of course constrained and shaped by their knowledge (cf. also ASP 1929d). Implicitly, at least, this prefigures the later Carnap; the difference lies in his almost Leibnizian (perhaps also Fregean and Marburg-derived) confidence, during this earlier period, in the powers of human reason to arrive at a *single* or a *unique* 'highest construction principle' on the model of Laplace's 'world-formula'. It is not surprising, therefore, to find evidence in this very passage that the practical orientation at the heart of his architectonic also looks *back* to the Leibnizian dream of a comprehensive system of categories:

This *teleological problem of knowledge-shaping* can in the present state of our knowledge at best be approached piecemeal, not as a whole. Such piecemeal approaches might include, for instance, the tendencies of substantialisation and causation that become important at the higher levels of the constitution system. (1928a §105, p. 146; PT p. 166)

It would appear, then, that even in their original 1922 conception these categorical 'tendencies' of substance and cause may have been envisaged as grounded – like, presumably, other 'conscious principles of the science of science' (such as the 'principle of maximal simplicity') – in something like an overall purpose-context of human life.

The pragmatic criterion for language choice at the level of the metatheory, which seems like such a radical innovation in Carnap's thought in the early 1930s, is clearly prefigured here, though of course not in a context of language pluralism. In any case this passage indicates that although any thought of a meta-perspective had certainly been pushed far into the background during the later 1920s, under the influence of Wittgenstein's sharp demarcation between cognitive meaning and the unsayable, it had not disappeared completely. (We will see in the next chapter how Carnap attempted to accommodate meta-logic within the Wittgensteinian single-language corset.) And the pragmatic tendency of the *Aufbau* did not go entirely undetected; Philipp Frank saw it right away. As he wrote later:

When I read [the *Aufbau*] it reminded me strongly of William James's pragmatic requirement, that the meaning of any statement is given by its 'cash value', that is, by what it means as a direction for human behavior. I wrote immediately to Carnap, 'what you advocate is pragmatism'. (Frank 1949, p. 33)

Like the other apparent vestiges of earlier ideas, then, the allusion to Carnap's earlier conception of 'category', in §105 and elsewhere, in fact points forward rather than backward – in this case to Carnap's much later conception, in which both 'theoretical investigations' *and* 'practical deliberations and decisions' bear on the choice of 'categorial concepts' (see below, Chapter 10, p. 265).

The *Aufbau* programme, exemplifying the 'constructive' component of rational reconstruction, had travelled a long distance from its origins in 1922. It had begun as a way of attaining an objective 'reality' from the chaotic and subjective 'primary world' of pure sensation, by using logic as a bootstrapping device to transmit phenomenal content from raw experience to theoretical statements. By 1928, it had evolved into something quite different, and went on developing into the early 1930s, as we will see in more detail in Chapters 7 and 8. The Wittgensteinian influence after 1926 did not change the direction of this development, but reinforced an existing process.

SCHEMATISING PHYSICS

In 1925–6, just as he was writing the *Aufbau*, Carnap also wrote *Physical Concept Formation*, in which the relation between physical concepts and observation is approached rather differently. There is no attempt, in this book, to found physical (or ordinary) knowledge on a phenomenal basis; but it is taken completely for granted that this is possible. 'Things and their qualities [*Dinge und Dingeigenschaften*]' are assumed from the start without comment; we perceive qualities of objects – colour, hardness, temperature, cohesion, elasticity, solubility, weight, etc. Some of these are perceived directly and spontaneously, others are revealed only in response to an action on our part, e.g. bending or dropping an object, stirring a substance into water to discover whether it is soluble, plucking a string to find its pitch, etc. This is a superficial distinction, though, as the spontaneously revealed qualities are elicited in response to certain conditions as well, only that we do not have to bring these about ourselves; the white light that is a condition for a certain surface to appear red is ordinarily provided for us by the sun, and so on. 'So every statement about a quality of an object says how