



HOW TOMORROW SCIENTISTS VALUE SCIENCE

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Abstract:

This study tried to investigate PhD students' experience while conducting research, as regards the reasons due to which someone chooses to conduct a PhD, the extent to which science is beneficial to everyday life and their aspects on whether science and scientists belong to 'elite'. PhD students often come across challenges, successes, emotional instabilities, enthusiasm, satisfaction, but also failures and disappointments. Issues of power, truth, research, fame, mystery and understanding new worlds come on the surface and proved that human beings have desires and weaknesses. We tried via e-mail interviews (with PhD students) to look into all the previous issues mentioned above.

Keywords: PhD students, research, emotions, 'elite', experience

Introduction

PhD students constitute a group marked by special characteristic compared to graduate and postgraduate students. They enter a field full of challenges, experience successes, emotional rollercoasting, enthusiasm, satisfaction, but also failures and disappointments. Very often, they realise that they are prisoners of their own efforts, as well as of the conditions related to their social and psychological capacity

This study has attempted to record the students' experience of conducting research for the purpose of producing a PhD thesis. The aim was to investigate:

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- the reasons for which one chooses to conduct a PhD, and
- the extent to which science is beneficial to everyday life, and
- their views on whether scientists constitute some form of social elite.

Available bibliography on this subject (Greek bibliography in particular) appears to be particularly sparse. This is probably because the focus of Social Sciences is not usually on groups that are deemed to be privileged and professionally/socially secure (as PhD students are typically considered to be); rather, the focus tends to be on individuals and groups that face problems with their social and/or professional development and with their interpersonal relationships, or are generally under threat of social exclusion or overwhelmed by problems in their daily life routine.

Having distanced ourselves from PhD research activity due to time elapsed since we were in the same position, we had the opportunity to decode more easily the criteria, the elements, the emotions and the aspirations involved in a decision to conduct a PhD. Anyone who has gone through this experience have literally seen themselves under a different prism both during and in the aftermath. One would dare say that they have conducted a “PhD on their PhD”.

Factors affecting the decision to conduct research and the choice of subject

There are many possible reasons why one would decide to conduct doctoral research. The most commonly accepted and understood is the academic career prospect: *“Because I want to follow an academic career and conduct research within my profession.”* (p10). In order to pursue this career path it is an essential requirement, at least formally, to hold a doctoral title. Most believe that this title is inextricably linked with the university arena. This, however, is not always the case. Most certainly there are personal motivations for a person to choose to go through the PhD process but, on a second level, there is the influence from the immediate social environment (parents, partners, friends, etc.), and of course also a set of factors such as social and financial conditions that facilitate the decision to commence.

With regard to the academic community, its members are somehow “obliged” to get their scientific work recognised. Recognition extends across multiple facets, ranging from citation index to peer acceptance, participation to international conferences (especially by invitation), leadership of state and international institutions, etc.

It appears that most scientists choose a subject on the basis of its sound scientific grounding, the availability of serious and resilient sources of evidence and the confidence on the prospect of producing results (in which case the research may fail to achieve popularity) or, conversely, on the basis of novelty and innovation where the risk of failing to yield significant results is higher (but, in case of success,

popularity is almost guaranteed). Each scientist's level of ambition and aspiration obviously contribute to the decision to follow either of two paths. According to Lemaine: *"A scientist is typically content with a modest success (and consequently modest recognition) [...]. Why, then, do some risk very little by choosing to do rather uninteresting research, yet others prefer to gamble against all odds?"* (in Papastamou, 1990: 224).

In conjunction with the above, the fact that a scientist needs to constantly keep publishing in order to gain acceptance and recognition – the so called 'publish or perish'- may be a cause for concern. Since the terms of engagement with the academic community dictate that quality must be sacrificed in favour of producing quantity, what then eventually really matters is the manner and logic of organising each field of knowledge – and also obviously each researcher's individual personality.

Regarding the personal reasons that influence a researcher's decision to pursue a PhD, we will now present a few elements that clarify the prism under which the process takes place. According to Rosenberg (1965), the self is the set of an individual's thoughts and emotions, and it includes both a cognitive and an emotional side. Self-perception and self-image belong to the cognitive side, whereas self-esteem and total self-worth belong to the emotional side. Moreover, both self- image and self-esteem involve an element of self-evaluation, through which an individual's reaction potential is produced.

In 1902, Cooley introduced the term "looking-glass self" (Cooley, 1902). There are some significant peers, whose advice we seek in order to affirm and support ourselves. In other words, our self is the mirror image and our self-image is composed by the evaluations carried out by all those significant peers (Paraskevopoulou-Kollia, 2006). Additionally, Mead (1934) asserted that we can only exist and express ourselves through interacting with others.

The influence of social surroundings upon the fluctuations of an individual's changes of stance is incontrovertible and people are affected by their cultural locations and so they do narrate over their life experience (Gergen, 1972; Street, 1994). In short, whatever happens around us always affects us. However, it needs to be noted that the way we are affected varies from individual to individual and is dependent on educational, social and financial background, life experiences individual personality traits (Bandura and Walters, 1963) as well as location and time setting. It is impossible, therefore, for a budding academic's self-image to not be influence by the opinion held of them by the academic community as well as their social environment.

Aspirations

There are no specific written rules to force students into a predefined trajectory in order for their aspirations to be fulfilled. Moreover, there are no specific written rules to

dictate to students what their (scientific, social, financial) aspirations should be. The scientist enters a “dangerous” field, full of challenges. The PhD title is earned through hard work, in order to verify the acquisition of “higher” knowledge and the transition to more advanced academic or professional fields. Each student’s personal motives for conducting a PhD may differ from the motives of the University where the work takes place and the title is eventually awarded. Without doubt, however, for most students the PhD is associated with their desire to commence and continue life as research for the purpose of personal satisfaction (Leonard et al., 2005).

Entering the research field

The PhD introduces students into a transitive period which often feels endless. They are kept in a state of “alert” against an ambiguous situation that cannot be easily described, with which they are absolutely connected to and from which they cannot escape, however they also do not want to escape from. Each and every PhD student is terrified of entering a research field; a process which, no matter how exciting, is basically a monotonous (in the sense of discipline) and lonely piece of work. Before each next step lurks the unknown which may even involve a research outcome that could result in “career death”. Any direct and obvious final result is still well past the horizon, resulting in a sense of constant futility and fear. This fear may or may not be conscious and may or may not include: the prospect of not completing the research; the negative criticism by a supervisor or other parties; the lack of a sense of direction; or the lack of reliability. One must not forget what we already mentioned earlier: The opinion of significant third parties, and also of the scientific community, has a very high level of influence and can affect (to the point of raising or collapsing) a researcher’s sense of self-esteem (Phipps et al., 2007: 236).

A question posed by researchers is whether the self is defined as a subject or an object (Leontari, 1996). As a subject, the self thinks, remembers, perceives, whereas as an object the self-escapes its limits, and judges, studies its own personality like an external observer (Paraskevopoulou-Kollia, 2006). During the course of PhD research, the self has difficulties in functioning like an object and is therefore impeded from escaping its own limits and judging the quality of its own research as an external observer. Identification of the self with the field of research is very strong, to the point of becoming indivisible. It is like the “truth” dilemma. There is never just one “truth” when a matter is under investigation.

Loneliness, emotional turmoil, discipline

Essentially, there is nobody capable of understanding the stages a PhD student is going through. Even supervisors and viva board members are unable to recall their own

memories from the time when they themselves were subject to the same processes – therefore unable to impart to the student a sense of security and autonomy. These need to be “earned” by the students themselves and the path through the alternation between extreme positive and negative emotive responses appears to be a one-way system.

Kearns et al (2008) have termed the period of PhD studies as a “race between the student and oneself”. In their effort to produce something original, students hit a wall of anxiety, exhaustion and feelings of self-cancellation. Overcommitment, procrastination and perfectionism (Kearns et al., 2008; Blanchot, 1989) are side-effects of their confusion regarding their motivations and the quality of their output. Blanchot (1989) described this confusion as a form of “incomprehensible torture” where the student self-flagellates by constantly pondering on whether the content of his/her write-up is something magnificent or insignificant, whereas liberation and re-assertion of self-perception is achieved by completing the authoring of the thesis. However, this process carries a risk of quitting the effort, or even long-term (negative) consequences on one’s future professional life (Kearns et al., 2008: 77).

PhD research has been described as a “convoluted process” (Deegan & Hill, 1991). Its duration typically spans a number of years, from three to six depending on the type of course offered by the university and/or chosen by the student (Blanchot, 1989: 55). It requires persistence and discipline (occasionally also including leadership skills, teaching skills, team spirit and administrative skills) and causes difficulties to the student because it requires a much higher level of involvement and discipline, especially in cases where the supervisor is based in a different country or has a particularly busy schedule. In these cases, the student feels isolated and abandoned. A problematic relationship with the supervisor contributes to procrastination and isolation. Conversely, treating PhD students as significant members of the academic community may function as a “protection shield” (Hakanen et al., 2006; Leiter & Maslach, 1988).

Contrary to the majority of the bibliography, which emphasizes on the negative and traumatic side-effects of PhD research, the study by Pyhalto et al. (2009) deals with the positive consequences. The centrepiece in this range is the development of critical thought skills and abilities: ability to control and compose ideas and information, recognition of opposing opinion, utilisation of knowledge for the purpose of interpreting data and evidence. *“Helps you see what happens around you on a daily basis through a critical eye and allows you to have a higher level of analytic ability”*.

To conclude: while a PhD student experiences both positive and negative emotional fluctuations, the process is a journey whereby the PhD is the vehicle that will convert the student to an academic (Deegan & Hill, 1991). This prospect, combined with

the right kind of relationship with the academic community, can constitute the motivation for completing the PhD course. Ignorance of the consequences of a demanding and painstaking piece of work, in combination with personal ambition and the social/financial conditions that may or may not facilitate the commencement and conclusion of research, are catalytic factors for a researcher-author. Eventually, everything depends on the student's degree of perceived security and on the conflict with himself. Whereas the PhD aims to a significant contribution to the academic community, it still remains a personal affair.

"Time had stopped; all I cared about was meeting the deadline. Every single day was committed to research, especially towards the end. A lot of anxiety, and a burden that would not allow me to enjoy anything else in my parallel life. However, I could feel my intellectual powers reaching a state of orgasm, whereby they would incessantly work and create. Adrenaline had a soothing effect and I felt constantly euphoric. I could not wait for my 'child-idea' to complete its birth so that I could find some relief..."

(p7)

"During my PhD, my emotions were all mixed up, ranging from absolute joy, a feeling of euphoria and inspiration and a strong sense of self-esteem, all the way to pessimism and personal devaluation. Sometimes you love it when your ideas and preconceptions are overthrown as you wade through the bibliography, and sometimes you hate it because you are desperate to reach a successful conclusion. Delivery feels like it's infinitely far away, and doubting of the results becomes progressively stronger. Long discussions with other students and with my supervisor for days on end, and on other days I do not even want to describe my research aims to colleagues when they ask me. However, this love-hate relationship with the PhD is highly addictive. Even when negative thoughts are present, they are quickly surpassed by the thirst for research."

(p12)

Methodology

This study is based on 24 mail "mini dialogues"- with PhD students, enquiring about their perspectives and feelings on science and on choosing and writing up their research. More specifically, we asked the candidates three questions, namely: their opinion on science; whether scientists are believed to be elite; and the reasons why they chose the research "path".

From the very beginning, the researcher who chooses interviews for data collection has to know that this is a method considered more capable of allowing the

interviewee's personal views to emerge (Flick, 2004), in order for the main aim to be achieved: the information to be as accurate as possible. Interviews are facing issues of validity and self-expression. Furthermore, the connection between the data and the arising facts is a sort of "conceptual truth". We were interested in people's narratives and reflective understanding of their every-day life experience during the PhD period and interviews could give us the opportunity to capture and develop the personal concepts that each one of them, coming from different social and cultural background, may have and, accordingly, may share (Busher, 2001; James, 2003; Duranti, 1997; Cazden, 2000).

What one has to remember is that qualitative research has always to take into account the need to avoid generalization of findings.

Using semi-structured e-mail interviews

Semi-structured interviews are low-cost and they can appear to be a rapid method for gathering information from individuals (Meho, 2006; Blomberg, et al., 1993). This is exactly what happens with interviews via e-mail, as well. They are low-cost and they have the possibility to give access to world-wide samples. The researcher has the opportunity to 'eliminate any errors introduced through incorrect transcription' and work on respondent's exact words (<http://sru.soc.surrey.ac.uk/SRU21.html>, Selwyn & Robson, 1998).

Most of the data were collected by means of electronic communications with strangers – thus giving them the benefit of being able to respond in their own time and space, calm and without tension (Olivero & Lunt, 2004: 104). In this case, it is possible to lose some information related to verbal communications and body language but still research 'showed that responses were genuine, thoughtful and insightful, while still conveying emotion' (McCoyd & Kerson, 2006). The truth is that interpersonal problems are avoided, though anonymity cannot be ensured.

The sample

The sample consisted of a total of 24 PhD students, doing research in Greece and in other European countries. Of those, 12 answered the first two questions and 12 answered the third questionⁱⁱ. They all constituted a group of people that agreed/were happy to express and expose their attitudes and dispositions towards such conflicting issues.

ⁱⁱ We refer to them as p1-12 and p1a-12a when writing their quotes.

Problems in language affecting the interviews' analysis

Most of the answers were in Greek and, in some cases; there were some difficulties in transferring and analyzing the exact meaning of the words spoken. Some terms could not be accurately translated. We tried to analyze the given data through being as accurate as possible; through presenting the respondents' points of view and expression without changing them according to my personal beliefs. There is also something that needs mentioning: this study does (try to) look for common ground across respondents' answers and cultures and for differences across them, as well.

Findings

Discussion

The findings of this study have come from e-mail interviews (taken for small scale research) that took place from March 2014 to July 2014. The interview schedule comprises three questions, which refer to science/research benefitting everyday life, to scientists and whether they constitute of elite and the reason why they do research. The analysis and comparisons can be made between beliefs, emotions, experiences, stresses and opinions expressed and felt by PhD candidates, in relation to each question. Each respondent gave their own unique answers, even though similarities were not uncommon between respondents.

It is very important to make it clear that those answers were viewpoints, beliefs and attitudes of each individual, which consist of personal elements such as their feelings, emotions and ideas. That makes the grouping and categorizing a more "delicate" procedure where the boundaries cannot be very strictly defined. Undoubtedly, approximations have been taken in the analysis in order to provide the best possible categorization. The findings are presented under three sub-headings within which individual questions have been analyzed: aspects of learning, aspects of teaching and aspects of impact on self as teacher.

Answers on *whether Science/Research benefits everyday life*

Data analysis on the survey responses suggests that most PhD students subscribe to the opinion that science assists and serves daily life and, consequently, humanity. This is definitely the case when science is conducted under suitable terms and conditions.

There is one knowledge, but on multiple fields of science. These differ between them but also share some common elements. One has to underline the discrimination towards humanities that are assumed to be less strict compared to positivist scientific fields, such as physics, biology and so forth; these called hard sciences. However, humanities and social sciences are treated with a lot of suspicion in

comparison to hard and physical sciences. This might be attributed to several reasons including traditional discrimination in favour of natural laws that govern the universe and have universal value. Positivist studies are considered harder and more demanding than studies in the humanities (see Storer, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC198502/pdf/mlab00170-0094.pdf>).

Science is, indeed, a social activity and such as is governed by the same sort of forces that govern social behaviour generally (Nowotny, Scott & Gibbons, 2001: 245). Additionally, the benefits arising from the findings of hard science is more readily observable and more directly verifiable (see Douthwaite et al., 2001). All these notions are evident in the quotes that follow. The items of information provided by the subject have been clearly stated, and our intervention is meant to be viewed only within the framework of our attempt to interpret the information supplied and to emphasise the elements that are relevant to the needs of our study:

“When research is conducted in the right direction and under the right motives, it certainly improves day-to-day life and, consequently, quality of life. These two characteristics are prerequisites in achieving the final aim.”

(p4)

All sciences are good in theory and helpful in practice.”

(p8)

“[Science] is helpful, if properly applied.”

(p12)

“Yes, I do believe that science is beneficial to everyday life when it is correctly utilised. For example, the management of everyday tasks (communication, transport, health, education, environment, functional and environmentally friendly home) is more efficient and clearly more effective. Also, through research it is possible to document and verify things that people used to do empirically, then people can either reject them or carry on with them.”

(p5)

“Science/research has emerged as a means of improving peoples’ everyday life, from the invention of the wheel to the first steps in medicine.”

(p6)

"In my opinion, research is an indispensable tool to what is basic to human development and civilization. Many claim that, (scientific or social) research is deemed as a theoretical investigation which advances knowledge without a specific practical application... However, once this knowledge is spread it fosters innovation and promotes growth which affects everyday life. It would be naïve to believe that science or research is simply an unnecessary luxury."

(p1)

"I seek solutions to problems that are hitherto unsolved."

(p10)

"Apart from the intellectual process, quality of life has improved due to research in all scientific fields."

(p9)

"To me it appears that there is a dynamic relationship between science/research and everyday life. You dispute, investigate, and start over. You start seeing everyday life through new 'filters' every time, observing details that have been created (or will create) new research interests, it provides solutions to problems and makes people's lives easier."

(p7)

Apart from the positive outlook, science/research is also viewed with (and contains therein) an element of suspicion. This is why it ought to be transparent with regard to the content of its findings and products. Apart from its positives, it is also a means to display power and present temptations, therefore carrying the risk of becoming a means of exploitations between human beings:

"For example, everybody complains that the billions spend on physics experiments at CERN are a pointless waste of money. They are not aware, however, that this is where the internet was created. On the other hand, Oppenheimer created the nuclear bomb based on Einstein's theories. The same is the case for social sciences such as Economics."

(p3)

"The problem emerges when science/research turns into a business. There may still be benefits to everyday life, either actual ones or deliberately engineered in order to achieve funding, but the ultimate aim is solely profit. In this case, everyday life may be at risk from profit-driven science/research."

(p2)

“A great percentage of research groups work on projects aiming to help society and solve serious problems. At the same time, their outcome can be used by other research groups in order to achieve the exact opposite result. A small example from medicine: cancer research is aiming to help millions of people suffering from this horrible disease – but there are also numerous cases of research labs that have been accused of developing and spreading viruses that contaminate people, in order to increase the profits of pharmaceutical companies.”

(p11)

“I believe that hard science research such as, for instance, the adaptation of a medicine, the manufacturing of a better plastic, energy studies, etc, are related to the everyday life experience of many people and, because they are carried out in collaboration with businesses and organisations they will (if successful) eventually find their way to the general public.”

(p10)

One interviewee reported the following: *“I find the question particularly difficult to answer when asked about of the research topics in social sciences and humanities I remember the subject of a Sociology PhD thesis carried out by an acquaintance of mine, on a subject related to the Chicago school and some branches of psychology (cannot remember the exact details) and, when we talked about it, I kept thinking it is terrible that a subject that we find so interesting has no effective contribution to any person’s life. I believe that any research related to social sciences or humanities is effectively of no benefit to people’s everyday life but, if properly utilised by their target groups and other researches they may, in time, change people’s lives within a society or maybe even change society itself by helping formulate new ideas, new policies, new views, new perspectives on reality. I will back up this view by using as an example my own PhD work on educational policies for gender equality in relation to actual educational practices. If my research produces any worthy outcome then, maybe, if it gets noticed by people whose job is to formulate policies –either from above or from below – it may prompt them to adapt their gender equality policies based on my research; or maybe further research may be based on my research which and eventually be utilised in order to improve the current practices until at least one boy or girl becomes more aware and conscious of his/her gender role. This benefit, which I consider very important, will not necessarily change the whole of society; or, if it does, it will do so over the long term.” (p4). Or, to summarise, science-research is important, but the utilisation of its products over the long term is even more important.*

Another interviewee expressed the view that science is the bases of all human activity: *“The answer can be given in the form of simple questions, all of them*

rhetorical in my opinion. Is a roof above one's head, the supply of safe drinking water, or the provision of healthcare, beneficial to everyday life? Consequently, is a civil engineer useful in designing and creating buildings, roads and water supply infrastructure? Is a doctor needed in order to ensure a long but most importantly high quality life? And, to take this one step backwards: is research necessary? Is it necessary to design better materials for the construction of buildings? Or the lab research in order to invent pharmaceutical products that can beat, for example, HIV? Could the answer to any of these questions ever be negative?" (p8)

Science may occasionally appear to function in an opportunistic base that cannot be beneficial to society. Self-limitation may not be ingrained in human nature, therefore society must be organised in a manner that restricts the laws of natural selection. Science could be considered as prestige and prestige is power. As Aronowitz mentions:

'...the term 'scientific community' has become identical with 'social context' '

and

'...support for the proposition that science and the scientific milieu is relatively autonomous is still powerful'

(Aronowitz,

<https://files.nyu.edu/mr185/public/www/classes/readings/Aronowitzfull.htm>)

"Both in Greece and in Britain I have come across professors conducting 'research' for their own benefit, sometimes indifferent and, worst of all, always prepared to place obstacles on colleagues by rejecting funding applications or just plainly refusing to offer any form of assistance". A professor's advice to me when I was looking for a PhD subject ('you must go where the money is') is, I think, a typical example of the mentality underlying research. Any progress achieved so far is relevant only to the Western world and only to specific sectors. Our overall quality of life is rather diminishing, and everyday life becomes progressively harder for most of us."

(p7)

Science must be appropriately utilised in order to bear results: *"To begin with, scientific (or not) research is defined as a procedure whereby the researcher is able to make a conclusive statement on a study created by him/her with the aim of judging facts with the minimum bias possible. If this bias is very low, then research most of the times succeeds in providing people with evidence on events they already know theoretically but lack proof. For example, in a typical day people have to make better choices with their money and research on behavioural economics can help people to do so. Another typical example is that of biomedical research which has proven how exercise can help with the treatment of mental or eating disorders. These are specific examples where people who do not belong in the field of research*

may be aware that, say, exercise can help but the extent of its effect can only be measured through research (i.e. collection and analysis of data). In the field of economics, for example, research is mostly a quest for new knowledge and exploration of the unknown by building on a theory. In Economics, no application is possible since all the experiments are natural.” (p1)

Answers on *whether scientist are perceived as ‘elite’*

Regarding the second question, the respondents’ points of view were conflicting. In general, the respondents agree to place in the ‘elite’ the financially strong people, with the exception of one person’s view who said that dedicated scientists are the ‘elite’ within academia galaxy. The divergence on subjects’ responses is due to the fact that respondents questioned the social value of scientific identity and contribution. They regard different scientists as ‘elite’ or not, depending on their social origin. Most respondents first tried to define what is meant by the term ‘elite’. Clearly, everyone gave a different perspective on the definition of the term.

“The term ‘elite’ has many meanings, and varies depending on the context set by society. I cannot say that the majority of researchers are paid so much that I could categorise them into the financial elite. In societies where suspicion and misery are ingrained, they are even “accused” for the journey they make for educational reasons or the government funding that they take. At least in Britain the illusion that they are ‘elite’ is generated by changing the person’s title from Mr / Mrs to Dr.”

(p4)

“Let me clarify that the below do not apply to all researchers since individual criteria are in place in each sector, society, culture. But unfortunately they refer to the majority of researchers, who all see academic posts.”

(p6)

“Real researchers who believe that science should be for the common good and devote all their lives to science constitute ‘elite’ and stand out for their spirit. For example, Einstein made over 300 publications - about 20 a year. This is far from what I’m doing and I need 3-4 publications in 5-6 years so I can remain in the academia. Otherwise the rest just make a living - perhaps more subtly.”

(p12)

“I think that scientists are not the elite of our society and that is because the values and our culture in general have changed. Plus I think that the term ‘elite’ means financially powerful.”

(p9)

"How do you define 'elite'? Socially? No, such a classification does not exist anymore in 2014. Most 'scientists' belong to the middle class."

(p5)

"I define 'elite' in terms of social status. In this sense the scientist is not considered 'elite' unless s/he has a great income or wealth and comes from a family with high social status. Of course in general s/he has a high status, but I would not characterize her/him as elite."

(p2)

"I overall think we need to feel that as scientists we are intellectuals (would prefer that term) which does not seem to be the case, as the scientist is familiar with a tiny bit of science and the intellectual is someone who has broad knowledge and aspects surpassing her/his capacity as researcher or scientist of a particular field and I would describe her/him as 'a modern philosopher'. A scientist is a potential intellectual."

(p7)

"My answer to this question is based on a generalisation (not all but most of the scientist are arrogant and elitists). I believe that one must study hard to become a scientist. Someone from an elite background is more likely to have the resources and parental support to succeed academically. I however strongly support the idea that society makes scientists elitists. The practice of science is elitist in the sense that we all know who the top scientists in our fields are and these individuals are often treated with great reverence. On the other hand, as scientist Michael Brooks claims 'we're making a bigger contribution than anyone else – why does nobody appreciate us?' The statement does sound arrogant; I however believe that scientists do make massive contributions sometimes without any recognition at all. To conclude I do believe that scientists are elitists; but then in our society today, sport is elitist, art is elitist and few can afford it, but no one complains. I agree that science should be open to everyone but not irrespective of their ability. In that sense scientists and academics are elitists."

(p8)

"Yes, they constitute 'elite'."

(p11)

"No. Research does not imply superiority. In order someone to belong to the elite s/he must combine many skills and particular sociological and political, that scientists generally do not have. When you consider 'elite' as a group of people who can influence the political and social life, then scientists can not belong to this group because they do

not aim to control society but they aim to their personal satisfaction through their work and moral exploitation of their discoveries or inventions."

(p1)

"Science / Research has a dynamic relationship with the daily routine for me. You contest, survey, over and over again. You begin to see everyday life through new 'filters' each time, observing details that have been created by research interests or you create new."

(p3)

"The answer is directly related to the point of view from which you see it. So there is the perspective of society and the perspective of the researcher. From the perspective of society, the first factor to consider is the financial rewards for researchers and if there are such that could classify them as 'elite'. The answer is a glaring no. Not when at least 10 years studies is needed in order to become a researcher, studies that automatically isolate you from the labour market. And when you become a researcher, the salary will be unable to exceed the salary of a civil servant and that is because salaries, unfortunately or fortunately, are closely related to profit. The profit that one can generate for a particular operator, company etc. And this profit certainly cannot be generated by a researcher. From the perspective of the researcher, though, the answer is 'yes, scientists are 'elite' '. What is 'elite'? Is derived from the Latin verb eligere (= choose) and denotes the 'chosen'. Chosen by society and fine the work that s/he has undertaken, which is to improve and lengthen the life of the community through a systematic search of it."

(p10)

Answers on why they (the PhD candidates) do research

The third question was on why they decided to deal with research. This question was only presented to a different group of respondents (i.e. not the ones who answered the previous two questions). This was in order to ease time pressure and prevent hasty responses.

"I do research because I like it. I am fascinated by the possibility that some of what I do can lead to a better world. Also through my research I am offered the opportunity to meet new ideas, people and places that most likely I would not have known otherwise."

(p1a)

"I do it to feel spiritual fulfilment as I like the research and from the moment I can offer something bigger (science), I do it. To say that I put my little help in the whole evolution

... no matter how small it may be. You know ... I have enough force, so I could use it for something [...]. Because I like the academic career and I love to teach... You know.... to propagate what I know."

(p5a)

"Look, accordingly, the reasons have changed. I started because I liked it, then I continued because I got a scholarship and I was getting good money and now I continue it as work even though I do not earn good money, because I like it and it has 3-4 months' vacation. It is important that you work at your own pace without having fixed working hours."

(p9a)

"In general, I can not find a specific reason that determined my decision to deal with research. The main reason was my personal interest to develop my knowledge in a field that interests me. Moreover, I felt that my involvement with research would personally help me to evolve and improve my skills as regards self-management but also resource management. It was clearly a conscious decision for me, not only do a PhD, but also under which conditions I wanted to do a PhD (supervisor, subject etc.). I always saw it as a necessary step for my professional and personal evolution. Perhaps therefore it conceals an intimate reason associated with prestige."

(p12a)

"One reason is that through research I can give answers and solutions to important problems. The prospect that the results of my research could enable me to assist in addressing a problem is a very important incentive that helps me answering the question why I do research. Motivation is also interesting; via research I deal with a very difficult issue which requires patience and perseverance to be resolved. Still, participation in a group that shares the same purpose is very interesting. Although research is a very solitary process, in order to solve the problems the contribution of ideas from several scientists is usually required. The exchange of views and culture of thinking is very important experience. Also, the experience can be used in new problems inside and outside the research environment. Research is a way to revise the knowledge that already exists. Not only the production of new knowledge, but also the transmission of it is a very important element of the research process. For example, to convince other scientists for an idea's innovation is very interesting challenge."

(p7a)

"I do research because I like my Professor!"

(p3a)

"I have been interested in becoming a researcher since I was maybe 12 years old, so doing a PhD thesis is completely natural in this case. I would also like to try, after my PhD degree, to work in the R&D sector in private companies, at least in order to see and to compare private and public sectors. An element making me definitely chose to do the PhD thesis is that I worried about doing a job which would not match with my expectations if I directly tried to find another job after the masters degree, so with a thesis I have the hope that my future job will be more or less linked to what I'm currently working on, which is an interesting subject for me."

(p8a)

"After a M.Sc. or a PhD we basically have two possibilities: doing some management or going for a more technical/scientific career. I chose scientific studies because I feel comfortable doing sciences and I don't see myself managing people, so this is the reason why I decided to go for a Ph.D. rather than finding an engineer job. Also, a researcher career is mandatory for people who want to work in the academic field and this is what I want to do!"

(p2a)

"From my point of view, we do research because it is a way to contribute in the improvement of the current conditions that affect the existence of any living being."

(p4a)

"Doing research wasn't in my mind 2 years ago. But after an internship in a lab, I found this work really interesting, it makes you learn a lot of things every day, and collaboration between researchers from different fields makes you develop new skills. Another thing that I really appreciate in research is the fact that you work on unresolved problems and you have to be innovative in order to propose new tools. This is very motivating!"

(p11a)

In summary, the reasons for choosing a career in research range from the romantic desire for conquest of truth, establishing power, wealth, power and profit, understanding the mystery and contact with new worlds all the way to the earning the affection of a role model (professor). We conclude that there are no 'good' or 'bad'

motives, but in any case, they are not neutral. The issue of whether and how science is affected from these is yet to be reached.

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