In this article we explore the importance of Science Fiction in organizing hackers’ practices of software development. Science Fiction is often part of hackers’ everyday life and it is in their daily practices. This claim can be easily verifiable thanks to several narratives, stories, and technologies (Levy, 1984; Crispin, 1978; Raymond, 1998; Graetz, 1981). Nevertheless, until today a serious investigation on Science Fiction and the organizing of Free and Open Source Software practices has not been carried on. In our work we maintain that, in hackers’ practices, Science Fiction has an active role which goes far beyond any metaphoric use of it.

Before entering into our contribution we would like to provide an account for the role of Science Fiction within organizational studies and within studies on working practices. We notice that the interest of organizational studies for Science Fiction is not
new. Nevertheless we must also notice that in many cases this interest has confined Science Fiction to the role of a source of concepts and metaphors, used in the analysis and in interpretation of concrete cases.

In order to illustrate our argument we would like to recall the contributions contained in a special issue of the journal “Organization” (AA.VV., 1999), entirely devoted to Science Fiction in organizational studies. For instance, in the article by Phillips and Zyglidopoulos (1999) the cycle of Asimov’s *Foundation* and the asimovian concept of “psicohistory” are taken in account. In particular the latter, which is understood as a form of science able to foresee future events and the evolution of a society, although only at a probabilistic level. Asimov’s Foundation is used by the authors as an interpretative lens, through which the authors encourage the readers to think about the limits of organizational science as a form of predictive science.

A second example we would like to take in account is that of Srinivas (1999) in which the concept of Android is used, inspired by Philip K. Dick’s novels. The concept of android represents the situation of a human being that is no longer entirely human, since he/she finds him or herself caged in a process of commodification. In such sense the contribution provided by Srinivas is that Dick’s android becomes a kind of literary resource that can encourage the organizational subjects to withstand the process of “androidization” which subjugate them.

A third example comes from the paper by Case (1999) where the author takes in account Stanislaw Lem's novel *Solaris* and Lem's epistemological and ontological concerns about scientific enquiry and human conditions. Case put forward Lem's argument of the conflict between rational and non-rational human motives as a way to understand a wide range of human conduct and especially human emotions. This seems to be useful especially when there is the
need to overcome “traditional” approaches to organizational studies that observe only the rational side of actual organizational behaviour completely forgetting the non-rational aspects. In the light of his analysis Case concludes the paper calling for organizational studies that could aspire to the narrative skills of Science Fiction writers.

From the initial analysis of these contributions we can extrapolate the general way organizational studies have seen Science Fiction. Organizational Studies have assumed Science Fiction as a source of interpretative concepts, which are useful for studying various organizational processes, ranging from commodification of people in organizations to the limits of organization as a predictive science. Against this use we claim that the explanatory role of the Science Fiction results diminished in the above accounts, because Science Fiction not only is a source of interpretative concepts or something to which organizational studies have to aspire, but can also be an active part of the organizational processes. To deepen this claim we focus our analysis on the Martian concept of “Grok”, described in the novel “Stranger in a Strange Land” by Robert Heinlein (1961). To understand the ways the concept of Grok participates in software development and use, we studied a software development project known as OpenGrok, paying attention in particular to the practices that surround and constitute it.

**STRANGER IN A STRANGE LAND**

The novel “Stranger in a Strange Land” by Heinlein (1961) narrates the story of Valentine Michael Smith (Mike), a human being raised by the Martians on the planet Mars. The novel describes Mike’s interactions with the terrestrial culture after its return on the planet Earth at the end of his adolescence.
Heinlein’s novel starts describing the composition of the first terrestrial spatial mission on the planet Mars and its miserable failure characterized by the death on Mars of all of its members. Heinlein’s novel continues describing a second spatial mission on Mars and the encounter of the members of this second mission with a human being that has been raised as Martian by Mars inhabitants. Mike is the child of two members of the first mission on Mars. Because of the death of his parents and all the other members of the mission, Mike grew up as a Martian. So that Mike can be considered a man of Mars, a human being in his physical structure but a Martian in his mental structure: “He's a man by ancestry, a Martian by environment.” (Heinlein, 1961, p. 20)

The second mission on Mars brought Mike on the planet Earth so that he could be submitted to careful studies. The declared objective of terrestrial authorities was to gain an adequate knowledge on the inhabitants and on the life of the planet of Mars. Once arrived on the planet Earth, the condition of Mike is that of a “Stranger in a Strange Land”, a Martian man among the humans ones that observes and interprets with Martian eyes the events of which he is protagonist. The story of Heinlein centres on the narration of the adaptation of Mike to the human beings and of his understanding of their culture and their practices, which is described by the author as an amplified version XX century America characterized by a “consumeristic” attitude and driven by the media (Wikipedia- article Stranger in a Strange Land).

The problem of the alienation of the man of Mars in comparison to the human beings is interesting from many points of view. Nevertheless in this writing we want to limit our attention only on one of them: the problem of knowledge, or better the practices through which the man of Mars tries to know the terrestrial world that surrounds him. In the whole initial part of the story it seems evident that the terrestrial human beings are forced to take
in account the ways through which Mike knows the world that surrounds him. For several aspects the question to which the human beings try to answer is the following: “How Mike knows the world?”. 

In Heinlein’s novel clearly emerges that the human beings attempt to understand the knowledge activity of the man of Mars and especially how this activity is mediated by the Martian language. In particular the Martian dictionary articulates around a fundamental verb that is to grok. This verb, according to the description furnished in the Martian tongue, assumes a multiple meaning: to drink, to understand, to love or “to be one with” a person. To grok means therefore to know a thing or a person in his/her completeness, in the totality of his/her being and at the same time to become part of this thing or person; if we want to express this with a single sentence: to grok a thing means “to be one” with that thing.

In the novel there is a passage in which the problem of human beings understanding of the word grok emerges with clarity and it is expressed as follows by one of Heinlein’s character: “'Grok' means to understand so thoroughly that the observer becomes a part of the process being observed—to merge, to blend, to intermarry, to lose personal identity in group experience. It means almost everything that we mean by religion, philosophy, and science—and it means as little to us as colour means to a blind man.” (Heinlein, 1961, p.266). Here the character expresses the difficulty for the human being to fully understand the meaning of the word “grok” which remains entirely mysterious to human beings. And it could not be otherwise since: “Mike thinks in Martian—and this gives him an entirely different ‘map’ of the universe from that which you and I use.” (Heinlein, 1961, p.264)
KNOWLEDGE AND GROK

At this point we can wonder why it is interesting to investigate the concept of grok as described in Heinlein’s novel and in particular the practices of knowing which is part of the verb to grok. For several aspects this verb connotes a knowledge superior in comparison to that that can be perceived or however realized by an external observer (Wikipedia-article “to Grok”). The relationship among the observer and the object of investigation is an essential point of the grokking: the knowledge realized by the man of Mars seems in fact to be able to revert the perspective, typical of western modernity, of the separation among who observes and the object that is investigated.

Western philosophy in general, and attitude toward knowledge in particular, have been for a lot of time moulded by the Cartesian perspective (Descartes, 1637), according to which the terminology subject/object is referred to an external observer (subject) opposite to the observed thing (object). In this sense, the knowledge leans on the acceptance of a necessary dualism among the person who knows and what is known. Nevertheless the knowledge realized in the grokking doesn't seem to have a place in the breast of the Cartesian dualism: in the grokking activities observer and observed object become one single thing, a particular form of quasi-object (Latour, 1991), which is not part of any form of dualism. For better understanding this point we can remember that the primitive meaning of to grok is to drink and it means to become one with the water that is drunk. Comparing the knowledge realized in the grokking - in which a unity is realized between the person who drinks and the water that is drank - with that of the observer that investigates the water as external object, we can locate the verb to grok in a place diametrically at the opposite of the Cartesian perspective.
GROKKING THE CODE

The description provided by Heinlein is a point of departure, insufficient however, to show the knowledge dynamics linked with the concept of grok. This task requires an empirical investigation and the possibility of discussing how the concept of grok is articulated in practice as a breakup of the Cartesian dualism.

For many aspects, a breakup in the relationship among the observer and an observed object typical of modern philosophy can be found in those practices defined as hacking practices and in the relationship that is built between hackers and calculators. According to the description offered by many authors (Weizenbaum, 1976; Turkle, 1984; Levy, 1984) this relationship doesn't seem to be an instrumental one, that of an external observed toward an object. Weizenbaum for example describes the existing differences between "professional programmers" that see the calculator as an instrument and as a mean completely separate from the subject that uses it and the "compulsive programmers" or hackers that exist only through and for the computers (Weizenbaum, 1976). The same rhetoric is presented in Turkle for which the hackers see the computers as things in themselves as opposed to the programmers of the computer as an instrument (Turkle, 1984). In other terms, according to these descriptions the hackers seem "to become one" with the calculators and in general with the technologies that they use.

Given the consideration above the verb to grok seems to be able to give us an interesting way to describe hacking practices. Nevertheless our goal is not to use the verb to grok in order to interpret the hacking practices. But on the opposite we would like to observe how the verb to grok is both active part of such practices and how our understanding of such practices would profit from an empirical enquiry based on the concept of grok.
We start from one of the resources recognized in the hacker social world: the Jargon File. This file is a fully comprehensive collection of the Jargon used by hackers to describe their practices and their relationships with computer. The Jargon File contains a voice devoted to verb to grok, that exactly describes the difference among an instrumental relationship to technologies and a relationship of complete understanding of technologies. According to the definition to grok “Connotes intimate and exhaustive knowledge. When you claim to ‘grok’ some knowledge or technique, you are asserting that you have not merely learned it in a detached instrumental way but that it has become part of you, part of your identity. For example, to say that you “know” LISP is simply to assert that you can code in it if necessary – but to say you “grok” LISP is to claim that you have deeply entered the world-view and spirit of the language, with the implication that it has transformed your view of programming.” (Jargon file-voice Grok). Thus for a person grokking a certain technology (e.g. the LISP programming language) means to become “one with” that technology in a way that as such this act of grokking has changed radically his/her own personality.

**OPENGROK: GROK IN PRACTICE**

What seen until now is not enough to justify our point of view on Science Fiction and hacking practices. To understand how the concept of grok participates to the software development activities, we have studied a software development project called OpenGrok¹, focusing on the practices surrounding and constituting it. OpenGrok is the tool to surf the OpenSolaris operating system code base and, in this way, it participates to the understanding of the OpenSolaris source code by developers. In relation to these

¹ The name of the program, as reported on the project homepage is “{OpenGrok”, with the presence of a parenthesis, character used in a lot of programming language. We have decided to refer to that simply as OpenGrok, without the parenthesis, to improve readability.
practices, the choice of the name OpenGrok remind to the association between surfing the code of a FLOSS project and the kind of knowledge translated with the reference to the Heinlein novel. In the following part, we show how this association implies a definition/redefinition of the actors involved and, through the technological mediation, authorized to participate at this kind of knowledge; on the other side, we show how the same association between intimate knowledge and this particular program is embedded in pre-existing practices and participates to their modification.

In order to study the case of OpenGrok we choose to base our theoretical framework on the perspective of the Sociology of association which has been put forward by Latour (1987 and 2005) and others (Callon, 1986; Law, 1987 and 2004).

In particular we follow their concept of translation considered as the interpretation given by technology builders “of their interest and that of the people they enroll” (Latour, 1987, p. 108). By this concept Latour and others means that technological projects are built attempting to enroll more and more people into the projects. In addition we must consider these practices as “practices of association” where developers builds technology mixing togheter (i.e. associating toghether) humans and non-humans elements.

These acts of enrolling and associating elements is possible thanks to the technological mediation. In Latour (2005) terms a Mediator are elements that “transform, translate, distort, and modify the meaning of the elements that they are supposed to carry” (p.39). In other words a mediator helps to see the definition/redefinition of elements involved into a translation.

As a last theoretical element we assume that these practices of association are part of an already ensemble of pre-existing
practices and materials and textual elements (Law, 2004). We assume that technologies are not built starting from scratch but that technologies are both embedded in pre-existing practices and participate to the modification of such practices.

Methodologically we have observed the discussions taking place in the mailing lists osol-discuss@opensolaris.org and opengrok-discuss@opensolaris.org, hosted at the OpenSolaris website, analyzed the blog entries related to OpenGrok, and conducted three email interviews with three OpenGrok developers, the two main developers (Chandan, Trond) and another one (Knut). The interview outline has been constructed after the analysis of the documents and of the mailing lists, analysis inspired by grounded theory practices (Glaser, Strauss, 1967). As a note, the interviews and observation have been conducted in the context of a two-years long cyberethnography (Hakken, 1999) of the OpenSolaris project.

**Toward OpenGrok: a security sentry problems**

As our first task, we have tried to understand how the association between OpenGrok and to *grok* emerged, and how it has translated the meaning of the same Heinlein's verb in social worlds and practices different from the science fiction genre. OpenGrok has been developed by Chandan, a security sentry\(^1\) at Sun Microsystems. At the beginning, OpenGrok had another name, rob.pl (Revenge Of Binaries) and was written in another programming language (Perl; now it's written in the Java language, but this transition is out of the aims of our paper). The practice embedding the first version of rob.pl is able to give us a first image of what “to grok” means if immersed in the hacking practices; at the same time, the program strengthens some pattern of action and weakens

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1 With the term “security sentry” or “sentry” (coming directly from the Chandan web-log), we refer to a programmer with the task of erasing security bug in the software source code, once they have been found (also by other programmers).
other ones. In his blog\(^1\), telling the story of OpenGrok, Chandan writes: “I keep a watch on reports of newly discovered security holes and then check if any Sun software is affected by them”. The relationship between subject (developer) and object (software) involved practices of view and control; these practices, according to Chandan, involved the participation of another program, cscope\(^2\), allowing a series of searches about the relationship between different functions of a program written in the C language. Two elements in the use of cscope were considered a limitation in the relationship between programmer and software: on one side, Solaris is a “Wad of Stuff”, with the presence of source files and binary ones; on the other side, some of the programs observed didn't allow access to cscope indexes. These boundaries for the reproduction of the sentry status have been the initial input to create new relationships with the software, new kinds of relationship that have brought to rob.pl in a first time, then to OpenGrok.

**Toward OpenGrok: from collecting information to understand them**

As shown, rob.pl has been developed with the aim of enlarging the number of information available for programmers, particularly collecting text strings from binary files; information able to shorten the distance between what a program does (cscope) and what a sentry search. Obtaining this kind of information is not the unique element of “grokking the code”: the practice of control about the presence of security bugs is improved by a search engine able to order the information disposable. Chandan choice was to use Lucene, “The good thing about Lucene, is that it does not understand document content. You will have to write analyzers for your own content. So you have the control and freedom to interpret

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\(^2\) [http://docs.sun.com/source/806-3567/cscope.html](http://docs.sun.com/source/806-3567/cscope.html)
different kinds of files the way you want. Lucene does a good job storing your interpretation and searching it.". In this sense, the relationship between programmer and the code under inquiry is a relationship mediated by the file interpretation that the same programmer consider relevant. The construction of information useful to reproduce the Chandan practices is not built as independent from programmer, but the same programming practices and interests participate to that. The boundary between the object of knowledge and the knowing subject has been cancelled through the mediation of a software program which is rooted in and strengthens the unity between subject and object. At this point, it seems clear how the association between grok and this program has been sustained by a pre-existing practice, that has defined the need for it and, at the same time, has been redefined by this definition. What has brought to the stabilization of this association in the name “OpenGrok”? What has been associated to Grok by programmers, redefining the meaning of the science fiction concept as a discursive resource?

**Toward OpenGrok: relishing the code**

It's the same Chandan, in an email interview, who describes the choice of the name: “We wanted a short, Google unique name (i.e the name should not give any results with Google to begin with). A colleague suggested to use the word 'grok' as it means to fully understand something.” (emphasis added). In this statement, we find another practice, the use of the Google search engine to do web searches, that is used to allow an unambiguous recognition of the project, moving the choice toward a short name. This practice is embedded in the developer field of action, the offices of Sun Microsystems, and the cooperative practices around projects, which are able to associate rob.pl+Lucene to a kind of full understanding (which presupposes a not-full understanding), which
is summarized by the word “grok”. The analogy with the Heinlein story goes on when grok had to be declined to become an unambiguous name; it's still Chandan telling: “We had initially thought of 'Groktose' to rhyme with Fructose and Glucose. After some discussions with Marketing it became OpenGrok.”. When we asked: “which was the aim of this "sweet" flavour you wanted for your program?”, the answer was “You could through your source code in a tar ball and hope that public will catch it, or you can 'serve' it with OpenGrok and hope people will relish it :­)”. In these statements, other two elements emerge in connection with OpenGrok and the relationship between programmers and code: on one side, involving competences and people of the marketing area, the practices of diffusion of OpenSolaris connect the project name with the same operating system, through the use of the prefix “Open”, used also in other Sun's projects; on the other side, the programmers conceptualization strengthen the idea of a physical relationships, that Heinlein put at the center of the concept of grok, to drink, that in this case become “to relish”.

**Beyond Grok: OpenGrok redefines the concept**

Something differentiate the science fiction concept from its practical and discursive actualization in the construction of the association who brought to OpenGrok: if, according to Heinlein, to grok is a concept humans can't understand, constructing a boundary between Mike and human beings; according to Chandan, OpenSolaris developer, and the Sun marketing area, OpenGrok, and the possibility to relish the code, can be interpreted as a way to enlarge the number of participants to the OpenSolaris project, allowing a more direct relationship with the operating system code. They put the full understanding of the system as one of the requirements for participation and, at the same time, as a way to overcome boundaries between participants and not-participants, as
the references to “public” and “people” make clear. At the same time, the public able to be attracted is not indistinguishable and undetermined, as another OpenGrok developer (Knut) underlined in an interview: “Having a name that just says what the product does is too dull, so you try to find a name which both tells something about the product and gives some other associations”. In this sense, the access to OpenGrok and OpenSolaris by the public is mediated by other elements: on one side, the capacity to interpret the name meaning, as connecting “to grok” to a full understanding; on the other side, other practices can allow the contact between developers and the program, postponing the activity of attribution of meaning to the name. For example, in the Knut case, being a Sun employee in Throndeim (Norway), engaged in the development of Apache Derby, as another OpenGrok developer, allowed Knut to begin using OpenGrok without knowing the meaning of the word “to grok”: “In fact, I was not familiar with the word "grok" when I started using OpenGrok, so I needed to search for it to find out what it really meant. The exact meaning is still not entirely clear to me, but I think I've understood enough of it to say that it's probably a suitable name. :).” With this statement, we are able to evaluate another element which is making relevant the study of science fiction as an active discursive resource in the hacking practices: the association between a software program, a “source code search and cross reference engine”, and a science fiction expression, the Heinlein grok, constitutes one of the ways through which the same meaning of what hackers do is redefined, and put developers in a learning process about “what it really meant”.

At this point, we can summarize the different ways through which the association “rob.pl + Lucene + gork” participates to hacking practices, and can be rooted in them: a form of full understanding of code is part of the requirement of some development practices, like the sentry ones, as Chandan remembers: “I needed the whole
picture of how everything that could ever interact with it [a software vulnerability] worked. That required lots and lots of searching and understanding source code.” This form of full understanding translates in having programs that reduce the distance between programmer and source code, as the choice of Lucene shows; the association of this form of understanding with the word grok, on one side strengthen the physical relationship between programmer and code, like the suggestion of Groktose shows, on the other side construct boundaries around the practices that are able to produce subjects (programmers) able to participate to this kind of knowledge, practices that not necessarily require the capacity to interpret the name OpenGrok. In conclusion, grok as a discoursive resource associated to a program, translates a meaning rooted in pre-existing programming practices, give them new meanings connected with the relationship programmer/source code and participates to establish how is it possible to access to the practices translated by the same “to grok”.

CONCLUSIONS

Our aim with this paper, has been to inquiry in which way Science Fiction is an active part of hacking practices. We started from the consideration that previous studies looked at Science Fiction as a source of interpretative concepts in organization studies, without considering how this can be considered also an active part in organizing processes.

To strenghten empirically our argument, we have investigated the concept of “grok” as described in the Heinlein's novel “Stanger in a Stranger Land“, observing how this represents a knowledge practice though which the observer gets blurred and becomes one with the observed object. The shift to an empirical field brought
us to consider this kind of knowledge as part of the hacking practices, as described in the Jargon File, discursive – conceptual resource for the hacker social world. In the following part, we have described an empirical case, the program OpenGrok, its birth, its lexical association with the Heinlein's word, and the differences with this science fiction concept, to describe its relationship of anchorage in and translation of hacking practices.

With this empirical analysis, we have shown how “to grok”, taken as an example of the science fiction imaginary, participates actively to hacking practices, defining modalities of relationships between the source code of a program and developers, and being itself translated by the participation to the same practices: the hackers' grok allow humans to become martians. Coming back to the Heinlein novel: “the words in English are a mere tautology, empty. In Martian they are a complete set of working instructions.” (Heinlein, 1961, p.490).

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