

International Journal of Human Sciences Research

I WOULD LIKE TO BE A SCIENTIST, BUT... SOCIAL REPRESENTATIONS OF STUDENTS ABOUT SCIENTISTS IN *THE BIG BANG THEORY* (SITCOM)

Silvia Domínguez Gutiérrez

Doctor in Education, research professor in the Department of Social Communication Studies, CUCSH-University of Guadalajara, Mexico. Research lines social representations of science and the scientist, science communication, science journalism
Orcid: 0000-0002-7808-0069

All content in this magazine is licensed under a Creative Commons Attribution License. Attribution-Non-Commercial-Non-Derivatives 4.0 International (CC BY-NC-ND 4.0).



Abstract: The purpose of this paper is to analyze what scientists mean to undergraduate students from the University of Guadalajara (UdeG) who appear in the television series *The Big Bang Theory* (sitcom). The study is based on the theory of social representations, which according to Moscovici (1979) social representations are an organization of images and language that personify or symbolize acts and situations and become common through different sources, among them the media. 297 students from the 6 thematic centers of the UdeG participated, answering a questionnaire of open questions, analyzed through content analysis. A complex figurative nucleus was identified among the students' responses in which the image of the scientist is based on his attributes or qualities in an ambivalent way: on the one hand, neutral qualities predominate, and on the other, there are negative attributes oriented towards stereotypes commonly associated with scientists. Most of the students report not identifying with any of the protagonists, and perhaps this undermines their conviction of professing a scientific discipline.

Keywords: University students, social representations, scientists, *The Big Bang Theory* (sitcom).

INTRODUCTION

In the present study I have focused on specifying part of a larger study whose goal is to detail the social representations of science, the scientist and scientific activity in university students from different public and private Higher Education Institutions (HEIs), as well as the consumption of certain sources that contribute to its formation. I start from a general conjecture that students, due to erroneous images, opinions and beliefs towards science, scientists and their work, do not perceive scientific activity as a profession in which they can develop. The current study is an approach to the television series *The Big Bang Theory* from the perspective of the students, to reveal how this series has contributed to the formation of social representations of scientists and what revolves around them, which could influence in identifying with some of the characters to dedicate themselves to being scientists in the future. The study is based on social representations, which, as Marková (2003) points out, are complex, holistic and can be seen as theories, a network of ideas, metaphors and images that include emotions, attitudes and judgments, and are also integrated into communicative practices, such as dialogues, debates, media speeches and scientific speeches.

Now, Farland-Smith, Finson, Boone and Yale (2014) as well as Fung (2002), refer that long before children can verbalize what careers interest them, they have collected and stored ideas through different media about the careers they are interested in. scientists and what their profession entails, which will later influence their career choice. Gottfredson since 1981 had emphasized that the career preferences of students and their aspirations for this or that profession are strongly linked to the images they have of these professions; in fact, Fung (2002) argues that there are reasons to believe that young students may not

consider careers in science due to the negative images of scientists shown in different media.

As we know, the media -as de facto powers and as recreational media- are notable in the life of contemporary societies, since through the themes, programs or proposals that they present together with the language and formats that they use, they show information, values, interests and knowledge that are shared for and by the population in the context in which they are exercised. The relationship between the media and social representations is fundamental, since the latter organize this information, values, proposals, etc., and give meaning to people's daily lives. Martín-Serrano (1994) uses the term "enculturation activity" to explain the way in which the media imprint their interpretations of the world on the information that circulates daily as a form of social control. The Spanish researcher expresses (p. 48):

Social representation is an interpretation of reality that is destined to be internalized as a personal representation by certain components of a group. Consequently, social representation has to be proposed in a story that can be disseminated....the elaboration of stories is a productive activity in two aspects: in that of the cultural production of social representations and in that of the material production of goods destined to express and distribute those representations. Social representation becomes a cognitive product inseparable from the communicative product, *understanding by «communicative product» a manufactured object that has a specific use value: making the information that some social subjects have produced available to others.*

It is known that Moscovici perceived this link throughout his research on the formation of social representations, reiterating that there is no representation without communication when treating both interpersonal

1 Sitcom is an abbreviation for Situation Comedy; defines a type of comedy with certain characteristics such as recorded laughter, low budget, seasons of approximately 24 episodes, with fixed sets and self-contained episodes (Telephile Dictionary: Sitcom-Espinof, <https://www.espinof.com/series-de-fiction/dictionary-telefilo-sitcom>).

conversations and mass dissemination; He even attributes to the media the fact that representations acquire social importance:

The millions of people who calmly read their newspaper, who involuntarily talk to their radio, who are part of the new form of crowd: immaterial, willing, domestic. It is about a public, or rather the public: readers-listeners, viewers. Without leaving any of their house, they are reunited. Looking different, they are similar. (Moscovici, 2005: 243)

Elsewhere he asserts: "Most people interpret what comes to them, form an opinion about their own behavior or the behavior of their neighbor, and act accordingly." (1979: 12)

Regarding an important communication medium, television, Orozco (2001) asserts that:

...the immeasurable media representation continues to have a vertiginous growth and is constituted as a product and a process at the same time, and in the vehicle to know, learn, feel and like. A technological and media-supported vehicle, which in the case of television has the support of its intrinsic virtues as a medium, of instantaneity, verisimilitude and visual evidence, placed in front of the viewer's own eyes to become naturalized, and that is invading the modes of perception, appropriation, production and circulation of knowledge, insights, judgments, attitudes, thoughts; but that also, and above all, transforms the social uses of what is perceived, appropriated and produced by the audiences. (p. 57)

Regarding television series, Bonaut and Grandío (2009) analyzed the importance of sitcoms¹ (situation comedies), a genre that since the 1950s achieved popularity over other animation formats such as sketches. Some of its characteristics are the form of production by "closed chapters" where each one deals with a specific theme and

the continuity between one and the other is presented through the relationships between the characters; A recurring factor is shooting indoors, and in general, for the configuration of the characters, stereotypes are used since they facilitate the recognition of their codes of behavior. Galán (2006:8) emphasizes that

Despite the fact that stereotypes appear more frequently in situation comedies - where it is not so important that the character is believable as his reaction to a given situation - in fiction series they are also an essential resource to generalize and reiterate attributes about groups. social, contributing to the creation, in the spectator, of predetermined prejudices and opinions.

Bonaut and Grandío (2009) conclude that the coherence between the resources of audiovisual language guarantees the effectiveness of the messages broadcast on television, so that the programs known as situation series constitute a typology susceptible to scientific analysis given the popularity and massiveness reached. for such entertainment spaces.

Therefore, we find it attractive to study the social representations of students about the scientists who appear in the television series *The Big Bang Theory* (sitcom) with the purpose of supporting the initial conjecture.

SOCIAL REPRESENTATIONS AND SCIENCE

In the book where he shows the emergence of the theory of social representations, Moscovici (1979) stated:

The sciences invent and propose most of the objects, concepts, analogies and logical forms that we use to face our economic, political or intellectual tasks. In the long run, what is imposed as an immediate datum to our senses, to our understanding, is really a secondary product, reworked, of scientific research. This state of affairs is irreversible. It corresponds to a practical

imperative. Why? Because we no longer expect to seize most of the knowledge that concerns us. Some competent groups or individuals are in charge of obtaining them for us and providing them to us. We have become acquainted, through other men, with an increasing number of theories and phenomena, which cannot be verified in the experience of each one. (p. 13)

Further on, he mentions that the phenomenon of the penetration of science and the social change that it represents, show many prejudices, since when one wants to analyze them carefully, “the impression arises of a degradation of knowledge that circulates from one group to another, and the conviction that most men are not fit to receive it or use it correctly” (p. 14).

Wagner (2007) has argued that our understanding of how the public understands science is incomplete as long as we do not answer the question of why, under what conditions, and in what ways basic scientific knowledge is assimilated by the general public. He refers that daily life and communication are governed by criteria of evidence and social efficacy; then, under the demands of everyday life, it is understandable that the lay public possesses and uses metaphorical and iconic representations of scientific facts, which has been called “vernacular science knowledge”, which means that the public has misconceptions of science. science, plus these social representations of science work for their daily events, and this way belief systems that circulate through discourses with other lay people are legitimized. These social representations are essential tools that follow the local rules of communication.

On the other hand, this German scholar, basing himself on the “Lisbon Agenda” carried out in March 2000, points out that a society based on knowledge must integrate all the available instruments for the acquisition of knowledge in a scheme accessible to all

members of the society. Society for various purposes, including to easily locate scientific evidence, to inform politicians, businesses and others. The author adds that scientific knowledge permeates all areas of society and, in light of this, it is worth examining some aspects of knowledge that circulate in daily life, as well as the criteria of evidence that govern daily social life and the role that scientific knowledge can play in the vernacular.

This way, Wagner (2007) continues, this approach has consequences for education, governance and technology regulation. Different audiences tend to have different versions of vernacular science, knowledge that determines the success or failure of education, and different audiences' reaction to technological change. The problem of the different publics and their knowledge constitutes a challenge about what knowledge society can and must be in the modern world. So, in modern times, according to the author himself (Wagner, 2012), the media have added another system of meanings that is much more dynamic and less resistant to the cultural underpinnings of society. This system comprises social representations of objects, events and facts that result from rapid scientific and technological advances, as well as economic, political and social changes that are typical of contemporary societies.

For this reason, it is important to take into account, in accordance with Moscovici (2000), Wagner and Hayes (2005), and Jovchelovitch (2007), that social representations are expressed at different levels of abstraction and in different areas that together make up the social discourse on a topic. Thus, for example, photographs and images, whether retouched or natural, are the language of the media that their recipients understand, and which they speak openly (in a personal conversation), as well as collective behavior (integrated by actions individual concerted) are the ways

in which people in a group reconstruct a represented object or theme.

Finally, it is essential to keep in mind what Moscovici signed, from a long time ago:

.... We frequently refer to the representation (image) of space, of the city, of women, of children, of science, of the scientist, etc. To tell the truth, we must face it actively. Since its role is to shape what comes from outside, it is more a matter of individuals and groups than of objects, acts and situations constituted through and in the course of myriad social interactions. It is true that it reproduces. But this reproduction implies a re-entanglement of structures, a remodeling of the elements, a true reconstruction... (1979:16-17).

In a society that we want to believe is based on scientific knowledge, especially in the academic field, it is interesting to study how scientists are presented through a television series and under what gaze they are seen by undergraduate students, active entities, of course. It is important to analyze whether these social representations contribute to the understanding of real scientific work, or are more inclined towards a "vernacular" science, which is accompanied by images of stereotyped scientists or not.

Empirical Similarities: Like the TV series: *The Big Bang Theory* (sitcom) it has been a very successful comedy due to the large number of people of different ages who watch it in various parts of the world. It has also drawn the attention of researchers who have studied it from different perspectives: Bednarek (2012) and Suãdes (2010) since translation and linguistics; on stereotypes Galvão (2009), Guerrero and González (2010); Oliveira and Tonus (2011) from neotribalism; Davis, Tilley, and Hague (2010) verifying the science presented in the series; Riesch (2015) from good humor as a resource in science education; Li (2016), and Li and Orthia (2016) also as a resource in learning

the nature of science; Stratton (2015) from the neoliberalist ideology, and Domínguez (2017) from the theory of social representations.

On the other hand, it is a fact that science fiction, whether through television, cinema, comics or videos on the Internet, is being used more and more to teach science to students and people in general, in an attractive and accessible way. This is reported, for example, by Li (2016), Li and Orthia (2016), Riesch (2014), Milanick and Prewitt (2013), Laprise and Winrich (2010), Smith (2009), Efthimiou and Llewellyn (2006), Barnett et al. (2006), Fraknoi (2003). Both Knippels, Severiens and Klop (2009) and Barnett and Kafka (2007) even show that some science fiction series have helped develop critical thinking skills among students.

This suggests that such a studied and questioned phenomenon deserves to be investigated from another angle and grounded in a particular context such as that of undergraduate students from a local public university, which apparently has not been touched.

METHODOLOGICAL APPROACH

What I am presenting next is part of a larger study that aims to cover several higher education institutions, both public and private. On this occasion, only part of what makes up the university network of the University of Guadalajara (UdeG) is shown in relation to its thematic centers, and it is considered a descriptive exploratory approach.

Participants: 297 students from the 6 thematic centers collaborated² from the UdeG, distributed as shown in Table 1. A selection by quotas was planned, that is, 50

2 CUAAD is the University Center for Art, Architecture and Design; CUCBA is the University Center for Biological and Agricultural Sciences; CUCEA is the Center for Administrative Economic Sciences; CUCEI is the University Center for Exact Sciences and Engineering; CUCS is the University Center for Social Sciences, and CUCSH is the University Center for Social Sciences and Humanities.

3 CUAAD students participated in December 2015 and January 2016, during the 2015-B school year, because undergraduate courses were not offered in this particular university center during the summer..

students for each university center; more like the collection of information was carried out during the summer courses of the 2015-A school year mainly ³ (between 9 a.m. and 1 p.m. in June and July) to take advantage of the conjunction of students from different careers and semesters in the same course, on more than one occasion the quota was not achieved, reaching an approximate.

Tool in the production of information: To achieve the purposes of the study, information was exchanged with the students through a questionnaire prepared personally and validated through previous research; it is made up mostly of open questions, around 25 questions, some of them related to the series and others connected to media consumption, which we ignore in this work. It is included if the boys have seen the television series: *The Big Bang Theory*, and in the positive case, a very brief description of it had to be made (to corroborate that they actually saw it); why they like to see it, if they consider that some of the characters represent scientific researchers, if they identify with them and why, etc. The most relevant answers for this stage of the investigation are taken up again.

Analysis technique and procedure: Through content analysis, a book of codes and categories was established based on the students' responses, which was a very broad and diverse corpus. According to Piñuel (2002), content analysis is usually called the set of interpretive procedures of communicative products (messages, texts or speeches -such as the television series-) that come from previously recorded singular communication processes (in this case, the students' answers to the questions in the questionnaire), and that based on measurement techniques

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	Total
Women	26	19	39	16	27	25	152
Men	24	30	22	32	19	17	144
The person did not answer	0	0	0	0	0	1	1
Total	50	49	61	48	46	43	297

Table 1. Total number of participating students from the centers thematic university courses of the UdeG

Source: Personal elaboration

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	Total
YES	29 58% ¹	23 47%	33 54%	25 52%	26 56.5%	14 32.6%	150
NO	20 40%	25 51%	28 46%	09 18.8%	20 43.5%	23 53.5%	125
The person did not answer	01 2%	01 2%	0	14 29.2%	0	06 13.9%	22
Total	50	49	61	48	46	43	297

Table 2. Have you seen the TV series: *The Big Bang Theory*?

Source: Personal elaboration.

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	Total
1. Sheldon Cooper	23	17	24	30	22	14	130
2. Penny	18	10	12	20	14	11	85
3. Leonard Hofstadter	16	7	13	19	13	14	82
4. Rajesh Koothrappali	8	5	10	15	14	9	61
5. Howard Wolowitz	7	2	10	13	10	9	51
6. Amy Farrah Fowler	2	0	1	4	3	3	13
7. Bernadette Rostenkowski	0	0	3	3	1	1	8
Total	74	41	73	104	77	61	430

Table 3. Main characters (frequencies)

Source: Personal elaboration.

¹ The percentages are calculated taking as a parameter the number of participants corresponding to each university center.

sometimes quantitative (statistics based on the count of units), sometimes qualitative (logic based on the combination of categories -which was what was done-) have the purpose of elaborating and processing relevant data on the very conditions in which those events have been produced. texts (the television series *The Big Bang Theory* and the fact of being undergraduate students together with their university center of affiliation), or about the conditions that may exist for their subsequent employment. Said analysis helped to group and differentiate the answers by themes (similar phrases, with similar meanings), and later transferred to Excel sheets to be able to see the differences or similarities by university center, which is thus appreciated in a better way. The information was crossed with related studies to establish analogies and corroborate the initial conjecture, and finally, in table format, the information is presented for better reading and understanding.

RESULTS AND ANALYSIS

Contrary to what was expected -due to the popularity of the series-, less than half (42%) of the informants have not seen the television series *The Big Bang Theory*, although just over half (52%) have heard of the series, that is, they know it by "hearing". However, slightly more than half (50.5%) confirm that they have seen it. Table 2 shows the breakdown by university centre, with CUAAD (art, architecture and design) being the pointers. It is worth mentioning that all, or almost all, are television users, and it is the main device through which they watch this series. The fact that 29.2% of the CUCEI students (exact sciences and engineering) have not answered the question stands out, which makes us question whether they did not answer because they simply did not want to, or because they did not commit to answering the following related questions, a fact that will be seen later

in inconsistency with this initial question/answer.

Now, those who see it, why do they do it? Faced with this question, their answers were classified into different categories to get closer to this particular taste, as shown below, although these answers are not differentiated by thematic center, since the comments are very close, that is, very similar, with predominance of the positive aspects:

POSITIVE ASPECTS

It amuses me, it's entertaining, interesting, it makes me laugh; you learn scientific facts; the interrelationships of the characters captivate; real in terms of youth; everyday topics; geek characters, scientists and their phrases; makes you think; pretty girls

NEUTRAL ASPECTS

It's good to pass the time, some chapters are good, others are not; I could see her without looking or expecting much from her.

NEGATIVE ASPECTS

I watch it, although I prefer to watch other types of series; It is not to my complete liking, it makes me angry at times; it is offensive, it goes against certain ideals.

As I said, they highlight the positive aspects, which as a comedy makes students laugh and amuse themselves. The phrases: "*makes you think*" and "*you learn scientific facts*" are related to analyzes of certain studies noted previously (Li, 2016; Li and Orthia, 2016; Riesch, 2014; Milanick and Prewitt, 2013; Laprise and Winrich, 2010; Smith, 2009; Efthimiou and Llewellyn, 2006; Barnett et al, 2006; Fraknoi, 2003), which favors the use of this type of series in the teaching/learning of a particular scientific discipline. The comment: "*real in terms of youth*", it also coincides with Domínguez (2017) in the presentation of a new image of the scientist based on age (young

vs old) that invites the fading of the famous stereotype that only adults (old) investigate and do science..

They were asked to give a brief description of the series as well as its main characters. There were no big surprises in terms of favorite characters (Sheldon, Penny and Leonard)⁴, as shown in Table 3; As for the series, they described it very well⁵.

The previous ones are answers with proper names by the students, but there were answers without alluding to a specific character; for example, “a group of geniuses”, “nerds”, “bigheads” (4 responses, 0.93%⁶). Or characteristics of some of them, for example: “with glasses”, “mushroom head”, “Hindu”, “Jewish”, “perverted”, “homosexual” (9 answers), in which a more acute sense is noted, although it was only 2.1% who made such mentions. More particularly, how do you describe each of the main characters?? I’ll start with the most cited: Sheldon.

SHELDON. Appearance: tall, slim. Positive Attributes: Genius, smart, top of the bunch, funny, loves science. Negative attributes: he thinks he is superior, arrogant, conceited, egotistical, arrogant, antisocial, weird, geek. Neutral attributes: physical scientist, nerd, child with an adult body.

Sheldon is the most popular and the one most associated with neutral attributes (38.5%), being, curiously, the exact and engineering students (CUCEI) who had the most responses in this category (at the beginning, a good percentage did not answer if they saw said series television, more apparently, it would be believed that they see it more than recorded). In general, most

4 And the most popular characters from The Big Bang Theory are...

<https://bigbangblogtv.com/.../y-los-personajes-mas-populares-de-the-big-bang-theory-...>

5 This television comedy shows the daily life of young scientists, the adventures they go through, and how a non-scientific girl (Penny) solves many of their daily problems in a simple way..

6 The percentages are calculated based on the total responses of the categories, and not by the total of each university center. In the following tables with their respective percentages, the same criteria was followed..

7 I only include the descriptions of the main characters such as Sheldon, Leonard, Raj, Howard and Amy, the most cited by the students themselves, and recognized as scientists.

of the students agreed, with the exception of those from CUCBA -biological agriculture-, CUCS -health- (who have an image more related to negative attributes, although very similar to neutral attributes), and students of art, architecture and design (CUAAD), who had a more positive image of this character who embodies a physicist/theoretician, but with minimal differences. Taking into account the orientation of the answers, we perceive a central nucleus on the neutral attributes, and very closely a peripheral nucleus of negative attributes -very typical of this character primarily because of his arrogance-. Not as close, but the positive attributes also form an important peripheral core. It is strange that very few made mention of his physical appearance (way of dressing, for example, also very typical of Sheldon).

LEONARD. Appearance: Average height, with glasses, wavy hair. Positive attributes: patient, the most normal, intelligent. Negative attributes: submissive, low self-esteem, insecure. Neutral attributes: shy, nerdy, in love with Penny, lives with Sheldon, physical.

In general, a central nucleus that revolves around neutral attributes is also identified for the character of Leonard (except for those of the CUCS -health- and those of the CUAAD -art, architecture and design- whose central nucleus for them are the attributes positive); more generally, as a peripheral nucleus, the positive attributes stand out closely, and the negative attributes far away, and even further away the reference to appearance. Unlike Sheldon, Leonard is perceived as having more positive attributes (for informants from all centers), which is accompanied

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	Total
SHELDON							
1.appearance	1	1	2	0	3	1	8 3.5%
2. positive attributes	14	6	9	15	10	6	60 26%
2.1 negative attributes	9	14	6	17	20	8	74 32%
2.2 neutral attributes	12	13	10	27	17	10	89 38.5%
Total	36	34	27	59	50	25	231

Table 4. Description of Sheldon

Source: Personal elaboration.

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	TOTAL
LEONARD							
Appearance	2	4	3	6	1	2	18 14.4%
Positive attributes	7	3	4	10	10	4	38 30.4%
Negative attributes	4	2	2	5	7	3	23 18.4%
neutral attributes	6	7	4	18	3	8	46 36.8%
TOTAL	19	16	13	39	21	17	125

Table 5. Description of Leonard

Source: Personal elaboration.

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	TOTAL
RAJESH							
Appearance	4	2	3	7	5	2	23 23.96%
Positive attribute	2	0	1	0	0	0	3 3.12%
Negative attributes	10	5	4	14	9	6	48 50%
neutral attributes	6	2	2	6	3	3	22 22.92%
TOTAL	22	9	10	27	17	11	96

Table 6. Description of Rajesh

Source: Personal elaboration.

by descriptions of his appearance (distant in Sheldon). In the insecurity, his low self-esteem and his submission to Sheldon (“he lives with Sheldon”, when in fact they share the apartment), the informants reveal their representation of this character as a dependent scientist. We observe again that it is those of exact and engineering students who had the greatest responses for Leonard.

RAJESH. Appearance: Hindu, oriental, dark. Positive Attributes: Smart. Negative Attributes: Doesn't talk to women, shy, insecure, awkward, antisocial. Neutral attributes: from a rich family, astronomer, researcher, nerd.

The foreigner -the dark-haired, the shy one, who does not talk to women, although he is an intelligent astronomer researcher- is the one who is perceived with the greatest negative attributes. It is very clear a central core loaded with negative aspects. For the students, this character outperformed the rest of his scientific colleagues in scores regarding his appearance (23.96%), and based on these results, it is very possible that the images that Rajesh's informants have seen the scientist who does not fit with the Anglo-Saxon team. In this particular case, all agreed with the highest scores directed towards negative attributes; we see a homogeneous social representation of the scientist, for this character, who is far from Caucasian, could it be that only those with white skin are the ones with the most neutral or positive attributes? Could it be that the one who fears talking to women -catalogued by the same character in the series as homosexual-, in a state (Jalisco, where the UdeG university centers are located) characterized as sexist, is perceived by the informants of various scientific disciplines, with negative characteristics? We see that exact and engineering students continue to be the pointers in their responses; Coincidentally, in this university center (CUCEI), male students

predominate, who have a reputation for annoying -through various compliments- the female students of that same university center; on the other hand, a rejection towards the “homosexual scientist” is derived from these students in particular.

HOWARD. Appearance: Short in stature, he dresses conspicuously, like a Beatle. Positive attributes: extrovert. Negative attributes: perverted, impulsive. Neutral attributes: Engineer, he lives with his mother, robotics specialist, Jewish.

To confirm the conjectures regarding the perception of Rajesh, in Howard we have categories very similar to those of his Anglo-Saxon colleagues, only that with this character there are also coincidences with all the informants in pointing towards neutral attributes. He is the least popular among the informants, and even so, the frequencies of the exact and engineering students stand out, who at the same time are the ones who point out negative attributes towards Howard. Being Jewish, an attribution given to this character, is something that he does not see with the rest of these protagonists, and it is very possible that this is due to the fact that it is frequently pointed out in the series.

AMY. There is no description of appearance. Positive attributes: more outgoing, sensible in adult life. Negative attributes: problems to develop in society. Neutral Attributes: Sheldon as a child, Sheldon's girlfriend, brain researcher.

It is not surprising that mentions of Amy are not abundant compared to the rest of her colleagues, which also coincides with her appearances within the series. The scientific woman, ignored in her appearance, was also ignored in attributes, although the neutral attributes persist -albeit minimal- for the informants from the CUCEI, CUCS and CUCSH, since as shown in Table 8, there was no mention of her by part of the informant

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	TOTAL
HOWARD							
Appearance	0	1	1	1	2	0	5 7.8%
Positive attribute	0	0	1	1	0	0	2 3.1%
negative attributes	0	0	0	2	0	0	2 3.1%
neutral attributes	11	3	5	15	11	10	55 85%
TOTAL	11	4	7	19	13	10	64

Table 7. Description of Howard

Source: Personal elaboration.

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	Total
AMY							
Appearance	0	0	0	0	0	0	0
Positive attribute	0	0	0	0	2	0	2 25%
Negative attributes	0	0	0	0	0	1	1 12.5%
neutral attributes	0	0	0	3	1	1	5 62.5%
Total	0	0	0	3	3	2	8

Table 8. Description of Amy

Source: Personal elaboration.

	neutral attributes	positive attributes	negative attributes	Appearance
Sheldon	89	60	74	8
Leonard	46	38	23	18
Rajesh	22	3	48	23
Howard	55	2	2	5
Amy	5	2	1	0
Total	217	105	148	54

Table 9. Attributes and appearance of the scientific protagonists of the series according to the informants (frequencies)

Source: Personal elaboration.

students from CUAAD, CUCBA and CUCEA; that is, the incarnation (through Amy) of women in science does not exist for them, which is an example that science belongs to men in general. For very few of the CUCS (3 of 46), it exists, and with positive (2) and neutral (1) attributes, and only one mention of a health student (CUCSH) to negative aspects (“problems to develop in society”) In general, there is a minimized social representation of the scientific woman More Amy does exist for those of CUCEI (exact and engineering), and with neutral attributes; everything points to a cognitive polyphasia⁸ among these students; that is, few women study the courses taught there, but somehow they are adapted to the context.

With the descriptions of the protagonists of the series, it is observed in most of the informants the similarities about their social representations about the scientist; There are, of course, differences according to the scientific discipline studied by the informants, although they are minimal -to a greater or lesser extent- according to the center of affiliation. Neutral attributes are clearly seen as predominant in all the characters, with the exception of the foreign scientist (Rajesh), and negative attributes second. It highlights the fact that Sheldon, -who is undoubtedly the main character- together with Rajesh have obtained the highest frequencies in negative attributes. The following table shows the previous results but grouped to better differentiate the categories.

Presented this way, the categories -by frequencies- allow us to make general conjectures for this work, that is, the social representations of undergraduate students about the scientists shown in the television series *The Big Bang Theory* (sitcom), are diverse, although neutral

attributes predominate. These attributes take precedence over appearance, which in a study conducted by Domínguez (2012) were the predominant ones. However, negative attributes are fundamental elements in these social representations, since, in part, these adjectives inhibit students from identifying with scientists and emulating them. But on the other hand, it is worth mentioning that the positive attributes towards scientists derived from this television series must be taken into account for the teaching/learning of science in students of different school grades.

To delve into aspects related to the identification of the scientists in the television series, the following table shows the relationships between the characters and their consideration as scientists:

40.7% think that the main characters (except for Penny, who is not a scientist) do represent scientific researchers, which largely agrees with the proposal of the series; however, Rajesh and Howard are also considered non-scientists and the reasons given by informants are seen in Table 11.

The previous answers give us more elements to approach the social representations of what the informants consider as scientific activity and the understanding of science itself: “*they have studies in scientific areas (physics, mathematics, astrophysics) where they prove what they investigate*”, “*because of their characteristics and personality such as their intelligence, language, what they do, their passion for science*”, “*because of scientific approaches, For example, they subject their relationships to tests and experiments*. So, they do relate the protagonists of the series as scientific researchers because of their outstanding intelligence, but also because of the type of science they do, that is, the exercise of basic and formal sciences -which

8 Moscovici (1979) defines it as a plurality of cognitive systems and social situations among which there is a relationship of adaptation. As Rose et al. (1995), different social groups can share certain parts of the field of representation and disagree on others, and this field is susceptible to contradiction, fragmentation, negotiation and debate.

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	Total
Who Yes	17	11	25	21	30	17	121
Sheldon	7	8	13	8	12	6	54
Leonard	6	3	6	5	7	5	32
Howard	1	0	3	2	2	1	9
Rajesh	1	0	3	3	4	3	14
Amy	1	0	2	0	2	1	6
Bernadette	0	0	2	1	1	1	5
Who NO	10	5	3	4	9	7	38
Penny	5	3	3	4	6	4	25
Rajesh	2	1	0	0	2	1	6
Howard	1	1	0	0	1	2	5

Table 10. Do you consider that the characters in the series represent scientific researchers?

Source: Personal elaboration.

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	Total
YES, because	11	7	14	20	16	9	77
... have studies in scientific areas (physics, mathematics, astrophysics) where they prove what they investigate	4	3	3	6	9	3	28
... because there are differences in the characters (personality, different jobs, intelligence, mental abilities, nerdy way of being)	2	2	4	6	3	3	20
... for their characteristics and personality such as their intelligence, language, what they do, their passion for science,	3	1	5	2	2	2	15
... they innovate, develop, update, advance, investigate in their scientific branch	1	1	0	3	2	0	7
... the series mentions the similarity (in personality) of the characters with real scientists (Sheldon-Steven Wozniak); as a projection of brilliant minds	1	0	1	1	0	1	4
... by scientific approaches, for example, subject their relationships to tests and experiments	0	0	1	2	0	0	3
NO, because...	9	9	12	7	4	7	48
... because it is a comedy, a series that dramatizes and exaggerates the characteristics; there is no relationship between the real scientists and the characters have stereotypical characteristics; because there are differences between the characters: some are geeks, and others are clueless	7	6	8	4	3	5	33
... show inconsistencies in scientific topics (do not show the method of investigation); they show no progress; There is nothing new	2	1	1	2	1	1	8
... I don't know; I don't know scientists; I don't remember	0	2	3	1	0	1	7
Total	20	16	26	27	20	16	125

Table 11. Why do you think that the characters in the series represent scientific researchers?

Source: Personal elaboration.

involve experimentation, trial and error. This must be highlighted because scientists are being associated with a single type of doing science, which could leave out social scientists. In other words, the scientist is only one who is dedicated to physics, mathematics, astrophysics.

On the other hand, fewer informants consider that there is no such relationship, mainly because *“it is a comedy, a series that dramatizes and exaggerates the characteristics”*; *“there is no relationship between real scientists and the characters have stereotyped characteristics”*, *“they show inconsistencies in scientific issues (they do not show the research method)”*, *“they do not show progress”*, *“there is nothing new”*. Some of the above alludes mainly to the stereotypes cited by them as *“geeks”* and *“clueless”* (stereotyped characteristics); more on the other hand, these opinions show a critical sense, fiction is distinguished from reality, which could be taken as emancipated social representations, although incipient and in its minimum expression, but existing among the students, predominating among the administrative economic informants (CUCEA).

Although the students in the sample perceive greater relationships between the characters in this television series and real scientific researchers, according to the following table, very few (4.8%) identify with any of these characters:

Despite the fact that the positive *“aspects”* were the most frequent responses about why they like to watch said series, the vast majority (71.2%) do not identify with any of the protagonists despite the fact that neutral attributes predominated, and although positive attributes were not ignored. Even if we put together the answers of yes (4.8%), with sometimes (24%), a total percentage of 28.8% would be achieved, which is not compared to the 71.2% of those who answered not to

identify with any of the scientific characters. of said series. It will be necessary to ask if this great majority does not identify themselves because stereotypes prevail towards scientists (they are not considered intelligent, nerds, and because of the personality traits of the protagonists), and also because the characteristics of *“vernacular”* science prevail (Wagner, 2007), as a single way of seeing science, and not completely correct.

It remains to break down many of the ideas expressed by the students (by gender, for example), plus the scheme that is presented below, synthesizes so far how the informants appropriate (objectify) and give meaning (anchoring) to it, in general, to the scientists within the television series: *The Big Bang Theory* (sitcom).

COROLLARY SCOOP

The initial purpose of this work was to study the social representations of the undergraduate students of the thematic centers of the University of Guadalajara with respect to the image of the scientists that appear in the television series *The Big Bang Theory*, which, as it was appreciated, is generally homogeneous. These findings strengthen the global dimension of this line of research, in which the media -in this case television- along with other sources, exert a considerable influence on the formation of social representations about science, scientists and of its activity in university students.

It has not been easy to analyze how young informants are socially represented to scientists through the television series *The Big Bang Theory* (sitcom), the information is abundant, it is necessary to give greater account of the specifications for each center, such as the gender of the informants, the affiliation careers, the different semesters in which they study, and make the pertinent relationships, etc. However, the initial objective was fulfilled

	CUAAD	CUCBA	CUCEA	CUCEI	CUCS	CUCSH	Total
YES	2	1	0	1	2	0	6
For his personality, tastes and ways of doing things, how to stand out	1	0	0	1	2	0	4
I feel just like them	1	1	0	0	0	0	2
NO	15	12	15	17	18	12	89
Because there are differences between my personality and my tastes (I am not attached to science), my morals, my lifestyle and behavior with those of the characters	10	4	5	8	13	4	44
Because I do not have intellectual capacities as developed as they do, nor the interest or habit of investigating	3	3	3	4	3	3	19
Because I do not consider that they represent scientists due to their fictional and exaggerated nature	2	2	2	3	2	5	16
I hadn't questioned that; I don't get along with any of them; a scientist is serious	0	3	1	2	0	0	6
SOMETIMES	7	3	3	8	7	2	30
Similarities in personality, behaviors, attitudes and character (being serious, acting mechanical, being sarcastic, perfectionist, obsessive, exaggerated, antisocial)	3	2	1	3	4	0	13
Similar in tastes, activities and interactions: taste for comics, research, science, learning, talking about different topics with family and friends, math	3	0	2	4	3	1	13
I identify myself by the situations that they live, the way of being (cultured, serious), by the career I study and by the expectations (becoming a researcher)	1	1	0	1	0	1	4
Total	24	16	18	26	27	14	125

Table 12. Do you identify with any of them?

Source: Personal elaboration.

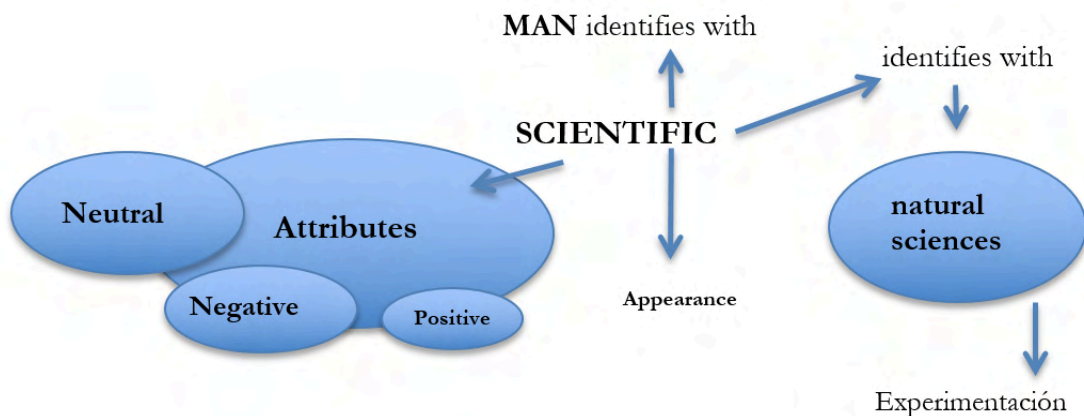


Figure 1. The scientist in: *The Big Bang Theory* (sitcom), from the perspective of the informant students of the university centers of the University of Guadalajara

in this exploratory-descriptive approach that allowed seeing from the outset the social representations of the scientist among the students, mediated by a television series.

It must be noted that, although homogeneous social representations were found, differences -albeit minimal- were observed between the students of the 6 thematic centers of the UdeG according to their scientific discipline. The representational field is characterized by the coexistence of heterogeneous contents, that is, images, concepts, beliefs that belong to cognitive levels of different complexity and origin that are influenced by different factors, such as gender, individual and social history, cohabit in it. educational level, among others, which are closely linked to the social experience of the individual, without all this necessarily conforming to a logically articulated structure, which is briefly stated as a state of cognitive polyphasia (Moscovici, 1979). The most visible case is that of the informant students of the CUCEI – exact sciences and engineering, although it is present in all of them in a certain way.

There are no definitive conclusions yet, but based on these first analyzes of the exchange of information with the students, they watch the series *The Big Bang Theory* because it is a comedy, it amuses them and makes them laugh, even if it is exaggerated in the characteristics of the protagonists, and precisely because of the exaggeration of the personality of the characters and their stereotypes, it is inferred that most of the students do not identify with any of the characters characterized as young scientists, who are shown mainly carrying out tasks of daily life.

The views of the students in the series, although different, keep a certain homogeneity in their visions, in their perceptions, images, opinions, that is, their social representations of scientists. On the other hand, “vernacular”

science, which according to Wagner (2007) means that the public has erroneous conceptions of science, plus these social representations of science work for their daily events and this way systems of science are legitimized. beliefs that circulate through the speeches with other lay people, does not escape these university students, that as we saw, only some disciplines are considered by them as scientific.

Finally, with a mainly educational purpose, fiction series such as *The Big Bang Theory* must be taken in our context in class sessions as examples for two things: 1. Show science with humor in everyday life as they have been proposed Li (2016), Li and Orthia (2016) and Riesch (2015), for example, and thereby demystify that science is boring, and 2. To analyze the stereotypes -wrong, of course- with which scientists are cataloged. scientists, and try to deconstruct the science of vernacular knowledge. A good task remains for us teachers to encourage a taste for scientific activity and sow, above all, concerns about research.

REFERENCES

- Barnett, M., y Kafka, A. (2007). Using science fiction movie scenes to support critical analysis of science. *Journal of College Science Teaching*, 36(4), 31-35.
- Barnett, M.; Wagner, H.; Gatling, A.; Anderson, J.; Houle, M.; y Kafka, A. (2006). The impact of science fiction film on student understanding of science. *Journal of Science Education and Technology*, 15(2), 179-191.
- Bednarek, M. (2012). Constructing 'nerdiness': Characterisation in *The Big Bang Theory*. *Multilingua*, 31(2), 199-229.
- Bonaut, J. y Grandío, M. (2009). Los nuevos horizontes de la comedia televisiva en el siglo XXI, *Revista Latina de Comunicación Social*, 64, 753-765.
- Davis, C.; Tilley, F.; y Hague, P. (2010). P4_6 the pot noodle proposal. *Journal of Physics Special Topics*, 9(1), 1-2.
- Domínguez, S. (2017). Los científicos "modernos": la serie de televisión *The big bang theory*, *Global Media Journal Mexico*, Volumen 14, Número 26, 1-23.
- Domínguez, S. (2012). Significados de la ciencia en estudiantes universitarios. Aproximaciones a las representaciones sociales de la ciencia, del científico y de la actividad científica. Guadalajara, México: Universidad de Guadalajara.
- Efthimiou, C. J., y Llewellyn, R. A. (2006). Avatars of Hollywood in physical science. *The Physics Teacher*, 44, 28-33.
- Farland-Smith, D.; Finson, K.; Boone, W. J., & Yale, M. (2014). An Investigation of Media Influences on Elementary Students Representations of Scientists, *Journal of Science Teacher Education*, 25, 355-366.
- Fraknoi, A. (2003). Teaching astronomy with science fiction: A resource guide. *Astronomy Education Review*, 1(2), 112-119.
- Fung, Y. (2002). A comparative study of primary and secondary school students' images of scientists. *Research in Science and Technological Education*, 20(2), 99-213.
- Galán, E. (2006). Personajes, estereotipos y representaciones sociales. Una propuesta de estudio y análisis de la ficción televisiva. *Revista ECO-PÓS*, 9(1), 58-81.
- Galvão, D. P. (2009). Os nerds ganham poder e invadem a TV. *Revista Científica Intr@ciência*, 1(1), 34-41.
- Gottfredson, L.S. (1981). Circumscription and compromiso: A developmental theory of occupational aspirations. *Journal of Counseling Psychology*, 28(6), 545, 579.
- Guerrero, I. J., y González, I. J. (2010). Análisis de contenido de los estereotipos presentes en "The Big Bang Theory". *Razón y Palabra*, 72(15, Mayo-Julio), 3-18.
- Jovchelovitch, S. (2007). *Knowledge in Context: Representations, Community and Culture*. London: Routledge.
- Knippels, J.; Severiens, S. y Klop, T. (2009). Education through fiction: Acquiring opinion-forming skills in the context of genomics. *International Journal of Science Education*, 31(15), 2057-2083.
- Laprise, S., y Winrich, C. (2010). The impact of science fiction films on student interest in science. *Journal of College Science Teaching*, 40(2), 45-49.
- Li, R., y Orthia, L. A. (2016). Communicating the nature of science through *The Big Bang Theory*: Evidence from a focus group Study. *International Journal of Science Education, Part B*, 6(2), 115-136.

- Li, P. (2016). Communicating science through entertainment television: How the sitcom *The Big Bang Theory* Influences audience perceptions of science and scientists. Thesis submitted for the degree of Doctor of Philosophy in Science Communication at The Australian National University.
- Marková, I. (2003) *Dialogicality and Social Representations. The Dynamics of Mind*. Cambridge, UK: Cambridge University Press.
- Martín-Serrano, M. (1994). *La producción social de comunicación*. México: Alianza Universidad Textos (2ª. Edición revisada).
- Milanick, M. A., & Prewitt, R. L. (2013). Fact or fiction? General Chemistry helps students determine the legitimacy of television program situations. *Journal of Chemical Education*, 90(7), 904-916.
- Moscovici, S. (2005). *La era de las multitudes. Un tratado histórico de la psicología de las masas*. México: FCE.
- Moscovici, S. (2000). *Social representations. Explorations in Social Psychology*, Cambridge: Polity Press.
- Moscovici, S. (1979). *El psicoanálisis, su imagen y su público*. Buenos Aires, Argentina: Huemul.
- Oliveira, A. y Tonus, M. (2011). *Bazinga! Uma Análise Neotribal Da Sitcom The Big Bang Theory*. Paper presented at the Intercom-Sociedade Brasileira de Estudos Interdisciplinares da Comunicação: XVI Congresso de Ciências da Comunicação na Região Sudeste, São Paulo.
- Orozco, G. (2001). Audiencias, television y educación: una deconstrucción pedagógica de la «televidencia» y sus mediaciones. *Revista Iberoamericana de Educación*, No. 27, 155-175.
- Orthia, L.; Dobos, A.; Guy, T.; Kan, S.; Keys, S.; Nekvapil, S. y Ngu, D. (2012). How do people think about the science they encounter in fiction? Undergraduates investigate responses to science in *The Simpsons*. *International Journal of Science Education, Part B: Communication and Public Engagement*, 2(2), 149-174.
- Riesch, H. (2015). Why did the proton cross the road? Humour and science communication. *Public Understanding of Science*, Vol. 24(7), 768-775.
- Rose, D.; Efaim, D.; Gervais, M.C.; Joffe, H.; Jovchelovitch, S. y Morant, N. (1995). Questioning consensus in social representation theory. *Papers on Social Representation*, 4, 150-156.
- Smith, D. A. (2009). Reaching nonscience students through science fiction. *The Physics Teacher*, 47(May), 302-305.
- Stratton, J. (2015). The Price of love: *The Big Bang Theory*, the family and neoliberalism. *European Journal of Cultural Studies*, 1-18.
- Suãdes, N. S. (2010). *The big bang theory: Catalacol.loquial i humor científic. Proposta de traducció del capítol pilot*. Barcelona: Universitat Pompeu Fabra.
- Wagner, W. (2012). Social representation theory. In D. J. Christie (Ed.), *Encyclopedia of Peace Psychology*. Malden, MA: Wiley-Blackwell.
- Wagner, W. (2007). Vernacular science knowledge: its role in everyday life communication. *Public Understanding of Science*, 16(1), 7-22.
- Wagner, W. y Hayes, (2005). *Everyday Discourse and Common Sense. The Theory of Social Representations*. Basingstoke: Palgrave-Macmillan.