

An Essay in Counterpoint: Wheeler, Schwinger, and ‘Conflicts in Physics’

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Abstract: J.A. Wheeler and J.S. Schwinger are two towering figures of 20th-century physics. Despite partially common interests, they also embodied two separate worlds: one characterized by conviviality, the other by seeming isolation; one believing that science is born out of conversation, the other often working alone; one heavily relying on heuristic pictures, the other on his formal virtuosity; one being a leader of the Matterhorn Project, the other outspokenly proud of not having taken part in the fabrication of the atomic bomb. If, however, thanks to Wheeler’s archives, we look at some of his less explored facets, we may appreciate some resonance in attitude with Schwinger, and in turn get some new insights about the latter. In this paper I will address how they both, under a sort of historical disguise, took their stance, in different moments, against the mainstream, when they both were trying to carve their own paths “far from the particle crowd”.

Keywords: particle physics, uses of history, styles, historiography of physics.

1. Worlds apart

“[...] or he took pleasure in constructing a very fierce dissonance and then finding all its possible resolutions, which, however, since the chord contained so many contradictions, had nothing to do with one another, so that the mordant sound, like a wizard’s cryptogram, forged relationships between the most distant notes and keys”
(T. Mann, *Doktor Faustus*, IX).

Let us take a look at these relatively well-known portraits of John Wheeler (1911-2008) and Julian Schwinger (1918-1994) (Fig. 1). On the right, we can see a friendly, possibly even jovial, self-assured man (in good company!), while on the left there is one with a vein of shyness but, at the same time, a quite challenging attitude.

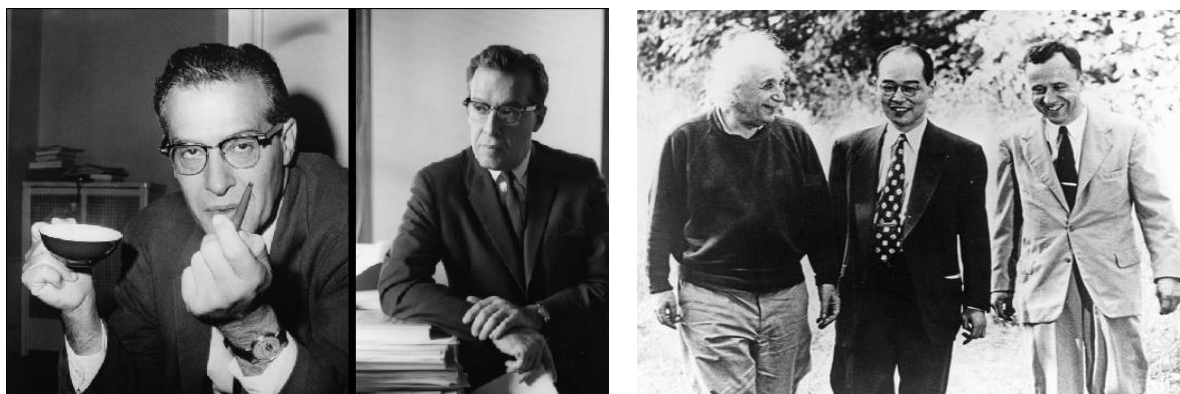


Fig. 1, right. J.A. Wheeler together with A. Einstein and H. Yukawa in Princeton (1953-1954). Credit: The Shelby White and Leon Levy Archives Center, Institute for Advanced Study, Princeton.

Fig. 1, left. J.S. Schwinger in 1965. Credit: United Press International, Acc. 90-105 - Science Service, Records, 1920s-1970s, Smithsonian Institution Archives.

Of course, it could be remarked that this is just an arbitrary choice of pictures, or better: a choice reflecting a message that was already meant to be conveyed. Visual rhetoric, nothing else. Still, even assuming that that was indeed the intention, we could substantiate this first impression by adding a few historical traits. We may claim, for instance, that these two men embodied separate, when not opposite, worlds: one – Wheeler’s – characterized by academic conviviality, the other – Schwinger’s – by an aura of isolation; one believing that science is born out of conversation, the other often working alone;¹ one heavily relying on heuristic pictures, the other on his formal virtuosity; one being a leader of the Matterhorn Project to create the hydrogen bomb, the other outspokenly proud of not having taken part in the fabrication of the atomic bomb; and even for historians nowadays, their archives are, respectively, on the East Coast – Philadelphia, for Wheeler – and on the West Coast – Los Angeles, for Schwinger.²

And yet, it is not that they were personal enemies or anything like that: actually, their interactions seem to have been fewer and more impersonal than one may expect. Such an expectation would obviously be due to the fact that this little game of oppositions, in order to sound passably meaningful, presupposes a common ground, which historically was certainly there: they were contemporaries; they belonged to the same nation; they were both physicists, and remarkable ones; they even shared research interests, especially in the late ‘40s. All this, however, is not particularly deep, clearly, nor difficult to notice. We may try to dig more: we only find that, even in Wheeler’s vast archives and extensive recollections, Schwinger’s presence is elusive. As Feynman’s former supervisor and inspirator, it would be indeed intriguing to know more about Wheeler’s perception of the rising star that rivaled his own most brilliant student, especially since, as is well-known, Silvan Schweber resorted to Wheeler’s notes – those of a first-row witness – in his reconstruction of the genesis of quantum electrodynamics (Schweber 1994). Looking at the list of items in Wheeler’s papers, the only relevant result for “Schwinger” is a folder in the middle of general correspondence: however, it does not even contain letters between them, just a copy of Schwinger’s 1969 paper *A Magnetic Model of Matter* and a personal note to himself by Wheeler, when, in 1966, he had to introduce Schwinger as an invited speaker at a Washington APS meeting. According to this note, he just recalled anecdotally the first famous encounter of Isidor Rabi with the young and precocious Schwinger, and then he added a comment by a common acquaintance, Freeman Dyson, stating that “others publish to illuminate the subject; Schwinger publishes to show that only he can do it” (a variation on Oppenheimer’s sentence about his talks).³ Nothing insightful or too personal, in short: the same can be said about some sporadic appearances of Schwinger’s name in Wheeler’s research notebooks from the 1950s on (at least for what has been explored so far), in the form of a mere (and sporadic) bibliographic reference. At the end of century, in his autobiographical memories, Wheeler would just mention that, when it came to civil defense and national security, he was not on the same wavelength as other physicists, among whom he named Schwinger, but only to add that mutual respect, based on their common scientific endeavor, had nevertheless prevailed.⁴

¹ Nonetheless, even someone like Schwinger was aware of the ultimately collective nature of science: “My research has always been enormously assisted by the fact that I had a crew of warm bodies and live minds on whom to try out new ideas. Conversely, the viable parts of that research were instantly incorporated into the things I talked about in class” (Mehra & Milton 2003, p. 570). We will return to this at the end of the first section, with some quite unexpected turn.

² For these and other pieces of information about their respective life we redirect the reader to Wheeler (2000) and Mehra & Milton (2003).

³ John Archibald Wheeler Papers, American Philosophical Society Library, Philadelphia, box 25.

⁴ “As other issues came along in the future – civil defense, missile defense, nuclear power, weapons tests – I and my friends often had to agree to disagree. Some – Wigner, Teller, von Neumann, and Alvarez, for example – were on my wavelength. Some – such as Bethe, Christy, Goldberger, Oppenheimer, and Schwinger – were not. It is a great happiness to me that I maintained cordial relations with all of these people. Our mutual respect and our common commitment to probing basic questions of nature overrode differences on policy issues” (Wheeler 2000, p. 199). Even if I am not aware of any statement about such topics in which Schwinger explicitly referred to Wheeler (or someone with positions close to his), it is not difficult

What I intend to suggest in this short contribution is a far less appreciated common trait, which, in both Wheeler's and Schwinger's case, manifested itself when they took a stance against the mainstream of particle physics. The conflict, therefore, was not between them, but with a larger community: if, according to what we said in the beginning, we can perhaps expect some grumpiness from Schwinger, it is probably more unexpected that, when we scratch under the surface of Wheeler's *persona*, we can find that he definitely shared – with his own connotations – a deep disgust for the “herd instinct” (Wheeler 2000, p. 172) of physicists. That distaste led both Wheeler and Schwinger to carve their own path “far from the particle crowd” (to play with the title of Thomas Hardy's novel).⁵ They certainly did that in different moments, with different aims, and for different reasons - but what is quite remarkable is the way they chose to engage with the past: a way totally ignored by commonplaces and clichés which evoke a picture of science that is only looking to the future, always busy in an almost automated march of progress that, “inevitably”, makes the deeds and ideas of previous ages obsolete, surpassed, and harmless.

Starting chronologically, the year is 1953, the focus is first on Wheeler. At the beginning of the '50s, just turned forty, he had a very distinguished position in the nuclear physics community and, being in Princeton, certainly had no problem staying in touch with recent developments. Already in the previous decade he had revealed a tendency towards ambitious theoretical schemes with a few well-established principles and an ontology as economical as possible in terms of “species” of basic entities: that was now in trouble with the explosion of the “particle zoo”, but also at odds with what he would call “the pion industry” (Wheeler 2000, p. 171). By the latter phrase he was referring to a way of doing physics that he judged too subordinated to a superficial account of the most recent experimental results, and thus excessively inclined to *ad hoc* theorizing. Standard narratives about those years often tend just to remember the new experimental discoveries and a few important theoretical attempts, but we could really say that it was a period of “crisis” - not in the sense of misery and stagnation, but in the etymological sense of a moment requiring a judgment (Furlan & Gaudenzi 2021) or, to put it differently, needing a reassessment in methodology and guiding ideas. Physicists such as Wheeler were faced with the dilemma of properly balancing the attention paid to experimentation on the one hand and, on the other, their drive to theorize. Facing the proliferation of the “particle zoo”, Wheeler's aim was to think more deeply about already well-established principles by exploring them to their extreme consequences, without introducing anything new (Blum & Brill 2020; Furlan 2022). In other words, rather than being distracted by the “overflow” of experimental data and trying to adapt to the new phenomenology, Wheeler sought to outline a grand view, grounded in consolidated physics and, hopefully, capable of deriving or ordering those recent results as well. While he was in the midst of this search, he accrued a sort of “conversion” which opened a new phase in his long career. Not without a gamble, Wheeler decided to look for his own highly original path, according to a motto that he would later put like this: “When I see a herd running one way, I like to march another way” (Wheeler 2000, p. 222). At the core of his interests he decided to set general relativity, which, at the time, was certainly not one of the most flourishing research areas (Blum & Brill 2020). Holding on to the methodology previously sketched, he intended to explore to the extreme consequences the dynamical character of spacetime geometry without introducing additional elements, with the hope of building even the alleged “elementary” particles from that.

Therefore, it was not a coincidence that, right in that period of crisis, when Wheeler was indeed taking a “risk” rather than merely surviving in his established position and mindset, he elaborated, articulated and even gave a name, “daring conservatism”, to his own heuristic methodology. This was,

to imagine some further disagreement between them during the Vietnam conflict, for instance: in 1973 Schwinger was clearly sympathetic with the “widespread revulsion against the Vietnam episode”, as he declared in an interview partly reported in Mehra & Milton (2003, p. 568).

⁵ Cf., in Wheeler's case, Furlan & Gaudenzi (2021).

at the same time, a form of self-reassurance, a way of bringing order to the confusion, and a lesson that he claimed to have learned from Niels Bohr himself (Blum & Furlan 2022). An assertive enunciation of Wheeler's stance against some of the tendencies of the day was uttered during his first trip to Japan, in 1953 (Blum & Brill 2020; Furlan & Gaudenzi 2021). More precisely, this can be seen in a speech he delivered in Tokyo (for a moment, he even thought of calling his heuristics "Tokyo program"),⁶ where, with his usual originality, he identified his attitude of daring conservatism with that of Sugawara no Michizane, the great poet and statesman of the Heian period, as counterposed to a man of action like the late Edo samurai Saigo Takamori.⁷ Thus, Wheeler, in front of his Tokyo audience, staged a sort of dialogue between these two local characters, without hiding his preference (at least in the eyes of those who did not remain baffled when hearing all that from an American physicist!). At this level, of course, Wheeler's use of history is just oblique and rhetorical, aiming at expressing in a mediated way – behind a mask – his own point of view, but with a different voice. Daring conservatism, however, had much deeper roots and more interesting presuppositions. As already mentioned, Wheeler claimed to have learned it from one of his two great mentors, Niels Bohr, and decided to apply it to the dusting off of the vision of his other main inspiring figure, Albert Einstein (Furlan 2022). Wheeler's daring-conservative re-exhumation, re-systematization and extrapolation of general relativity clearly reveal his belief that the theory's "untapped potential" was still to be disclosed (Blum & Brill 2020; Blum & Furlan 2022); and many other examples from Wheeler's interests, from that period on, could be examined to highlight this non-trivial vision of history and non-sterile relation with the past.⁸

If we now shift our attention to Schwinger in that same period, we can easily say that he was establishing himself as a star of the new generation of physics. The popular narrative (assuming that the adjective "popular" can be used in this case: perhaps we should call it "physics folklore") reassumes his life more or less as follows. In the beginning we find the precocious young man (tacitly assumed, as any calculating "prodigy", to be uncritically at the service of the great machinery of scientific progress, unless some personal idiosyncrasy or difficulty interrupts such service), solely focused on physics, lucky enough to find a mentor such as Rabi that allowed him to blossom (and to get a proper college training in the first place, his neglect of other school subjects notwithstanding); then came his quick ascent to the rank of a top theoretical physicist, thanks to his seminal work in "climbing the mountain" of quantum electrodynamics (but from a different, more complicated, seemingly formalistic and less intuitive side than Feynman's); after that, there followed a slow and obscure decline, signed by grumpiness and self-marginalization, with much time and work wasted on his "source theory" (without any substantial gains over the dominant approaches); and finally he even "jumped the shark", as they say, by writing about cold fusion and firing other polemics.⁹ I believe that each one of these "steps" can – or has to – be contested. Perhaps we can get some inspiration thanks to the blueprint of Wheeler's case as we have briefly sketched it, but we have to consider a later phase of Schwinger's life.

⁶ The reference is not just to the Japanese capital, but also – somewhat oddly – to Tokyo Rose, the radio broadcasters that, during World War II, spread demoralizing propaganda against the Allies (Blum & Brill 2020). Wheeler, by analogy, intended to demoralize the "pion industry" and its related *modus operandi*.

⁷ This is, at least, the reading offered by Blum & Brill (2020) and Furlan & Gaudenzi (2021), in the light of Wheeler's notebooks of that period. In a later note, Wheeler himself added another layer and claimed that he was identifying Michizane with Tomonaga and Takamori with Nishina (Wheeler 1982).

⁸ In those same years Wheeler contributed to set in motion the project *Sources for History of Quantum Physics*, and that was just one of his history-related activities. For how all this actually got entwined with his research activities and reflections, cf. Costa & Furlan (2023); Furlan (2024a).

⁹ Further details can be found in the already mentioned (Mehra & Milton 2003), but perhaps that is the point: pieces of information are added, but the underlying narrative from "folklore" is not challenged or contested enough. After all, rich as it is in material on a personality who has not received the attention he deserves, this biography is certainly not Mehra's best work. A few insights that a new kind of presentation of Schwinger's figure could benefit from are suggested in Furlan (2024b) and, less extensively, in the following paragraphs.

In December '65, Schwinger ended his Nobel prize address with some lines by none other than John Keats (certainly he was much more refined and cultured than the cliché about a calculating *idiot savant* suggests), featuring Hernan Cortés and the exploration of new worlds (Schwinger 1966a, p. 953): “[...] like stout Cortez when with eagle eyes / He star’d at the Pacific - and all his men / Look’d at each other with a wild surmise - / Silent, upon a peak in Darien”.¹⁰ The path to the future – Schwinger optimistically believed – was to be found in a “phenomenological relativistic quantum field theory”, that he would soon present under the name of “source theory” (Schwinger 1966b).

We are not interested here in dealing with its technical aspects, nor do we have the space, but we can still make a few comments. If the first shock of the “particle zoo” had by then passed, also those years could nonetheless be considered a period of theoretical “crisis” (in the sense previously specified), marked by the uncertainties of physicists between quantum field theories (what Schwinger called “operator field theories”) and S-matrix-inspired programs. It is in this context that Schwinger devised, or better made explicit, his own approach, cautiously phenomenological (and this alone is rather interesting, against some stereotype of him as a mere formalist), but not afraid of occasional speculations (as long as recognized as such). Perhaps we could even venture to say that this mixture of caution and speculation was partly akin to daring conservatism, despite all the other differences between the two approaches. Alas, source theory did not score any success that other formalisms had not already achieved in a less sophisticated way, but Schwinger strongly believed that unwise assumptions and unphysical complications in those alternatives could seriously preclude the path towards the future: that was why it was important to shape new generations in the philosophy, so to speak, of source theory, before their minds could be corrupted by the mindset of the mainstream. Schwinger thus decided to write a textbook on source theory, *Particles, Sources, and Fields* (Schwinger 1970), which, however, was not exactly a success, either. Among the reviews, particularly harsh was that of Arthur Wightman (1971); Schwinger wrote a letter to be published as a reply, but it was refused by the editor and that increased his bitterness.¹¹

The reception of source theory, in general, had been very different from what Schwinger expected and hoped, and this led him to an increasing isolation that carried some traits of his solitary *modus operandi* to the extreme. When he abandoned Harvard and marginalized himself, in a sense, on the shores of the Pacific, not “upon a peak in Darien” but in Los Angeles, the tension quite soon exploded and manifested itself in a speech with the quite telling title of “Conflicts in Physics”, dating back to 1977 (Shah 2006). Like Wheeler in Japan, Schwinger made use of some historical examples – such as Herapath’s and Waterstone’s early work in kinetic theory of gasses – in order to remind his fellow physicists, in a not too veiled way, that, even if the pettiness and the conformism of individuals, as well as the arrogance of institutions, could ignore important results and ideas for a while, ultimately they would be resurrected and their true potential unleashed. Schwinger was arguably identifying himself with such figures, or with Boltzmann exclaiming, “I am conscious of being only an individual struggling

¹⁰ These lines are from the sonnet *On First Looking into Chapman’s Homer*. Interestingly enough, Wheeler too – who had certainly read that address, since his former student Feynman had also been awarded on the same occasion – would allude to them in his research notebooks at the beginning of 1967: “Why is everyone so silent? Why does it have to be me who says this? Story crying to be told. Why so long. Silent, on a peak in Darien – the only charitable explanation. Have to touch on this question” (John A. Wheeler Papers, Relativity Notebook 14, p. 140, American Philosophical Society Library, Philadelphia), where “crying” and “Have” are underlined by Wheeler himself. Some cracks in his ultimate geometrodynamical vision were starting to manifest themselves – and while at the end of that same year Wheeler began, in public, to enthusiastically popularize the phrase “black hole” and the progress of the recently-born relativistic astrophysics, in private we can perceive a sense of restlessness and isolation that perhaps, for a moment, could make him closer to Schwinger’s fate in the years to come. In any case, with reference to the different overtones in the use of the quote from Keats, it seems as if Wheeler and Schwinger had switched roles, at least if compared to their usual portraits – or perhaps, given the interplay of public and private sphere, we should just see this as another resonance, when we get beyond the surface.

¹¹ Even the fact that an axiomatizer such as Wightman was not at all in consonance with Schwinger should lead one to reflect on the usefulness of the label of “formalist” often attached to the latter.

weakly against the stream of time. But it still remains in my power to contribute in such a way that, when the theory of gases is again revived, not too much will have to be rediscovered” (Shah 2006, p. 50). If Wheeler, however, had delivered a rather clear message (at least to those who had ears to hear) in the context of a creative staging and with an open and “assimilative” attitude, Schwinger was adding quite explicitly – again from behind Boltzmann’s mask, so to speak – that one day the mainstream will be sorry for it: “One regrets almost that one must pass away before their decision” (*ibidem*).

It would thus seem that Schwinger’s underlying notion of history, rather than simply being an active unprisoning of past potentialities, was a prophetic admonition against those who were ignoring his own ideas. However, there is another interesting aspect to add. It is as if the brilliant young man, who, when giving a talk, did not mean to show everyone how something is done, but to show that only he was capable of doing it - the same young man that, when he heard from Oppenheimer about Tomonaga’s results in quantum electrodynamics, did not pay much attention, firmly convinced about the superiority of his own approach -, started to develop, in the midst of his increasing isolation, a sort of empathic sense of analogy with other people, far away in space and/or time. His historical, or quasi-historical, evocations are not mere masks to suggest that what happened once will happen again and that, in the end, he would be the one laughing: Schwinger, evidently, had no problem saying something like that explicitly, without the strict need of a mask in order to communicate indirectly (actually, even the very idea of a mask seems in an interesting tension with Dyson’s and Oppenheimer’s characterization of his publications or public speeches, but, after all, we are speaking of a different phase, both professionally and emotionally). This use and interest in history (or perhaps better: in some other personal histories) is more than a merely rhetorical or formal device: it is rather a sort of identification through some analogy of circumstances or some *personal* connection to a topic, the discovery of a form of distant conviviality at the bottom of his own solitude. Among the other examples to which Schwinger dedicated at least a speech, we may list: Leonardo da Vinci, with his peculiar historical fate (Mehra & Milton 2003, pp. 616-618; Furlan 2024b); George Green (Schwinger 1996), whose functions were used by Schwinger with spectacular success a century after their creator (in this sense, the *greening of Green’s functions*, to recall Schwinger’s own pun in the title, is another instance of something from the past that was still waiting to be properly unleashed in its full potential); and Sin-Itiro Tomonaga (Schwinger 1983), where the directly personal element – quite in contrast with the young Schwinger’s attitude toward the third co-formulator of quantum electrodynamics – is again evident in the pun of the title, the *two shakers of the world* being a reference to the German “schwung” and to the Japanese “Sin-Itiro”.¹²

Besides the anticipation of justice-to-come, there is often bitterness in Schwinger’s words – but there is also a form of empathy *sui generis*, an ability (and willingness) to relate with someone well beyond the meager boundaries of presentism. This also applies, *mutatis mutandis*, to Wheeler’s deeply personal frequentations of the past – and that is something worth underlining today, against some widespread assumptions about science and its relation with an allegedly obsolete past.

¹² Of course, one could read puns and word games as an element of cold detachment, too, but, according to what is reported, e.g. in Mehra & Milton (2003), Schwinger was moved to tears when pronouncing this tribute after Tomonaga’s death. In this case, there was not only a change in attitude over the years, as we have just remarked, but it is quite easy to perceive Schwinger’s effort to imagine – with a certain proxemics and with question marks – part of the life of a sort of *alter ego* in a distant land and culture. Perhaps something similar could be said of Schwinger’s tribute to Feynman, too (Schwinger 1989), in which, despite all their differences in character and in approach, there are eloquent words of recognition. A form of distance, nonetheless, seems to be a crucial part of these “analogical” exercises by Schwinger, which is why, also on these occasions, he has been branded (for a change!) as formally detached, even in Mehra & Milton (2003), where the authors also provide an “explanation” which is far from being psychologically deep: “In the last week of January 1988, shortly before his death, Richard Feynman told Jagdish Mehra that he wanted to see and interact with Schwinger as much as possible, ‘but here we are, within ten miles of each other, and in spite of numerous overtures by me, we don’t meet. It has been a source of much regret to me’. It was Schwinger’s extreme shyness and difficulty in reaching out to people that kept him apart from even Feynman” (p. 611).

2. What's in a diptych?

All this was just a sketch, needless to say: in order to properly perceive the game of analogical and disanalogical traits in our two cases, one should have in mind the content of the more extensive papers we have referred the reader to. Nonetheless, guidelines have been given and there are now some broader methodological considerations to offer from a historiographical point of view. Especially when it comes to recent physics, an individual focus (except for biographical studies) is not that widespread: among the reasons for this we may definitely count the increasingly evident collective nature of the scientific endeavor, but, arguably, also a certain mindset that, given the technical aspects of the topics in question, tends to merely show off an expertise in consolidated textbook knowledge, often back-projected onto some “case study” under exam. There is no need to linger to point out the shortcomings of such operations, but, taken notice that juxtaposing two personalities without direct points of contact is a quite unusual operation in these contexts, we can think a bit more about the uses and possibilities of creating, in general, a similar “diptych”.

A first option, the most obvious one, is to generate or suggest a sort of “dialogue” – as is customary to say nowadays in other areas – between the two figures. Excluding the trivial cases in which the only aim is sensationalism of big names, there is also the risk of creating a sort of “sacred conversation” with saints from different ages and cultures, gathered around a central topic which is thus tacitly assumed to be historically invariant (temptation which seems strong in highly mathematized areas). However, that is arguably not the most fruitful way to consider the above exercise about Wheeler and Schwinger, but it remains a valuable possibility when a similar attempt can allow us to have a sort of “stereoscopy” on a subject, thanks to two distinct points of view. This actually preludes to the second option, which we may call “historical monadology”, as has been sketched and briefly applied in a previous congress (Furlan & Gaudenzi 2021).

The basic idea is that, in order to challenge consolidated mainstream narratives, which not rarely – even when emphasizing some specific historical actors – are a sort of mean field approximation of the opinions that experts “at that time” are assumed to have had,¹³ we can adopt a series of significantly chosen viewpoints (thus looking at the correspondence, working papers, and so on of these scientists) and, from the perspective that each one of them can offer – with tensions, alternatives, contradictions and whatnot – try and get an idea of that historical situation, instead of picking the usual treatments of the latter and then circumscribe it to a certain personality. For instance, as we have already said, if conventional narratives about the early 1950s celebrate the new experimental discoveries in particle physics and at most allude to the confusion deriving from the explosion of the “particle zoo”, if we look at two interesting and not obvious figures such as Wheeler and Nambu, then we can perceive a series of overtones (or more than overtones) that are usually missed. We can then also enlarge our scope of investigation and examine the reactions and reflections of other scientists at the time, getting an overall picture that is emerging thanks to those “monads” or viewpoints. That is clearly different from the more or less teleological historiography that, at most, adds details to some sub-disciplinary narrative. Using highly regarded personalities that, at some point, moved to the margin and from there kept developing their viewpoints, such as Wheeler and Schwinger when they are put in tension with the particle physics community at large, can be stimulating, without the obvious risk of taking too seriously the sort of anamorphosis that derives from their defiled position. In this sense, our “diptych” can naturally develop into a “polyptych”, according to the guidelines of a “historical monadology” as just outlined; this, of course, would entail a much larger project.

An option more concluded in itself, but quite in line with the considerations of these last few lines, may be called – readapting an adjective from Hugo von Hofmannsthal – *allomatic* (that is, involving a mutual transformation): the two figures in the diptych are juxtaposed because they can cast some light

¹³ To be compared with the above criticized back-projections of textbook knowledge.

on each other, especially on some aspect that is not usually perceived, and thus the pictures that we have of them contribute to their mutual transformation. Commonplace portraits of Wheeler do not take into account his stance against particle physics and its *modus operandi*, for instance, nor do they contemplate that “private side” of which we have offered a few glimpses; narratives about Schwinger’s isolation do not pay attention as we did to his uses of history and to a truly personal dimension. In both cases, it was the other figure that helped us see a certain facet. All this is admittedly part of a historiographical heuristics; or perhaps better, to recall the title of the present contribution as well as the original meaning of the word: it is an *essay*. As such, one may *try* to juxtapose a couple of figures that are typically considered in a separated way – perhaps even with the explosive and provocative effects of a *montage* technique – and then see (or hear, if we get back to “counterpoint”) their tensions, their similarities and differences, and so on. Perhaps we could count Plutarch’s *Parallel Lives* as a sort of predecessor to this kind of operation: after all, it has been emphasized by several parties that Silvan Schweber had done something similar more than once, even if with obvious differences and different aims (Gordin 2007). The possibilities are many: why not test them if they can lead to new insights?

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