

Galilei's Strategy of Subjectivisation

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1. The Fundamental Principle of Modern Philosophy

Hume considered a doctrine of Galilean origin the «fundamental principle» of «the *modern philosophy*» (FPMP)¹. The FPMP concerns the status of the proper sensibles of the Aristotelian tradition², which I shall henceforth refer to as *sensible qualities*, and has two components. The first is *irrealist*: sensible qualities are «without any resemblance to the qualities of objects». The second is *subjectivist*: sensible qualities are «nothing but impressions in the mind» that result from an interaction of the sensory apparatus and the material world. The FPMP effectively buries the Aristotelian metaphysics of material objects while handing sensible qualities a lifeline as features of minds.

Before Boyle christened these qualities «secondary»³, Galilei gave the quintessential and first articulation of the FPMP in *Il Saggiatore*. It is commonly assumed – not least by Galilei's chief contemporary crit-

¹ DAVID HUME, *A Treatise of Human Nature. A Critical Edition*, David Fate Norton, Mary J. Norton (eds.), Oxford, Clarendon Press, 2007, 1.4.4.3.

² Colours, sounds, odours, flavours, and various tangible qualities, cf. ARISTOTLE, *De Anima*, Christopher Shields (trans.), Oxford, Oxford University Press, 2016, II.6; ID., *De Generatione et Corruptione*, C.J.F. Williams (trans.), Oxford, Clarendon Press, 2002, II.2, 329b.

³ ROBERT BOYLE, *The Origin of Forms and Qualities According to the Corpuscular Philosophy*, in Michael A. Stewart (ed.), *Selected Philosophical Papers of Robert Boyle*, Indianapolis, Hackett, 1991, pp. 1-96.

ic, Philipp Goff⁴ – that Galilei's irrealist metaphysics is the basis for his subjectivist conclusion. In other words, the irrealist component is more fundamental and grounds the transition to the subjectivist component. The aim of this paper is to explicate and critically examine this transition, which I call the *Strategy of Subjectivisation* (SoS), based on Galilei's views.

To get the SoS clearer into view, I will clarify Galilei's irrealism and subjectivism. (2.-4.) Assuming the correctness of Galilei's irrealist metaphysics, I will argue that two additional assumptions are needed for the SoS to work. (5.1.) First, that sensory qualities are properties of something rather than nothing. Second, that sensory states represent properties of objects by being like them. While the former can be supported by phenomenological considerations (5.2), the latter represents a blind spot in Galilei's thought – ironically Aristotelian in origin – that prevented him from revolutionising the nature of mental representation along with our conception of the natural world (5.3-7.).

2. A Subjectivist Manifesto

Galilei's «scientific manifesto»⁵ *Il Saggiatore* is the modern origin of the FPMP⁶. Surely, there are precedents of the view in ancient atomism, most clearly in Democritus⁷, and the rediscovery of Lucretius *De rerum natura* cannot be underestimated as an influence on Galilei's thought on these matters either⁸. But the articulation of the FPMP as part of

⁴ PHILIP GOFF, *Galileo's Error. Foundations for a New Science of Consciousness*, New York, Pantheon Books, 2019.

⁵ STILLMAN DRAKE, *Galileo at Work. His Scientific Biography*, Chicago and London, University of Chicago Press, 1978, p. 266.

⁶ EDWARD ARTHUR BURTT, *The metaphysical foundations of modern physical science*, London, Kegan Paul, Trench, Trubner & co., 1925, pp. 74-76.

⁷ LEUCIPPUS, AND DEMOCRITUS, *The Atomists: Leucippus and Democritus*, C. C. W. Taylor (trans.), Toronto, Buffalo, University of Toronto Press, 1999, D16.

⁸ LUCRETIVS, *On the Nature of Things*, Martin Ferguson Smith (trans.), Indianapolis, Hackett, 2001, pp. 730 sqq. For story of its rediscovery, see STEPHEN GREENBLATT, *The Swerve. How the World Became Modern*, New York, London, Norton & Co., 2012.

the purely quantitative description of the material world that came to dominate modernity is genuinely Galilei's.

To underscore the Florentine's inventiveness, consider that Kepler did not formulate the FPMP. Kepler, visionary in his mathematical description of planetary motions and presumably never swayed by a view for its outlandishness, took a sustained interest in optics, too. Although he radically altered our understanding of human vision by discovering that the retinal image is inverted, he still held that sensory qualities are properties *outside the subject*⁹. Galilei's invention and legacy thus consist in adding what is distinctive of the FPMP, i.e., a *link* between the quantitative description of reality and the subjectivity of sensory qualities. Galilei's scientific manifesto is at the same time a subjectivist manifesto, immortalised in the following passage from *Il Saggiatore*:

[4] Indeed, without the senses to guide us, reason or imagination alone would perhaps never arrive at such qualities. For that reason I think that tastes, odors, colors, and so forth [1] are no more than mere names so far as pertains to [2] the subject wherein they [appear to us to] reside, and [3] that they have their habitation only in the sensorium [*corpo sensitivo*]. Thus, if the living creature were removed, all these qualities would be removed and annihilated. [4] Yet since we have imposed upon them particular names which differ from the names of those other previous real attributes, we wish to believe that they should also be truly and really different from the latter¹⁰.

Let us begin with an overview of Galilei's claims.

[1]: *Irrealism* articulates the metaphysical basis of Galilei's view in semantic terms. As I will show, the thesis that predicates for sensory qualities, for short: sensory concepts, are «mere names» is to be read

⁹ JOHANNES KEPLER, *Optics. Paralipomena to Witelo & Optical Part of Astronomy*, William H. Donahue (trans.), Santa Fe, Green Lion, 2000. See GEORGE PAVLIDIS, *A Brief History of Colour Theory. Foundations of Colour Science*, Cham, Springer International Publishing, 2021, ch. 4.2.

¹⁰ GALILEO GALILEI, *The Assayer*, in *The Controversy on the Comets of 1618*, Stillman Drake (trans.), Philadelphia, University of Pennsylvania Press, 1960, p. 309.

as their failure to pick out a property of material objects because they do not have sensory qualities.

[2]: *Phenomenology* contrasts the fact that objects do not have sensory qualities with how they present themselves to us, namely as properties of the external objects we experience.

[3]: *Subjectivism* offers an alternative account of what sensory qualities are, namely properties of the experiencing subject. Importantly, this excludes the view that sensory qualities are *nothing*: they are *something*, but just not what they, naïvely, seem to be.

[4]: *Projectivism* explains why we *believe* that sensory qualities are properties of things. Our experience of sensory qualities leads us to introduce corresponding predicates. Availing ourselves of these conceptual resources, we go on to map differences in our experience of an object onto the object experienced. Evidently, this mechanism yields erroneous beliefs if no difference in the properties of the object corresponds to differences in how it appears. Because of *Irrealism*, this is the case for sensory qualities. We thus end up *projecting* appearance into reality¹¹.

How does the SoS relate to these theses? The SoS concerns the transition from a metaphysical thesis that things *have* no sensory qualities to the thesis that sensory qualities are located *in the experiencing subject*¹². *Projectivism* is irrelevant to this transition. What sensory qualities are, not what we believe them to be, is at stake. Our investigation must centre on the relation between *Irrealism* and *Subjectivism*, which I will clarify in what follows to then to then consider whether *Phenomenology* can serve as a bridge between the two.

¹¹ Projectivism is often traced back to HUME, *A Treatise of Human Nature. A Critical Edition*, cit. For a contemporary advocate, see SIMON BLACKBURN, *Spreading the Word. Groundings in the Philosophy of Language*, Oxford, Oxford University Press, 1984; ID., *Essays in Quasi-Realism*, New York, Oxford, Oxford University Press, 1993.

¹² The passage above clearly counts against Husserl's analysis, according to which the methodological decision to mathematically describe reality is responsible for the elimination of sensory qualities, see EDMUND HUSSERL, *Die Krisis der europäischen Wissenschaften und die transzendente Phänomenologie. Eine Einleitung in die phänomenologische Methode*, Husserliana, vol. VI, Walter Biemel (ed.), den Haag, Martinus Nijhoff, 1976.

3. Galilean Subjectivism

Subjectivism is the view that sensory qualities «have their habitation only in the sensorium [*corpo sensitivo*]». Sensory qualities are a property, an accident, of the sensory apparatus. This is a thesis about what sensory qualities *are*, not about what concepts designate, or experiences represent. For sensory qualities to be is for them to inhere in the sensory apparatus of a living being. That distinguishes them from the «real accidents» of objects, namely «shape, number, motion, penetration, and touch»¹³, which I shall call *physical properties*.

Galilei carefully qualifies his thesis by saying that sensory qualities «have their habitation *only* in the sensorium»¹⁴. The *only* does important work here. Otherwise, Subjectivism would be indistinguishable from the trivial thesis that all sensory states are *ipso facto* states of a subject's sensory apparatus. One may assume that sensory experiences involve a *change* in the subject, as they are temporally finite. The natural way to articulate this view is to hold that the subject acquires and then loses a property¹⁵. In this sense, *every* sensory state is a property of the sensory apparatus of a subject, even if it directly presents the world as it is.

Subjectivism differs from this trivial view in claiming that sensory qualities are *nothing but* states of the sensory body, as Galilei's counterfactual conditional confirms: «Thus, if the living creature were removed, all these qualities would be removed and annihilated». Drastically put, sensory qualities would not survive the extinction of life on earth because sensory qualities are *nothing beyond* the living creatures whose sensory apparatuses they inhere in. By contrast, shapes are not only present in the sensory experience of living beings, but also properties of the material objects they perceive. That is why physical properties would sur-

¹³ GALILEI, *The Assayer*, cit., p. 311.

¹⁴ Emphasis mine.

¹⁵ GALEN STRAWSON, *Real Direct Realism*, in Paul Coates, Sam Coleman (eds.), *Phenomenal Qualities. Sense, Perception, and Consciousness*, Oxford, Oxford University Press, 2015, pp. 223-225.

vive the extinction of living beings. Sensory qualities enter and leave the stage together with subjects because they are nothing but experiences.

In sum, Subjectivism is the view that sensory qualities are nothing beyond properties of sensory apparatuses. Sensory qualities are *mere* experiences while physical properties may *also* be experienced. Importantly, Galilei's view neither entails a wholesale elimination of sensory qualities, nor relegates them to a lower ontological rank¹⁶.

We now turn to our investigation of the SoS by clarifying Galilei's Irrealism to then investigate whether Subjectivism is a consequence of it.

4. Galilean Irrealism

Galilei articulates Irrealism in semantic terms, stating that sensory qualities are «no more than mere names» relative to the object they apparently belong to. The following passage clarifies Galilei's usage of the expression «mere name»:

I do not believe that for exciting in us tastes, odors, and sounds there are required in external bodies anything but sizes, shapes, numbers, and slow or fast movements; and I think that if ears, tongues, and noses were taken away, shapes and numbers and motions would remain but not odors or tastes or sounds. These, I believe, are nothing but names, apart from the living animal – just as tickling and titillation are nothing but names when armpits and the skin around the nose are absent¹⁷.

The locution «mere name» is used with the contextual restrictors «apart from the living animal» and «when armpits and the skin around the nose are absent». What role do they play? Consider the first occurrence, which relies on the contrast of *physical properties* and *sensory*

¹⁶ Parallel points are made by ROBERT E. BUTTS, *Some Tactics in Galileo's Propaganda for the Mathematization of Scientific Experience*, in Robert E. Butts, Joseph C. Pitt (eds.), *New Perspectives on Galileo*, Dordrecht, Springer Netherlands, 1978, pp. 66–69.

¹⁷ GALILEI, *The Assayer*, cit., p. 311.

qualities. Physical properties are causally sufficient for, but independent of, the instantiation of sensory qualities in a living body. Sensory qualities, on the other hand, depend on living bodies. Metaphysically speaking, it is constitutive of sensory qualities to belong to living beings. It follows that the extension of sensory concepts would be empty in a context devoid of living animals – which is just what Galilei calls being a «mere name». Hence, «mere name» designates that the extension of a concept is empty *relative to a context*.

This helps clarify Galilei's statement of the FPMP, which reads: «tastes, odors, colors, and so forth are no more than mere names *so far as pertains to the subject wherein they [appear to us to] reside*»¹⁸. The italicised phrase is the contextual restrictor in this case. As we know from *Phenomenology*, sensory qualities «appear to reside» in the material objects we experience. So, sensory concepts are mere names relative to material objects: they do not designate a property of them. In contrast, physical concepts designate «real accidents» in the same context. And the reason for this difference is clear: material objects have *only* physical, and *no sensory*, properties. It emerges that Irrealism is a metaphysical claim in semantic clothing.

Metaphysically speaking, it is noticeable that Galilei calls physical properties *accidents* of material objects. That usage is deliberate. While Galilei holds that the world is to be entirely described in terms of physical properties, he does not take himself to thereby articulate their essences. The metaphysical claims of Galilean science are more limited:

Similarly, I do not understand the true essence of earth or fire any more than that of the moon or the sun; this knowledge is reserved for our understanding when we reach the state of blessedness, not before¹⁹.

¹⁸ Emphasis mine.

¹⁹ Id., *Opere. Edizione Nazionale*, vol. v, Firenze, Tipografia di G. Barbèra, 1895, pp. 187-188. Translated in Id., *The Essential Galileo*, Maurice A. Finocchiaro (ed., trans.), Indianapolis, Cambridge, Hackett, 2008, p. 101.

Galilei expresses considerable humility as to the metaphysical status of his experimentally backed description of reality. Galilean science is not an account of what reality, ultimately, is. It describes the accidents of the objects that populate the universe, not their innermost nature²⁰.

Note also that Galilei's view, thus far, is consistent with *but does not imply that* sensory concepts refer to states of the sensory apparatus, contrary to what two recent commentators hold²¹. Surely, Galilei holds that sensory qualities *are* states of the sensory apparatus. But that view does neither imply nor require our concepts of sensory qualities to *designate* these states, too. For instance, Galilei may hold that sensory qualities are states of the sensory apparatus of a living being while assuming that colour concepts designate "Aristotelian colours," colours as they would be if the world were as it appears²². In fact, there are reasons that count in favour of this view. First, Galilei's account of how we form sensory concepts – based on how sensory properties appear to us – renders it *prima facie* plausible to think that they designate properties of objects. Barring an externalist construal according to which our sensory concepts would, behind our backs, come to designate states of our bodies, that view seems even inevitable²³. As such forms of externalism were not current in Galilei's day, that cannot have been his default position. And there is, as far as I can see, no textual evidence to the contrary. For these reasons, it is implausible to attribute the view that sensory concepts designate bodily states to Galilei.

²⁰ That Galilei takes mathematical properties to be essential to material objects has recently been articulated, but not textually justified, in ID., *Il Saggiatore. Edizione Commentata*, Michele Camerota, Franco Guidice (eds.), Milano, Ulrico Hoepli, 2023, p. XXXIX.

²¹ Ibid., p. XL.

²² For the description of such a scenario, see DAVID J. CHALMERS, *Perception and the Fall from Eden*, in Tamar Szabo Gendler, John Hawthorne (eds.), *Perceptual Experience*, Oxford-New York, Clarendon Press, 2006, pp. 49-125.

²³ For such a construal, see J.J.C. SMART, *Sensations and Brain Processes*, in «The Philosophical Review», 68, 2, pp. 141-156.

In this section, I have shown that Galilei's Irrealism semantically articulates the metaphysical view that no property of material objects corresponds to what we experience as their sensory qualities. Based on this metaphysical view, Galilei concludes that our concepts of sensory qualities are «mere names», which is to say: they fail to designate a property of objects in the actual world because these objects do not satisfy the content in question.

5. Phenomenology as a Bridge to Subjectivism?

5.1. Two Gaps

With *Irrealism* and *Subjectivism* clarified, we know where to start out from and where to go. We can now embark on our search for the SoS that explains the transition from the former to the latter.

Galilei requires an SoS because Subjectivism is not a consequence of Irrealism, or at least not straightforwardly so. Irrealism does little to indicate what sensory qualities are because it merely rules out that they are properties of the material objects we experience. Moreover, Subjectivism is not the only alternative to Irrealism. For one, it does not follow from Irrealism that sensory qualities are *anything at all*, a thesis entailed by Subjectivism. For another, Irrealism does nothing to rule out other accounts of *what* sensory qualities are, if they are something. The SoS must bridge these two gaps. Before I will set about asking which Galilean views could serve to bridge them, I will characterise them more precisely.

That sensory qualities must be properties of *anything* is far from obvious. An alternative view, held by Keith Frankish, casts our experience of sensory qualities as illusory, plain and simple²⁴. Like rainbows are no objects, sensory qualities are no properties. The merits of Frankish's

²⁴ KEITH FRANKISH, *Galileo's Real Error*, in «Journal of Consciousness Studies», 28, 9-10, 2021, pp. 141-146. This view goes back to Dan Dennett, *Consciousness Explained*, Boston, Little, Brown and Co., 1991.

view are of no concern for present purposes. What his view, henceforth: *Illusionism*, shows is important, though: that sensory qualities must be properties *at all* does not go without saying.

Let us bracket Illusionism to focus on the second gap. Does it follow from Irrealism, under the assumption that sensory qualities are properties of something, that they are mere properties of the subject's sensory apparatus? It does not. Even if material objects do not have sensory qualities in any literal sense of the term, they could still be analysed as properties of material objects, e.g., in the Lockean way as the «power to produce various sensations in us by their primary qualities»²⁵. On Locke's account, causal powers of material objects *as well as* the response of experiencing subjects to the exercise of these powers enter the constitution of sensory qualities. Consequently, they are exclusively properties of the object nor the experiencing subject²⁶. This view, call it *Dispositionalism*, shows that, even if sensory qualities are properties of something, and even if they are not categorical properties of objects *qua* Irrealism, it does not follow that they are mere properties of the experiencing subject²⁷.

What Galilean resources are available to bridge these gaps? The natural place to look is a thesis we have so far largely ignored: *Phenomenol-*

²⁵ JOHN LOCKE, *An Essay Concerning Human Understanding*, Pauline Phemister (ed.), Oxford, Oxford University Press, 2008, 2.8.10; MICHAEL AYERS, *Primary and Secondary Qualities in Locke's Essay*, in *Primary and Secondary Qualities*, Lawrence Nolan (ed.), Oxford, Oxford University Press, 2011, p. 137. A concise profile of the competing Galilean and Lockean accounts of sensory qualities is to be found in ANTONIA LOLORDO, *Gassendi and the Seventeenth-Century Atomists on Primary and Secondary Qualities*, in Lawrence Nolan (ed.), *Primary and Secondary Qualities*, Oxford, Oxford University Press, 2011, pp. 62–80.

²⁶ JOHN McDOWELL, *Values and Secondary Qualities*, in *Mind, Value, and Reality*, Cambridge (Mass.), London, Harvard University Press, 2002, p. 133. For a contemporary articulation for the case of colours, see PAUL A. BOGHOSSIAN, J. DAVID VELLEMAN, *Colour as a Secondary Quality*, in «Mind», 98, 389, 1989, pp. 81–103.

²⁷ Dispositionalism also shows that subjectivism is not a consequence of atomism or materialism, especially on Galilei's conception of atoms, which are not featureless. On Galilei's atomism, see FRED ABLONDI, *Reading Nature's Book. Galileo and the Birth of Modern Philosophy*, New York, Peter Lang, 2016, pp. 59–60.

ogy. I will first investigate whether it can serve to exclude Illusionism, to then ask whether it offers reasons against Dispositionalism.

5.2. Phenomenology *contra* Illusionism

To offer reasons against Illusionism, Phenomenology must support the view that sensory qualities are properties of something. How could it do so? As it is coherent to suppose that sensory qualities are not properties of anything, we should not expect Phenomenology to show that Illusionism is false. What we can expect, though, is a reason that renders Subjectivism more plausible than Illusionism. To see how Phenomenology can support a case against Illusionism, let us clarify Galilei's theses about our experience of sensory qualities.

Two points are salient in Galilei's discussion of how sensory qualities appear. First, Galilei presupposes that there are differences among sensory qualities, both on the level of types (colours and odours, say) and tokens (red and blue, say). Galilei further supposes that we would «never arrive at such qualities» if we did not have «the senses to guide us». This view requires that the difference between sensory qualities is drawn exclusively based on experience, which entails that it must be *present* in experience. Thus, we must assume that each sensory quality has a *distinctive experiential profile*. Second, Galilei's holds that sensory qualities «are no more than mere names so far as pertains to the subject wherein they [appear to us to] reside». As these «subjects» are the material objects our experience is about, Galilei must hold that we experience sensory qualities as parts of, as belonging to, material objects. Taken together, Galilei holds that sensible qualities are phenomenally distinct features that we experience as belonging to the denizens of the external world.

Phenomenology gets us closer to Subjectivism once we realise that Galilei holds (as part of Projectivism) that the experiential profile of sensory qualities is indispensable for our understanding and conceptualisation of them. As he puts it, reason and imagination would not be able

to grasp or form sensory concepts if we had no experience of them²⁸. But if we are dependent upon experience to have even the slightest inkling of a sensory quality, we are by the same token bound to conceptualise them *according to* experience. It follows that we form sensory concepts whose proper designation is a property, or accident, as opposed to a substance, say. So interpreted, *Phenomenology* lends plausibility to accounts of sensory qualities as properties of material objects.

Based on this reasoning, a case against Illusionism can be mounted. For an item whose understanding and conceptualisation constitutively depends on experience, experience also fixes the *kind* of item it is. That is because we have no other way of accessing what items of this kind could be. Correspondingly, concepts which we introduce to designate that item are also dependent on experience. So, they cannot but designate an item of the kind experienced. Now, sensory qualities do so depend on experience. And they are experienced not as substances, but as properties, or accidents, of material objects. So, candidate referents of concepts of sensory qualities must be properties of material objects, too. And for this reason, an account of sensory qualities that accounts for them as an instance of the same metaphysical category as they appear to belong to, is, other things equal, to be preferred. That is because an account that construes sensory qualities as items of a radically different sort than we experience them cannot account for the fact that we are dependent on experience to understand what this account is even about. Subjectivism has this advantage over Illusionism.

This train of thought lends plausibility to Galilei's disregard for Illusionism, the option that sensory qualities might not be properties of anything. The sketch of an argument I gave relies on Galilean theses, but is not formulated by him in this way. I do, of course, not want to suggest he had anything like this in mind. My goal is to indicate how one could rationally motivate Subjectivism. That is, it serves the purpose of understanding his view as rational based on theses he accepts.

²⁸ A thought reminiscent of the so-called «knowledge argument», see FRANK JACKSON, *Epiphenomenal Qualia*, in «The Philosophical Quarterly», 32, 127, 1982, pp. 127-136.

Let us grant that the case against Illusionism based on Phenomenology is successful. With that, we are at best half-way on the path to Subjectivism. We also need to rule out more complex analyses, such as *Dispositionalism*, which do respect the constraint that colours must be cast as properties.

5.3. Limits of Phenomenological Arguments in Metaphysics

Our phenomenological argument leaves room for all accounts that construe sensory qualities as properties of some sort, even if they do not agree with Subjectivism that they are properties of the experiencing subject. Consider *Dispositionalism*, which construes sensory qualities as an amalgam of the propensity of material objects to affect our sense organs and our response to such events. The Dispositionalist can well accept that material objects do so only by virtue of their physical qualities, while not endorsing full-blown Subjectivism. Clearly, more resources are needed for the SoS to succeed.

What are the prospects of pushing the argument based on Phenomenology further? Can we not argue, by the same token, that what appears to us when we experience, say, a red tomato, is certainly anything but a disposition? And does that not rule out an account of colours in terms of dispositions?

Matters are not as simple as that. Two points must be distinguished. First, it is one thing to argue that sensory qualities must be properties. It is another thing to hold that sensory qualities must a *specific kind* of property. Second, it is also not evident that for sensory qualities to be properties *at all*, these properties must be exactly as they appear.

Regarding the first point, we must ask whether Phenomenology rules out that what appears can be cast as a relational or dispositional property, say. This line of reasoning is not promising, however. On the contrary, we often experience that an object's intrinsic properties remain the same while its sensory qualities change: changing lighting conditions influence what colour we experience an object as having, wind-conditions influence whether we smell an odour at all, and the

direction of travel and speed of a source of sound relative to an observer (think of an ambulance driving past) influences the pitch experienced by that person. Hence, our experience of sensory qualities does not rule out that sensory qualities are relational, dispositional, or some other complex sort of property.

The second point requires addressing the role of Phenomenology in our metaphysical account of sensory qualities more broadly. To do so, let us distinguish between *reliable* and *faithful* representations, following Robert Pasnau²⁹:

Reliability: A perceptual experience is *reliable* if it presents *differences in the properties of the things on which it depends*.

Faithfulness: A perceptual experience is *faithful* if it is, one, reliable and, two, *presents a property of the object as it is*.

Reliability and faithfulness concern the relation between the *qualitative character* of an experience and its *content*. To experience a property faithfully is to have direct access to the property itself. E.g., the perception of shapes presents, perspectival distortions aside, the property itself³⁰. Therefore, a faithful experience of a property licenses the judgment that the world is as it appears.

Reliability, on the other hand, does not afford such direct access to properties³¹. E.g., Locke's account of sensory qualities is naturally construed in terms of reliable, but not faithful representation: sensory qualities represent differences in the powers of things by virtue

²⁹ ROBERT PASNAU, *After Certainty. A History of Our Epistemic Ideals and Illusions*, Oxford, Oxford University Press, 2017, p. 66.

³⁰ E.g., CHRISTOPHER PEACOCKE, *Truly Understood*, Oxford, Oxford University Press, 2008, pp. 29–35.

³¹ Reliability in this sense is not necessarily equivalent with the statistical phenomenon commonly so-called in contemporary epistemology, although it might be an admissible way of cashing the relevant notion out. For such an account of reliability, see ALVIN I. GOLDMAN, *What is Justified Belief?*, in George S. Pappas (ed.), *Justification and Knowledge. New Studies in Epistemology*, Dordrecht, Boston, Reidel, 1979, pp. 1–24. Thanks to Vincenzo Fano for pushing me to clarify this point.

of causing different experiences in us, but the powers they represent are nothing like the phenomenal character of a sensory quality. Consequently, merely reliable experiences do not come with an epistemic licence to judge that the world is as it appears.

The notion of a reliable experience helps us to spell out the consequences of *Irrealism* and *Phenomenology* more precisely. It shows that it may be perfectly legitimate to introduce concepts for properties of objects based on experiential differences even though their appearance does not present the *properties* we are confronted with. If differences in the world match differences in experience, we are still presented with properties of objects. It is just that experience itself puts us in no position to spell out *what in the world it latches onto*³².

Once the possibility of merely reliable experiences is granted, it is easily appreciated that Galilei can at best exclude, based on *Irrealism*, that sensory qualities are *faithful*. If objects do not have sensory qualities, objects cannot be as they appear in that respect. That part of his train of thought is sound. Yet, the conception of a reliable experience shows that sensory qualities could represent a property of the object without appearing as it is.

Where does that leave us with respect to the SoS? *Phenomenology* may be used to determine that sensory qualities should be construed as properties. That, in turn, may be used to rule out *Illusionism* as a plausible view. But *Irrealism* and *Phenomenology* alone are insufficient to underwrite the SoS for two reasons. First, phenomenological considerations are insufficient to rule out an account of sensory qualities in non-subjectivist terms, e.g., as dispositional or relational properties. Second, and more generally, the possibility that a property of an object may be given to us in experience without presenting itself

³² These considerations do not prevent us from respecting the phenomenological constraints we established in our discussion of *Illusionism*. It is consistent with an experience's mere reliability that any plausible account of sensory qualities must be in terms of properties because the specific changes we experience require such a construal.

considerably limits the weight of phenomenological considerations in a metaphysics of sensory qualities.

Phenomenology, therefore, is insufficient to close the second gap in Galilei's argument. He has to move from the *non-faithful* presentation of things in colour perception to the conclusion that colour perception does *in no way* present us with a property of material objects. Moreover, Galilei provides us with the ingredients we would need to construe sensory experiences as merely reliable, as he argues that physical properties are sufficient to «excite» sensory qualities in experiencing subjects³³. It remains to be explained what prevents Galilei from doing so.

6. Galilei's Blind Spot

Alas, our search for an explanation hits a blind spot in Galilei's thought. No set of theses explicitly endorsed in *Il Saggiatore* allows for a complete SoS. However, our considerations regarding faithfulness point to one way of bridging the remaining gap. If reliable, but not faithful experiences were ruled out in principle, Subjectivism would follow from Irrealism and Phenomenology. In this case, sensory experiences could only present properties of objects as they are. As Irrealism rules out that sensory qualities are faithful, Subjectivism appears to be the last resort. Do we find resources in Galilei to rule out reliable, but not faithful experiences?

I will put forward a conjecture that closes the remaining gap and completes the SoS: Galilei thought of representation in terms of likeness because he was influenced by the species view of perception. I am speaking of a «conjecture» because we have no definite proof that Galilei endorsed it when composing *Il Saggiatore*. If I am right, this view was an unquestioned background assumption of his, rather than a considered view. Still, I will do my best to render the conjecture plausible. But first, some detail about the conjecture.

³³ GALILEO GALILEI, *The Assayer*, cit., p. 311.

The species theory is a descendant of the Aristotelian account of perception as laid out in *de Anima*. One pivotal idea of this account matters for present purposes: that sensory experiences represent qualities of objects by means by being “like” them³⁴. This view does not leave room for a reliable, but not faithful presentation of a sensory quality³⁵. Paired with *Irrealism*, it severs our sensory qualities from the objects experienced. For if there are no sensory qualities in the objects we experience, our experience of sensory qualities is not “like” these objects in any reasonable sense and thus does not present features of them at all.

But what speaks in favour of attributing this sort of view to Galilei? In his day, standard accounts of perception were based on the *species theory*³⁶. Such accounts presuppose that sensory qualities are properties of material objects and explain their perceptual experience as follows:

First, the object sends its form through the medium to the perceiver – a form that would come to be known in the Latin tradition as a «species». Each sense organ is, in turn, affected by that species according to a particular intentional aspect, such as color, texture, or taste. The ensuing sense impressions are conveyed from each organ through the nerves to the *sensus communis* at the forefront of the brain, where they are combined into a composite intentional representation of the object. This representation comprises all of that object's perceptible attributes, including not only the proper sensibles (color, taste, feel, odor, and sound) but also the common sensibles (such as size, shape, and motion). Remanded to the imagination for short-term memory, this compos-

³⁴ ARISTOTLE, *De Anima*, cit., II.5, 418a 5 sqq.

³⁵ This is independent of how likeness is cashed out. For a literal reading, see RICHARD SORABJI, *Body and Soul in Aristotle*, in «Philosophy», 49, 187, 1974, pp. 63-89. For a non-literal reading, see MYLES BURNYEAT, *De anima II 5*, in «Phronesis», 47, 1, 2002, pp. 28-90.

³⁶ I cannot cover the diverse elaborations of the species theory. For surveys, see DOMINIK PERLER, *Theorien der Intentionalität im Mittelalter*, Philosophische Abhandlungen, Frankfurt am Main, Klostermann, «Philosophische Abhandlungen» vol. 82, 2002; ROBERT PASNAU, *Theories of Cognition in the later Middle Ages*, Cambridge, Cambridge University Press, 1997.

ite form – which later comes to be known as the «sensible species» – constitutes an intentional representation of the object in all its physical and spatial particularity. As such, it stands proxy for the object itself and, bearing a host of ulterior intentions at the intelligible level, provides the wherewithal for a cognitive evaluation of what kind of object it is³⁷.

Two elements are worth highlighting in relation to Galilei's view. First, the species theory casts the experience of sensory qualities as involving a change in the experiencing subject that originates in the external object experienced. Galilei agrees with this part of the Aristotelian account, as he takes sensory qualities to be properties of the sensory apparatus caused by the object experienced.

Secondly, Galilei, qua Irrealism, does not share the view that the object has proper as well as common sensibles. Rather, he holds that objects possess only the latter. But the species theory requires that the form of the experienced object makes a second appearance in the soul of the experiencing subject, as it were. Galilei's Irrealism therefore prevents him from assuming that the causal process leading up to a subject's experience of a proper sensible is at the same time the transfer of a part of the object – its form – to the subject. Now, Galilei could accept that there is a sensible form of the object, but if he did, he would have to argue that it consists only of common sensibles. Thus, it is the transferral of the form of the object via species that bars the contents of sensory experience from being reliable.

But do we have reason to hold that Galilei thought of sensory experience in terms of a transferral of species? It is safe to assume that Galilei was familiar with Aristotelian accounts of perception as they were the standard of his day. Knowing about them was virtually unavoidable³⁸. Moreover, Galilei professes to have studied Aristotle care-

³⁷ A. MARK SMITH, *Perception*, in *The Cambridge History of Medieval Philosophy*, Robert Pasnau, Christina van Dyke (eds.), Cambridge, New York, Cambridge University Press, 2010, p. 337.

³⁸ DRAKE, *Galileo at Work. His Scientific Biography*, cit., p. XIX.

fully³⁹ and his logical treatises show close familiarity with contemporary commentaries of Aristotle's logical corpus⁴⁰. This is significant because sixteenth- and seventeenth-century commentaries drew close connections between logic and Aristotle's psychology in *De Anima*⁴¹. In particular, Galilei explicitly refers to *de Anima* II.6 in his manuscript *On Foreknowledge* – fittingly, the place where Aristotle puts forward his views on colour perception⁴². What is more, Galilei copies extensively from a treatise by Carbone, which outlines a variant of the species theory of cognition⁴³.

But not only is Galilei familiar with the Aristotelian account; he also *conceptualises* perception in terms of the Aristotelian idea of a transferal of species around 1610:

Exhibit A: When discussing the illusion of a straight stick appearing bent when half immersed in water, Galilei argues that the senses do not err. Rather, the error lies in our judgment because we do not know that «the *visible species* are refracted in different media»⁴⁴. This account crucially relies on the idea that something passes through a medium

³⁹ E.g., GALILEO GALILEI, *Opere. Edizione Nazionale*, vol. IV, Firenze, Tipografia di G. Barbèra, 1894, pp. 32–33.

⁴⁰ ID., *Galileo's Logical Treatises: A Translation, With Notes and Commentary, of His Appropriated Latin Questions on Aristotle's Posterior Analytics*, William A. Wallace (trans.), Dordrecht, Springer, 1992, pp. 6–7. For discussion, see ROBERT M. WALLACE, *The Dating and Significance of Galileo's Pisan Manuscripts*, in Trevor H. Levere, William R. Shea (eds.), *Nature, Experiment, and the Sciences*, Dordrecht, Springer Netherlands, 1990, pp. 3–50.

⁴¹ WILLIAM A. WALLACE, *Galileo's Logic of Discovery and Proof: The Background, Content, and Use of His Appropriated Treatises on Aristotle's Posterior Analytics Book I*, Dordrecht, Springer, 2011, p. 35.

⁴² GALILEI, *Galileo's Logical Treatises: A Translation, With Notes and Commentary, of His Appropriated Latin Questions on Aristotle's Posterior Analytics*, cit., p. 100.

⁴³ Ibid., p. 7; WILLIAM A. WALLACE, *Galileo's Logic of Discovery and Proof: The Background, Content, and Use of His Appropriated Treatises on Aristotle's Posterior Analytics Book I*, cit., ch. 2.

⁴⁴ GALILEO GALILEI, *Opere. Edizione Nazionale*, vol. III/1, Firenze, Tipografia di G. Barbèra, 1892, p. 398. Emphasis and translation mine.

(or prism) – the visible species, or the form of the object insofar as it is perceptible – and is refracted in the process.

Exhibit B: In a letter to Dini, Galilei sought to defend his sightings of Jupiter's satellites against the criticism that, even if they existed, their light could not arrive at the earth. This opens the possibility that Galilei's observations were mere optical illusions. Galilei uses the idea of a transferral of visible species to explain how a telescope functions and rule the possibility of an illusion out. He argues that the «visible species [...] do not spread without light, and where these species arrive, light does arrive». So, whatever quality of the visible the telescope augments «presupposes the existence» of that quality, concluding that it is indeed the «species of the four Medicean Planets» which are observed in through the telescope⁴⁵.

Exhibit C: In a letter to Grienberger, Galilei uses the species theory to confront the argument that the naked eye is the absolute and last measure of illuminated objects in their «true shape». He argues that «the telescope has no other effect but to bring the species of the visible objects closer»⁴⁶. Similar to Exhibit A, Galilei uses the species as a kind of substratum that serves to explain an optical effect.

Unquestionably, the species theory influenced Galilei's thought. However, I am not aware of conclusive textual evidence that points towards Galilei's adoption of a species-like theory around the time he composed *Il Saggiatore*, or later on. For instance, the discussion of the perception of sound in the *Discorsi* is vaguely reminiscent of a species-model but does not mention species at all⁴⁷. Moreover, this lack of references to species is not explained by a lack of discussion of perceptual phenomena in Galilei's writings. Galilei stresses the importance of empirical confirmation and often explains how observa-

⁴⁵ To Dini, 21 May 1611: ID., *Opere. Edizione Nazionale*, vol. XI, Firenze, Tipografia di G. Barbèra, 1901, p. 115. Translation mine.

⁴⁶ To Grienberger, 1 September 1611: *ibid.*, p. 195. Translation mine.

⁴⁷ GALILEO GALILEI, *Opere. Edizione Nazionale*, vol. VIII, Firenze, Tipografia di G. Barbèra, 1898, p. 144.

tions are to be properly interpreted⁴⁸. It is therefore not implausible that Galilei grew less convinced of the species account as time went on. Although Galilei's methodological views changed considerably in subsequent years⁴⁹, nothing goes to indicate that he possessed an alternative to the Aristotelian conception of mind or anything close to a metaphysics of perception to undergird his discussion of perceptual phenomena. And, most importantly for our purposes, nothing goes to show that he freed himself from a conception of representation as likeness of experience and object. The latter is the only part of the species theory that is essential to complete the SoS, according to my conjecture. And, needless to say, this part can be held independently of the species theory.

If my conjecture is on the right track, a narrow conception of representation as likeness is Galilei's blind spot and responsible for his Subjectivism. For if a sensory experience can only *represent* a property of the object by being *alike*, *Irrealism* rules out that our experience of sensory qualities presents properties of the object. From there on, assuming that all experiences involve a change in the subject undergoing them, it is natural to identify sensory qualities with states of the subject.

⁴⁸ For useful discussions, see FILIPPO CAMEROTA, *Galileo's Eye: Linear Perspective and Visual Astronomy*, in «Galilæana», 1, 2004, pp. 143-170; GABRIELE BARONCINI, *Galileo e l'esperienza sensata*, in Gabriele Baroncini (ed.), *Forme di esperienze e rivoluzione scientifica*, Firenze, Leo S. Olschki, 1992, pp. 63-101; MARCO PICCOLINO, NICHOLAS J. WADE, *Galileo's Eye: A New Vision of the Senses in the Work of Galileo Galilei*, in «Perception», 37, 9, 2008, pp. 1312-1340; MICHELE SINICO, *Galileo Perceptionist*, in «Perception», 41, 4, 2012, pp. 483-488; STILLMAN DRAKE, *Galileo on Sense Experience and Foundations of Physics*, in «Isis», 68, 1, 1977, pp. 108-110.

⁴⁹ For an overview, see MARCO SGARBI, *The Age of Epistemology. Aristotelian Logic in Early Modern Philosophy 1500-1700*, London-New York, Dublin, Bloomsbury, 2023, pp. 65-91.

7. Aristotle's Hand in the FPMP

This paper sought to assemble a coherent train of thought, based on Galilean views, which rationally (if not inevitably) leads from Irrealism to Subjectivism, thus grounding the FPMP in a metaphysical view. I have shown that an SoS is required because two gaps need to be bridged between *Irrealism* and *Subjectivism*. The first gap concerns the thesis that sensory qualities must be properties of something at all. I have argued that *Phenomenology* can motivate this thesis under the Galilean assumption that our conception of sensory qualities is essentially dependent upon experience.

As there are multiple ways of construing sensory qualities that are consistent with *Phenomenology*, a second gap needs to be bridged. By introducing the notion of a reliable presentation of properties in experience, I have shown that a gap between appearance and reality is consistent with our experience's latching onto properties of objects. That, in turn, opens our experience up to a wider range of properties. These considerations point to what Galilei needs to assume to rationally motivate Subjectivism, namely that sensory experience must present the world as it is, or faithfully, to present it at all.

Based on this reasoning, I have offered reasons to accept the conjecture that Galilei, under the spell of an Aristotelian account of mind, did not consider the possibility of a reliable, non-faithful presentation of a property in experience. Aristotle's philosophy was not only left behind in early modernity. Disguised as Galilei's blind spot, Aristotle's narrow conception of representation as likeness likely shaped philosophical modernity by leading to the formulation of the FPMP. From there on, Subjectivism emerges as the compelling view to endorse.

At this point, one may wonder how Galilei's views relate to his overall scientific programme⁵⁰. Galilei pioneers the unification of abstract mathematical description and empirical observation, thus shaping the

⁵⁰ I am grateful to an anonymous referee for prompting me to address this point.

scientific revolution and the sciences to this day⁵¹. Science, in Galilei's view, is achieved if mathematics and experience join forces to confirm «principles with sensory experiences»⁵². In this sense, Galilei's observation of the moons of Jupiter constituted crucial support for the Copernican over the Ptolemaic system because the mathematical predictions of the latter were not compatible with the empirical data⁵³. The trustworthiness of empirical observation therefore plays a crucial role in Galilean science. But to what extent is this role consistent with Galilei's Subjectivism and Irrealism? Why do these views not undermine the trust put in the deliverances of sensory experience for the purposes of scientific knowledge?

Sensory experience must represent properties of material objects if it is to play a role in our process of accounting for their nature. If the SoS applied, *mutatis mutandis*, to the mathematically describable properties of material objects which take centre stage in Galilean science, the latter would indeed stand on shaky ground. However, the SoS reconstructed in this paper does not threaten the role of observation in science because the path to the subjectivisation of properties it makes available is *based on* Irrealism. Although this metaphysical presupposition is, on its own, insufficient to subjectivise sensory qualities, it is an indispensable ingredient of the SoS. But Galilei's background metaphysics, according to which the universe is constituted only by mathematically and geometrically describable properties, provides no reason to extend Irrealism to the common sensibles because they can be

⁵¹ GALILEO GALILEI, *Two New Sciences. Including Centers of Gravity and Force of Percussion*, Stillman Drake (trans.), Toronto, Dayton, Wall & Emerson, 2000, p. 225.

⁵² Ibid., p. 169; DRAKE, *Galileo on Sense Experience and Foundations of Physics*, cit., p. 109. A discussion of Galilei's changing views on scientific methodology would lead too far afield. For an overview, see WINIFRED LOVELL WISAN, *Galileo's Scientific Method: A Reexamination*, in Robert E. Butts, Joseph C. Pitt (eds.), *New Perspectives on Galileo*, Dordrecht, Springer Netherlands, 1978, pp. 1-57.

⁵³ GALILEO GALILEI, *Sidereus nuncius, or, The Sidereal messenger*, Albert Van Helden (ed., trans.), Chicago, University of Chicago Press, 1989.

described in quantitative terms⁵⁴. As there is no motivation for Galilei to extend Irrealism to the common sensibles, the SoS cannot get a grip these properties. Their status as «real accidents»⁵⁵ of material objects remains intact and their faithful representation in sensory experience is readily explained by an Aristotelian account in terms of likeness. Therefore, the SoS does not threaten the role of sensory observation as lending abstract mathematical descriptions a foothold in empirical reality.

Still, our results leave us with a sense of disappointment. Galilei had all the ingredients to bring about a second revolution by dethroning and reconceptualising the Aristotelian paradigm of mind and representation. He could have cast the causal dependence of sensory experience as a determiner of the content of experience and the concepts formed on their basis. But rather than seeing causation without resemblance as opening up the world up to our experience, Galilei turns onto a road that leads inwards: the SoS. It will take another genius of this century so rich in geniuses, Descartes, to revolutionise how we understand our own minds⁵⁶.

The SoS harbours a general lesson. How we understand our minds and their relation to the material world may covertly play an outsized role in our metaphysical theorising. Metaphysical views are in constant danger of being no more than aberrations of our understanding of mind and perception. If we construe the presence of properties in experience too narrowly, we will be constrained to look for precise, literal analogues of our qualitative character of experience in the world. Fighting against this sort of naïveté is part of Galilei's enduring legacy and deserves to remain powerful today.

⁵⁴ That is one point of the famous book of nature-passage, see ID., *The Assayer*, cit., p. 184.

⁵⁵ Ibid., p. 311.

⁵⁶ RENÉ DESCARTES, *Principia philosophiæ*, Œuvres de Descartes, vol. VIII-1, Charles Adam, Paul Tannery (eds.), Paris, Cerf, 1905, I.70. For an excellent discussion of Descartes' views on sensory representation, see RAFFAELLA DE ROSA, *Descartes and the Puzzle of Sensory Representation*, Oxford, Oxford University Press, 2010.

We do not live in a world that is as it appears. One thing that we have learned since Galilei is that appearances can be a guide to reality, even if they do not faithfully present reality to us. The world does not need to be as it appears for appearances to disclose the world to us⁵⁷.

Riassunto Galilei sostiene che le qualità sensibili esistono solo come proprietà dei soggetti esperienti. Esamino se il suo soggettivismo possa basarsi su una metafisica austera del mondo materiale e considerazioni fenomenologiche. Sostengo che siano insufficienti e avanzo la congettura che Galilei non l'abbia visto perché aderiva a una concezione aristotelica della rappresentazione come somiglianza.

Abstract Galilei holds that sensible qualities exist only as properties of experiencing subjects. This paper examines whether Galilei's subjectivism can be based on an austere metaphysics of the material world together with phenomenological considerations. I argue these are insufficient and conjecture Galilei missed this because he adhered to an Aristotelian view of mental representation as likeness.

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