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The Dynamics of On-line Interactions in a Scholarly Debate.

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Summary : This article focuses on different means of constructing a scholarly on-line debate related to the field of Science Technology and Society. The study shows how scientific interactions are reproduced in a new medium while simultaneously, some users take advantage of new possibilities offered by the medium. The first section analyzes how the debate emerged, was constructed, and subsequently revealed the heterogeneity of goals and ideas among the participants. The second section discusses the practices that the participants explored to make the debate evolve. Two attitudes, identified as strategic and tactical, were observed. The tactical practices were to enable the emergence of a sense of community. From this perspective, the way some participants sustained mobilization and stimulated participation are analyzed. The strategic attitude is illustrated through the behavior of those who tried to be the leaders in the debate.

Keywords: scientific communication, , scientific controversy, Computer-Mediated Communication, rhetoric, science technology and society, technology use.

This article illustrates some uses of electronic discussion lists in a scholarly cross-disciplinary environment. These lists are available to the public via the Internet, and can be important for scientific communication, since they lead to rapid diffusion of written information. They might supplement correspondence between scientists, and be even more effective, partially replacing postal service, telephone, and fax machines for some people. Such a publicly available electronic bulletin board seems an appropriate solution to create forums for lively discussion, especially since comments sent to scholarly journals can take months to be published. Although scientific information is created and transferred in new ways, the extent to which these new communication technologies can affect the content of the scientific information and replace traditional media when it comes to transforming information into knowledge is not clear. Bruce Lewenstein (1995) studied this means of diffusing recent information in comparison with traditional means during the cold fusion controversy. This case is a famous example of the use of new communication technologies in the diffusion of scientific knowledge. The study showed that the bulletin board was an ineffective tool for creating knowledge, although it enabled scientists to obtain more precise data about Fleischmann and Pons's experiment. The reasons for this were mainly the great amount of irrelevant material in the messages and the difficulty of applying extra-textual cues to the judgment of information.

In this article I will describe the dynamics of a similar scholarly electronic debate. The questions at stake in the debate did not deal with a controversy but questioned the role of a scientific community. These agonistic exchanges are part of the scientific activity (Latour and Woolgar, 1979), yet this debate was less dramatic and concerned a much smaller scale than the cold fusion controversy.

The conception of the use of technology I sustain here is inspired by some considerations of Michel de Certeau (1980), who speaks of "*braconnage*" (poaching) concerning the social appropriation of technology. An example of this attitude appears in the act of someone taking the text from someone else's writing to use it in his or her own. He distinguishes between two types of attitudes toward any technology: the strategic use and the tactical use. The first attitude, the strategic use of technology, refers to the construction of a place from which power is exerted, a place from which the "enemy" (irrationality, the objective one has to overcome, etc.) can be identified as external. The second attitude, the tactical use of technology, derives from actions without places from which they are grounded. With this conception, there is no global aim toward which users collaborate, rather, the users artfully take advantage of opportunities they receive. They cannot control the technology because they do not have the power to do so, but neither are they controlled by technology. In de Certeau's conception, an everyday use is not overwhelmed by a global conception of technology, it is a tactical action. This everyday use of the technology supposes an appropriation of this technology, which remains an invisible act, with no place to act from. If we want to consider this theoretical frame for our study, we have to think of not only task-oriented actions in the use of Computer-Mediated Communications but of how the users take advantage of the situations they encounter and in which they find opportunities to use or to play against power; in other words, of how the users find their own way through.

The electronic debate I present here occurred on a discussion list in the field of science, technology and society (STS), a field to which many members of the international community subscribe.¹ The list is called "sci-tech-society" and was based at the University of California, San Diego.² The multidisciplinary origin of the participants — sociologists, anthropologists, historians of science and technology, but also scientists, engineers,

policymakers and economists — presented a rare opportunity for these groups to engage in dialogues.

The study is based on observations of interactions among participants during the debate. Other relevant materials (such as conferences and articles in STS journals) were also examined. This information was then compared with the information gathered in a questionnaire addressed to the participants in the debate.³ A quantitative investigation was undertaken to evaluate the rate of exchange of messages during the debate. The results presented below are based on the full set of messages that were exchanged. The purpose of these quantitative evaluations was to confirm qualitative assumptions coming out of the analysis of the debate and the participants' comments about what was happening. Because of this comparison, some elements could be set out more clearly. For example, the way participants became involved in the debate, sustained mobilization and stimulated participation, or the behavior of who appeared to be the leaders of the debate became more explicit. Some excerpts from the electronic debate have been incorporated in the body of the article in order to exemplify some issues that were raised and to show the multiplicity of positions. They also visualize the link between the medium used and the framework of the exchanges that were constructed during the interactions.

The electronic medium affects the dynamic of the on-line debate. Because these interactions are text-based, the medium affects what can be said, and how it can be said. The main feature of the interactions that took place during the STS on-line debate was how participants rewrote their own texts as well as the messages of others. My argument is that this manipulation of the texts enabled some participants to reappropriate the discussion. Two styles of appropriation can be distinguished: on the one hand, a power-driven strategy of imposing a particular view on the debate, and on the other hand, a tactical takeover of opportunities to participate, emerging out of the context of the discussion. I will interpret these two attitudes in the second section of

this article. In the first section, I will outline the way the debate emerged and how it was socially constructed.

Thus, I shall begin by positioning this study among other relevant studies. Thereafter, I introduce the technological and social or institutional frame in which the debate started. I then explain how this debate was considered by the list members and to what extent they were involved in it. To elucidate this question, we have to look at the persons who participated, or who did not participate, and why they acted this way.

After this first analysis, we will be able to describe, in the second section, how participants constructed a particular dynamic of interaction to mobilize participation in the debate and create a sense of community. Finally, I outline how leadership was constructed during the debate — in spite of some attempts to hinder the emergence of authority.

The emergence of the debate.

Electronic discussion groups do not usually support scientific debates. On this point, Martina Merz (forthcoming) shows how electronic discussion groups have been deserted by scientists at the CERN,⁴ where she is doing an anthropological fieldwork. However, exchanges of information and knowledge are a central part of scientific practice. These scientists drastically need to gather new information, in order to know what is going on and who is working on what (Traweek, 1988). They find this information often through informal discussions. Merz argues that informal discussion spaces are a way to encourage the emergence of new collaborations and new ideas. As a matter of fact, scientists need to meet in real life to engage in collaborations. For particle physics scientists, the Internet is then rather used when collaborations are already underway, when some temporary distance and independence from their colleagues is wanted. The Internet is also used as an information browsing tool, like World Wide Web browsers, first developed at the CERN.

In this present study, I question how a pluridisciplinary scientific debate, drawing on broad perspectives, could emerge. I report on a case where an electronic debate had substantial consequences for a scientific community, and I analyze the social construction of this debate in the electronic medium. This debate illustrates the unusual attitude that part of the STS community adopted when faced with new possibilities of interaction.

Scientific communications are a function of the social context of a scientific field. Thus they are socially constructed. One aspect of this social construction is exemplified in the unequal use of these new communication technologies across various scientific fields. On this point, Walsh and Bayma (1996) showed that computer network use differs by scientific fields. They explain these differences in terms of the social structure and the organization of each field. For example, particle physics is a geographically dispersed but also tightly coupled scientific community. Computer-Mediated Communication is therefore more frequently used than in more autonomous groups, such as experimental biologists. Furthermore, fields that are closer to commercial markets, such as chemistry, use this medium less than fields that have no commercial outcomes, such as mathematics. A brief summary of how the STS field is structured enables us to apply these considerations to the situation described here. It is thus possible to examine the relations between the social context and the way technology is used.

The common perspective for all members of the STS community is the study of the social construction of science and technology. This community is organized in many geographically-dispersed work groups. Although these groups are relatively autonomous, since they support a great diversity of approaches, regular meetings and conferences enable the members of this community to be well-acquainted with each other. Isolated scholars — geographically or institutionally — use this medium to keep in touch with STS-related information, as they sometimes explain in the discussion list.

Besides, the weak academic position of this community and its fragility in the face of budget cuts, make it flexible and adaptive. Following Walsh and Bayma's categories, these characteristics of the STS community make it easy for its members to take advantage of Computer-Mediated Communication.

Another aspect of the social construction of scientific communications is exemplified in a more general study by Orlikowski and Yates (1992). They use the concept of "genres" in organizational communication, or typified communicative actions (for example, the memo, the meeting, the business letter), to study communication as embedded in social process. They focus both on structural and cultural problems in integrating Computer-Mediated Communication into previously existing work practices. They show how a new genre of communication can emerge and become institutionalized through a socialized use, or how a preexisting genre is reproduced through a new medium. Their distinction between a genre of communication and the medium used to mediate it, enables them to explore the process of reproducing one given genre across different media. Of course, some genres are more likely to be used with certain media than with others (as for example informal exchanges in electronic mail), but there are no rigid boundaries between the medium and what can be said through it. Here I will illustrate this process of reproducing, reinforcing and transforming a socially embedded type of scientific exchange, or "genre" (a scientific debate or controversy in our case) in an electronic mail system. However, we will also see that some innovations in this type of scientific exchange can occur while people use the new communication technology. Some users take the opportunity to investigate the new possibilities of which they are becoming aware. This will be illustrated by analyzing the different replying practices, which will be described as both tactical and strategic. There is definitely not a simple reproduction of a given pattern into a new medium while people get used to that medium. We can consider here a more creative activity of

appropriating this medium to fit the style of discourse used by academics. Social realities are dynamically created through interactions. In the present case, when participants exchange messages, they take advantage of the medium in different ways to influence social realities. Baym (1995), relying on previous work on Computer-Mediated Communication, shows that the members of electronic groups creatively exploit the features of the system to create emergent social dynamics. We shall see later some characteristics of the social dynamics mentioned by Baym. For now, a description of the global frame of the discussion list and of the debate will give the first view.

The structure of the debate.

The debate started on October 3, 1994 with a message from Dr. Patrick W. Hamlett under the header: "STS under attack." This message reacted to the full-page ad in the September 9 issue of the journal *Science* with the headline "Science is under attack?" (pg. 1508). The article considered the recent theoretical developments within the STS community, particularly social constructivism, as an attack against science and reason. The article also showed a lack of information and of concern within the scientific community for the theoretical moves that the STS community instigated. The electronic debate ended around December 12, following a meeting organized by Steve Fuller (one of the most active participants in the debate) from December 3 to 4, at Durham University (UK) on the subject of the debate. There was a follow-up from December 9 to 12, on the discussion list, concerning the issues raised during this meeting. The *Times Higher Education Supplement* was asked by Fuller to monitor the list during these four days and to publish the most significant messages. This opening of the discussion space to a broader public encouraged some participants to post messages to the list for that occasion.

Many participants were well known members of the STS international community. Members of the list were from 24 countries, two-thirds of them

were American (65%) and a minority were from other countries (Canada [7%] and Great Britain [6%] were the next most important groups of participants). Only a very few of non-American STS scholars became involved in the debate. As many issues dealt with the present American academic context, members from other countries might have been discouraged from getting involved. About 16% of the subscribers to the list participated in the discussion (75 out of approximately 450 subscribers at the time of the debate, although it was not possible to follow the subscribe/unsubscribe movements). This low rate of participation raises the question of the extent to which it is possible to speak of a community through electronic interactions. McLaughlin, Osborne and Smith (1995) investigated the possible use of the metaphor of "community" in electronic interactions. Their argument is that the high proportion of lurkers — readers who do not post messages — in any electronic discussion group make the existence of a community problematic. In their sense, the community to which these discussions apply is amorphous and possibly ephemeral. The same restrictions apply in the context I am studying here. Yet the existence of an STS community in the social world, with meetings, conferences and journals dedicated to STS studies, enables us to speak also of a community in the electronic world. Thus, in this case, the medium does not create a community, rather a preexisting community takes advantage of the medium. In what sense, and for what purposes, did they take advantage of the medium is a question I try to elucidate in this paper.

Another characteristic of this discussion list might help explain the form of interactions that occurred during the debate. The list is not moderated. As it is explained by the list-owner in an introductory posting to new subscribers, the list has been created to enable better exchanges of information among STS students. His original goal was to build a community and to foster exchange of ideas about what an interdisciplinary intellectual community should be. There are no explicit rules about the kind of messages members are allowed to post, but of course, participants are still asked to

follow a widely disseminated set of rules for conduct, usually called "netiquette" conventions. Besides, it is hard to specify a stable group of members for the list, since subscribers come and go and anyone with access to the Internet may participate. Despite this loose structure, the messages have an academic form and tone compared to other not moderated lists. One possible explanation for this academical style in the discussion is the important number of scholars among the members of the list. Unlike other discussion lists, the proportion of graduate students on the list was only about 32%, whereas that of professors or researchers was over 52% during the debate. This statistic came from a survey conducted by the list owner shortly before the beginning of the debate. The reproduction of an academic style of exchanges into this medium illustrates the questions Orlikowsky and Yates pointed to. We shall see in this case how some participants used this medium in a specific way, whereas the content of the discussion appeared to be similar to a traditional scholarly debate.

The issue of the debate.

If we focus now on the content of the messages, it appears that most of the questions raised by the debate concerned the role and legitimacy of the STS field with regard to other scientific communities and the society at large. The main theme of the debate was the relationship between the STS community and other scientific communities. The debate echoed several questions at issue in the STS community, and therefore urged people to get involved. These subjects were salient enough to elicit many reactions., subsequently revealing the great heterogeneity of the points of view. Polemical questions were raised, such as the role of this community in science policies or the extent to which scientists refuse the legitimacy of STS studies. Out of these questions emerged the challenge of demonstrating the importance of these studies. A a critique of the constructivist analysis of

science written by two scientists, Paul Gross and Norman Levitt (1994) was often mentioned during the debate. Gross participated in the on-line debate and strongly rejected the legitimacy of any STS study upon scientific activities, a position which provoked a vivid debate inside the community. The question of the respect for STS people's work — such as inquiring into scientific activity — by other scientists was a salient point. Thus, it resulted in a challenge raised by the question "What are we really trying to accomplish in the long run?" that mobilized many participants. The answers that followed were often descriptions of individual goals and particular STS projects. Many different aspects of the STS community — or the STS network as some participants referred to it — emerged. This involvement of list members in the discussion revealed the heterogeneity of practices, goals, and ideas regarding the social construction of science.

The social construction of the debate.

The evolution of this debate revealed the role that the electronic medium played to foster the exchange of ideas. During the discussion, a link appeared between the content of the discussion and the form used to mediate this debate. Actually, the issues at stake in the debate and the use of this medium to engage in the discussion, were responding to one another in a subtle way. I explore here the relations between the content of the debate and the medium through which it occurred. I suggest that there was a mutual elaboration between the discussion and the medium used. In fact, people always encounter technology in a particular context, a situation which influences their further understanding. There is a simultaneous development of the technology and of its environment (Woolgar, 1987; Hamlin, 1992). In this sense, the meaning of what the machine does is reflexively linked to what the user does.

As the interactions evolved, the messages took into account the limitations of the medium. These limitations can be considered, Kiesler and Sproull (1991) argue, as the consequence of the lack of direct social cues. These cues regulate interpersonal behavior and include people's feelings, social status symbols, and attitudes. People take more extreme positions when they interact through e-mail than in face-to face groups, and the authors found that it takes four to ten times longer to reach consensus. More recent investigations showed that the members of an electronic discussion group are actively compensating for these limitations in social cues through the interactions in which they engage (Baym, 1995). Cyberspace is not a totally anonymous place. When interactions between people develop, they elaborate at the same time a social understanding on how these interactions can occur. All interactions convey social meaning and a social understanding of these interactions (Watzlawick, Beavin and Jackson, 1967). As the new medium does not assign rigid forms to the interactions that take place, there is room left for innovations. Thus, as Baym mentions in her study of the alt.soap.opera newsgroup, these electronic forums are places of social creativity. She speaks of emergent social dynamics that are related to the elaboration of forms of expressions, to the creation of otherwise unlikely relationships, to the creation of norms of conduct, and to the exploration of possible identities. She illustrates how participants in electronic interactions invent new communities. However, in our case, the social existence of the STS community influences the construction of the related cyber-community. Because of this social context, there is somehow a limitation in the number of ways members structure the discussion, whatever the medium they use. Any scholarly discussion is dependent on the scientist's need to gain recognition (Hagstrom, 1965; Bourdieu, 1975; Latour and Woolgar, 1979). I argue here that a facet of the social construction of community, other than those reported by Baym, appears in the present case. It consists of a participant's "community-awareness" while writing the postings, since what one said in the discussion

list could be considered as addressed to the whole STS community. This aspect of the interactions in an on-line debate will be further explored in the second section. For technical reasons,⁵ it was not possible for members of the discussion group to know who received the messages among the members of the STS community. The result of this uncertainty was a loose perception of who were to be the recipients of the claims made in the discussion list. Sometimes the discussion turned into a call for a mobilization of the STS community in response to being the victim of an "attack," as the following message indicates:

From: "Dr. Patrick W. Hamlett,"
Date: Wed, 5 Oct. 1994
Subject: STS Under Attack -- Yet Again!

[...]We've been noticed, folks, and it's time to introduce ourselves to the wider world as we understand ourselves, rather than to allow others to define us, our goals, and our insights for us. [...]

These incitements were attempts to use the discussion list to assemble the various orientations that constitute the STS community into an integrated scientific field. The argument developed for this purpose is simple: if we are under attack, we must have a coherent reaction and denounce the representations of our community that our enemies perpetuated. These (hypothetical) enemies are a powerful means to federate a disseminated group. Arguing for the urge to defend the STS positions (as distinct and plural as they are in fact) is then a way to construct a sense of community through the electronic medium. The emergence of such comments, suggestions, and incitations to collaborate was a way to give the STS community a general and unified representation of itself. Yet, this initiative

can also be considered as a first step in constructing one's authority over a coherent representation of a heterogeneous field. We will see below how this latter claim was used by some participants to orient the debate in order to enable them to gain authority in the discussion. The debate showed that STS people had multiple conceptions of what should be the role of science studies. The medium was used to reveal the existence of these positions, which are not always easy to distinguish in the "official" communication means (publications, conferences, etc.). In this sense, we can say that the debate clearly revealed the heterogeneous composition of the STS community. Clearly, the issues debated were intended for a large audience inside the STS community.

It is remarkable that in this debate, a scholarly discussion and an explicit social understanding of it were elaborated simultaneously. This means that a sense of community was constituted in relation to the issues of the debate. Yet this social understanding usually remains implicit. A reflexive dimension of the debate is addressed here: the debate was an opportunity to constitute — by making visible — what could be the common interest of the STS community in the face of the questions addressed in the debate. It was also a means of making explicit some statements such as the underlying intention of participants regarding their ideas, academic position, and need for recognition. Some participants were questioning the social implications and the social meaning of such a debate for the STS community. Thus, they were also arguing about the relevance of what they were doing while posting messages to the discussion list. This reflexive aspect of the debate is not mere chance: the STS community has precisely elaborated on this concept. Having originated in phenomenology, it has been used by ethnomethodology, and has constituted one of the four elements of David Bloor's "strong program" (1976), a basic reference in science studies. This debate does not simply illustrate the process of constructing a common perspective in a discussion. The specificity of the approach of STS studies is bound to a position of

criticism with regard to the process of constructing power in science and technology and in the discourse related to their practice. Assuming that position, one must immediately ask himself how his own claims are also attempts to construct power. This paradoxical position in STS studies can be seen as a way to see the branch one is sitting on. Yet we can see in this question an important issue, since it has elicited many reactions inside the STS community and in the electronic debate. While the debate evolved, there was simultaneously and reflexively a questioning of the impact of such a debate.⁶

Involvement in the debate.

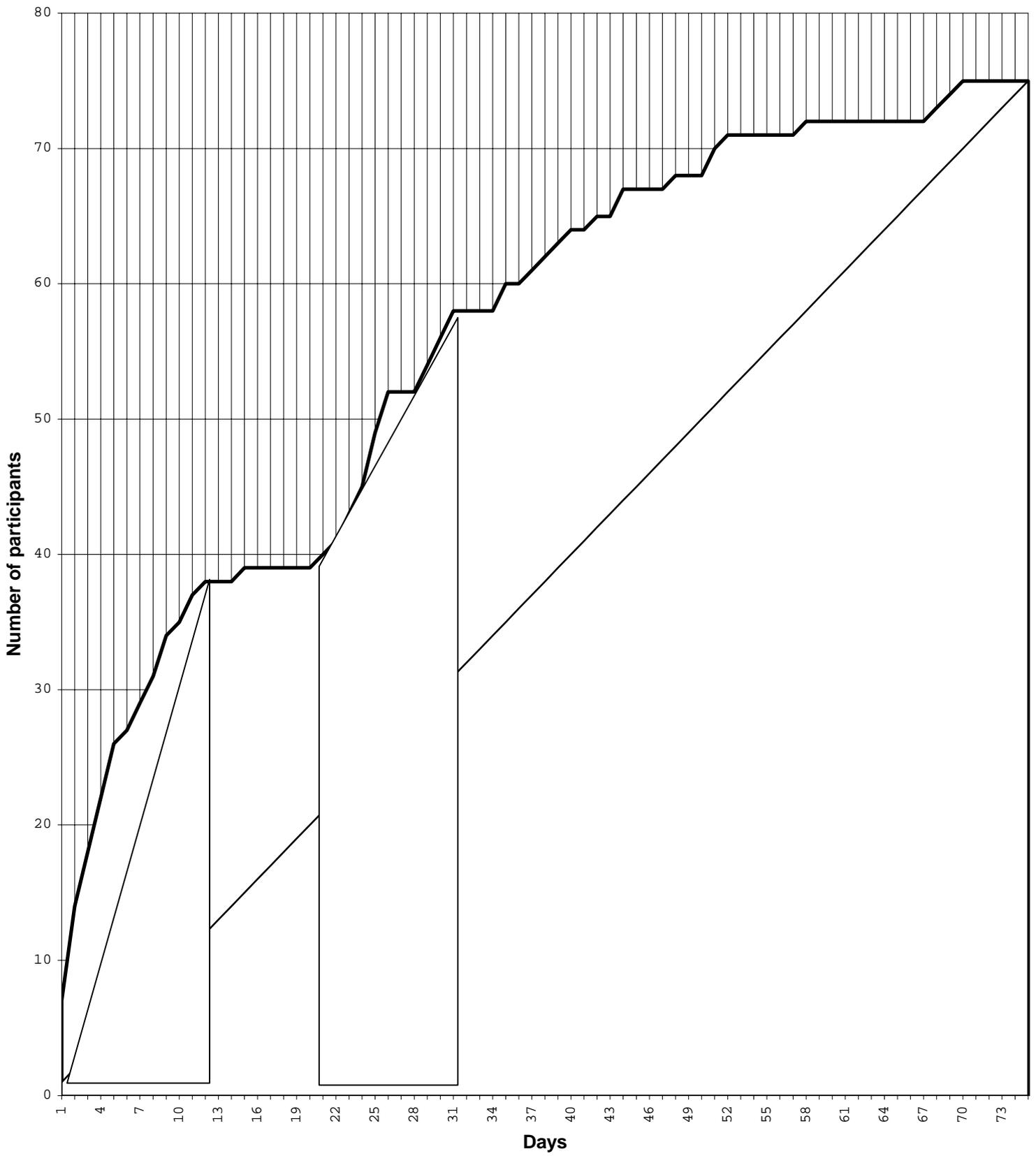
In this section, I will describe how the debate was constructed and identified by the participants as emphasizing important issues. There were several conditions that enabled the debate to be predominant. I will concentrate here on three factors of the development of the debate. The first aspect deals with the extent to which the debate was open to new participants. The second aspect concerns the importance of this debate in comparison to other discussions in this list. The third aspect refers to the involvement of the participants in the debate. This last point will be put into the perspective of the deficit of a majority of list-members' participation.

If we look at the evolution of the number of participants (Fig. 1), we can see that after the first month, 80% of those who were to participate had joined the discussion. A theoretical growth of one new participant each day is set on the graph (Fig. 1), enabling a comparison of this linear growth with the real evolution of the number of participants. The comparison shows that their number grew fast at the beginning of the debate and then became stagnant. The debate stopped after 75 days (there were only one or two references to it later on)⁷ when 75 members had joined the discussion. There was a high

mobilization during the first days of the debate. A second movement appeared three weeks later (on day 21 approximately), due to new participants challenging further questions on the STS movement's role. These two periods of growth are shaded on the graph. The growth of new participants became less important until the debate dropped off abruptly. The questions that made the debate evolve during these two periods of important growth in participation were summarized under two kinds of headers in the messages. The first header that solicited many messages was: "STS under attack." There were 26 messages referring to this initial claim. The second header that induced many messages was: "You don't get no respect."⁸ There were 88 messages referring to this header. These two headers were often reused, since many computer interfaces automatically add the same header when people use the reply function to a message. Thus, while reusing the same header for the various messages that constituted the debate, a coherence in the debate could emerge.

The extent to which participants have met face-to-face or have spoken with each other in relation to the debate can be estimated through their responses to my questionnaire. It appears that the members of the list

Fig. 1. Evolution of the number of participants.



have interacted in private messages they exchanged to confirm their positions. The data about these private exchanges were difficult to collect, and constitute the invisible part of the discussion. In this sense, the public debate was only the emergent part of the iceberg, and all the hidden interactions are difficult to evaluate. To have an idea of the importance of these exchanges, I quote here an answer one participant in this debate sent to me, long after it had stopped:

There were 65 messages [mostly Americans, but also from four countries in Europe] in my e-mail file on that discussion; about ten were postings to the list [including mine] and all the others were "private" messages about my postings. I've heard from others that this ratio matches their experience.

Of those 55 or so "private" messages, about 25 were messages from five people, continuing for about a week their commentaries about the ongoing "public" postings. [The five included two grad students, an assistant professor, an associate prof., and a full professor; all but one were Americans. Two I knew fairly well; the others were at that time acquaintances.]

Most of the "private" messages were from people who rarely ever made "public" postings to the list, so far as I had noticed.

On the discussion list, or even in the direct queries I made, no mention was made of the annual meeting of the Society for the Social Studies of Sciences (4S) that took place at the time of the debate, in late October 1994. This meeting is the place where STS scholars from all countries can meet. It is difficult to know whether the meeting had an influence on the turn of the debate, as its influence has not been clearly identified. However, the 1995

meeting of this society clearly reported on the on-line debate. The above-mentioned participant in the debate also commented privately to me on this point:

The next 4S meeting was very interesting for me, first because of all my chats with people who had sent those "private" messages, and secondly because of all the discussions with people who had read the exchange but did not feel comfortable communicating their thoughts electronically. Almost all these "face-to-face" conversations were substantive and interesting to me.

At this meeting, two sessions at least were devoted to the impact of this debate (session 19: "Authoris Response to Critics" with P. R. Gross, N. Levitt, and S. Fuller; session 24: "Beyond Higher Superstition: A Round Table Discussion on STS and the Future" with S. Fuller and S. Traweek, to mention only the participants in the electronic debate). One session was devoted to the impact of electronic communication for scientific communities (session 20, organized by S. Shapiro, "Contextualizing the New Information and Communication Technologies"). The importance inside the 4S conference of the questions previously raised by the e-mail debate illustrates the on-going interest of the community in these issues. Furthermore, international journals and newsletters continued addressing issues raised in this debate. In *Social Studies of Science*, for example, Jay Labinger (1995) dealt with issues similar to the electronic debate, and received responses from *Harry Collins* (pp. 306-309), *Steve Fuller* (pp. 309-13), *Sheila Jasanoff* (pp. 314-17), *David Hakken* (pp. 317-20), *William Keith* (pp. 321-24), *Michael Lynch* (pp. 324-29), *Harry Marks* (pp. 329-34), *Trevor Pinch* (pp. 334-37), and *Alan Stockdale* (pp. 337-41) and responded himself to these critiques (pp. 341-48) (the names appearing in italics are of persons who were active in the electronic debate). All these papers deal with questions similar to those that arose in the on-line debate. At

least three other journals (*Times Higher Education Supplement*, *Technoscience*, and the *EASST Newsletter*) also reported on the Durham conference and on related issues.

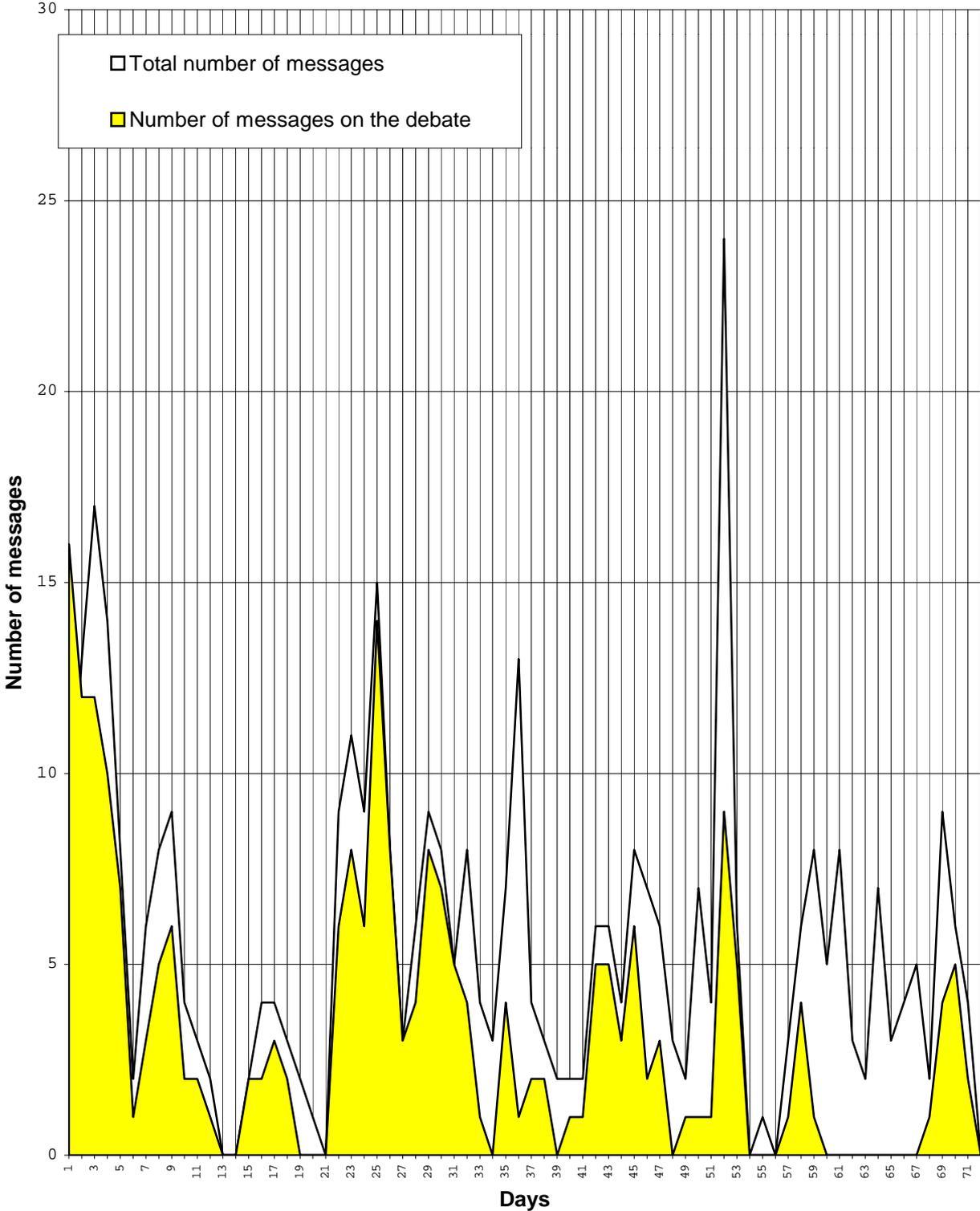
The second aspect of the way list-members were involved in the debate is illustrated by the importance the debate took among other subjects in the discussion list. As shown by Figure 2, it appears that the debate filled almost all the discussion space in the beginning, but its importance decreased in the course of the debate. The graph (Fig. 2) plots the number of messages related to this debate compared to the total number of messages in the discussion list. Although the discussion slowly shifted towards other concerns, yet the debate still lasted ten weeks, unlike other more precise or technical interactions. This important mobilization around the debate probably could not have been sustained without the other parts of the social context, such as references in the messages to recent events (political, scientific, social, etc.), or to papers and books relevant to the questions debated. Self-promotion of the participants and their publications played an important role as a stimulation for further discussions.

The third aspect deals with the differences in participation of those who posted messages related to the debate. The important rate of messages referring to the debate does not imply an equal involvement of all the participants. Figure 3 shows that a minority of the participants were responsible for the largest part of the messages. To a large extent they were well-known scholars in the field. According to Figure 3, 17% (13 out of 75) of the leading scholars sent about 50% (102 out of 230) of the messages. These 13 persons sent 5 or more messages (i.e. one poster sent 21 messages, one sent 10 messages, one sent 9, two sent 8, 7, and 6 messages, and four sent 5 messages, totaling 13 persons who sent 102 messages).

Number of messages	Proportions of participants
1 message	43 %
2 to 4 messages	40 %
5 messages or more	17 %

Freeman (1984) set a theoretical frame to characterize the social structure of a scientific community in relation to the links among scientists. He used the notion of awareness as opposed to acquaintanceship to distinguish two kinds of basic relations linking people. He argues that the emergence of a scientific specialty is related to the process of moving from becoming aware of a colleague to a proximity enabling the development of a scientific community. He also analyzed the influence of

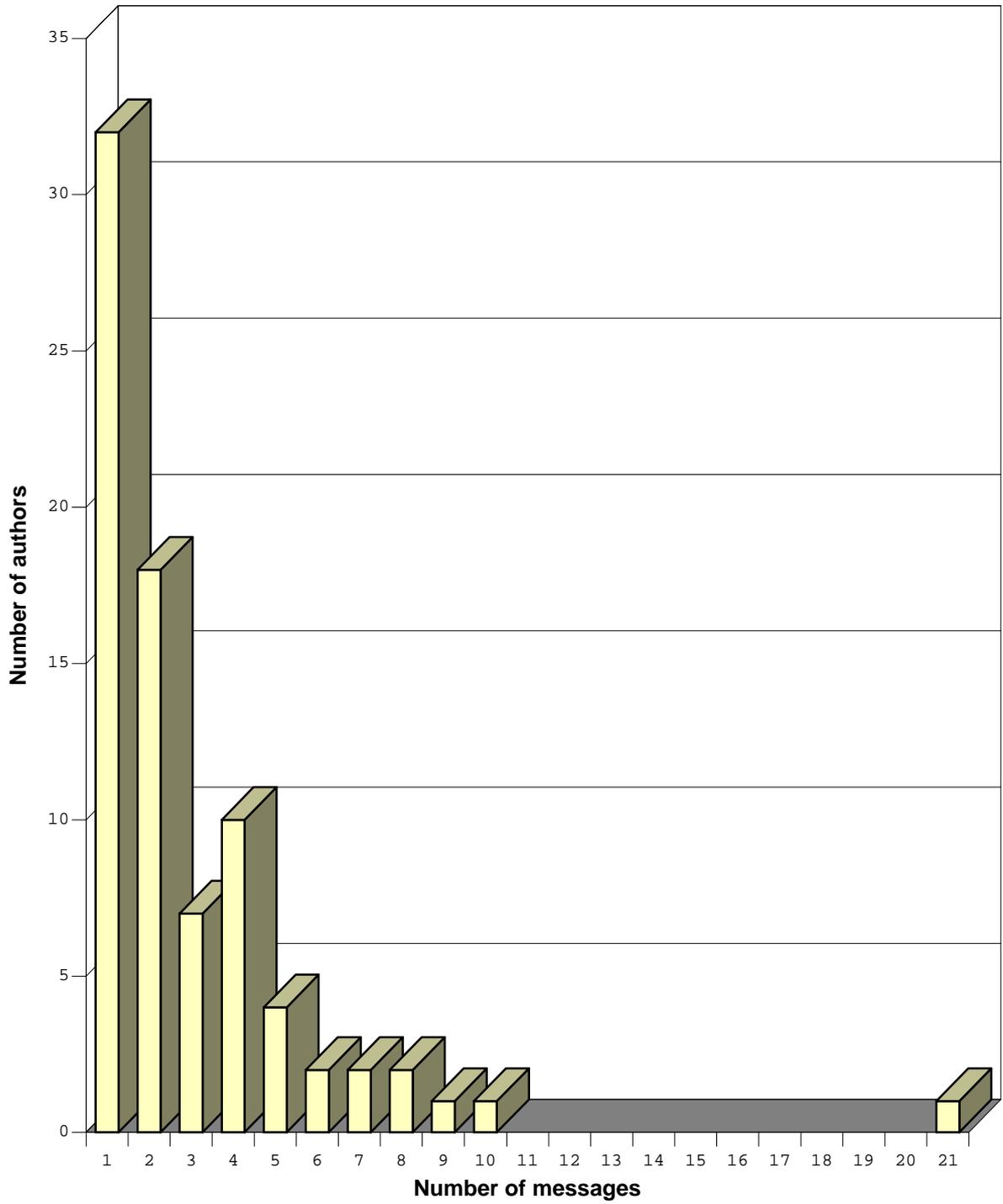
Fig. 2. Proportion of messages forming part of the debate.



on-line interactions to facilitate the emergence of a scientific specialty and concluded that it has a very indirect effect. In this sense, the electronic debate was a means by which individuals in the scientific community could facilitate the process of tightening their links. However, the third graph shows that almost half of the participants (32 out of 75) sent only one message. Thus, the extent to which one can speak of a sense of community emerging out of the debate, or built around this electronic discussion list, remains doubtful. The idea of proximity that Freeman uses can be sustained here only for a small proportion of participants. We can only assume that the electronic debate played a part in the process of clarifying the representations about the STS community, both inside and outside of it. Still, these assumptions about the failure of the discussion list to create a sense of community must be put into the perspective of some participants' attempts to sustain a greater implication of the STS community in this debate, as will be seen in the second section of this article. The on-line discussion was only a part of the larger context in which the questions were addressed to the STS community.

As this debate has been resumed and continued in a second stage through various other means, it confirms at least the existence of an on-going process initiated by the electronic medium. The ending of the on-line debate remains surprising, though. If the 4S conference of 1995 questioned these issues again, one year after the on-line debate, why did the discussion not perpetuate through the computer medium? Even

Fig. 3. Average number of messages per author participating in the debate.



though the conference planning was set long before its beginning, there was no implication that the discussion list had to remain silent during this time. I assume that the reason for this unexpected turn was the shift of interest of the most active participants, consequently depriving the list of those who were provoking discussions and replies (see the next section on this point). Baym (1995) speaks of the necessity of the presence of heavy users to develop electronic communities. Those users' positive perception of the medium encourages exchanges and relationships.

The unequal involvement mentioned above deserves two further comments. First, as it has not been possible to learn the names of those so-called lurkers who only read the messages without posting during the debate, it is difficult to know to what extent the debate expanded across the international STS community. Furthermore, there were scholars who entered the debate only after having been cited in one or several messages. For example, this was the case for Paul R. Gross, who was mentioned several times before he participated. His posting revealed that he had been following the discussion. To cite another example, Harry Collins, a leading STS scholar, had his opinions about the questions under debate presented in the discussion group by Steve Fuller. Collins disagreed with Fuller's interpretations and he decided to explain his position in the discussion list himself.⁹ So even if STS scholars in general were aware of the debate, only a few of them decided to participate. This cautious participation raises further questions about the intention of some participants, as will be discussed in the second section.

Second, all those who did not express themselves during the debate could be seen by all the other subscribers as having had nothing to add to the different positions taken. But of course, there were also *other* reasons for subscribers not to participate in the debate. The direct questions I asked the list members revealed several attitudes. The answers I received from lurkers

cannot provide an exhaustive explanation for the deficit in participation of some list-members. Yet they illustrate a set of attitudes and reactions regarding the development of a scholarly electronic debate. Partial conclusions to the reasons why members did not participate are as follows:

- Three male members said they had nothing significant to add. One explained that he was not feeling threatened by the attacks on STS that motivated the debate.
- Four female members were angry about the debate. One respondent spoke of being "put off by what people were saying" and felt "that it wasn't worth spending time and effort on." Another member answered that there was "too much intellectual muscle-flexing and posturing in this group." Two persons complained that they were not satisfied by the turn the debate took, and that "these cyber-debates are usually fleeting and insubstantial."
- Two male members explained that they tried to keep quiet during the debate because it was not their area of expertise, although they could not remain still all the time, if their "frustration boil[ed] over."

To complete this list, another point can be elaborated on the self-censorship practice of those who did not consider their messages as really important to the STS community. Any member of the discussion group could theoretically express his or her point of view, as the discussion list was not moderated. There was apparently no real direct censorship, yet the vivid reactions of some participants to apparently harmless messages discouraged some members to cut into the debate. The following reaction I received from a female professor in response to my questionnaire illustrates this feeling of exclusion :

I did not participate in the debate because I find these "debates" very exclusive and exclusionary.

And from another female member:

I didn't [participate] because things are too fast and I need time to think and articulate. I was sometimes intimidated. I felt I had a lot to say but I need space and time to formulate it.

These reactions are roughly displaying four kinds of attitudes. The first attitude expresses the lack of concern by the lurkers toward the questions raised. It shows that not all members of the list — and furthermore not all members of the STS community — felt involved. The second is a more direct contestation of the importance and the interest of the whole discussion. The third expresses an interest in the debate, but from outside the community. The fourth kind of attitude reveals how the access to the debate was restricted. There were probably other reactions that led members to avoid participating in the debate, but those presented here already indicate the multiplicity of the reasons not to participate. We can also notice that mostly women reported on the exclusionary aspect of the debate.

These answers show that even if visual cues do not interfere in an e-mail debate, the debate still contains elements of social confrontations. Since this debate focused mostly on strategic and political issues, the electronic discussion list could be compared more to a seminar or a conference (with a rather silent public) than a public forum. Therefore, the medium does not bring about more equal interactions, in spite of the same theoretical possibility for every participant to express his or her opinion. The hierarchical and power-driven context is still present. Susan Herring (1993) studied the ways men and women communicated in two electronic discussions groups and she discussed the idea of a "democratic discourse." In using this idealized conception, the author established a framework consisting of a hypothetical

possibility that any participant might express their own assertions without being constrained into silence. Her conclusions showed that males and females did not participate equally, but also, and this is mostly interesting for this present study, that the conditions for a democratic discourse were not met. According to Herring, "a very large community of potential participants is effectively prevented by censorship, both overt and covert." In our case, the low participation of women on the list (12 women out of 75 participants, 16%) and the very low proportion of students who took part in the discussion (there was only one student as far as I know) illustrates this problem. In fact, only female members of the list wrote that they felt the climate was aggressive (7 out of 23) in their answers to the electronic questionnaire.

To sum up, we could observe, as one participant who answered my questionnaire did, that the debate was "undeveloped and fleeting [...], but it [was] interesting to see what certain people think." He added: "I always found the private exchanges (generated by specific postings) the most interesting." "The debate didn't lead to a consensus, but everyone reached his own conclusion" was another reaction. Thus, the debate helped to introduce nuances in people's views of STS that might not have been clarified otherwise. The positions were played out for the benefit of the silent members of the audience, and the players were not expected to change their minds substantially (at least not publicly). Still, the spreading of these positions across a significant part of the STS community constituted an opportunity for some participants to determine various strategies for improving and stimulating the debate, but also strategies for using the debate to fit one's own interests.

Strategies for developing the debate.

Here I shall describe three means used by the participants in order to develop the on-line debate. The possibilities of the medium were used to enforce the impact of the debate in the STS community. The medium alone does not enable any effect on its own — such as the ability to reach a consensus through interactions or the emergence of a sense of community. We saw, for example, in the previous section how the notion of community emerging from such a debate remains problematic and hypothetical. These effects are rather the outcome of a social constructing of the debate, its implications, extensions, and who is involved in the definition and the legitimate explanation of the broader social context of the debate. When one speaks of social construction, there is an aspect of a collective elaboration and negotiation that is addressed, but there is also a dimension of a struggle for power and recognition. These two aspects will be considered here. For now, I will concentrate on the first aspect and illustrate it by presenting two solutions. Then I will consider the second aspect and illustrate it with a third solution. The two first solutions can be opposed to the third in terms of tactical versus strategic actions respectively. The first solution that was used to develop the discussion is related to the practice of quoting, reusing and referring to earlier messages in postings concerning the debate. These practices made appear the context-dependent meaning of the messages that were posted. The second possibility was to stimulate participation and to sustain mobilization. The third possibility was to construct leadership in the debate by redefining the issues and the explanations about the debate.

The context of the debate.

The great number of messages sent (220 related to the debate), their average length of over one printed page, the rapid reactions of some participants, and their cross-referencing from one day to another made it necessary to follow the discussion closely. One had to read many messages if

one wished to understand the context of the debate. The various interactions created a shared memory that shaped the enunciating context. Newcomers were socialized into the discussion group through this preliminary reading of the messages from the previous interactions. Still this enunciating context can be fully interpreted only if the interpreter also shares the implicit knowledge of the persons who have been sending the messages. In other words, one has to be a member of the STS community to understand the meaning of the debate.

Yet it is not simply the content that helps bind a group; it is also the wide circulation of information that enables the creation of a community. A common sense of community might have emerged for the members of the electronic discussion list from this debate. Bruno Latour (1987) points out that the central characteristics of scientific documents are their mobility and their immutability. These characteristics enable the spreading of scientific facts. Since such electronic discussions groups allow mobility, but not immutability, e-mail messages, even if they are not scientific *documents*, acquire a social function in the community within which they circulate. The mutability of e-mail is linked to the "cutting" and "pasting" of messages from one to another that e-mail readers enable. This practice of "poaching" makes the exchanges more vivid — and less scientific — by allowing new messages to be composed out of someone else's. It is a tactical action that uses the possibilities of the context. This medium is then a resource for negotiating different interpretations of some messages. The interpretation is constructed in the community around the messages under consideration. Although these messages are not properly scientific texts, they are still important to bind the scientific community in the virtual space of the discussion group.

The practice of reading previous messages gives a specific weight to the first or to regular posters. Indeed, those who post messages first are more likely to be read or cited more often by others, and have their positions

strengthened in what slowly appears to be the framework of the debate. Although it was not necessary to read all the previous messages in the debate to react to one specific posting, many messages referred to other messages, directly or implicitly. It was essential for all who wanted to get involved in the debate to follow the evolution of the discussion through a chain of interwoven messages.

Another context-dependent practice was the quoting of each other's messages, and the sending of "referring messages," those messages that contain a synthesis of the various positions. There is a general convention in the use of electronic messages to insert part of others' original messages into one's own answers. This is a function of the software interface used. Some interfaces (like Eudora, for example) enable easy editing of multiple messages. This practice of appending answers to original messages creates continuity and conversational context. Orlikowsky and Yates (1994) define a dialogue genre in an electronic medium as a form of written interaction modeled on oral dialogues, but one which uses the capability of the medium to insert all or part of previous messages. According to the authors, these communication practices "embod[y] a continuity and interdependence among messages." This specific feature, one not easily available on paper medium, enables posters to make connections with previous messages, letting them know what other posters are referring to in their messages. As illustrated in the next excerpt, these dialogue genres are characterized by a specific feature — messages embedded within a new message — and by the purpose of responding to a previous message.

Date: Wed, 5 Oct. 1994 14:28:09 -0400 (EDT)

From: Ahmed Bouzid

In-Reply-To: "Paul R. Gross" at Oct. 4, 94

Dear STS-ers:

>From GROSS:

> Well, maybe. But how about responding substantively to the

> substantive arguments made by [...]

Of course they will respond — and it's as easy as one-two-three
what they will say. (See HAMLETT's posting.) I believe that [...]

> Your strategy, rather, is to Get the [...]

Yes, with your conception of what history is about [...]

This example is a referring message because it encompasses previous messages by quoting them. These quoted excerpts are usually marked by an identification sign (here: >). But there also can only be an indirect reference to a previous message as shown below:

Date: Wed, 26 Oct. 1994

From: Steve Fuller

To: sci-tech-studies@UCSD.EDU

Response to HAKKEN, SCHMAUS, SOYLAND, and TRAWEEK

[...] let me start with SOYLAND's challenge. [...]

Now on to "models" of STS-scientists' interaction. I think HAKKEN, SCHMAUS, and TRAWEEK are working with three quite different conceptions.

SCHMAUS's is the clearest: [...]

And here I am probably in agreement with HAKKEN, when he says that [...]

As for TRAWEEK, I am not clear what model of STS-scientist interaction she's working with [...]

The next excerpt illustrates the consequences of this practice of referring to earlier messages for the collective understanding of the debate.

Date: Wed, 9 Nov. 1994

From: Stuart Shapiro

Subject: back to the backlash (long)

[A] Now that things have subsided a bit, I thought I'd throw in my 2 cents worth. I'm not going to worry about attributing embedded ideas to particular people, otherwise I'd need a wall chart to keep them straight. No slights intended.

[B] [...] Well, if you need to rally the troops and circle the wagons it helps to have a well defined enemy, and it seems that a segment of the scientific community has latched onto STS as the chief villain. Of course, in order to do this effectively they have to focus on the more radical (and thus readily identifiable as threatening) parts of what we're all aware is an extremely heterogeneous STS universe. In this sense, it's to their advantage to keep the debate polarized; once you acknowledge the diversity of STS the perceived threat level can't help but go down and it becomes much more difficult to use STS as a way of framing the case for support and protection of science.

[C] Therefore, I don't see much to be gained from spending a lot of time and effort trying to refute the various misperceptions and ill-founded criticisms. Instead, I think STS needs to concentrate on presenting itself as a means of usefully addressing important kinds of issues of concern to a great many people. [...]

This message is an example of the multiple levels at which the messages of the debate could be read. Three levels can be distinguished here.

The content and intention of the message appears at the first level (B). This example is part of the set of suggestions to react and respond to the attack against STS. Shapiro addressed the whole community in this message by trying to make other members aware of the importance of the way the STS community is perceived outside the field. He claimed that this perception needs to be strengthened.

Two other levels can be distinguished. At the second level (C), we see that this part of text consists of tacit references to previous messages and of reactions to them. The meaning of this fragment of text is quite understandable only in the context of the debate. The comment on what the broader discussion is about is elaborated at this second level. Such comments are attempts to compensate for the lack of explicit cues related to the discussion. The author guides his message along the web of interwoven messages that compose this debate. The message finds its meaning inside the debate, thanks to its author having linked it to other messages.

The third level that can be distinguished is the reintegration of clues that might compensate for the misleading or possible misinterpretation of this message. This is due to the lack of direct social cues, which need to be reintegrated through increased interactions, explanations, and comments on the texts related to the debate (A).

Stimulating participation.

The second possibility used to develop the debate was to stimulate participation and to sustain mobilization. One approach was to challenge the many reactions to some postings. If we compare the number of messages sent with the number of citations that each participant received, the correlation between the two appears (Fig. 4).¹⁰ Some participants received more citations than the number of messages they sent. If we consider the persons who sent more than five¹¹ messages, seven persons were quoted out of proportion to

the number of messages they sent (B, M, N, R, U, AG, and AP). In other words, the more often a participant was quoted in the debate, the more he managed to give this debate an important place in the STS community. With their actions, these participants created a mobilization of the community. We noticed previously that the messages acquired a public dimension when they were quoted several times by participants. Thus, the messages that were often quoted shaped the content and the focus of the debate.

Another aspect of some participants' involvement in stimulating the discussion can be illustrated by considering how newcomers quoted their messages (Fig. 5). I identify here the messages that induced persons to join the debate or provoked a reaction from those who had first decided not to appear in the debate. Stimulating such a response can be considered as a way to keep the debate going. As we have seen, some members felt they had things to say but waited until they could not remain quiet any longer. If we arbitrarily consider only those persons who elicited four or more citations from newcomers, there are five participants that can be isolated (A, B, N, U, and AP) (Fig. 5).

A content analysis of the newcomers' messages indicates that they perpetuated the practice of considering previous messages or messages referred by a given posting before quoting and replying. Although it was not always the case, this practice shows that the newcomers were aware of the former exchanges related to the debate. They took into account previous statements. Thus, while quoting previous messages, newcomers perpetuated them, consequently reinforcing the context that emerged through the interwoven messages. They contributed to the construction of a shared memory related to the debate. This practice of activating previous messages and giving them sometimes new meaning was a means of elaborating and enriching a complex ramification of statements. In this manner, the debate

could last over ten weeks. This elaboration is based on the practice of commenting on and reformulating some participants' messages, and led to the community's appropriation of the opinions exposed in these messages. After a while, these opinions were known by all the participants and set the context of the discussion. Here, this indirect and invisible takeover was a tactical enterprise.

Constructing leadership.

After these considerations of how the context and the mobilization into the debate were constructed, we can now analyze how leaders emerged during the discussion. There were some participants that tried to use the public discussion space to construct what I call leadership in the debate. Constructing leadership can be defined as a similar practice to develop the debate, as described earlier, but the intention was different in this case. While the previous strategies could be identified as attempts to elaborate a collective position, in the present case, the participants who wanted to become leaders in the debate tried to redefine the purpose and the issues of the discussion in order to assume a central position in the debate. This attitude of some participants can be exemplified in three ways.

Fig. 4. Sustaining mobilization in the debate.

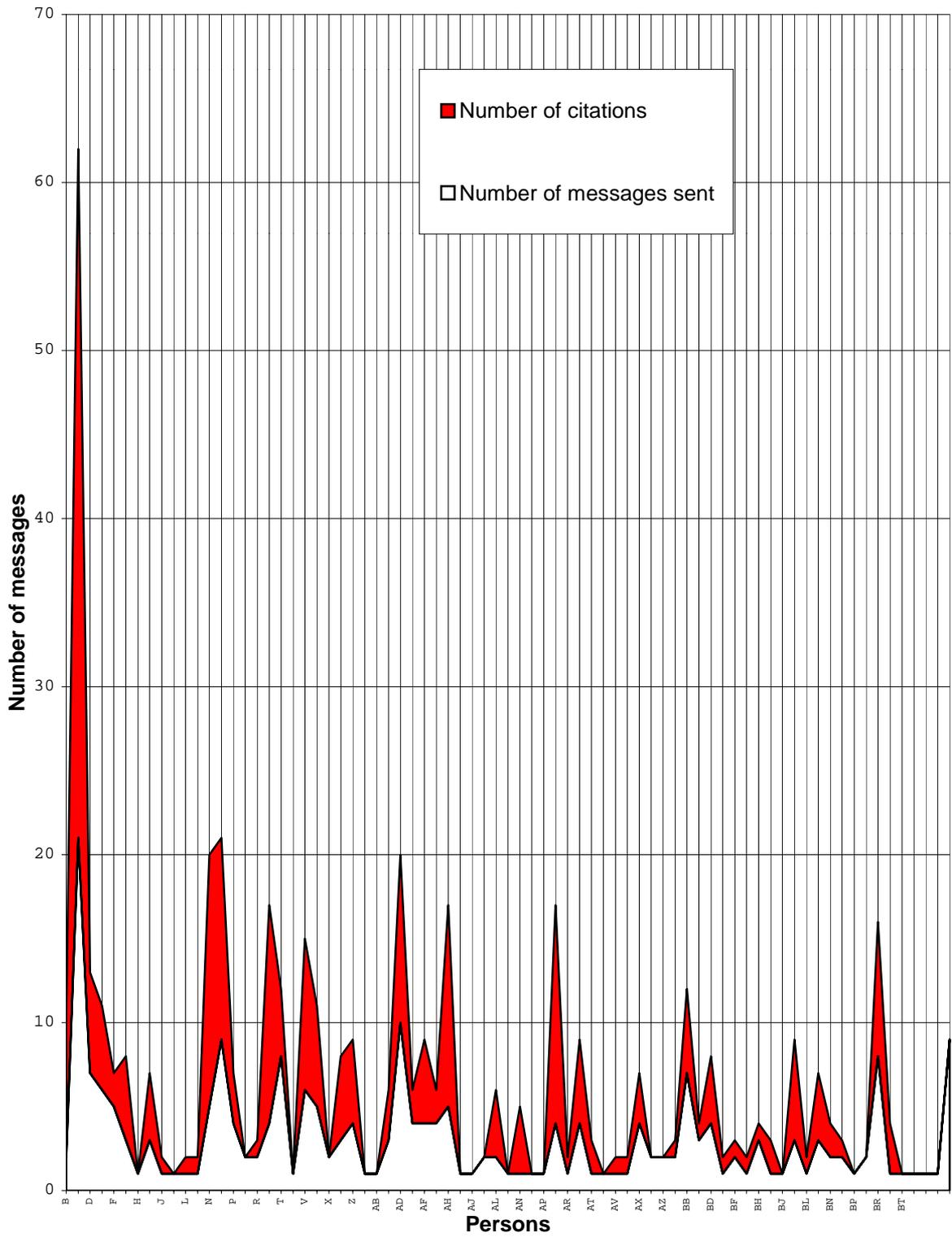
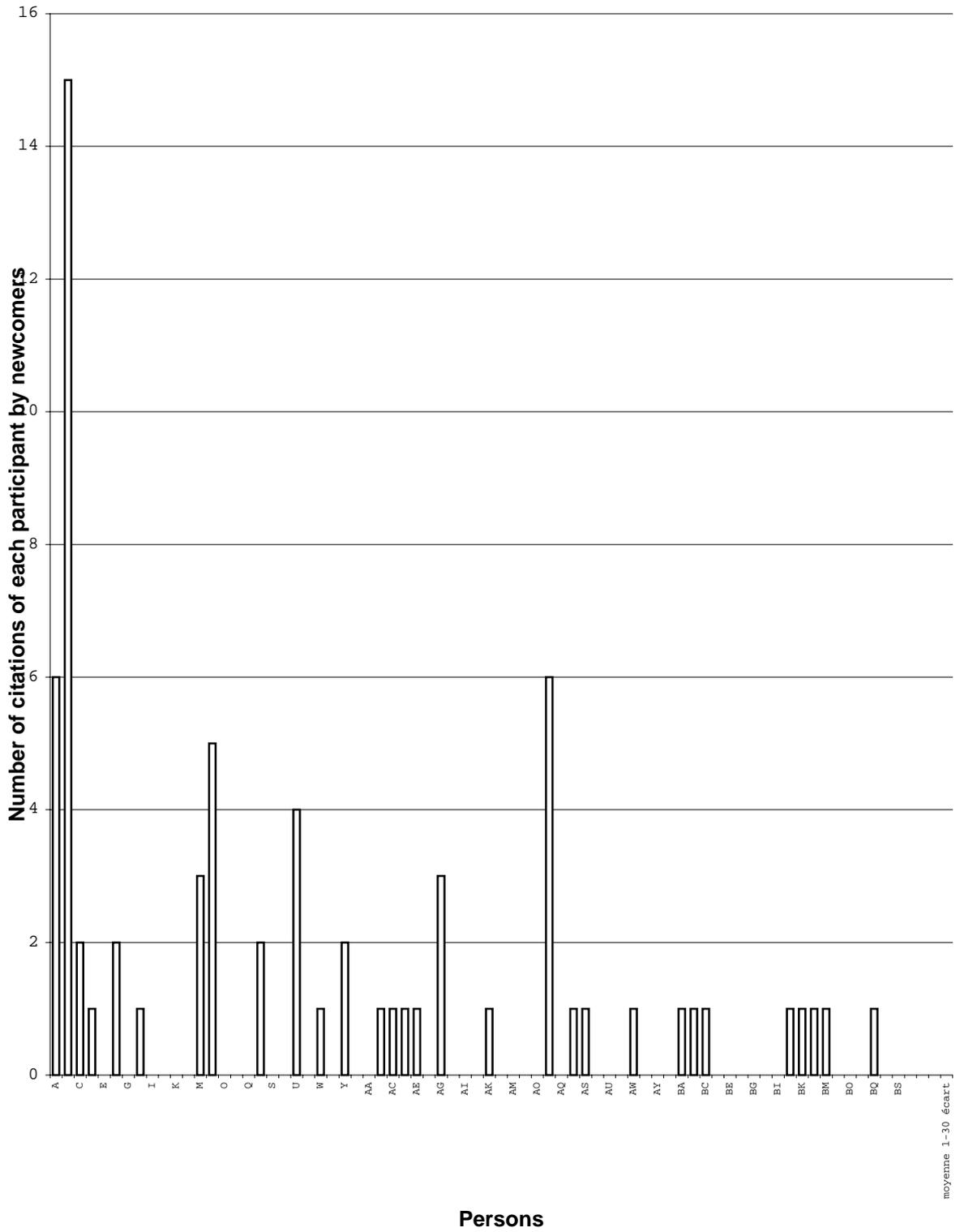


Fig. 5. Stimulating the involvement of new participants.



First, constructing leadership by redefining the debate can be achieved by synthesizing the various positions presented into referring messages. When some posters quoted the arguments of other participants, they were able to compare these arguments to their positions, and, of course, to argue in favor of the latter. In this way, their arguments occupied a central position. If we consider those who sent six or more messages of synthesis, as shown in Figure 6, four leaders emerge (B, D, N, and AC).

Second, the quoting of messages led to the practice of manipulating the texts. Some authors complained of having their own messages "dissected" in messages that were supposed to answer theirs. As the following message suggests, there was a movement of "disappropriation" of one's text:

From: B. Lieberman
Date: Fri., 7 Oct. 1994
Subject: A CLARIFICATION
To: SCI-TECH-STUDIES@UCSD.EDU

It is apparently dangerous to write a provocative message to our list. It was first said that I believe no external reality exists and then that I do not think history and philosophy of science are not [*sic*] of much value.

Neither is my belief. [...]

It was also said that I do not value those who write on history and philosophy of science. That too is not what I believe.

Let me clarify. I do believe [...]

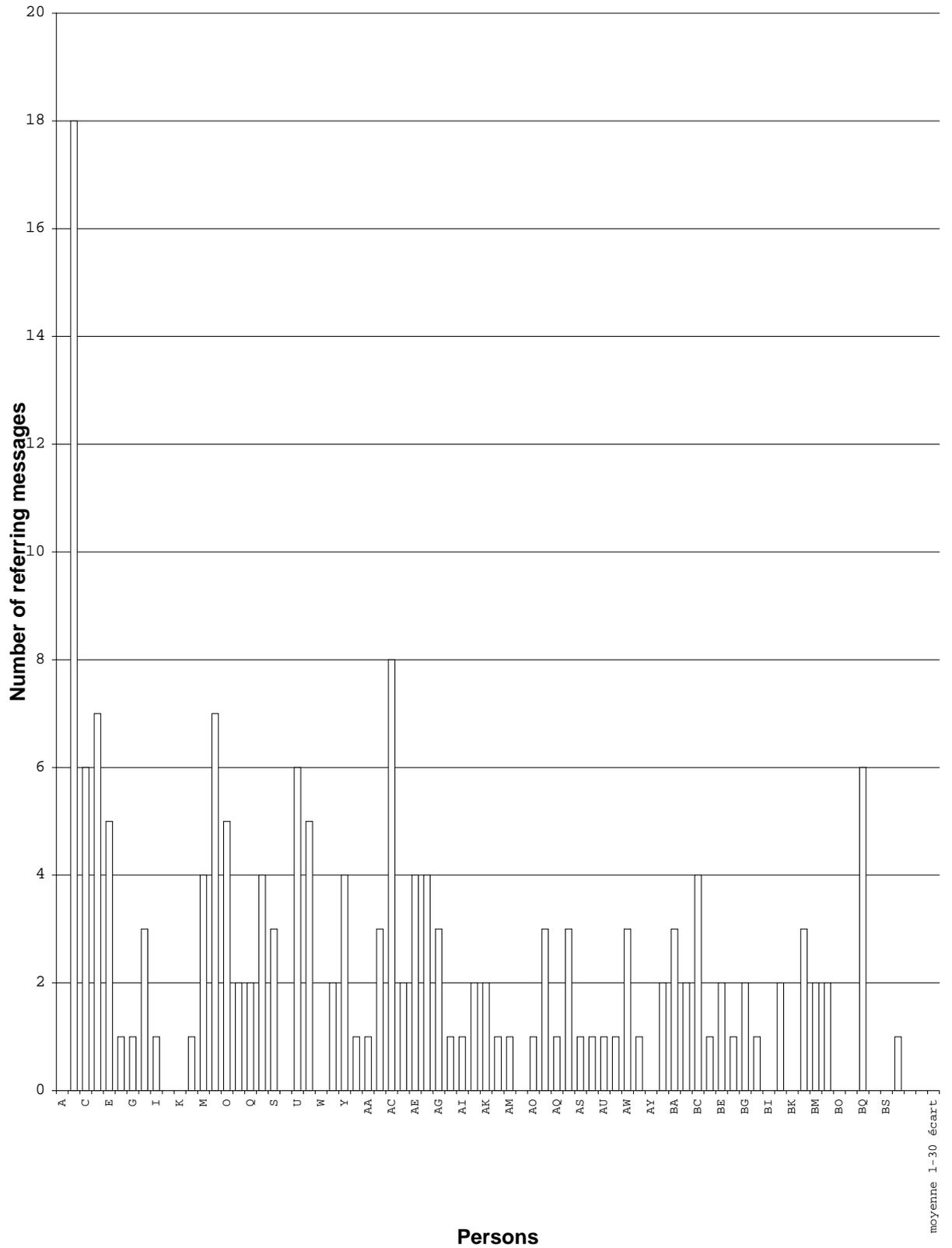
Lewenstein (1995) points out that the distribution of individual pieces of information over the net may lead to unintended or uncontrollable social perceptions about a topic. Since it is difficult to interpret remarks as they were intended, one often needs to check with others, as one participant wrote in

reply to my questions. Very often these queries had the character of asides, e.g., "Is this guy for real, or is he just joking?"

Unlike traditional written texts, these forms of writing show the process of constructing arguments in interaction with some of the recipients of those arguments. The debate is rewritten as it moves along, and one's texts are mixed with others' to become somehow the position emerging from the electronic discussion. This collective appropriation of the messages people send leads to a reappropriation of the claims made in these messages by certain participants. The exchanges were implicitly considered as similar to traditional scholarly debates, whereas the use of the medium led to new possibilities of taking over a collective elaboration in a private perspective. Therefore, I speak of the construction of leadership when such practices of manipulating other posters' texts were used.

Third, as common as it is in scientific exchanges, the debate evolved on the basis of controversial and polemical claims. But such controversies are part of scientists' conceptions of the way to reach the truth (or rather a social consensus) out of contrasted positions. This possibility of giving a

Fig. 6. Constructing leadership by synthesizing the debate.



social dimension to a message was used by some participants to carry out a stronger position and to advance their claims. Two participants admitted, when they answered to my questionnaire, that in this on-line debate, their main goal was to get their opinions across, to test the reactions elicited and to get people used to these opinions. This attitude was also defended publicly, as the following excerpt illustrates:

From: Steve Fuller

Date: Thu, 27 Oct. 1994

To: sci-tech-studies@UCSD.EDU

Subject: Re: Models

[...] Finally, I am genuinely baffled by the following remark, since — for better or worse (and it may be the latter) — I make a point of practicing what I preach. What it may mean is that I have a bad theory of rhetoric!

> In your book, Steve, you argue theoretically against giving rhetoric a
> bad name. But you continue to use it on the list in a way that
> contributes to its bad reputation!

There was a propagandistic intention in some messages. Here appears one characteristic of the electronic mails in this debate: the texts only presented individual positions and it was, in the end, difficult to determine a constructive answer from the heterogeneity of the texts. We earlier considered this heterogeneity in the first section. Here it appears again, but this multiplicity tends to be undermined by the pressure of a struggle for legitimization. In a scholarly debate — as is illustrated here — the effective aim is not simply to reach a consensus, but to promote individuals.

This way of constructing one's leadership was a strategic action. Following de Certeau's concept, rewriting part of the messages in one's own text is clearly constructing a place from where power is exerted. This is a way to identify the enemy as going in the wrong direction, and as falling behind the truth. In contrast, the two other above-described practices of developing the debate can be identified as tactical actions. We will examine now the differences between both of them.

Tactical versus strategic action.

Here we can look at the differences between the ways of developing the debate. All participants mentioned in the first case (Fig. 4), except the first participant (A, alias Patrick Hamlett who initiated the debate), appeared also in the second case (Fig. 5), but only two appeared in the third case (Fig. 6). There were also two participants (B, N) who appeared in all three cases. These comparisons invite two comments. First, they confirm the opposition between the two first cases and the third case. Second, they show that these two types of actions do not completely exclude one from the other, as illustrated by the two exceptions. Yet they confirm the overwhelming position that these two participants, who can be distinguished from the other posters, occupied in the debate. Steve Fuller (B) was a constant and very prolific participant who was very involved with the issues of the debate. Paul Gross (N) co-authored with Norman Levitt the book that was often criticized during the debate and in scholarly articles (1994).

This medium, like any other medium, introduces different practices depending on the way the users express their intentions. Thus, among the three above-described ways described above of identifying an active participation in the debate, one of them — the practice of sending messages of synthesis (see Fig. 6) — characterizes a strategic activity of constructing leadership. Synthesizing others' messages supposes that one has a personal

position on the questions currently discussed and that he or she wishes to have this position known to all the members of the discussion list. The other way of constructing the debate was to assume a critical position. The consequence of this attitude was that a process of making other members aware of the issues at stake was carried out. Sometimes a broader participation of the list members was possible because of these initiatives. Figures 4 and 5 illustrate this position, as they show which participants managed to challenge many reactions and induced newcomers to join the debate. This second attitude defends a more interactive dimension of the electronic debate and takes advantage of the medium in a tactical perspective.

Therefore, on the one hand, there were those who became leaders through an active process of creating authority, and on the other hand, there were those who assumed a position of criticism toward the other participants. These two kinds of participants often opposed one another. Some details from the content analysis of the debate indicate this tension clearly, such as the following exchange between Steve Fuller and Sharon Traweek (alias B — leader of the first kind of participants, and AP — an active participant of the second kind). Traweek was the only woman in the group of the active participants that were isolated in the previous Figures. The following message is Traweek's response to a message from Fuller, in which he commented about another message she had earlier sent to the list.

Date: Wed, 26 Oct. 1994

From: Sharon Traweek

Subject: talk among diverse sorts of research practitioners

To: sci-tech-studies@UCSD.EDU

[...] I am exceedingly reluctant to "reply" to Fuller's remarks, not only because that would require a long posting, but also because, unless I'm careful, that

merely puts him in the position of defining the terms of discussion, which, of course, is the problem. [...]

In order to make that point I'll just add my remarks interstitially in what Fuller said about my last posting. In a very message, of course,

On Wed, 26 Oct. 1994, Steve Fuller wrote:

> As for TRAWEEK, I am not clear what model of STS-scientist interaction
> she's working with.

[...] Rhetorically, Fuller's "(at least my) unclarity" is a rather clear display recognizable to anyone familiar with certain rather common agonistic academic displays. For the uninitiated I will explicate: the implication is that "TRAWEEK" is unclear. The "in the first place" pointedly says that I did not manage, in my posting, to make even the first point about why 'TRAWEEK's utterances, orally or in print, would be of interest to scientists. We're at the red pencil in the margins stage; that is, I have been classed as the bad student. In ethology that sort of gesture is called a dominance move. I pass.

[...] Back to Fuller's [oops, that should be FULLER's] s l o w l y delineated queries to "TRAWEEK" as if I were still the dull witted student being red-lined (why in the world have other readers of this list put up with this when their messages are being dissected in this desiccated way?):

[...] Ah, yes, FULLER's concluding logo:

> > Yours in discourse,
> Steve Fuller

I've always wondered: discourse with whom? What kind of discourse is that? So what have I managed to do with my posting tonight? Does this palimpsest add up to a commentary? Do FULLER's comments and my

sequential intercalations make a duet? What kind of interaction is this? Now that brings us back to the beginning.

Traweek is deconstructing both Fuller's attack and Fuller's discourse strategy. These oppositions reveal not just a disagreement on scholarly questions, but differences in the way of defending one's position. Each of these two participants was inspired by a different philosophy beyond his or her claims. I will come back to this point below. These positions played a part in the evolution of the debate. Therefore, if these participants' intentions were not always to elucidate the issues of the debate for the STS community, at least their activity might have made the context of the debate for the other members clearer than before.

We can contextualize this exchange by considering the broader frame of the STS community. In the volume "*Science as Culture and Practice*" edited by Pickering (1992a), the contributions, including ones from Fuller and Traweek, try to reach a synthesis in the field of Science Studies. In this volume, their positions move away from each other as fast as they can, as Pickering indicates (1992b). The on-line debate perfectly illustrates this tension and made it more explicit to the general audience than is possible in a scholarly paper.

In the electronic debate, the issue of this confrontation was not that one of the opponents was supposed to succeed in constructing a synthetic position by quoting, reformulating, and reusing the messages of the debate; rather, the issue was that the participants achieved to sustain the heterogeneity of the positions that they formulated during the on-line discussion. This is undoubtedly one of the reasons why there was a confrontation — not only between STS people and the larger scientific community — but also *inside* the STS community. Ensuring that the plurality could be expressed and sustained was a challenge elaborated during the discussion and with the help of the possibilities of the medium.

One can wonder if the active participants who tried to sustain the issues that are described in this paper (the heterogeneity of perspectives, the emergence of a sense of community, the tactics of poaching to stimulate participation, and so on) succeeded in their attempt. One difficulty that these active participants had to face was that the increasing importance of the context of the debate introduced a reluctance to shift the focus and the framework of the debate, even though this often seemed to be called for. People on the list who answered my questions often explained that they were not looking for general conclusions but for multiple voices. The list should be a perfect medium for those multiple voices to be heard. But when questioned by me, some subscribers found "the multiplicity disappointingly minimal." Thus, the debate did not account for the real multiplicity of positions, goals, and perceptions in the STS community regarding the issues discussed. The statements coming out of the debate appeared as socially elaborated positions, while they were sometimes only the result of a process of interpreting arguments by quoting and encompassing them in referring messages. An individual position could acquire a public dimension and increase in authority through this process of taking possession of and reusing in one's own messages those publicly disseminated in a discussion list. The authority of these latter messages was the result of a synthesizing process. In spite of the attempts of the participants who tried to open the discussion to new perspectives, the electronic discussion space remains a strategic place where power and authority are constructed.

We can compare a tactical action to more oral-like exchanges and a strategic action to a more text-based activity. Indeed, the practice of synthesizing and redefining the context of other posters' messages refers to a written activity, whereas the tactical actions described above are more based on interactivity along the debate. Although all the exchanges that took place

were written, the style of interactions — particularly in relation to tactical actions — was sometimes very similar to oral exchanges (informal tone, context-dependent, inconsistent phrases and wrong spelling, and immediate reaction to previous messages). Since the interactions are still based on writing — even if they resemble an oral form of exchange — it can be difficult to avoid an authority which is exerted over the texts that are produced. This authority can be correlated to what Foucault said about what it means to be an author (1977). Writing a text is one way to construct narrative strategies to produce what Foucault called "truth effects" through the individual composition of texts. The author's authority refers in this sense to his or her intentions and to a correspondence with reality. There is a similar construction of authority in these electronic discussions. Yet this authority does not necessarily appear because the oral and tactical form of the exchanges tends to emphasize the collective elaboration over the individual strategies.

Finally, there is a tension between the two ways of using this medium that appear here. On the one hand there is a potential for elaborating a sense of community, and on the other hand there are new opportunities for individual claims to the "right" way of interpreting the multiple formulations that grow out of an electronic debate. This tension can be considered as an illustration of the confrontation between the repertoires of the oral and the written. There might not be a possible synthesis between the two utilizations of the plurality of these electronic texts.

Discussion

This study leads to some preliminary conclusions concerning the use of electronic discussion lists in a scholarly debate. The debate did not lead to any global consensus, but several members of the list seemed to reach their own conclusions.

It is never really clear — and sometimes even impossible — to determine all the individual consequences of what is at stake when people meet and enter a discussion, even in a working environment. We can only make some suppositions based on what the participants have expressed about this debate. We have seen that it has enabled a clearer conception of the various arguments, as well as an exemplification of some people's determination to support these arguments. Some scholars' ideas were formulated in a more direct and informal way. Thus, the positive impact of the on-line discussion can be correlated with the argument that it is certainly better to make people talk about their ideas than to listen to well worked-out papers during a conference. This forum was used mostly by people to express, or at least to experiment with, their disagreement concerning some part of the heterogeneous STS community. This outcome is not surprising, for this community is a crucial place where social scientists as well as scientists exchange their views on various issues. In this sense, electronic debates are one of the possibilities for people with different perspectives to go further in their exchanges and reciprocal influences. But when one speaks of influences, it is also easy to think of possible abuses. We have seen some of them here. Despite the original intention of this list to develop interdisciplinary exchanges and to allow multiple voices to be heard, the difficulty in shifting the debate away from the interests of the most prolific participants tended to undermine the possibilities of this technology to stimulate debates. A controversial debate creates a social environment, which subsequently leads to contradictory statements and unequal abilities to argue about them. Although cyberspace is a new place to interact, old and well known aspects of social relations reappear. Rhetorical abilities and academic affiliations of some participants invaded the supposedly more equal and democratic discussion space. This is a consequence of the fact that the way technology is deployed refers to the way users take it over. Many relevant studies have focused on this point (Latour, 1992; Bijker & Pinch, 1987; Bijker & Law, 1992; Woolgar,

1987). This medium apparently enables new forms of interactions by allowing anyone to participate in a discussion. But these technical capacities may not correspond to what really happens. Between the technical capacities designed by engineers and how they are really used, there is a gap due to the social use of technical objects. This real use of the technology does not always correspond to the purpose it was made for.¹² I focused here on two different approaches of technology: a tactical and a strategic approach. Both appeared during the social construction of this electronic debate, and the differences between these two attitudes were illustrated.

Technology plays a social role, but this role does not appear in a task-oriented conception of technology. For example, Kiesler and Sproull (1991) have considered that Computer-Mediated interactions are determined by the properties of the computer. Because people using this medium cannot see, hear, or feel one another, they cannot use contextualized cues. This lack of social cues leads to greater anonymity and thus enables a more evenly distributed participation in electronic groups than in face-to-face meetings, but also increases the time to reach consensus. In this perspective, the medium is responsible for the kind of interactions produced. However, these considerations do not fit well with the fact that users appropriate the machine in different contexts.

We saw how a scholarly debate occurred within an electronic discussion list and what motivated this debate. Then we examined the involvement of some participants and the way they set the context of the debate, sustained mobilization, and created a sense of community through a tactical action. Finally, we explored the way individuals became involved in the discussion and used the device to construct their authority. By manipulating the text resulting from a supposedly socially-constructed position in the discussion, they exercised authority over the discussion and affirmed their leadership through a strategic action.

This strategic action is made possible by establishing a place from which to impose one particular view on things — i.e., what is the purpose of STS, for whom is it legitimate to speak in the name of STS. To construct such a place from which to "conquer the world" using strategic actions, one has to gain stability. In our case, stability means a clear definition of the "right" representation of STS. This process involves coercion at some place. In contrast, the tactical attitude toward the debate consisted of attempts to find new solutions within the on-going interactions. The message from Sharon Traweek presented previously is an illustration of this confrontation. Here, Steve Fuller used an academic discourse and rhetoric (which in de Certeau's perspective is always strategic) to strengthen his position against Traweek. In a tactic reappropriation of his discourse, she used the opportunities she perceived in his attack to reveal the way it was constructed.

Another aspect of this opposition can be correlated with the "cultures" of men and women. Although it is highly caricatural to attribute the two attitudes described here to the hypothetical differences in the way men and women react to a given situation, these differences are suggestive. Sherry Turkle (1984) observed two basic approaches of children who used computers. Those she called "hard masters" applied a structured and technical style to impose their will over the machine. In contrast, those she called "soft masters" adopted a more gradual and interactive evolution and allowed ideas to emerge. Turkle found that most of the "hard masters" were boys and most of the "soft masters" were girls. We saw here that only one woman became a leader in the debate. Yet, many women chose not to participate in the debate, as some explained in the survey. Their attitude does not imply that they had nothing to say in this discussion. Rather, it can be correlated with a tactical — and invisible — use of the debate.

These technological improvements offer new opportunities to foster interactions in a scientific context. However, we must not forget that the difficulties rely on the social shaping of this technology and its appropriation.

The gap between what one could hope for from the new communication technology (more equal access to a discussion space) and its use in a real context illustrates this argument. In this sense, the electronic medium is not as open to new influences and opinions as it seems. Leaders might introduce new perspectives but might also try to impose a particular point of view on the issues debated. The interwoven messages that constitute an electronic scholarly debate enable new possibilities of interactions and expressions of heterogeneous practices, goals, and ideas. At the same time, this plurality is undermined by strategic messages meant to redefine the debate. Electronic forums are theoretically a place for social interaction and for social meaning if they are used in relation with a tactical perspective, but they are also an arena for a strategic construction of authority and power.

References:

Ashmore, M. 1989. *The reflexive thesis: Wrighting Sociology of scientific knowledge*. Chicago: University of Chicago Press.

Baym, N. K. 1995. The emergence of community in computer-mediated communication. In: *Cybersociety: Computer-mediated communication and community*, ed. S. Jones. London, Thousand Oaks and New Dehli: Sage, (pp. 138-163).

Bijker, W., Hughes, T., and Pinch, T., (eds.) 1987. *The social construction of technological systems: New directions in the sociology and history of technology*. Cambridge: MIT Press.

Bijker, W., Law, J., (eds.) 1992. *Shaping technology — building society: Studies in sociotechnical change*. Cambridge: MIT Press.

Bourdieu, P., 1976. Le champ scientifique. *Actes de la recherche en sciences sociales*, (2-3):88-104.

de Certeau, M., 1980. *L'invention du quotidien*. Paris: UGE. Trans.: 1984. *The practice of everyday life*. Berkeley: University of California Press.

Foucault, M., 1977. What is an author?. In: *Language, counter-memory, practice*, ed. D. F. Bouchard. Ithaca: Cornell University Press, (pp. 979-988).

Freeman, L. C. 1984. The impact of computer based communication on the social structure of an emerging scientific specialty. *Social Networks* 6:201-221.

Fuller, S. 1992. Social epistemology and the research agenda of science studies. In: *Science as practice and culture*, ed. A. Pickering. Chicago: University of Chicago Press, (pp. 390-428).

Gross, P., and Levitt, N. 1994. *Higher superstition*. Baltimore: Johns Hopkins University Press.

Hagstrom, W. O. 1965. *The scientific community*. New York: Basic Books.

Hamlin, C. 1992. Reflexivity in technology studies: Toward a technology of technology (and science)? *Social Studies of Science* 22(4):511-544.

Herring, S. C. 1993. Gender and democracy in computer-mediated communication. *Electronic Journal of Communication* 3(2). Available at vm.its.rpi.edu.

Kiesler, S., and Sproull, L., 1991. *Connections: New ways of working in the networked organization*. Cambridge: MIT Press.

Labinger, J. A. 1995. Science as culture: A view from the petri dish. *Social Studies of Science* 25(2):285-306.

Latour, B. 1987. *Science in action*. Milton Keynes: Open University Press.

— 1992. *Aramis, ou l'amour des techniques*. Paris: La Découverte.

Latour, B., and Woolgar, S. 1979. *Laboratory life: The social construction of scientific facts*. London and Beverly Hills: Sage.

Lewenstein, B. V. 1995. Do public electronic bulletin boards help create scientific knowledge? The cold fusion case. *Science, Technology, & Human Values* 2(20):123-149.

Merz, M., forthcoming. Nobody can force you when you are across the ocean — face to face and e-mail exchanges between theoretical physicists. In: *Making Space for Science*, ed. J. Agar, and C. Smith, London: Macmillan Press.

Mallein, P., Toussaint, Y., and Zamponi, F. 1987. *Les processus de médiation dans les nouvelles technologies de communication*. Paris: Centre d'Etude des Pratiques Sociales, C.N.R.S.

McLaughlin, M. L., Osborne, K. K., and Smith, C. B. 1995. Standards of Conduct on Usenet. In: *Cybersociety: Computer-mediated communication and community*, ed. S. Jones. Sage: London, Thousand Oaks and New Dehli, (pp. 90-111).

Orlikowski, W. J., and Yates, J. 1992. Genres of organizational communication: An approach to studying communication and media. *The Academy of Management Review* 17(2):299-326.

— 1994. Genre repertoire: The structuring of communicative practices in organizations. *Administrative Science Quarterly* 39(4):541-574.

Pickering, A. 1992a. *Science as practice and culture*. Chicago: University of Chicago Press.

Pickering, A. 1992b. From science as knowledge to science as practice. In: *Science as practice and culture*, ed. A. Pickering, Chicago: University of Chicago Press, (pp. 1-26).

Traweek, S. 1988. *Beamtimes and lifetimes, the world of high energy physics*. Harvard: Harvard University Press.

— 1992. Border crossings: narrative strategies in science studies as among physicists in Tsukuba Science City, Japan. In: *Science as practice and culture*, ed. A. Pickering. Chicago: University of Chicago Press, (pp. 429-465).

Turkle, S. 1984. *The second self: Computers and the human spirit*. New York: Simon and Chuster.

Walsh, J. P.; Bayma, T. 1996. Computer networks and scientific work. *Social Studies of Science* 26(3):661-704.

Watzlawick, P., Beavin, J., and Jackson, D. 1967. *Pragmatics of human communication: A study of interactional patterns, pathologies, and paradoxes*. New York: Norton.

Woolgar, S. 1987. Reconstructing man and machine: A note on sociological critiques of cognitivism. In: *The social construction of technological systems: New directions in the sociology and history of technology*, ed. W. Bijker, T. Hughes, and T. Pinch. Cambridge: MIT Press, (pp. 311-328).

Woolgar, St. 1988. *Knowledge and reflexivity: New frontiers in the sociology of knowledge*. London and Beverly Hills: Sage.

Legends:

Fig. 1. Evolution of the number of participants.

Fig. 2. Proportion of messages forming part of the debate.

Fig. 3. Average number of messages per author participating in the debate.

Fig. 4. Sustaining mobilization in the debate.

Fig. 5. Stimulating the involvement of new participants.

Fig. 6. Constructing leadership by synthesizing the debate.

¹ Science, Technology and Society (STS) is the name under which several approaches to the social study of science and technology meet.

² The present subscription address is: listserv@kasey.umkc.edu. To subscribe, send in the main body of the message: `subscribe sci-tech-society <your name>`.

³ I received answers to my questions from 23 participants who have been assured they will remain anonymous. I also received answers from "lurkers" which enabled me to consider their views of the debate. The questions were the following:

- Did you exchange private mail about the debate on the list? If yes, with people also connected to the list?
- What did you conclude for yourself about the debate, regarding both the content and the form of the debate enabled by discussion lists?
- Do you think these forms of discussion are, among other things, a new way to make statements on global perspectives for a community (like the STS movement)? Are they a way to complement national or international meetings?
- Do you think this way of interacting is more democratic than a classic conference meeting (as Kiesler and Sproull seem to indicate in "*Connections*" by MIT Press, 1991)?
- Do you think that this mean of communication is used in a different way in some areas of social sciences than elsewhere (in natural sciences)? I have no significant data on this point, so I wonder if there are different uses, depending on, for example, the cross-disciplinary state of a field. Have you any ideas on that point?

- Are you satisfied with the turn the debate took (many positions, many ideas, but few conclusions - I suppose everyone took his or her conclusions)?

- If you did participate in this debate, why did you do it? Do you think the assumptions were particularly interesting? Were you upset by what people were saying? Were there important issues to debate? etc.

- If you didn't participate, can you explain why? Did you find the debate uninteresting? Were you too intimidated to answer? Did you think it wasn't worth while to add your contribution? Did you consider that you had nothing more to say? Do you think that the discussion was too narrow for your interests?

- What are your main fields of interests?

This set of questions enabled open and direct answers. Despite the low proportion of answers, their content was revealing for this study and highlighted the heterogeneity of the members' conception of the debate.

⁴ This is the European Nuclear Research Center, based in Geneva, Switzerland.

⁵ This has been due to the list processor, who was not able to retrieve the list of subscribers, at least for the time the debate took place.

⁶ For further explanations on the implications of this notion, the reader is invited to see Ashmore's *Reflexive Thesis* (1985), or Woolgar's *Knowledge and Reflexivity* (1988).

⁷ A new discussion has started up in this forum on similar issues in July 1995, and with some of the same participants. However, there are far fewer reactions to the postings, and some participants regret the obsessive turn some of the messages took.

⁸ There were, in fact, 60 messages containing in their header a reference to "You don't get no respect" and 28 referring to further developments concerning this question.

⁹ He refused to share a roundtable with Lewis Wolpert, a developmental biologist and author of *The Unnatural Nature of Science*, at the September 1994 annual meeting of the British Association for the Advancement of Science.

¹⁰ The names of the participants have been replaced by letters in the graphics to keep them anonymous. The letters follow the order of appearance in the debate.

¹¹ The level of the five messages is purely arbitrary, and is used mainly as a means to identify the more prolific participants.

¹² There are studies of the French Minitel (Mallein, Toussaint, and Zamponi, 1987) that illustrate this point. They show the differences between the original project (to provide an information system for government aimed at the citizens) and their effective use (bulletin board systems, "messageries roses"). The first experiments with the Minitel did not have a positive impact since the users were forced to follow the original project. The bulletin boards grew from a local initiative and spread all over the country, thus making French households adopt the Minitel.