

Ten Commandments for Writing a Meritable Scientific Paper

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Abstract

Every postdoctoral scientist undergoes a finite pressure to publish the results of his work. After all, glancing through the written outcomes of her studies is what will have a decisive influence in determining the direction of her career after this transitory period in the life of a scientist. Mastering the art of scientific writing is thus of great importance to every postdoctoral scholar and a handful of advices piled from memory on a Sunday afternoon will be presented here.

Somewhere on the booklet of the last record of an alternative American band (Hüsker Dü 1987) in the mid-80s, a message is hidden, telling us that the most beautiful songs ever sung lie hidden in each and everyone's hearts. What makes a difference between the artist and the layman is that the former has found the way how to dig them out to the surface and present them in all their charms to the people. I have always enjoyed this quote because it reminded me that artists, including myself, are neither a special breed of people nor anywhere more aesthetically sublime than those who have no interest to engage in artistic creation. From a practical standpoint, it, however, reminded me that without investing time and effort in learning how to communicate our knowledge and all the blissful insights that our inner, artistic eye has experienced, no one will ever learn of the beauty we have come to see and know, and all this inner wealth of the spirit will eventually fade away. Since I have always been inclined to do something about this permanent drift of things to the abysses of nothingness, I opted to become passionately obsessed with engraving them in form of lasting messages to people, be it in form of songs, records, scientific or philosophical and poetic writings.

The reason why I have begun this short article with these insights is because I wanted to make it clear that finding merit in expressing our knowledge in terms of scientific writings is the first step in producing meritable scientific papers. It is such a simple and yet so often overlooked principle that simply states that willing to make steps towards a destination from the depth of our heart is what drives us, step by step, to it. Hence, the first advice on our journey will be the following:

Advice #1: Find selfless value in expressing your knowledge instead of only edifying it.

Just like we must alternately inhale and exhale to live, so does our wellbeing depend on our ability to find a balance between impressing ourselves with external and/or contemplative stimuli on one side and expressing the emotional and intellectual treasures that we have forged within ourselves on the other. Of course, to produce truly inspiring things with our pen, we need to stop thinking from the narrow confines of our ego and understand that science is a collective effort of entire humanity. Or, as Albert Einstein noticed, "The extent to which a man has liberated himself from the shackles of ego is the extent to which he has become a truly valuable member of the humankind" (Einstein 1950). Hence, communicating science while being driven by the visions of our tenure, personal glory, shoulder tapping at conferences or exorbitant salaries that professorship and reputable positions in industry nowadays increasingly bear does not place us on the road to producing meritable scientific writings. Only when we tune our whole

being to the frequency of selfless devotion and begin to write for the sake of inspiring the eyes of the world that are dying of hunger for truly inspirational insights, something truly fabulous and unexplainably touching will come out of our pen. And then, as we shall see, the helping hands of Nature will always be around us to magically guide us along our ways, whenever we get stuck in their gutters.

Of course, in equipping ourselves with the mastery of writing, there is always a danger of falling into an opposite imbalance, that is, ceasing to live through our knowledge and emotions and instead finding fulfillment in merely writing about them, beginning to live in the world of fantasy thereby and finding ourselves agreeable with the stance occupied by Stéphane Mallarmé when he responded to complaints of Edgar Degas about how poetry was a terribly difficult task for him even though he never lacked ideas by saying, "But Degas, you can't make a poem with ideas... You make it with words" (Valéry 1931). Somewhere along the same line of thought we can restore the words with which Isadora Duncan opened her autobiography: "It has taken me years of struggle, hard work and research to learn to make one simple gesture, and I know enough about the Art of writing to realize that it would take me again just so many years of concentrated effort to write one simple, beautiful sentence. How often have I contended that although one man might toil to the Equator and have tremendous exploits with lions and tigers, and try to write about it, yet fail, whereas another, who never left his verandah, might write of the killing of tigers in their jungles in a way to make his readers feel that he was actually there, until they can suffer his agony and apprehension, smell lions and hear the fearful approach of the rattlesnake. Nothing seems to exist save in the imagination, and all the marvelous things that have happened to me may lose their savor because I do not possess the pen of a Cervantes or even of a Casanova" (Duncan 1927). However, in these strivings to develop "the pen of a Cervantes", we might truly reach our aims eventually, but at a terrible cost. Namely, we may then be able to weave an exciting story around anything, like the enthralling Persian storyteller, Scheherazade, but the essence of our storytelling will be wholly vacant, as we realize that we have possibly become yet another hypocritical preacher that "says but does not" (Matthew 23:3). We might thence find ourselves alluring people to some golden coasts of knowledge and being like wily advertisers, but only to witness them discover how emptied of starriness and emotionality that we have so loudly advertised these landscapes for they are in reality.

After all, to bring our mind into unison with details from reality that we write about is a vital prerequisite for our attaining the vistas of inspirational writing; yet, to confuse maps with their territories, or "to identify abstract conceptions with reality" (Stanfield 1983) as A. N. Whitehead would have put it, is a trap on

the edge of which all masterful writers dance. Writing is thus an epitome of a double-edged sword, a tool that transform from a slave into a master if the writer is careless enough not to incessantly repeat René Magritte's mantra Ceci n'est pas une pipe and let the giant from Hindu mythology swallow us in the blink of an eye. Although a vital tool for enriching the writer's microcosm and founding the spirit of collectivism, writing is thus also a perfect way to corrupt the writer's soul whenever he substitutes the fulfillment of an act with writing about its fulfillment. After all, whoever has written with passion knows that as much as the writer writes writings, writings write back the writer; hence, so much dizziness as we try to explicate the essence of the relationship between the writer and his writings.

Advice #2: Do not be afraid of getting lost so long as you return to the path of concise discourse.

The reason why I started off this article with a random thought and then wandered off the central topic before I even began numbering the advices I had mentioned in the abstract is because I wanted to insinuate the charms of being alternately lost and found, something that is deeply engrained in every engaging plot of a movie or a novel. And if our writings are meant to capture people's attention, they better do resemble exciting storytelling in their essence. Needless to add, with one such approach one is being given a chance to sign a death sentence to the exceptional predictability and technical narrowness that makes scientific papers so boring to read nowadays.

Advice #3: Respect Occam's razor that warns us against multiplying entities without necessity, but, still, do not avoid repetition of important insights more than once, when needed.

The art of writing a paper implies neither the use of such a complicated language that the reader will eventually become thoroughly confused, unable to walk through its forest and conclude that the author must know more than the reader (this is often the sole author's intention when writing such overly perplexing pieces), nor the use of language so simple and plainly obvious that it insults the reader's intellect. Yet, when editors insist that you eliminate every single multiple reference to a central idea of your discourse, point at a meadow full of spring flowers and ask back why Nature does not leave a single flower on it to reiterate Her aesthetic message when they all look the same. Yet, in tossing Occam's razor to ocean depths, still be aware that just like 10-Goto-10-like recursive statements provide the best way to disable a computer in sight, so are they equally effective in blowing apart the human intellect from time to time. In view of this, please avoid logically recursive or plainly obvious statements (e.g., since $A \Rightarrow B$ and $B \Rightarrow C$, then $A \Rightarrow C$, or even worse, since $A = B$, then $B = A$) like a plague. Yet, know that the indulging in usage of the most conventionally prohibited principles comprises the essence of postmodern artfulness that finds beauty in poverty and feeds on stuff that the affluent ones around us have discarded as useless or trivial. Hence, know that the room for each and every method or expression exists in an enlightened mind. Or, as the fool from Federico Fellini's *La Strada* exclaimed after he had picked up a random pebble

from the ground and looked at the sad eyes of Gelsomina he wished to comfort, "Everything in this world is useful for something... take a little stone, for example; even this little stone serves the purpose" (Bondanella 1978).

An example where Occam's razor is quite valuably applicable is the experimental part of a scientific paper. Namely, although some do stick to the principle that only details absolutely required to repeat described experiments should be reported therein, many are there who will write about electronic schematics of the instrumentation that they used, copying words from operation manuals in need to appear smart, aside from including a plethora of other sound, but irrelevant details. In that sense, it is crucially important to write the experimental part so that everyone could repeat the reported experiments. Years of reviewing papers for scientific journals made me familiar with scientists who would either intentionally or out of sheer carelessness hide the experimental details of the methods that they write about. To report and yet not to report: that is the battle crusading within such self-centered scientific minds. Yet, how many times have you wished to repeat an experiment whose details were published, but only to become halted at an obscurely described step, realizing that it simply cannot be repeated? The golden rule tells us not to do onto others what we would not like to have done to ourselves, and following it will surely impel us to pay more attention when writing the experimental part of a paper next time. I, personally, made it a rule to make the experimental description in a paper something that I would go to when I want to repeat the given experiments instead of my lab notebook.

Advice #4: Write individual thoughts ideally immediately after they have occurred to you.

Instead of expecting all good thoughts to fall on us like a thunderous summer rain, the phenomenon that very rarely happens in my case, it may be better to keep our daily consciousness open for the individual droplets of rain that come out of nowhere and carry precious insights alongside them, and as soon as they fall on us, to run to the computer screen and scribble them down. This is so because every thought that suddenly occurs to us resembles a train that has just swooshed through our head, heading over far beyond some distant horizons of our consciousness. Of course, our memory has arranged that trains of individual ideas pass through and then mostly disappear from our mental sight in order not to have a mess of trains colliding at the central crossroad overseen by the eye of our mind.

Another thing I have found important is that it is quite worth investing effort and focus to make the first sentence that falls on the computer screen be as concise and well shaped as one could make it. This would make all the subsequent corrections of it much more effective, as opposed from starting from a trashy sentence, never knowing whether it was the thought we were fully satisfied with when we initially laid it down, or it was merely a casual and hurriedly jolted remark. Hence, the image of a statuesque writer in a dreamy state of mind, sitting pigeon-toed and slumped over a notebook held on his lap, with stars swirling over his head.

Advice #5: Do not hesitate to hypothesize when interpreting the outcomes of your observations.

This is perfectly allowable since science, strictly speaking, never proves anything, as Gregory Bateson would have insisted on (Bateson 1979). There are many reasons why this is so and one of them is that all the tautologies from which we derive our inferences about observed phenomena, the assumptions that comprise the foundations of our logical apparatuses, are exactly that: improvable assumptions. Or, as Albert Einstein pointed out, “Physical concepts are free creations of the human mind, and are not, however it may seem, uniquely determined by the external world” (Einstein & Infeld 1938). Quite concordantly, Henri Poincaré observed that “the geometrical axioms are therefore neither synthetic a priori intuitions nor experimental facts. They are conventions. Our choice among all possible conventions is guided by experimental facts; but it remains free, and is only limited by the necessity of avoiding every contradiction, and thus it is that postulates may remain rigorously true even when the experimental laws which have determined their adoption are only approximate. In other words, the axioms of geometry are only definitions in disguise” (Poincaré 1905). After all, it is always worth reminding ourselves that Euclid, in fact, never used the word *axioma* in his writings, but merely spoke of *koine ennoia*, that is, of “common opinion”, the term that only Proklos and Aristotle later redefined to “propositions that neither can nor need be proved” and thus inconspicuously attached the attributes of academic sacredness to their essence (Wiles 1983). Therefore, no matter what, always be aware of the irrationality of stances of all those who insist that only provable points ought to be reported in scientific papers. As an editor of *Nature* magazine noticed, one such insistence would have proven devastating for the basic discoveries of molecular biology since what Watson and Crick proposed in their seminal paper on the structure of genes was more a hypothesis than verifiable scientific insight. Einstein’s general theory of relativity was likewise published when it contained only vague empirical evidence in terms of the explained anomalous perihelion shift of Mercury observed in 1859, that is, before a solid body of its empirical foundations could be supplied. The quantum physicist, Daniel Greenberger thus pointed out the following: “If Einstein were to send his paper to *Physical Review* today it would have almost no chance at all of being published. ‘Highly speculative!’ would be the referee report, a death shell to any paper. He would have to append it to an article on string theory, or some other fad, and hope it wasn’t noticed” (Elitzur 2006). Such sad state of affairs is, of course, something which upcoming generations of scientists will cordially dissent against.

Advice #6: Always make your wordings be in concord with the music of your internal being.

Once I came across a book that teaches the art of aesthetic writing by starting off with the following sentence as a self-explanatory example: “This sentence rocks” (Casagrande 2010). It goes on to convince the reader that such simplicity, no doubt seen as debilitating by some, including myself, is the way to go on the road to inspiring writing. Of course, what this author may have slipped off her mind was that practically all philosophers of European origin as well as innumerable

writers, from James Joyce to Jack Kerouac, would have objected to such oversimplified vulgarization of language. Hence, whether you find satisfaction in creating or reading extraordinarily lengthy, rollercoaster-like sentences that take you on and on on a ride through mind-bending lexical warps, or you feel illuminated upon jolting down or glimpsing as simple scientific writings as that recently authored by a classroom of 9-year-old boys and girls in an elementary school in southern England and published in a *Royal Society* journal (Blackawton et al. 2011), altogether with children’s drawings in colored pencil in place of computerized images, stay away from careless judgments over which one is better than the other. For, as it frequently happens in the world of arts, one side of the coin is always subjective and very, very personal. So, don’t mess up with it. The same goes for the length of written pieces. In this world dominated by ultrashort, a little bit more than Twitter-sized, sensationalist news that are meant to capture people’s attention in a blitzkrieg fashion, while delivering not much at all thereto most of the time, extensive and eloquent writings are often seen as worthy heartless rejection by the editors. “People are busy, they won’t have time to read long pieces”, is what I often heard from editors, and I could not agree less with this frequent saying of theirs. For, space is always required to describe a complex stance that, as a rule, is a blend of pro and con arguments with respect to discussed issues. To avoid misunderstandings and incorrect categorization, sufficient wording is thence a must. Also, in the modern world where costs of online publications, accessed by 99.9 % of scientists during their literature searches, are minimal, the length should not present such a critical constraint as it often is.

Hence, the only rule when it comes to style is to remain in concert with the music of one’s own being. When writing, conform to yourself first and foremost rather than to journal styles and instructions. Likewise, write to the collective consciousness of humanity, the mind of Gaia, of moms and dads, imaginary boys and girls, or millions of muses dancing through your head, but never write merely so as to conform to the opinion of the mainstream or the spirit of academic judges who, we feel, watch us like big brothers from the darkness of our mind.

Advice #7: Know that grammatical and typographical pedantry does not comprise the ends of beautiful writing.

If there is one single message I would reiterate to the upcoming generations of earthlings, it would be the one that tells us that invisible essence is much more important than the apparent surface. If the wisdom inscribed in all the religions, sciences and schools of ethics could be distilled into a single saying, it might easily turn out to be exactly this one. To avoid falling into traps on insistence on glazing the surface rather than paying attention to the true value of the essence, one should let one’s attention jump into James Joyce’s Molly Bloom’s soliloquy (Joyce 1922), which T. S. Eliot considered to have “single-handedly killed the 19th Century”, or open Jack Kerouac’s *On the Road* every once in a while and read a sentence such as this one: “the only people for me are the mad ones, the ones who are mad to live, mad to talk, mad to be saved, desirous of everything at the same time, the ones who never yawn or say a commonplace thing, but burn, burn,

burn, like fabulous yellow roman candles exploding like spiders across the stars and in the middle you see the blue centerlight pop and everybody goes 'Awww!'" (Kerouac 1957), and all that while Dean Moriarty peeped behind the writer's back, saying "man, wow, there's so many things to do, so many things to write! How to even begin to get it all down and without modified restraints and all hung-up on like literary inhibitions and grammatical fears...That's right man, now you're talking'" (Kerouac 1957). When I, myself, feel as if shackles of stiffness have come to grip me, I enjoy plunging into works of one known simply as Doris in the fanzine world (Crabb 2011), and seek inspiration in passion and craze in her writing, in the way her words are spread along different directions, breaking the rules of well aligned text and grammar, as if she is a punk writing rebellious, but beautiful and profound messages on the city facades, in her intentionally misspelled words and a freedom to start a new sentence with sometimes a capital and sometimes a small letter, and then in some golden childishness in her expressions, which can be seen from the way her writings naturally instigate one to read slowly, word by word, and let each one of them reverberate with patience and carefulness along the flowery walls of one's mind. And just like tidying up and polishing the surface often serves the purpose of making it reflective, not permeable to the rays of viewers' attention, so does shattering things on the surface often stands for the best way to open the view of the gorgeous essence of our being. Sweet and sympathetic mistakes made on the surface of our expressions are thus an excellent way for revealing the heart of ours in all its softening tenderness, when dolling up the surface with pretty adornments would merely conceal this core from others' views. -

Advice #8: It is irrelevant who came to certain conclusions first, for science is an effort on behalf of humanity as a whole.

Therefore, don't be calculative and hold back insights and results to reap fruit on future occasions; instead, tell all that you have had in mind, freely and openly. Also, although it is impossible to figure out if we were the first ones to have arrived at a certain conclusion, stay humble and refer to other people's work as much as possible. For, science is a collaborative effort and each one of our works is based on former insights of millions of pioneers that inhabited this planet. Or, as Jonas Salk asked back when he was asked whether he would patent the polio vaccine he had discovered, "Can you patent the sun?" From one such enlightened perspective, one can with sadness observe scientists in dispute over who is supposed to get more credit for their achievements, claiming limited authorships and patent rights while forgetting about the fact that every tiny discovery is always made on the back of entire humanity. Whatever the beautiful things we see in the world, they are always, more or less, existent owing to our standing on the shoulders of giants, that is, on the pedestal of the preexisting foundations of creativity of our civilization. Of course, should we start searching for anyone who contributed in any way to any work done by anyone of us, we would eventually have to include the whole humanity and every single creature that has ever belonged to it. And, as you may guess, not only humanity, but the entire evolutionary backbone that

preceded us and the entire biosphere that supports the existence of humanity would have to find their place there as well. In this context, we may as well highlight the words of Ludwig Feuerbach: "The single man in isolation possesses in himself the essence of man neither as a moral nor as a thinking being. The essence of man is contained only in the community, in the unity of man with man - a unity, however, that rests on the reality of the distinction between 'I' and 'You'" (Feuerbach 1843). This balance between individuality and unity, between being sanely self-responsible and yet compassionately cohesive with surrounding minds, brings us straight to the doorsteps of the Way of Love, of which much more has been said on previous occasions (Uskoković 2012).

Advice #9: It is too early to talk about shattering the standard structure of scientific paper - Introduction, Experimental Part, Results and Discussion, Conclusions - to pieces because then we would never get published, but think about it because its deconstruction is bound to happen in future.

Why not beginning the paper with an inspiring question or a mysterious equation rather than following the same old shabby model? That is the question that has incessantly orbited around the sun of the eye of my mind. Also, why not describing our research the way it really happened, step by step, with all its intellectual soars and falls, and thus making it reflect what it essentially is: the most exciting adventure of the human mind, the adventure aimed at knowing the incessant dancing partner of our spirits, Nature, in the ontological dialogue between the two, through which all perceivable things are created (Uskoković 2011). Or, as Peter Medawar would have put it, "The scientific paper is a fraud in the sense that it does give a totally misleading narrative of the processes of thought that go into the making of scientific discoveries. The inductive format of the scientific paper should be discarded...scientists should not be ashamed to admit, as many of them apparently are ashamed to admit, that hypotheses appear in their minds along uncharted by-ways of thought; that they are imaginative and inspirational in character; that they are indeed adventures of the mind" (Medawar 1963). And as in every adventure, being lost and found and lost and found all over again is a necessity rather than an option.

Advice #10: Remember that words are music and their arrangements ought to flow like a river; in fact, embrace the balance between aesthetics and rationality with your whole creative being.

Avoid placing disconnected thoughts one after the other, like on a disarrayed pile of straw. Just like a connection exists between one two adjacent entities in any edifice around us we could think of, from bricks in houses to cells in organisms, so should it be with the written works of ours. We need not go as far as Gustav Mahler's beliefs that "The symphony should be like the world: it must embrace everything" (Painter 2002, Johnson 2007) and indulge in similarly grandiose dreams of composing sounds that would flow from one to another without any obstacles, but we should do our best to get close to it and make our wording flow smoothly like a river, from one thought to the next, from beginning to its end, closing the

circle, as in every masterfully conceived piece of art. Yet, despite writing in concord with your inner music, always remember that the paper's ultimate purpose is to be read by others and that it presents your five Warholesque minutes to grab people's attention by the hand of your intellect and invisibly sow seeds of some inspiring trees of knowledge through their eyes and into their mind. Or, as Martin Buber mentioned, "I do, indeed, close my door at times and surrender myself to a book, but only because I can open the door again and see a human face looking at me" (Buber 1923). After all, if we are judged by Nature in our endeavors, daily and lifelong alike, it is certainly by how much effort and drive we have invested to beautify Her.

By balancing aesthetics with clear-cut logical reasoning, science of the modern day gives us a wonderful chance to become a glass bead game player (Hesse 1943) like no other. Since this balance has the same status as empiricism had doing the days of Inquisition, we should be sure that should we collect enough courage to go out and talk about it openly, the rewards might be great one day, despite the obvious risk for our professional reputation and career choices. However, without coping with risks, nothing valuable could have been created by the inventive inhabitants of this planet. Such is their mutuality that instead of choosing the road of ingenuity, we can likewise opt for the one where riskiness lurks. And I believe that the time will surely come when scientists will approach this balance more intimately and begin to value it more openly and not secretly and shyly as is the case today. After all, it does not take much insight to realize how arts enrich scientific thought, while the latter makes the former more analytically streamlined (Uskoković 2010).

If you have begun to feel that following these aesthetic criteria will make us move in the direction of an artistic analysis of the scientific paper, you were right. For, all these advices pinpoint the horizons beyond which science and arts join their hands and begin to boogie with the dancing elephants and laugh with the singing manatees, but that is a story for some other bedtimes.

Post Scriptum advice: This postmodern list of advices for postdoctoral scientists cannot be complete without this post scriptum. And it goes like this: discard all these advices and find those that work for you and you only, and then erase them all once more and remain levitating in an unindoctrinated no man's land, knowing that the evolution of science and our very beings is inextricably tied to questioning every doctrine, including this final doctrine that tells us that no doctrine is left to follow and that, maybe, but maybe, all of these advices could be faithfully followed in the end without hurting our genuinely adventurous and skeptical scientific open-mindedness.

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