

System, Hypothesis, and Experiments: Pierre-Sylvain Régis

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Abstract: Pierre-Sylvain Régis's Cartesianism is quite singular in seventeenth-century French philosophy. Though, can we speak of a form of experimental science in Régis's work? After exploring his notions of "system" and "hypothesis," I will define his position in relation to Claude Perrault, Jacques Rohault, and the Royal Society. I argue, first, that the contrasts which traverse French science are not so much about the use of experiments but about whether or not observational data can be traced back to hypotheses and to a coherent system. Secondly, that we can detect a significant similarity between Boyle's positions and the views expressed by Perrault and also by Régis. Lastly, that French science, even in its Cartesian version, is much more probabilistic than English experimental philosophy.

Keywords: Pierre-Sylvain Régis, system, hypothesis, experimental natural philosophy, speculative natural philosophy, Claude Perrault.

Pierre-Sylvain Régis's Cartesianism is quite singular in the panorama of seventeenth-century French philosophy. His *Système de philosophie* (1690) combines in innovative ways the different philosophical traditions upon which it draws. Despite his obvious debts to Jacques Rohault—including from a biographical point of view, since Rohault introduced him to the Cartesian philosophy that led to his abandoning the Sorbonic training meant to make him a theologian—, Régis distinguished himself from his master by his ambition to provide a complete and exhaustive course of Cartesian philosophy and to make explicit the metaphysical foundations of physics.¹ There is, however, a similar attempt in French Cartesianism: Jacques Du Roure produced a comprehensive textbook of philosophy inspired by Descartes's thought.² His attempt, however, was passed over in silence by the mainstream of Cartesianism, within which references to his pioneering work are few and far between. It is therefore difficult to determine whether he could have inspired Régis's project.

The systematic ambition also distinguishes Régis from Dom Robert Desgabets, who provided him with much of the inspiration behind his gnoseology alongside several metaphysical theses.³ In this regard, it is also necessary to

¹ For an overall description of Régis's philosophical personality, see Del Prete 2019.

² On this intriguing personage, see Roux 2020; Roux 2021.

³ See the seminal book Schmaltz 2002.

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mention that the theological interests of Régis are most evident in his last work, which on the one hand seems to detail metaphysical theses on God and his action, and on the other to have clearly had an apologetic goal (against Spinozists and Socinians): it does not share with Desgabets the same tone, nor does it have the same extent of the theological interests of Desgabets.

Régis's refutation of Malebranche consists essentially in the rejection of occasionalism and the theory of vision in God. Régis does not hesitate, however, to adopt some of the Oratorian's theses and use them consistently with his dismissal of any purely intellectual activity of the soul. A Cartesian metaphysics which risks association—because of its definition of substance and modes—with Spinoza's thought, coupled with a sensualist gnoseology and a physiology of the brain that allows for an explanation not only of sensations and imagination but also of judgment and reason without an appeal to the *mens*: such, in a nutshell, is the philosophy of Régis.⁴ His gnoseology, in particular, caused him to be classified among the radical Cartesians. On this basis, can we speak of a form of experimental science in Régis's work? And if such an experimental science stands, how can we situate it in relation to the scientific practices of the time?

I will focus on three questions. First, I will explore what Régis means by system and what kind of use can be made of hypotheses. This will then allow me to define Régis's position in relation to Claude Perrault who not only represents an anti-metaphysical form of empiricism but is also hostile to any generalization going beyond sense experience and leading to general systems about the nature of phenomena. Lastly, I will compare Régis's views with those of his master in Cartesianism, Rohault, and of some members of the Royal Society in the 1660s, in order to highlight the similarities and differences with Régis's thought.

1. In Search of a System: Completeness and Order

Investigating the *Physique* of Régis is not an easy task. While his metaphysics, logic, and morals have been studied extensively,⁵ the same cannot be said for his physics, despite the fact that it is, quantitatively, the main part of his work. If we take as a reference the 1691 edition of the *Cours entier de philosophie*—which notably names Descartes on the cover page—, we find that, of the three volumes that make up the work, logic occupies 62 pages; metaphysics, 209; physics, 1,247; and morals, 151 pages. Thus, the *Physique* is almost six times as extensive as the *Métaphysique*. Not only is the *Physique* imposing by sheer weight of page numbers, but also by the breadth and scope of the subjects with which it deals: from the definition of the body, of motion and rest to the explanation of the passions of the soul, it also encompasses cosmology, physics itself, chemistry, botany,

⁴ Schmaltz 2002, 107–29 and 245–51. See also Del Prete 2018a; Del Prete 2018b.

⁵ In addition to the above-mentioned book by Tad Schmaltz, see Des Chene 2002: despite its title (“Cartesian Science: Régis and Rohault”), this article deals with Régis's theories of creation, of eternal truths, and of ideas.

anatomy, animal and human physiology. In this vast picture, Régis relates the views of his contemporaries, takes a stance in relation to them, and sometimes polemicizes with those with which he disagrees. In writing to Leibniz on 30 May 1691, Simon Foucher had immediately grasped this aspect:

Vous scavez, comme je pense, que Mr Regis a donné au public un grand systeme de philosophie en in quarto avec plusieurs figures. Cet ouvrage renferme plusieurs traitez de plus considérables comme de la percussion de Mr Mariotte, de la chymie de Mr l'Eméri, de la medecine de Mr Vieuxsang et de Mr du Vernai. Il y parle mesme de mon traité des Hygrometres quoy qu'il ne me nomme pas. La Physique de Mr Rohault y a bonne part, il y refute le P. de Malbranche, Mr Perraut, Mr Varignon; le 1er touchant les idées, le 2e touchant la pesanteur, et le 3e, lequel a esté nouvellement receu de l'Academie royale des Sciences touchant la pesanteur aussi. Les Metheores du Pere l'Ami font encor une partie des ornements de cet ouvrage et le reste est de Mr Descartes. Ce n'est pas que Mr Regis ne se soit conduit assez adroitement dans son systeme surtout dans sa morale (Foucher to Leibniz, 30 May 1691, A II/2, 421–22).⁶

This passage merits some commentary. While having polemicized with Malebranche some time before, Foucher is not interested in Régis's theory of ideas nor his metaphysics: apart from a very quick reference to morals, all his attention is focused on the *Physique*. He recognizes the composite nature of this work: without saying so explicitly, the long list of sources enumerated by Foucher testifies to Régis's lack of originality. This, however, is not something for which Foucher believes Régis should be reprimanded: on the one hand, Régis very often acknowledges his debts by explicitly referring to the authors whose theories and observations he borrows; on the other, the *Système* does not aim to bring new knowledge, but to organize in a different way what is already known. It is again a letter, sent by Jean Robert Chouet to Pierre Bayle, which attests that Régis's contemporaries had perfectly understood what was his purpose:

Le cours de Mr Regis, dont vous me parliés, Monsieur, est assurément un bon ouvrage, et Mr Leers, à mon avis, n'y perdra rien; car, encore que ce qu'il y a de nouveau ne soit pas grand-chose; cependant, comme c'est un cours complet, et qui est escrit avec beaucoup de netteté, il sera recherché (Chouet to Bayle, 25 August 1684, Bayle 1999–2019, vol. 5, 52).

According to an aim that is very clearly indicated in the preface to the *Système*, Régis acknowledges that his goal is not to make discoveries, but “d'établir un Système par lequel on peut expliquer uniformément celles qui sont déjà découvertes.” Nevertheless, this systematization allows him to give new definitions: those he quotes are related either to metaphysics (spirit, soul, understanding, will) or to physics (movement, rest, quantity, prime matter). For him, the singularity of his book, compared to other expositions of Descartes's philosophy,

⁶ On Régis's sources, see also Mouy 1934, 147–66.

resided in the fact that the *Système* treats all philosophical disciplines and exposes them in such a way as to join together principles and consequences in a coherent whole:

Ceux qui n'ont fait que des traités séparés de Logique, de Métaphysique, ou de Morale, n'ont rien donné de plus complet; il n'y a que ceux qui ont rassemblé en un seul corps toutes les parties de la Philosophie, qui aient tenté le même dessein que moi: Mais si l'on considère bien leurs ouvrages, on y trouvera si peu de rapport entre les parties de ce corps qu'ils ont essayé de composer, que sans leur faire tort on peut dire que cet assemblage ne donne point l'idée parfaite d'un tout bien régulier; car il ne suffit pas pour faire un corps naturel, de joindre plusieurs parties ensemble, il faut aussi que ces parties aient de certains rapports entre elles, sans lesquels elles ne produisent qu'un corps difforme et monstrueux (Régis 1691, vol. 1, *Préface*, unpaginated).

Régis's aims are twofold. First, he wants to treat all the parts of philosophy and secondly, he wants to build a coherent and orderly whole. To treat all the parts of philosophy he must take up the same challenge as confronted the other Cartesians who intended to write a complete course of philosophy: he must integrate a logic into the tree of knowledge described by the *Lettre préface* to the *Principes* (which includes metaphysics, physics, and the products of these sciences—namely, mechanics, medicine and morals); he must also develop the parts of the Cartesian tree that Descartes himself had never written (Ariew 2014). The *Système* thus contains a *Logique*, a *Métaphysique*, a *Physique*, and a *Morale*. This general design is very close to that of Du Roure's *La philosophie divisée en toute ses parties* (1654); the use of Hobbes's *De cive* (1642) in the section devoted to morals is another common thread between the *Système* and Du Roure.

Concerning the second aim—the building of a coherent order—, Régis is very critical of his contemporaries, as the previous quotation shows. The order that Régis intends to follow is determined by the application of analysis: he begins with what is best known to us—namely, ourselves. Having devoted a few pages of his *Système* to a summary of the *Art de penser* (Milani 2012), Régis exposes Descartes's metaphysics; his close following of the analytic principle with which he begins provides us with the definition of the body and allows us to move on to physics. The *Physique* ends with the study of the passions and the faculties of the soul, allowing Régis to move on to morals; that is to say, the roles of the above-mentioned faculties in the free choice of good and evil:

Ainsi la Morale suppose la Physique; la Physique suppose la Métaphysique; et la Métaphysique la Logique: et par ce moyen toutes les parties de la Philosophie ont un tel rapport, et une telle liaison ensemble, que j'ai cru que le tout qui résulte de leur assemblage, pouvait justement être appelé le *Système général de la Philosophie* (Régis 1691, vol. 1, *Préface*, unpaginated).

The absence of a right connection between the parts has unfortunate consequences not only for the general structure of the textbooks, but also for their

specific content. Metaphysics is an assemblage of abstract notions; morals is a logic or a disguised metaphysics; physics consists of experiences piled up one on top of the other, lacking coherent explanations insofar as it involves the use of the most disparate hypotheses:

En effet, on ne voit dans les Traités de Physique qu'expériences entassées les unes sur les autres, avec des explications qu'on ne peut réduire aux mêmes principes, parce qu'elles sont fondées sur des hypothèses qui n'ont, aucune analogie entre elles. On ne trouve dans la Métaphysique que des notions abstraites des substances corporelles, et des substances intelligentes. Enfin on ne rencontre dans la Morale que des questions de Logique, ou des maximes de Métaphysique, qui n'ont aucun rapport avec la connaissance des devoirs de l'homme, qui est pourtant le vrai objet de la Morale (Régis 1691, vol. 1, *Préface*, unpaginated).

2. System and Hypotheses: Régis and Perrault

When, in the *Préface* to the *Système*, Régis contrasts his approach with that of some of his contemporaries who overload their books with a “multitude confuse de propositions peu liées et mal suivies,” he is not referring to his Peripatetic opponents, but to a famous member of the Académie des Sciences, Claude Perrault. Perrault is the author of the *Essais de physique*, published in 1680. In the *Préface* to that work, the author distinguishes between the philosophical and the historical parts of physics (Perrault 1680, vol. 1, *Préface*, unpaginated). The first one looks for causes, and formulates hypotheses but results in probabilities. The second accumulates experiences and its conclusions are provisional, since they can be falsified by other experiences. In both cases, the research can only be endless: the hypotheses of the first are indeed probable, and the facts of the second do not eliminate the doubts. The purpose of physics is thus the search for novelties and the formulation of explanations that we know to be very provisional. However, one should not completely give up the search for causes: Perrault distances himself from other physicists who have an even more empirical attitude than he does. We can therefore freely put forward hypotheses and make use of all possible systems, without taking a definitive position in favor of one or the other: assembling into a single system the hypotheses made to explain our experiences is beyond our understanding. Our knowledge is indeed finite and imprecise, whereas the world is the product of an infinite wisdom: to choose this or that system, while discarding the others, would be tantamount to trying to determine the *modus operandi* of God.

The partitions that we find in the *Avertissement* at the beginning of Régis's *Physique* are very close to those of Perrault. Régis sketches an opposition between the Ancients, who looked for the causes of phenomena whilst neglecting the facts, and the Moderns, who “font consister toute la Physique dans la découverte de nouveaux faits” (Régis 1691, vol. 1, 275–76). He speaks about speculative physics and practical physics. Régis does not reject Perrault's probabilism: he clearly distinguishes between mathematical demonstrations and physical explanations

(Régis 1691, vol. 1, 275). Mathematics studies mathematical bodies. It can infer the properties of these bodies from definitions and its demonstrations are absolutely certain. Speculative physics studies physical bodies, whose parts are insensible. It does not use a deductive process but guesses the causes from the effects. It does not develop demonstrations. Its explanations are only probable. We can measure the distance between Régis and Descartes by comparing the *Système* with a letter to Mersenne: Descartes undoubtedly acknowledges that there is a difference between the mathematical and physical demonstrations, but argues in favor of their being equally demonstrative. The strength of physical demonstrations is threefold: the principles of physics have been demonstrated at the metaphysical level, they are not contrary to experiences, and they are logically correct in their construction:

Vous demandez si je tiens que ce que j'ai écrit de la réfraction soit démonstration; et je crois que oui, au moins autant qu'il est possible d'en donner en cette matière, sans avoir auparavant démontré les principes de la Physique par la Métaphysique (ce que j'espère faire quelque jour, mais qui ne l'a point été par ci-devant), et autant qu'aucune autre question de Mécanique, ou d'Optique, ou d'Astronomie, ou autre matière qui ne soit point purement Géométrique ou Arithmétique, ait jamais été démontrée. Mais d'exiger de moi des démonstrations Géométriques en une matière qui dépend de la Physique, c'est vouloir que je fasse des choses impossibles. [...] Car on se contente, en telles matières, que les Auteurs, ayant présupposé certaines choses qui ne sont point manifestement contraires à l'expérience, aient au reste parlé conséquemment et sans faire de Paralogisme, encore même que leurs suppositions ne fussent pas exactement vraies (Descartes to Mersenne, 27 May 1638, AT 2, 141–42).

Régis outlines a virtuous circle between practical and speculative physics: practical physics accumulates experience allowing us to know effects. Speculative physics puts forward hypotheses that amount to explaining phenomena by a suitable arrangement of the parts of matter. It then brings these hypotheses back to the first truths. If these two steps are taken correctly, we can conclude that the hypotheses are proven and that we have explained the effects.⁷

However, in some situations, several hypotheses can explain a single phenomenon. When we have various explanations of the same experiences, equivalent in their capacity to give reasons for all their aspects, the choice of the best explanation can be arrived at by several different approaches. The first is to choose the supposition conforming to the laws of nature that have been previously stated. We have a concrete example of this approach in the *Système*: reference to the laws of nature allows Régis to discard the hypothesis that mus-

⁷ Desmond Clarke proposed a very insightful analysis of the Cartesian use of hypotheses/conjectures: Clarke 1989, 131–63; I would just like to add that Régis's probabilism concerns physics in general, not just explanations of phenomena that result from the action of parts that are beyond the senses.

cular contractions depend on fermentation alone or that the movements of our limbs are caused by the mere change of figure of the muscles, without the help of any additional matter in their fibres (Régis 1691, vol. 2, 505).

Alongside this criterion of choice, however, there are others: on some occasions, faith tells us that a hypothesis is to be rejected, at least until there is no experimental evidence to the contrary; in other cases simplicity decides between two otherwise equivalent hypotheses. Régis uses the first criterion in the case of the soul of animals: the existence of a soul different from the body but which is unable to exist without its body and which is therefore mortal is rejected as unreasonable. Between the Cartesian mechanism and the hypothesis that animals are endowed with a soul different from the body and capable of existing after death, it is faith that tells us that we must side with Descartes (Régis 1691, vol. 2, 506 and 630–32). It is only simplicity, by contrast, which allows us to decide between two different types of preformism, to reject the supposition that germs are scattered everywhere in nature, and to embrace the view that they are present in females (Régis 1691, vol. 2, 537–39 and 641).

Régis's epistemology is becoming clearer. Logic, metaphysics, and morals are domains where there is no place for suppositions and hypotheses. Physics, on the other hand, is different: physics uses suppositions and hypotheses, thus being a discipline where probability reigns, in contrast to the demonstrative rigor of mathematics. However, the use of hypotheses is subject to precise rules: they must compose a coherent whole, which means that they must be derived from first principles or at least be compatible with them:

Je n'ai rien supposé dans la Logique, dans la Métaphysique, ni dans la Morale; et si j'ai fait quelques suppositions dans la Physique, ce n'a été que pour expliquer ce qu'elle a de plus problématique, avec cette précaution, que les suppositions que j'y ai faites, dépendent absolument des lois générales de la nature, ou au moins, n'y sont pas contraires (Régis 1691, vol. 1, *Préface*, unpaginated).

There is no qualitative difference between hypothesis and system but a quantitative difference, the system being a set of hypotheses:

Il n'y a de la différence entre Système et Hypothèse ou supposition, qu'en ce que l'Hypothèse est un Système plus particulier, et le Système est une Hypothèse plus générale, ou pour mieux dire, le Système n'est qu'un composé de plusieurs Hypothèses (Régis 1690, vol. 1, *Dictionnaire des termes propres à la philosophie*, entry "Système," unpaginated).

Hence, Perrault and Régis share the idea that physics is divided into two different branches, one more theoretical and the other more related to the simple observation of phenomena; they also agree that both should be cultivated, without privileging only one; they describe physics as a probable knowledge formulating hypotheses allowing for the explanation of phenomena. Their dispute exclusively concerns the possibility or impossibility of reducing the hypotheses to a coherent whole, connecting them to primary truths. This contrast is very clear if we compare their statements:

Il y a encore une autre chose qui fait que je ne sçauois estre de l'opinion de la plus grande partie des Philosophes qui veulent que dans la Physique on s'attache à un seul systeme: car puisque il ne nous est pas possible de trouver le veritable, et que le plus vrai-semblable ne sçauoit jamais estre assez pour éclaircir toutes les difficultez d'une matiere si difficile, ma pensée est qu'il le faut recevoir tous; afin que ce que l'un ne sçauoit faire entendre, l'autre le puisse expliquer [...] (Perrault 1680, vol. 1, *Préface*, unpaginated).

Comme la nature agit toujours par les voies les plus simples, nous sommes persuadés que son action ne saurait être expliquée que par un seul système. Le système est donc un ensemble d'hypothèses liées les unes aux autres, capable de mettre en relation les effets et leurs causes, les phénomènes et les premières vérités. Expliquer les effets produits par un corps particulier revient donc à avancer des hypothèses portant sur la taille, la figure, l'arrangement des parties qui composent ce corps et qui sont capables de produire cet effet. Ce qui ne saurait convenir aux hypothèses purement arbitraires, telles que sont celles de la plupart des Philosophes modernes (Régis 1691, vol. 1, 275–76).

But what exactly are the primary truths that lie at the top of Régis's physics? He enumerates these in the *Avertissement* of his *Physique*:

Qu'il y a une nature corporelle qui existe; que cette nature considérée selon quelque grandeur, prend le nom de quantité; que la quantité est divisible par sa nature; que le mouvement local se fait suivant quelques règles; que selon ces règles les parties de la quantité reçoivent certaines figures; que selon ces différentes figures les corps physiques qui sont composés de ces parties sont capables de produire différents effets (Régis 1691, vol. 1, 276–77).

The criticisms addressed to Perrault, under a purely epistemological aspect, hide a background of a metaphysical nature: the truths allowing the construction of a system are indeed those that are at the basis of the Cartesian mechanism. For Régis, indeed, the idea of body includes both extent and existence, as he showed in his metaphysics (Régis 1691, vol. 1, 74–6).⁸

3. Experience: Probable or Certain?

The connections between Régis's *Système* and Rohault's *Traité de physique* are deserving of an extensive and thorough study. I will limit myself here to some surveys concerning probabilism in physics and the role of experience.

If we look at the declarations of principle, we see that there are two important respects in which Rohault's *Traité* differs from the *Système*. The first concerns the use of mathematics; the second, that of experience. Rohault's *Préface* contains

⁸ Régis's physics is founded on metaphysics; in this regard, he is much nearer to Descartes than to Rohault, as Schmaltz argued: Schmaltz 2017, 300–6.

a defense of the usefulness of mathematics in physics and a classification of the uses of experiences and experiments in physics, which either have no equivalent in the *Système*, or are opposed to explicit statements by Régis. While admitting that mathematics is useful, Régis indeed argues—in his *Préface*—that a scientist can be a good physicist without being a good geometer and he emphasizes the difference between the two disciplines. As we have just seen, mathematics is made up of necessary demonstrations, physics only of probabilities; physics is satisfied with comparing the magnitudes of physical phenomena, mathematics claims “aussi connaître avec évidence les rapports exacts qui sont entre elles, ou de combien précisément elles sont plus grandes; ce qui ne regarde en rien la Physique.” The distinction introduced by Régis between physics and mathematics is consistent with his classification of knowledge and his methodology, but it diverges for sure from the scientific approach of Rohault, whose mathematical skills have recently been highlighted.⁹

Regarding experiences and experiments, and their use, Régis does not devote specific attention to this subject. He limits himself to reminding us of the invitation to join reasoning and experience, placed at the beginning of the *Traité*. Rohault, by contrast, distinguishes between three kinds of experiences. The first is the simple use of the senses; the second consists in making experiments that are not guided by a scientific hypothesis, but merely by trial and error; the third, however, serves to test a conjecture, by trying to find a necessary consequence of our suppositions on the nature of a phenomenon (Rohault 1671, *Préface*, unpaginated).¹⁰ The absence of a specific discussion of experiments does not imply a disagreement with Rohault regarding the relationship between experiments and hypothesis: they both affirm that suppositions must show how the mechanical structure of matter can explain phenomena.¹¹ This structure must respect the properties of matter—as attributed by Descartes—size, figure, arrangement of insensible parts. What is astonishing is Régis’s ability to integrate into such a theoretical framework the results achieved by scientists who often had a very different philosophical and epistemological orientation: this is the case for Edme Mariotte, who could hardly be classified as Cartesian, and for Nicolas Lemery.

Another element of continuity between Rohault and Régis is the fact that they share some rules allowing us to choose between different scientific hypotheses: like Régis, Rohault states that he prefers simple explanations (Rohault 1671, vol. 1, 21–2). What seems, however, to be a characteristic particular to Régis is his insistence on conformity to the laws of nature and the systematic coherence of hypotheses. There is agreement on the rejection of experience as

⁹ On the usage of mathematics in Rohault’s *Traité* see Dobre 2020.

¹⁰ Several authors have stressed the experimental character of Rohault’s physics, which differs from the deductive approach of Descartes: McClaughlin 1996; McClaughlin 2003; Des Chene 2002, 194–95; Dobre 2013, 209–15; Dobre 2019; Spink 2018. By contrast, Sophie Roux and Schmaltz do not see profound differences between Descartes and Rohault on the use of experiments (Roux 2013; Schmaltz 2017, 294–300).

¹¹ On the use of experiences among Cartesian scientists, see Clarke 1989, 201–12.

the definitive or even sole criterion for preferring one hypothesis over another, with exceptions to the rule stating that hypotheses must explain all known effects. Rohault, for example, explicitly affirms that one should not abandon a well-established hypothesis because it cannot explain a newly known property of a body. The match between the old hypothesis and the new property indeed could be found later, as happened with the telescopic observations that eliminated a difficulty in the Copernican hypothesis concerning the apparent size of Venus (Rohault 1671, vol. 1, 22).

Similarly, in Régis we find a very clear defense of the hypotheses against the observational data when we can identify another perceptible element that can play the same role as the element that has been discarded by the experience. Let me explain by way of an example: Régis is acquainted with the latest developments in anatomical knowledge, especially those discoveries concerning the brain. He is aware of Thomas Willis's work and he uses the *Neurographia universalis* (1684) of Raymond Vieussens, whom he had met in Toulouse. He no longer identifies the pineal gland as the unifying center of psychological activity and as the seat of the soul. All the functions of imagination, memory, and also the cerebral transcription of the activities of understanding and reason are located in the oval center.¹² What matters, in his opinion, is not the anatomical or physiological detail, but the function that this detail assumed: if this function is preserved, the detail can change without too many problems. The rejection of such an important explanation, in the name of agreement with the evolution of our anatomical and physiological knowledge, does not imply the rejection of the general hypothesis trying to explain by neurophysiology our intellectual functions: it is enough to find a new and more efficient center of cerebral activity. This is the reason why Régis can declare that the hypotheses put forward by Descartes are still valid and why he can still consider himself Descartes's heir while abandoning his master on matters that he deems to be of minor importance. Thus, he can assert that: "tout ce que j'ai dit, [doit] être attribué à *Monsieur Descartes*, dont j'ai suivi la Méthode et les Principes dans les explications mêmes qui sont différentes des siennes" (Régis 1691, vol. 1, *Préface*, unpaginated).

Crossing the Channel, we find some unexpected similarities. Peter Anstey detected the presence of a constant opposition between experimental and speculative natural philosophy in English philosophy in the second half of the seventeenth century (Anstey 2005). While the terminology varies from one author to the next, experimental natural philosophy is fairly consistently understood to pertain to experiments whereas speculative physics is linked to hypotheses constructed from experiments. Perhaps the strongest parallel to the categorization we encountered in Perrault and Régis can be found in Robert Boyle: in the *Proemial Essay* (1657) of his *Certain Physiological Essays*, the practical part of physics is based on experiments while the speculative philosopher seeks the

¹² On this specific topic, see Schmaltz forthcoming; see also Del Prete 2019, 376–77; Del Prete 2023.

causes of phenomena. These two activities must work together to build a sound natural philosophy:

I shall [...] do what is requisite to commend Experimental Learning to you, if I be so happy as to make it out, that Experiments considered in the Lump, or one with another, may very much assist the speculative Phylosopher, that is sollicitous about the causes and reasons of Naturall things; and that the speculative Phylosopher so assisted, may (on the other side) very much improve the Practical part of Physick. And consequently, that both of them may very happily conspire to the Establishing & Advancement of a Solid usefull Naturall Philosophy (Boyle 1999–2000, vol. 2, 23–5).

Hypotheses are not explicitly mentioned in this text: conversely, we can find them a few years later in Samuel Parker's *A Free and Impartial Censure of the Platonick Philosophie* (1666). Here the distinction between experiments and hypotheses becomes an opposition between certainty and uncertainty, a dichotomy also confirmed by the subdivisions of the *Physiologie*: the history of nature, which is based on observations and experiments, is certain and exact; hypotheses are doubtful, uncertain, and probable (Parker 1666, 45–6). However, the uncertainty of the hypothesis does not imply that it should be avoided altogether. Only a few decades later, in texts such as William Wotton's *Reflections upon Ancient and Modern Learning* (1694), do we find a clear-cut condemnation of the use of hypotheses, and we move from a twofold to a threefold partition: the faithful and neat experiments; the theories, i.e., the consequences, immediate results, or manifest corollaries of the experiments; and the hypotheses, now reduced to chimeras:

I do not here reckon the several *Hypotheses of Des Cartes, Gassendi, or Hobbes*, as Acquisitions to real Knowledge, since they may only be Chimæra's and amusing Notions, fit to entertain working Heads. I only alledge such Doctrines as are raised upon faithful Experiments, and nice Observations; and such Consequences as are the immediate Results of, and manifest Corollaries drawn from, these Experiments and Observations: Which is what is commonly meant by *Theories* (Wotton 1694, 244).

It should be noted that in the latter text the fanciful hypotheses are no longer those elaborated by the Ancients, but those found in some modern philosophers who share the same condemnation beyond the albeit lively controversies that have opposed them: Descartes, Gassendi, and Hobbes. Anstey interprets this growing hostility to hypotheses as the effect of the shift from an era in which the main polemical target was peripatetic philosophy, to one in which the enemies instead became some seventeenth-century philosophers perceived as heralding materialism. The result is to hold experimental natural philosophy as entirely certain: this choice contrasts sharply with the conjectural nature of science supported by Perrault and Régis, who never claimed observations and experiments to be something capable of providing us with indubitable and certain knowledge.

We can therefore draw three conclusions. First, the contrasts that traverse French science and oppose more pro-Gassendist philosophers and Cartesian

philosophers are not so much about the use of experiments and adherence to a more or less abstractly deductive model of science, but about whether or not observational data can be traced back to hypotheses that can constitute a coherent system. Secondly, Anstey's article allows us to detect a significant similarity between Boyle's position and the views expressed by Perrault and, to some extent, also by Régis: Perrault's and Régis's partitions of physics are quite similar to Boyle's definition of experimental and speculative natural philosophy; they all share the claim that we must aspire to a wise use of hypotheses.¹³ This similarity, however, disappears if we look at the English intellectual debate in the following decades: in fact, an accentuation of the absolutely certain character of experiences prevails alongside a strong condemnation of hypotheses, in open polemic not only with Descartes, but also Gassendi and Hobbes. Lastly, French science, even in its Cartesian version, is much more probabilistic than English experimental philosophy, which is very confident in the certainty of observations and experiments: Gassendi's legacy seems active and powerful not only in the early Académie des Sciences and in the work of its renowned member, Claude Perrault, but also in the work of Pierre-Sylvain Régis.

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¹³ Dmitri Levitin has convincingly argued that seventeenth-century French science is definitely experimental and that this character results from multiple influences, among which Francis Bacon's philosophy is not the most decisive: Levitin 2005. See also Roux 2013, 85; Sturdy 1995, 23–4, 124–25, and 157.

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