

CREATIVITY IN ARTS AND SCIENCES: A SURVEY

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Abstract. The motivation for this chapter lies in a survey on creativity among a significant number of artists and scientists (largely but not only astronomers) worldwide. It mainly illustrates there is no unique creativity process, although similarities abound between artistic and scientific creativity. No major difference appears between the groups of artists, nor between the subsamples of male and female surveyees. Comparisons are offered on the basis of well-documented creativity processes as well as a few additional comments.

1. Introduction

The unfortunate lady next to me lost a number of her illusions that evening. At least, she lost a few of her romantic and idealistic views on the way paintings were conceived and materialized.

The noted local artist in front of us, also a guest for dinner of a mutual friend, had just gently explained her that, every time he was standing in front of a blank canvas, the challenge was simply to produce something he could sell and make a living out of it – a quite materialistically-minded creativity indeed. He would of course give as much as he could of himself in the work, but he would also totally integrate external constraints for his own subsistence and career. In fact, his creativity was basically market-driven.

Is it different for science and astronomy in particular?

We, in science, have certainly a much more comfortable situation as the financial aspect is generally ensured on a monthly basis ... once a grant or a position has been secured. But could we say our creativity is not *market-driven* either? Getting a position is not all in science. Career has to be pursued, essentially based on *recognition*. And this recognition relies

largely on the capacity to include refereed publications in a curriculum vitae. Recognition is also critical for obtaining acceptance of proposals (*e.g.* leading to data collection), and for achieving funding of projects (allowing materialization of ideas).

Beyond intrinsic merits, this cannot be done without consideration of external elements. Research must be identified as excellent, certainly trendy and worth being invested in financially and humanly by the funding agencies and by the decision makers and takers.

2. Creativity?

This is not the place here for a treatise on creativity. The concept has become fashionable nowadays and several web sites are already offering extensive compilations of creativity-related books and quotations¹.

The list of these could be extended almost *ad infinitum*, from the late French President François Mitterand (1916-1996) declaring that “had [he] had creative talents, [he] would have never entered politics” (Martí 2001) to the London-based Spanish shoe designer Manolo Blahnik (1943-) saying his creativity surges from his obsessive and neurotic phases (Fernández-Santos 2001) – just to take a couple of examples from recent news reports.

How could a scientist not be curious about his/her own creativity? My own interest in creativity processes dates a long time back and can probably be traced to (or has been reinforced by) two influences.

The first one was with British writer Arthur Koestler² whose book *The Act of Creation* (1964) has been hailed as a richly documented study on creativity³. Briefly said, Koestler argues in that book that the mind’s capacity for inspiration and thought is enhanced when rationality is suspended (as, for example, in dreams and trancelike states) and when automatic routines of behavior are suppressed. Kellner (1965) calls it “the most ambitious attempt yet made to integrate the findings of a range of disciplines into a single theory of creativity”.

Koestler is well known for many other books, such as *The Sleepwalkers* (1959) where he shares his – again well-documented – sympathies and antipathies for great astronomers of the past. In the tragi-comedy *The Call-*

¹See for instance <http://members.ozemail.com.au/~caveman/Creative/Books/> and <http://members.ozemail.com.au/~caveman/Creative/Resources/crquote2.htm/>.

²Budapest, 1905 – London, 1983.

³Interestingly the two volumes of the original English-US edition have been reduced to one by Koestler himself for the French edition entitled *Le cri d’Archimède* (1965). The author explains that critics reproached him to put together two parts addressed to two different audiences, the second one being directed to specialists (embryology, etc.). In the same foreword, Koestler also modestly expects progress in psychology and neurology will show his theory of creation is unsatisfactory, but hopes it will nevertheless be a step towards a better understanding of human thoughts and emotions.

Girls (1972, 1974), he stigmatises certain superficial scientific attitudes on the background of an imminent world conflict.

The Belgian writer Georges Simenon⁴ has been very outspoken on his creativity processes, especially in interviews. As however his biographer Assouline reminds us in his voluminous and masterly written work (1996), one must always be careful with what individuals under study have written or declared on themselves – the usual differing perspectives between memoirs and biographies⁵.

A rich personality, this prolific writer (under his own name and a number of pseudonyms) with an international career (Belgium, France, USA, Switzerland) originates from a city and a region quite familiar since I grew up and lived there for about thirty years. Characters like Simenon (his way of expressing himself, his exuberant sexual life, his stylish personality, his extensive travelling, the daily pragmatism of his books and his deep understanding of the human nature shown in his characters, ...) are not uncommon in the area. Simenon actually will be, not our reference in the following, but a kind of comparison for the survey.

3. A survey on creativity among artists and scientists

3.1. GENERALITIES

A few basic questions were put together and sent to a number of people worldwide. The purpose of this initial approach was essentially to collect reactions from a wide range of disciplines and sensitivities. So diversity was more important than a large number of answers.

The surveyees were also promised confidentiality and anonymity. So no names will be given hereafter, nor personal elements nor indications allowing some identifications (or they would be vague enough). Except where gender identification will be interesting for a couple of comments (essentially Question 4), the surveyees will be identified in a neutral way, as ‘persons’.

3.2. THE SURVEY QUESTIONS

Here were the questions of that survey:

1. What is your category of recognized creation?

⁴Liège, 1903 – Lausanne, 1989.

⁵This must be obvious, so is it necessary to recall that people with public profile tend naturally to improve their image and would rarely confess anything that might be damaging to it? Autobiographies evidently always emphasize the ‘nice’ sides and are rather discrete on the other ones – unless they are well known, in which case they would be explained, excused or minimized.

- [painting, writing, music, science, ...]
2. What are your motivations for creating?
[none (spontaneous process), making a living, conveying messages, knowledge advancement, career progress, ...]
If several motivations, please rank them by decreasing order of importance.
 3. Is the result of your creativity expected (you know in advance what you will achieve) or (even partially) unexpected?
 4. Would you say that creating is giving birth to something?
[feel free to elaborate]
 5. Would you say that your creativity is produced by another 'person' inside you?
[feel free to elaborate]
 6. What is the time of the day/week/month/year when the creative process is working best?
 7. Is weather influencing your creativity?
 8. Is any stimulant helping or indispensable to your creativity?
 9. Please describe your creative process in a few words.
Are there several phases?
[preparation, concentration, depression, ...]
 10. Did you notice an evolution/changes with age?
 11. Would you say your creativity is a family gift?
[other creative people in your family?]
 12. What do you think of the claimed parallel between artistic and scientific creativity?
 13. Additional comments?

3.3. SYNTHESIS OF THE ANSWERS TO THE SURVEY

About 50% of the questionnaires were returned, which can be considered as a good score, but, more important for our purpose, the answers were received in about equal numbers from artists and scientists, as well as from male and female surveyees. This last aspect is also interesting as one could expect differing sensitivities from men and women. Question 4 was especially interesting to peruse in this respect.

The answers were not only coming from a large range of creative areas (see hereafter Question 1), but also from quite different parts of the world: Europe, both Americas and Australasia.

There was one wholly negative reaction: a scientist simply declared having no time anymore for creativity. There might have been a misunderstanding on the term creativity, unless that person understood the survey was

aiming at non-professional creativity. It is true also that this person now has important managerial responsibilities.

In a couple of instances, surveyees did not answer some questions directly for themselves, but were telling their general philosophy on the point (complementary definition). We either disregarded the answers or adopted what was somehow defined *in absentia*.

As mentioned earlier, we shall give, whenever we found the information (Assouline 1992; Simenon 1959 & 1963), what would Simenon have answered to each question.

3.3.1. *Question 1: category of recognized creation?*

Here is the large range of disciplines covered by the returned survey questionnaires (alphabetical order, with of course some overlapping, but also frequently several answers per category): architecture, astronomy, biology, chemistry, computing, dance, design, digital media, drawing, geology, history, lecturing, literature, movies, multimedia, music, painting, photography, physics, printing, presenting, scientific research, sculpture, software, sound arts, teaching, virtual reality, visual arts, writing.

Our comparison Simenon was of course a writer.

3.3.2. *Question 2: motivations for creating?*

The wording of that question (see 3.2.2) suggested some options. About half of the surveyees repeated them, often saying they were identifying a mixture of the possible reasons listed, but that it would be difficult to rank them by importance as the actual situation was depending of various factors and/or evolving over time.

The most frequently reasons listed, about equally, were an inner necessity (mainly, but not exclusively, by artists) and the advancement of knowledge (by scientists). Communicating with a larger audience (both categories) followed, as well as conveying information and career progress. Making a living was also mentioned a few times, as well as the spontaneous process, probably of the same family as the inner necessity. A couple of surveyees beautifully answered the “quest for immortality” which is to be linked with the need for recognition answered by others. Fun, meaning in life, sharing experiences were also among the motivations quoted.

For Simenon, this was an imperious inner necessity.

3.3.3. *Question 3: result unexpected?*

The overwhelming answer here was partially unexpected, sometimes with additional comments in the spirit “of course, otherwise there would be no creativity”.

Some surveyees answered the result was always unexpected, totally unexpected, unexpected at beginning, not always expected, “it depends”, and a couple of answers were simply ‘expected’.

For Simenon, the result was partially unexpected (the failure of the novels was not always known to him beforehand).

3.3.4. *Question 4: giving birth to something?*

This ‘psychic’ question has been the source of interesting strong reactions and it is appropriate to make here a distinction between answers from male surveyees (ms) and female surveyees (fs).

The majority of surveyees found they were somehow giving birth to something. Here are a few of the comments, starting with clearly negative ones and ending with positive ones:

- No, I think that is a male cliché by people who will never actually give birth. (fs)
- No, I’m too macho. (ms)
- No, I think of it more in terms of inventing, more closely related to finding than giving birth, more like being an explorer. (fs)
- It is the process of creating that I cherish, not so much the product. (fs)
- Yes, but it would be pretentious to believe I give birth to something entirely new. I am happy if I am able to inspire a few other people. (fs)
- Yes and no. There is an internal period of gestation during which the form begins. But the realization of the form only happens through the process of [creating]; that is, the thing is not fully formed within, then ejected from the body. The process is a halting one. The [work] may emerge misformed and one has a chance, many chances, to refine and reshape until the integrity is there. (fs)
- Yes, there is a spark (a thrill) of idea + image. A gestation period, then as the work comes into being. I am, quite literally, dismembered (in the persona, psyche + though physically) and my life/soul energy is taken to bring the work across ‘the river’. (fs)
- Birth involves intense pain and pleasure, and involves something new that is more than the sum of its parts, so yes! (ms)
- Yes, of course. It can also be said to release something that is present without form. Ideas are like this. (ms)
- Yes very much so; my [work was] my third baby (mother of two).

Simenon was definitely giving birth to something.

3.3.5. *Question 5: created by another person inside?*

This other ‘psychic’ question has sometimes been answered by describing the creative process itself (cf. Question 9) than by simply ‘yes’ or ‘no’. But in those terms, the general answer was negative.

Simenon repeatedly explained he was in the skin of someone else when he was writing.

3.3.6. *Question 6: best time for creativity?*

That question was initially drafted with simple times of the day or the year in mind. Another aspect was however frequently mentioned instead in the answers: the best time is when there are no disturbance, distractions, inescapable solicitations and duties, burdens of all kinds, financial difficulties, health problems, etc., or even, as said a (male) surveyee, “when not in love”! All these situations can of course happen at different times of the day and year.

Otherwise, more to the initial point, a very large majority of the surveyees are more creative in the morning. Among the seasons, Winter and Autumn seem to be best, followed by Spring. Summer has not been mentioned.

Simenon was typing his books from 6:00 to 9:00am (but see also Questions 8 & 9).

3.3.7. *Question 7: weather influence?*

There is no clear majority, except perhaps in the sense that about half the surveyees said they did not notice any influence. Others claim they work better on sunny days, while some prefer rainy days to stay inside and ‘work’ (create). A couple of more complex answers pointed out that sunny weather and outdoor activities helped getting ideas, but bad weather was ideal to subsequently materialize them.

I have found no evidence of weather influence for Simenon.

3.3.8. *Question 8: stimulants helping or indispensable?*

Do not expect anything spicy here: all the surveyees seem to be quiet and reasonable people. The only substances mentioned recurrently were tea, coffee, chocolates, occasionally red wine and nicotine, otherwise music and stimulating conversations.

Simenon was known as a regularly very heavy drinker, but not as an alcoholic. His exuberant sexuality has also been the source of many commentaries⁶. There is no indication however that this helped or was necessary to his creative process. He often said that, when he was feeling the need to start a new book, he used to go out for a long walk and that it

⁶Probably with his cold Belgian humor, he boasted one day when interviewed “10,000 women”, most of them prostitutes of course, something immediately echoed by the media. Later on, he ‘modestly’ claimed that, since he had been active since the age of 13, this corresponded on the average to only one woman every second or third day ...

was the smell or the scent of something that was triggering memories and calling places, faces and characters to his mind.

We shall come back to the stimulants issue in the final comments.

3.3.9. *Question 9: creative process?*

Each case is of course personal and often linked to the specific activities of the surveyees. It would therefore be too long to reproduce all the details here. Additionally some surveyees have obviously been studying their own process more deeply than others.

Summarizing all answers, it seems to me that there are generally at least two main phases.

First, a preparatory phase can take different shapes (quoting representative excerpts from questionnaires):

- meditation in front of a blank piece of paper or canvas;
- reading + thinking + assimilation;
- ideas popping up when travelling, walking in woods or relaxing on couch;
- research, contemplation;
- preparation, concentration;
- gathering data;
- getting rid of all pending things (including domestic ones);
- etc.

The second phase is actually the ‘perspiration’ one (quoting again):

- it requires effort, determination and tenacity to make things work;
- rush of work in a tunnel of concentration;
- get to doing the work until completed;
- sustained application;
- working, testing, working;
- Etc.

There might be of course several iterations and accessory phases. No surveyee but one reported subsequent phases such as depression, exhaustion, need for rest, and so on. But the painful character of creating, both mentally and physically, is often stressed, as well as the total isolation from the rest of the world during the most intense periods.

Simenon has described his creative process several times with a luxury of details, and this was confirmed by the testimonies of his near relations. When he was feeling that imperious need of writing a book (often a kind of uneasy feeling⁷), a couple of walks would define the places and characters (see Question 8). Then there would be a phase of careful preparation and meticulous gathering of documentation. He would then enter a phase of productivity, being in the skin of someone else (see Question 5), totally

⁷The French word he used was ‘malaise’.

absorbed (once passing his wife and greeting her without recognizing her), typing frantically in the morning (Question 6) at the rhythm of one chapter per day with absolute prohibition to disturb him, sometimes changing shirts because sweating abundantly.

He was able to hold such a rhythm and withstand the stress for about ten days, which would explain why his novels have less than a dozen chapters. He needed a period of rest afterwards (several days) and was sometimes anxious for his mental integrity (*i.e.* not being sure he would always emerge intact from such periods).

3.3.10. *Question 10: evolution with age?*

Yes, definitely, there are changes with age. So, here is a sample of the most characteristic features listed:

- Younger: bigger need to create, more daring, more spontaneity, more energy, more health, more strength, more enthusiasm, less patience;
- Older: harder to find time, more silence required, loss of innocence, more refinement, slower process, less risk-taking, more down to points, more conscious of impacts, larger experience to build on, rushing before diminution of faculties.

Simenon often said that his understanding of the human nature increased with age as he was going through more experiences. He wanted to write until an old age to be able to go “all the way round the human nature”.

3.3.11. *Question 11: family gift?*

Answers are very split on this point, with some (likely statistically insignificant) predominance of ‘no’, as probably would have also answered Simenon (no clear statement found on that specific point).

There are of course several examples of creative families (Renoir, etc.) and dynasties of astronomers (Struve, Schwarzschild, etc.), but there are certainly other factors involved here than just genetics.

3.3.12. *Question 12: parallel between artistic and scientific creativity?*

Virtually all surveyees believe this is a true thing. Here are a few additional comments reproduced from the returned questionnaires:

- Some science can be extremely artsy. All is a creative endeavour. In either science or art, creativity is based on work work work. The work is different, but the joy is the same.
- I think (having mixed more with scientists than many in my discipline) that there is more art/beauty/creation in science and scientific theory than many artists realise – *e.g.* the beauty of a formula – or the real meaning of harmony in Pythagoras’ theory. I’m sure that creation of scientific ideas

must undergo similar processes to artistic creation.

- Yes, but science does not move the souls as the arts do.
 - Being creative is a gift, a fundamental attribute of a person, but it can take several forms: science, art, ...
 - Humans are united at a deeper level than the disciplines of their activity. Creation, synthesis, inspiration, all work equally well in art and science.
 - Definitely real parallel with scientists having however more boundary conditions (physical laws, etc.) to respect.
 - I think research scientists who truly ask/theorize abstractly are great artists.
 - Yes of course! An example is the long-term link between music and astronomy since Pythagoras.
 - The science provides facts and principles that help our intellect grasp the physical nature and complexity of things, while visual art that deals with these subjects provides interpretation and inspiration leading toward a deeper aesthetic, spiritual, and metaphysical understanding.
 - Two different worlds, according to me, but with some obvious links.
- Simenon had a rather encyclopaedic view of creativity.

3.3.13. *Question 13: additional comments?*

Most surveyees found the survey interesting and were curious to see the results, in other words to compare their situation with that of others. They were sent a copy of this report.

4. Conclusions and additional comments

The variety of answers to most of the survey questions is an indication, if not a proof, that there is no unique creativity process, although similar features abound. Additionally, no major difference appeared between the group of artists and the group of scientists, nor between the subsamples of male and female surveyees.

The survey undertaken is pointing out a number of directions for further investigation. It should probably be carried out again on a much larger scale, with more questions and a finer stratification of points.

Comparisons could be multiplied, for instance:

- with Leonardo da Vinci whose vision has been extraordinary,
- with Michelangelo who has been one of the greatest and most versatile artists of the *Rinascimento* (Italian Renaissance),
- with Albert Einstein (see *e.g.* Fölsing 1997), hailed as The scientist of the XXth century and who is now the most-quoted philosopher, at least in scientific circles,
- with, why not, the famous Belgian schools of cartoonists (see *e.g.* Dayez

1997) whose members were more than prolific with creativity of all sorts, – and so on.

In OSA Book I, White (2000) presented the INSAP conferences that are opportunities to review the bridges (*cross-overs*) between astronomy and the arts and literature. I attended two of the three conferences organized so far. Following those experiences, it is obvious to me that artists and scientists – the creative ones at least – have a lot in common.

We all know by experience that creativity is not absolutely necessary nowadays to make a career in astronomy (or science in general) as it has become such an intricate business that it offers plenty of slots for competence not involving creativity. This is of course acceptable as long as the career tracks followed are identified as non-creative ones, which is not always the case. Not infrequently, scientists make a career simply by adapting or plagiarizing ideas of others.

This brings us to a general comment on the way universities and most ‘grandes écoles’ are *not* preparing students to research. Students are too often treated – and rated – rather as good sponges: they are taught a number of things and rated according to their capacity, when pressed and squeezed at exams, to produce the same kind of juice. Some higher education establishments also emphasize too much clanning and good handling of relationships compare to creativity.

Additionally I have seen *many* PhD theses that were largely if not totally devoid of any type of creativity, and this for a number of reasons such as the inappropriate level of the supervisor and/or the student, or because of time constraints on the theses rendering the exercise hopeless.

A final comment regarding the potential usage of stimulants: there is no reason to question the sincerity of the answers to the survey presented in this chapter, but it is obvious that the usage of drugs or of chemical adjuvants is wider-spread than it is accepted generally. Of course, this is a delicate matter and one cannot expect people frankly to tell a surveyor of possible habits in that respect.

It should also be noted that scientists may take drugs for other reasons than just creativity. In the past, winter nights were cold and long at telescopes, and drugs (from chocolate to red wine and perhaps opium) might have been taken to withstand fatigue and keep the brains alert.

To be complete, the existence of a number of medical studies dealing with the influence on creativity of various disorders must be mentioned. This is of course totally outside the scope of this chapter.

Acknowledgments

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