Structural Realism without Metaphysics: Notes on Carnap's Measured Pragmatic Structural Realism

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ABSTRACT: Carnap's reinvention of the Ramsey-sentence approach to scientific theories has been at the center of a new debate in recent years. Following Grover Maxwell, Psillos (2000a) argued that Carnap's re-invention of the Ramsey-sentence had failed to lead to the desired neutral stance in the realism-instrumentalism debate, and ended, instead, to a form of structural realism which happened to be liable to Newman's objection to Russell's version of structural realism. The objection held that without putting suitable restrictions on the range of the variables of the Ramsey-sentence, a Ramsey-sentence approach to theories renders trivial and a priori true all ontological commitments to unobservable entities issued by scientific theories. By arguing that Carnap achieved the neutral stance, Friedman (2011) counter Psillos claim. He denied that any form of realism could be attributed to Carnap. In this paper, I provide a middle ground, where an unorthodox form of structural realism could be attributed to Carnap. I highlight parts of Carnap's work which deal with the problem of designation of abstract terms and the relation of the language to the facts of the matter (in Carnap 1934; 1950; 1966), to argue that it was Carnap's view about the practical methodological considerations, being at work in the construction (or choice) of the linguistic systems, which led him to the unorthodox form of structural realism. I also claim that the same practical considerations constitute the nub of a viable Carnapian answer to Newman's objection.

KEYWORDS: Carnap – conventionalism – structural realism – metaphysics – Newman's objection – pragmatics – Ramsey-sentence approach – semantics – truth.

0. Introduction[1]

Carnap's reinvention of the Ramsey-sentence approach to scientific theories has been in the centre of an interesting debate in recent years. The credit of bringing back the subject to the foreground goes to Stathis Psillos (1999, 2000a, 2000b). While Psillos' work gave rise to a number of studies and assessments (e.g. Creath 2012, Cruse 2005, and Demopolous 2008), it finally fell to Friedman (2011) to make an attempt for answering Psillos' challenge.

Psillos' (2000a) claim was that Carnap's re-invention of the Ramsey-sentence had failed to result in the desired neutral stance in the realism-instrumentalism debate, and led, instead, to a form of *structural realism*, which happened to be liable to Newman's objection (which had been originally aimed) to Russell's version of structural realism. The objection held that without putting suitable restrictions on the range of the variables of the Ramsey-sentence, a Ramsey-sentence approach to theories renders trivial and a priori true all ontological commitments to unobservable entities issued by scientific theories (see Psillos 2000a, 254).

Friedman countered Psillos' view by arguing that Carnap's conception of a scientific theory, as the conjunction of its Ramsey-sentence and Carnap-sentence, had indeed resulted in the desired neutral position (see Friedman 2011). Consequently, Friedman claimed that Newman's objection, raised in the context of the recent debates about the structural realism, is no problem for the Carnapian metaphysically-neutral structuralism (cf. Friedman 2011).

My aim is to find a middle ground, to state that Carnap's structuralism is accompanied by an unorthodox but fulfilling form of realism, which rests on the functioning of *the practical methodological considerations*. These considerations were contrived to work at the basic level of the construction (or choice of the rules) of the linguistic systems. I will develop this to suggest that the Carnapian stance is an elaborated extension of realism, because, in spite of Friedman's (2011) discord, at least as far as the *physical systems* are concerned, there are indeed some robust *factuality-conducive referential links*

in the Carnapian system. These links are forged by the pragmatic-practical factors, and they subtly prevail between the variables of Carnap's structures to connect them to the facts of the matter. The referential links, therefore, are soiled with some pragmatic taint, and the semantical relations at the root of Carnap's irenic[2] form of structural realism are pragmatically enriched.

The referential connections are settled pragmatically and methodologically. Therefore, interestingly enough, Carnap's realist stance is not at odds with the metaphysical neutralism which Friedman has underlined in his interpretation. It is not resting on the standard semantics of metaphysical realism. Nor does it hinge on some contentious metaphysical arguments such as No Miracle Argument (NMA) and Inference to the Best Explanation (IBE)

But to obtain its full-legitimacy, Carnap's structural realism needs to survive the Newman's challenge. Friedman's answer to Newman's objection came in terms of depriving Carnap's approach from any commitment to the factual or synthetic content of the existentialised terms of the theory, beyond what is conveyed by their empirical adequacy. My response is developed in a different direction, and it indicates that the problem of finding the appropriate structures, or equivalently, setting restriction on the sets of the existentialised variables of the Ramsey sentences, could be sorted out plausibly enough, in a pragmatic, rather than in a syntactic or semantic way. This answer to Newman's objection is an extension of the moderate pragmatic realism which I read into Carnap's anti-metaphysical structural realism.

1. Carnap's empirical structural realism

Existence of an unfathomable chasm between observational and theoretical domains in Carnap's conception of scientific theories has been questioned by Creath (1985, 2012). By arguing that the ontological commitment, which has been readily made with regard to the observational entities, could be extended into the adjacent (and in Creath's view, entwined)

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2   The term has been coined by Creath (1985), who assigned a form of irenic realism to Carnap.

domain of theoretical sentences, he stated that Carnap's philosophy is prone to be understood as a subtle form of (irenic) realism. Although Creath's interpretation is persuasive, neither Psillos nor Friedman accepted that Carnap's endeavour had led to a solemn form of realism. My construal of Carnap's reinvention of Ramsey-sentence approach was spelled out to meet Psillos and Freidman's recent non-realist interpretations.

Creath's remark about the blurredness of observational-theoretical border notwithstanding, it is customary to assume that the received view of theories indicates that there is a distinction between these two parts of the language of science. The Ramsey-sentence approach to theories (developed by Ramsey 1929), had been supposed to be efficient in dealing with the troublesome theoretical parts (i.e., conveyed by secondary terms, in Ramsey's terminology), via explaining their meaningfulness solely in virtue of their connection to the observational domain.[3] It was received as an empiri-

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[3]   There already exists a prosperous literature formed around Ramsey-sentence approach and Carnap's innovation. All necessary technical details are articulated in the mentioned works (Ramsey 1929 and Carnap 1966 besides, particularly Psillos 2000a; 2000b; 2006 and Creath 2012 and Cruse 2005 seem to be the most instructive ones). Therefore I am only spelling out Ramsey-sentence approach and Carnap's innovation as briefly as possible. Let us take TC as our theory, holding theoretical (T_i) and observational (O_j) terms and postulates (in Ramsey 1929, secondary and primary terms respectively). This is the standard (received) form of a theory:

$$TC(... T_1 ... O_1 ... T_2 ... O_2 ... T_n ... O_m ...)$$

where T_n are theoretical predicate constants and O_m are observational predicate constants. From this we can derive the Ramsey-sentence R(TC):

$$R(TC): (\exists U_1), . . ., (\exists U_n)TC(U_1, . . ., U_n; O_1, . . ., O_m)$$

In R(TC) the observational terms (O_j) are preserved, and the theoretical constants (T_i) which occur in TC are replaced by distinct higher-order predicate variables (U_k) which do not occur in TC, and then the variables are prefixed by existential quantifiers. This is the realized form of the theory, because, according to Ramsey, R(TC) would be observationally equivalent to TC, and would preserve the empirical content of the theory, (that is T(C)→O if and only if R(TC))→O). And according to Carnap R(TC) would be *semantically* equivalent (L-equivalent) to TC. That is, (speaking in model-theoretic terms) if there exist a class of entities which satisfy the Ramsey-sentence, then there is a denotation between theoretical terms (T_i) and the class members. Carnap-sentence of the theory namely (R(TC) ⊃ TC) works as an analytic part of the reformulation of the theory to provide the necessary interpretation of the theoretical terms to the necessary extent.

cist solution for the problem of the meaning of the theoretical terms. Carnap reinvented the approach in mid-1950s (the story of reinvention has been mentioned in Carnap 1963 and Psillos 2000a) and made some clarifications about it in mid-1960s (cf. Carnap 1963; 1966).

It was with regard to this chapter of the history of empiricism, and after examining the Carnapian differentiation between (with regard to the borders of linguistic frameworks) internal and external questions (elaborated in Carnap 1950; 1956), that Psillos asked "why isn't Carnap's position realist enough?" (2000a, 256). It is true that Carnap had declared that any question concerning the reality of the system of entities as a whole, is an external (or metaphysical), and hence an illegitimate (*pseudo*)-question. But questions could be asked about the reality of particular entities, questions which were raised and answered after the acceptance of a certain Linguistic Framework (LF). These were internal questions, which their answer might be found, legitimately enough, by either purely logical or purely empirical methods, depending on whether the framework is a logical or an empirical one (cf. Carnap 1950).

The looseness in fixing LFs in a cognitively meaningful and theoretical (i.e. logical) way makes the approach inapt for being considered as a form of orthodox scientific realism which is based upon the watertight semantics of correspondence theory. But it could be construed as a limited or internal form of realism all the same. This eccentric form has been traced back by Psillos to Feigl's (1943; 1950) "empirical" or "semantic realism", which held that scientific theories imply commitments to unobservable entities no less than to observable ones. The claim is, of course, empirical (in Feigl's sense) rather than metaphysical" (Psillos 2000a, 257). This much could be conceded to almost unarguably.

But Psillos went even further. He claimed that Carnap's empirical realism had been taking some *structuralist* turn, in the course of Carnap's reinvention of the Ramsey-sentence approach. I explained Ramsey's approach in the previous endnote. Carnap followed the same track in his "The Methodological Character of Theoretical Concepts" (see Carnap 1956): The language of science was supposed to be divided into two sublanguages. The observational language L_O which is completely interpreted (in virtue of referring to observable domain) and L_T, whose vocabulary V_T consists of theoretical terms. Carnap's Ramsey-wise move, which was evolved at first independently (and in ignorance of Ramsey's achievement)

by Carnap, was to suggest that the vocabulary of V_T could be conceived as ranging over the class of natural numbers which are representing mathematical, rather than theoretical, entities. To make the mathematical parts adequate for the representation of the physical concepts, some C-postulates had been contrived to connect the theory, which was presented as exemplifying certain logico-mathematical structure, to the observable world. It was how the scope of Carnap's structural realism was spread.

It is a historical fact that Carnap's reinvention of Ramsey-sentence approach had been subjected to criticism from the very beginning. The objections were raised to challenge the aptness of the representational (or referential) function of the logical structure, from two opposite fronts. It has been argued that concerning the existentialised variables of the Ramsey-sentence, either they serve their purpose and inferentially refer to the theoretical entities, and therefore do not undertake any fewer ontological commitments than the original theory (as remarked by Hempel 1958), or they refer to nothing beyond the abstract set-theoretic mathematical notations which conveys them, and therefore the approach would lead to a form of "syntactical positivism" (this was remarked by Feigl 1958). Taking the dilemma in either way, the demise of the Carnapian peculiar form of structural realism would be inexorable: it is doomed to collapse either to the orthodox scientific realism, or to syntactical positivism, which strives to stay limited to formal notations, without taking the risk of assigning semantical interpretation to the formulas.

More recently, Psillos and Friedman raised similar issues. Although Psillos did not regard Carnap as an advocate of the orthodox scientific realism, he argued for the necessity of reducing Carnap's version of structural realism into traditional scientific realism. Friedman, on the other hand, maintained that the theoretical parts of language of science could not be interpreted in terms of the standard Tarskian semantics.

For structural realism, to overcome such qualms and become a significant metaphysical and ontological thesis, theories should be primarily conceived as abstract mathematical structures, and then, by application of a semantics which permits the interpretation of the theoretical parts, the main ontological commitments have to be undertaken primarily with regard to these structures. In more precise words, within the context of the received view of the theories, "within which a theory is taken to be a set of sentences, realism amounts to the commitment to standard (correspon-

dence) referential semantics, and to truth, for the whole theory" (Ladyman 1998, 416). Making unswerving ontological commitments to existence of unobservable phenomena (being recognized as structures in ontic structural realism, or theoretical entities in traditional scientific realism) seems to be at the heart of the standard understanding of realism. And it is an unchallenged presupposition that in the syntactic period, this metaphysical realism (MR) ran through the semantical machinery of the correspondence theory (hereafter CT).

But Carnap's philosophy is bereft of any such semantical and metaphysical compartments. He was allegedly unwilling to appeal to the standard correspondence semantics to assert that the theoretical sentences refer to the unobservable entities or structures of extra-linguistic domain.

2. The factuality-conducive referential link

The *referential relation* between the structures of the existentialised variables and their referents in the extra-linguistic domains was supposed to be formed by application of CT. But Carnap's anti-metaphysical agenda was urging him to be reluctant to undertake any such ontological commitment with regard to unobservable entities or concede to the standard referential semantics. Scientific realism rests on the standard referential semantics, and the requisite referential links could not be forged within the framework of this limited realism. According to Friedman (2011), in absence of *a direct referential link* between theoretical terms and unobservable physical phenomena, we should "keep firmly in mind the fact that theoretical terms, for Carnap, are semantically uninterpreted: we assign no designata to them in our semantical meta-language, and so Tarskian semantics (as Carnap understands it) literally assigns no truth-values at all to purely theoretical sentences" (Friedman 2011, 256). This is the most serious piece of evidence that Friedman has offered in the way of ruling out the viability of the realist interpretation of Carnap's structuralism.

So, there is an essential question that the advocate of the realist interpretation of Carnap's structuralism should answer: abiding by the limitations of Carnap's internal realism, how the factuality-conducive referential links could be established between the existentialised variables and their referents in the extra-linguistic domains. If it could be shown that Carnap

had contrived the appropriate means for making a theory of factual reference, albeit without giving way to MR or CT, then it would be easy to argue that Carnap's enterprise does not collapse into a version of strict empiricism or even a neutral stance with regard to realism-instrumentalism debate, but would instead lead to an interesting and elegant though unconventional version of structural realism, provided that we could accept that realism does not necessarily amount to the commitment to standard (correspondence) referential semantics.

The problem on the way of establishment of the referential links is that, as Friedman remarked, the theory of "factual reference", which had been assumed to link the theoretical terms to their unobservable referents (as CT demands), has been replaced in Carnap's thought by the question of which form of language we should prefer – and prefer for "purely pragmatic or practical rather than theoretical reasons" (Friedman 2011, 257). This connotes that purely pragmatic reasons do not count as justifications, or at least as *epistemically viable justifications*, in accounting for the choice of the realist stance which conveys the referential links, and they could not be used in construction of a theory of factual reference. Let's see why.

2.1. Carnap's conventionalism

From the early 1930s onward, in his so called syntactical episode, conventionalism about language and logic has been the kernel of Carnap's thought (see Carnap 1934, §17, which contains Carnap's famous principle of tolerance[4]). The conventional elements have survived the semantical turn and were transferred to Carnap's studies about the nature of truth and semantical relations, reference and designation (in 1940-50s). Conventionalism was, therefore, the enduring essence of Carnap's philosophy. For example in "Empiricism, Semantics, and Ontology" (see Carnap 1950), Carnap continued the same conventionalist vein to suggest that "the question of the admissibility of entities of a certain type or of abstract entities in general as designata is reduced to the question of the ac-

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[4]   "In logic, there are no morals. Everyone is at liberty to build up his own logic, i.e. his own form of language, as he wishes. All that is required of him is that, if he wishes to discuss it, he must state his methods clearly, and give syntactical rules instead of philosophical arguments" (Carnap [1934] 1937, 52).

ceptability of the linguistic framework for those entities" (Carnap 1950, 92). That is, the question of the designation of, say, the theoretical term "electron", depends on accepting LF of modern physics. The question of acceptance of the LF and its constitutive rules, on the other hand, is not an authentic logico-philosophical problem, but a matter of convention and hence, at most, a practical question of expedience. Notice that this was precisely the context in which Carnap reinvented the Ramsey-sentence approach. Because in Carnap (1956), along with all of the technical elaborations, he kept up to speak in terms of the distinction between the inside and outside of frameworks (as had been initiated in Carnap 1950), to state that there are two kinds of existential questions and two senses of "real".

As Carnap remarked in Carnap (1956), you can accept the reality of an event, or assert the truth of the statement which describes it, only after acceptance of the general logical system, or a body of rules and postulates which rule over the theory which conveys it. But as the postulates and rules do not yield themselves easily to semantic interpretation, the question concerning the existence of the general system of entities should be taken as a question of framework principle. It is true that, as Carnap declared, "for an observer to 'accept' the postulates of T means here not simply to take T as an uninterpreted calculus, but to use T together with specified rules of correspondence C for guiding his expectations by deriving predictions about future observable events from observed events with the help of T and C" (Carnap 1956, 45). But the rules of correspondence work as parts of the inductive systematization to organize and interpret the theoretical expressions in accordance with the observational outcome. As Friedman (2011, 258) has remarked, this does not mean that there is any referential (correspondence) semantics at work in connecting the formal structures to the unobservable events and structures of the world. The rules and postulates of the system are generally contrived in a conventional and arbitrary manner, to (arbitrarily) assign a sequence of semantic values to theoretical terms so that the general outcome of the theory could obtain its empirical adequacy.

Therefore, Carnap's semantics is incapable of offering any ontological indications about the existence of unobservable entities or the modal relations between them, of the kind that the metaphysical realist expects of CT to contribute.

2.2. The theory of factual reference and the theoretical sentences

Carnap's stress on the role of pragmatic factors in latching the logical system into the objectivity of the factual world tends to be examined more carefully as an important chapter in the Carnapian studies in recent years (see Mormann 2007, Richardson 2003; 2007 and Uebel 2013 among a few others). The aim of this section is to show how the pragmatic or practical reasons which are at work in preferences of linguistic forms, could play a decisive role in forging the factuality-conducive referential links which, according to Friedman, could not be accounted for theoretically in Carnap's philosophy. Moreover, I will specifically show that the theoretical sentences of language refer on a par with the observational sentences, in a Carnapian system. Finally I will build my argument on this, to conclude that the existence of the theory of factual reference is enough for founding a peculiar form of realism. Let me elaborate.

There are of course more things conveyed in the vast frameworks of Carnap's ocean of logical systems, than are dreamt of in the narrow scope of traditional philosophy. Even so, when it comes to systems which should be used for accommodating the *language of natural sciences*, LFs could not be produced in some arbitrary and whimsical conventional ways. The language of natural sciences should be useful for communication of reports and predictions, and not every arbitrary language is convenient for accomplishing the task. It is the language of sciences which the philosophers of sciences are mostly concerned about. Now, in spite of his profuse conventionalism, as early as in his 1934 book Carnap remarked that:

> The construction of the physical system is not effected in accordance with fixed rules, but by means of conventions. These conventions ... are, however, *not arbitrary*. The choice of them is influenced, in the first place, by certain *practical methodological considerations* (for instance, whether they make for simplicity, expedience, and fruitfulness in certain tasks). This is the case for all conventions, including, for example, definitions. (Carnap [1934] 1937, 320, my emphasis)

And after three decades he still observed that:

> Factual knowledge is necessary in order to decide which kinds of conventions can be carried out without coming into conflict with the facts

of nature, and various logical structures must be accepted in order to avoid logical inconsistencies. (Carnap 1966, 68)

Thus the objectivity of the referential relations laid at the foundation of the linguistic system (devised for communication about what natural sciences convey) was preserved against the conventional elements, and the factuality has been neatly interwoven into part and parcel of Carnap's conventional approach, via what was called methodological practical considerations in 1934. The choices of these LFs were not dislodged of the factuality of the world of experiences, and the construction of LF did not take place in an unrestrained and arbitrary way. The upshot is that although, as Friedman emphasized, the question of the reality of the theoretical entities has to be reduced to the question of the preference and practical decision about the language of science (cf. Friedman 2011, 250), yet the frameworks were not devoid of factual content, and the designation relations which were established within the framework had been evolved to be factuality-conducive: as these were pragmatic considerations which were appointed to rule over the choice of LFs to vouchsafe the connection to the factual domain, we may conclude that the designation relations and truths which were formed and conveyed within the framework were pragmatically encroached as well, and by the same token, were attached to the facts of the matter.

Let me summarize. It is true that the ontological commitments of Carnap's internal realism are frame-relative. Normally, this may appear to be at odds with the traditional realist position that seeks to establish the objective and theory-independent reality of unobservable entities. As the links which were forged within Carnap's system were not contrived to work as *direct* referential links to channel between theoretical terms and unobservable physical phenomena, it may be claimed that, there were no ordinary semantic rules of designation in Carnap's system. This may represent Carnap's enterprise as fitting within an anti-realist position. But considering the possibility of choosing and constructing physical linguistic systems in a non-arbitrary manner and in consistency with the facts of nature, it could be agreed that the referential links which have been carved out in the Carnapian physical systems were subtly ushered by the objectivity-preserving considerations to carry factual content within them, albeit in a holistic and non-literal manner. I argue that this provide some footing for launching a subtle form of realism. I should emphasize that this is true about the ref-

erential relations of the theoretical sentences, in an equal footing with the designation of the observational statements of the system: the sequence of the semantical values that make the theory come out true from among the values ranged over by the theoretical variables are not assigned more *arbitrarily* than the designations of the observational parts of the language. The explanation is as follows.

In Carnap (1950), in unfolding the philosophical implications of his semantical enterprise, unlike a man who in his everyday life does with qualms many things which are not in accord with the high moral principles he professes on Sundays (or the physicist who is suspicious of theoretical entities and tries to mark a part of the language of science as uninterpreted and uninterpretable), he did not make a difference between abstract and concrete terms of a theory (cf. Carnap 1950, 85). In contrast to such double-dealers, Carnap conceded to the possibility of assigning truth-value to the theoretical sentence on a par with the observational ones, the postulates and rules of inference of his system permitting (i.e. if "electron" was supposed to designate electron according to the rules of designation of the system, see Carnap 1950). Carnap gave a clear and decisive reason for his impartial behaviour: in certain scientific contexts, it seems hardly possible to avoid referring to the abstract entities (the mathematical and theoretical entities involved). Particularly in physics, Carnap declared, it is more difficult (than mathematics) to shun referring to theoretical entities, for the language of physics serves for the communication of reports and predications, and cannot be taken as a mere calculus (cf. Carnap 1950, 85). Thus, by something like an indispensability argument, Carnap came to the conclusion that acceptance of a language referring to the theoretical entities is completely consistent with empiricism and strict scientific thinking. And as the acceptance of the language is guided by the objectivity-preserving factors, the semantical referential links carved out therein do not run against the grain of the factuality of the world of experience.

Carnap's sophisticated and pragmatically contaminated system of semantics is adequately apt for being used in the way of interpretation of the theoretical statements. The designation relations and truth are impartially assignable to theoretical as well as observational statements in interpretation of physical systems. The tradition has it that the technical features of Carnap's structuralist approach have been contrived to explain the meaningfulness of the theoretical statements in virtue of their relation to the ob-

servational counterparts. But when examined against the vaster context of Carnap's unprejudiced semantics, which includes the subtle technicalities, the claim that Tarskian semantics (as Carnap understands it) literally "assigns no truth-values at all to purely theoretical sentences" (Friedman 2009, 256) would appear to be incorrect. Therefore it is only on grounds of this minute point that I argue that Carnap's philosophy slightly bends toward a form of unorthodox realism. This construal could still be challenged: are the presence of merely indirect ontology and the absence of correspondence theory still within the lines of realism? Well, obviously these are not in line of an up-front standard realism. But even in absence of CT, it could still be argued that Carnap's semantics assigns truth-values to theoretical sentences in an equal footing with the observational ones. And this provides the necessary foundations of a subtle form of unorthodox realism. Of course the primary distinction between the orthodox and unorthodox forms of realism is a mere matter of classification rather than argument. But it does not turn the debate to a verbal issue. For, there are historical pieces of evidence and philosophical arguments to be produced to show how this unorthodox form of realism could obtain its legitimacy and plausibility.

Regrettably there is little space for a detailed historical survey of the invention of semantics in hands of Tarski, Carnap, and a few other gifted logicians (for Carnap's account of this history see Carnap 1963, 29-36). To make a long story short, there is no denying that, according to some understanding, Tarski's semantics is a lair to CT. But this does not mean that Tarski's correspondence referential semantics, being constructed around his definition of truth in formal systems, has to be necessarily understood in terms of metaphysical realism. As Tarski himself explicitly acknowledged, "the semantic definition of truth implies nothing regarding the conditions under which a sentence like ... snow is white can be asserted .... Thus we may remain naive realists, critical realists or idealists, empiricists or metaphysicians-whatever we were before. The semantic conception is completely neutral toward all these issues." (Tarski 1944, 362) The truth-value of the sentences, in a Tarski's system, would be decided in the fit between the object-language and meta-language, without giving way to any metaphysical indications about the referents of the statements of the object-language or the ontological state of the meta-language. Neither truth nor the referential relations were articulated in terms of metaphysical realism any more than, say, a pragmatic or deflationary account (for an ex-

tended explanation on this see Wilfrid Hodges' (1985-86) "Truth in a Structure").

Accordingly, even Carnap's investment in Tarski's semantics did not persuade him to add some metaphysical realist flavour to his logic of science. In such circumstances, the notions of pragmatic truth and designation, defined within LFs which were pragmatically picked and formed, could very well play the role of the underlying semantical foundation of the Carnapian form of realism. That is, staying in the metaphysically neutral grounds does not prevent the approach from bringing about realist fruits in philosophy of science. As the theoretical sentences within Carnap's system are capable of conveying truth-values – in terms of Tarski's unfamiliar understanding of Tarski's semantics – Carnap's structuralism is prone to be interpreted in terms of a sophisticated and untraditional form of structural realism.

The untraditional aspect is not by itself a gap in the Carnapian view. Many a peculiar form has been developed in parallel to the orthodox trend of scientific realism. One tends to think that there should be a common essence to these (sometimes remotely) resembling forms of realism, which have all of the properties of the members of an unruly family. But an unshakable loyalty to the standard referential semantics of CT does not seem to be either the essence or the necessary requirement of realism. It is true that, in a realist understanding of the theories, the scientific theories and models should represent the world in one way or another. But as French's (2003) interesting inquiry on the nature of representation shows, the existence of an isomorphic relation (the model-theoretic relative of CT in semantic view) is neither the necessary nor the sufficient condition for the representation of the world within the models.[5]

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[5]   Perhaps as French suggested, to outline representation in holistic and nonliteral ways, the idea of denotation could be appealed to, as a suitable relation for showing how a model stands for physical system and explaining how theoretical conclusions correspond to the phenomena and decides whether the theory is empirically adequate (see French 2003, 1478). Denotation, embodied in form of partial isomorphic account, is much more flexible and modest than the idea of total isomorphism or linguistic correspondence. To take the discussion back to the context of Carnap's so-called received view, it seems that the loose conventional relation which is pragmatically restricted, is akin enough to French's notion of denotation, to equip Carnap's structuralism with the appropriate means for channelling between theories and the world.

Perhaps we still can concede that after accepting the theory, believing in truth of what the theory says – in whatever imaginative way that the belief in truth may bloom – could be maintained as a handy but provisional characteristic of realism. Mind that the belief in truth of the theory may flourish in quite a number of imaginative ways (see Boyd 1999; Ellis 1988; Fine 1990, French – Saatsi 2006; Hacking 1982; and Quine 1981). But whether truth should or shouldn't be characterized as correspondence with reality (as was taken for granted in the standard scientific realism) is a separate question, which as Horwich (1991) persuasively argued, has a little bearing on the question of realism.

2.3. Purely pragmatic reasons?

There is another significant point to be remarked before going to the next part of the paper. The pragmatic reasons, which play a significant role in loading the system with objectivity-preserving factual elements, are not, in spite of Friedman's remark, "PURELY pragmatic or practical rather than theoretical reasons" (Friedman 2011, 257). If they had been of purely pragmatic nature, then, at least according to the advocates of the orthodox epistemology, they could not assume epistemic roles in stabilizing the foundations of knowledge.[6] It's true that they certainly were not staged to play the role of purely epistemic factors which partake in the cognitive nature. But (at least in Carnap's 1950 and some later works such as his answer to Abraham Kaplan in 1963 Schlipp's volume) this was not taken to mean that they were totally detached from the domain of theoretical justifications and cognitively meaningful expressions either. According to Carnap:

> The decision of accepting the thing-language, although itself not of a cognitive nature, will nevertheless usually be *influenced by theoretical knowledge*, just like any other deliberate decision concerning the acceptance of linguistic or other rules. ... The efficiency, fruitfulness, and simplicity of the use of the thing-language may be among the decisive factors. And the questions concerning these qualities are indeed of a *theoretical nature*. (Carnap 1950, 87, my emphasis)

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[6]   There are of course the advocates of pragmatic encroachment in epistemology (e.g. Fantl and McGrath, Stanley, Hawthorne, Weatherson), who are arranging a revolt against this dominant orthodox view. But I try to stay in the framework of the orthodox view for the time being.

Therefore, if it is the want of the theoretical touch which keeps the practical reasons back from being considered as viable candidates for vindicating the choice of the realist framework, then by remarking that the influence of the theoretical knowledge on practical considerations is strong enough to boost them to the level of (even epistemologically) plausible justifications, it could be shown that the choice of the realist LF which conveys the factuality-conducive referential links is quite reasonable in spite of not being based on metaphysical speculations. The practical and the theoretical deliberations work together in dealing with the problem of the choice of linguistic frameworks, as Carnap declared some years later (see Carnap 1963, 539).

3. Newman's challenge

Here I attend to Psillos' qualm about the plausibility of Carnap's structural realism. As Psillos' "Choosing the Realist Framework" (2009) implies, he was primarily somewhat interested in the moderate and measured form of realism which had some "pragmatic ring to it" and was "free from metaphysical anxiety".[7] Unlike Friedman, Psillos did not altogether dismiss the aptness of pragmatic reasons for founding an interesting and unorthodox form of realism. But eventually, it turned out that Carnap's irenic position was not realistic enough for Psillos either. For, although it did not give way to a negative form of instrumentalism, it was "not a fully realist position either, since asserting what these entities are is no longer a substantive assertion, but instead it reduces to adopting a meaning postulate" (Psillos 2000a,

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[7]   Although this paper mostly deals with Feigl's empirical realism, Psillos in short and to the point remarks explains how Carnap's thought is connected to Feigl's endeavor. One of his hints, is so remarkable that we would quote it right in here:

In fact, in his *Empiricism, Semantics and Ontology*, Carnap (1950, 214) refers the reader to Feigl (1950) piece "for a closely related point of view on these questions [how do we adopt a framework?]". Conversely, in his own defence of semantic realism, Feigl refers the reader to Carnap's (1946, 528), where Carnap says: "I am using here the customary realistic language as it is used in everyday life and in science; this use does not imply acceptance of realism as a metaphysical thesis but only what Feigl calls 'empirical realism'". (Psillos 2009, 308, footnote 4)

270). And this is quite true. For Carnap, in elaborating the technical aspects of Carnap (1956) did indeed assert that only the observational parts of the theory are semantically interpreted in his approach. The semantically uninterpreted theoretical parts are defined implicitly through the postulates of the system. But as I discussed in the previous section, the choice of the meaning postulates (as well as definition and any other kind of convention) could be supplied with some viable pragmatic reasons, to guarantee that they are justified enough to be laid at the foundation of a realist framework (see Carnap 1934). It was how the metaphysical realist semantics of CT had been replaced by pragmatic vindications of methodological naturalism in Carnap's thought. So I have to confess that I feel very tempted to wave away Psillos' objections as relic of some misplaced royalty to the dogma of MR. But the objection carries a vicious technical feature which could not be dismissed without doing an injustice to Psillos' endeavour.

Carnap's reinvention of the Ramsey-sentence approach has been formed around a structuralist idea: "the structure can be uniquely specified but the elements of the structure cannot. Not because we are ignorant of their nature; rather because there is no question of their nature" (Carnap 1956, 46). But by the same token, the view is liable to Newman's objection. So at the end of his paper, Psillos noted that there is a challenge that the Carnapian should face to obtain the viability of her structural realism:

> If it is not to become a trivial thesis, nor to collapse to scientific realism, then at least a story needs to be told as to how it can survive the Newman challenge. (Psillos 2000a, 275)

Psillos did not think that the approach could, in its present formulation, face the challenge. In a nutshell, Newman's objection holds that:

> Any collection of things can be organised so as to have the structure W, provided there are the right number of them. Hence the doctrine that *only* structure is known involves the doctrine that *nothing* can be known that is not logically deducible from the mere fact of existence, except ('theoretically') the number of constituting objects. (Newman 1928, 144)

And obviously, merely knowing about the number of constituting objects is not enough for maintaining a realist stance. To overcome the objection, the Carnapian should set a restriction on the range of the variables

which set up the theoretical structures. Otherwise, in confrontation with the experience, the theoretical structures would be multiply realizable: having a formal structure is not enough for determining the uniquely true set of the referents of the structure. In other words, as Psillos indicated, there is a dilemma that the advocate of the Carnapian structural realism has to face:

> Either they should choose to avoid addressing the issue of which structures are specified by theories and their Ramsey-sentences, thereby making the claim that theories are true empty and a priori true. Or they should have to appeal to non-structural considerations in order to say which structures are important, thereby undermining the distinction between knowledge of structure and knowledge of nature upon which they base their epistemology and their understanding of theories. (Psillos 2000a, 274)

Psillos has even offered a solution to the objection: the structures should be restricted by contriving a stipulation about the necessity of ranging the variable over the natural classes. This part of solution does not *per se* contradict the structuralist approach. But to fulfil this task, Psillos suggested, the structural realist should be able to make a distinction between natural and non-natural classes, and she has to appeal to some "non-structural knowledge": "the only way to do that is to rely on interpreted scientific theories and to take them as their guides as to which properties and relations are the natural constituents of the world" (Psillos 2000a, 274). Carnap, of course, could not possibly comply with such modifications. The anti-metaphysical allegiance accompanying his structuralism nips anything like appealing to pre-[linguistic]-existing natural kind structures in the bud. So Psillos' solution is not a viable option for the advocate of the Carnapian structural realism.

The solution that I am going to suggest in order to resolve the problem expectedly amounts to appealing to the role of the pragmatic factors in restraining the number of structures and fixing the actually feasible vessels of conveying the factual content. The explanation is simple enough and could be spelled out briefly: the *methodological practical considerations*, or (in semantical period) the practical-pragmatic reasons, which have been the substantial ingredients in the establishment of the Carnapian realism, could very well be appealed to in restricting the range of the constitutive variable

(as well as relations) of the structures of the theory. Of course, these meth-
odological considerations are not to be understood as some formal logical
properties attached to structural relations.[8] They are the *meta-logical* prac-
tical considerations which fix the relevant relation between the structure
and the nature. Sorting the structures according to their (say, computa-
tional and empirical) simplicity, expedience, efficiency, fruitfulness, etc.,
would remarkably help in constraining the number of the appropriate can-
didates for representing the modal relations between certain domains of ob-
jects. Theoretically, it is still possible for two or several structures to organ-
ize the same number of things with an equal simplicity, efficiency, etc., but
practically, finding even one appropriate structure which could do the job
appropriately enough would be quite rewarding.

The meta-logical information (about simplicity, expedience, etc.) does
not need to be encoded within the structures, and so, and to Psillos' de-
light, we can say that there are indeed "*non-structural* considerations" at
work in setting restrictions on variables and relations of the existential-
ised structures. We may even go so far to add that the distinction be-
tween knowledge of structure and knowledge of nature is to some extent
encroached in this reading of the Carnapian stance. We already saw how
the objectivity-related elements, working in the capacity of pragmatic fac-
tors, leave their impressions on the choice of the rules and postulates of
the system, and penetrate into LFs to influence the semantical and syn-
tactical relations therein. In this way, we can assert that the distinction
between knowledge of structure and knowledge of nature is as flimsy as

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[8]   In his examination of Carnap's possible answer to Newman's objection, Ainsworth
(2009) disapproved Carnap's approach, and blamed him for inventing logical predicates
at whim. According to Ainsworth's reading (based on what Carnap said in his *Aufbau*):

> The essence of the proposal is the suggestion that we should take importance
> (or as Carnap [1967] calls it, 'foundedness') as a primitive (second-order) logi-
> cal property that attaches to some relations (in the way that identity is some-
> times taken as a primitive logical relation that holds between some pairs).
> (Ainsworth 2009, 163)

My point is that if perhaps not in *Aufbau*, but at least in Carnap's later syntactical and
semantical endeavours, there were the pragmatic-practical reasons, which could be used
in the capacity of an unfailing license, and applied in singling out certain logical rela-
tions, and highlighting them against the background of the others. And these were not
formal logical properties attached to relations, but meta-logical considerations.

the conventional border which has been traditionally drawn between the domains of semantics (concerning the rules of formation and inference of an artificial language) and pragmatics (which in general sense of the term, has been defined as the study which involves speakers of scientific languages... from methodology to the sociology of science (and beyond); see Uebel 2013, 530). Whether the distinction is or is not completely undermined remains beyond the scope of this study. Be that as it may, I showed that Psillos' dilemma is resolvable in Carnapian terms and Newman's challenge does not seem to be a threat to this form of structuralism anymore.

4. Concluding remarks

Let's grant that factual and the conventional elements, or as Quine (1936, 125) once described them – the white and the black threads of the lore – are not quite separable from one another. Although the links are smeared with conventionalism, yet there actually survives a theory of "factual reference" which is strong enough for linking the language to the real, empirical, and objective domain in an indirect way, and yet is subtle enough to not entrap us in the burdensome metaphysical speculations about the nature of the external world or an unexplainable correlation between language and reality. It was with regard to this later point that Carnap said that these questions [of efficiency, fruitfulness, and simplicity] cannot be identified with the question of realism. For the factuality-conducive links which had been carved out within the pragmatically encroached frameworks were not designed to be as cumbersome as metaphysical chains. There is no straightforward semantical story about the hidden access strips between language and reality, nor has any ontological record been presented to account for the pre-existence of the real entities as the blue-prints of the terms of the theory. Carnap's thesis should not be understood as implying that "those who accept and use a language are thereby committed to certain "ontological" doctrines *in the traditional metaphysical sense*" (Carnap 1956, 45, my emphasis). But if we could accept that for obtaining the plausibility of our view, we cannot appeal to methods other than the intellectual tools used in scientific practice, as methodological naturalism persuade us to believe, then we can enjoy all of the benefits of the realistic stance without

paying any unreasonable metaphysical price.[9] As Richardson (2003) indicated, the notion of methodological naturalism had been inspired to Carnap by the pragmatists of the day.[10] And I believe that a respectable though modest version of realism could be built upon this common legacy.

Far from being ashamed on account of its metaphysical poverty, this form of realism, which was founded upon the referential links fostered by pragmatic factors, can stare any other form of realism out of the countenance in a debate over its philosophical richness, any day of the week. There are worse things than being in poverty, after all. Being uncared for, unloved and unwanted are such things. Being in endless and fruitless meta-

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[9]   This point is mainly inspired by Richardson (2003, 21), who explained how Carnap had embraced the methodological naturalism, without making any commitment to metaphysical naturalism. There is some similarity in Richardson and Laudan's conception of methodological naturalism as an empirical discipline of regularities which govern the research (cf. Laudan 1996, 110). But in the present context, the concept is calibrated according to the concerns that Carnap had originally shown about the problem of choice of LF and the factors that rule the choice.

[10]   Richardson showed that the term that Carnap and Charles Morris (i.e. the pragmatist of the day) actually used for "methodological naturalism" was "scientific philosophy" (see Richardson 2003, 21). Scientific Empiricism was also the title of Charles Morris' speech at the mentioned meeting, a speech which was planned for reviewing and cherishing the affinities between the aims, methodologies and working plans of logical empiricism and American pragmatism of the day. Participation of Morris (a fervent pragmatist and loyal advocate of Mead and Dewey) to a program which was originally planned by logical empiricists was indeed an early instance of the realization of the very aim of the program.

The concept of "scientific empiricism" was used by Carnap (who perhaps was the original architect of the plan), a few years later, in his "Testability and Meaning" (see Carnap 1936) in an illuminating footnote which was presented to define the main characteristics of philosophical approach of the philosophers who were allegedly called logical positivists:

> It has sometimes been called Logical Positivism, but I am afraid this name suggests too close a dependence upon the older Positivists, especially Comte and Mach. We have indeed been influenced to a considerable degree by the historical positivism, especially in the earlier stage of our development. But today we would like a more general name for our movement, comprehending the groups in other countries which have developed related views... The term 'Scientific Empiricism' (proposed by Morris [i] p. 285) is perhaps suitable. (Carnap 1936, 422)

physical feuds is more undesirable than paying the price of realism by the pragmatist coin.

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