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Women Writing for a School Mathematics Journal: Belonging and Becoming in a Gendered Network

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Euclid A *is a school mathematics journal; at the same time it constitutes a network where math educators can contribute voluntarily as members of a collective editorial board. Despite their involvement in a supportive atmosphere, women still restrict themselves towards negotiating who they are as they perform 'math' identities. The present study, following Butler (1990) and Scott (1999) espouses the view that gender as a conceptual category tends to upset ordinary definitions concerning gender differences. As such, the gender category assists our attempts to focus attention on the social and political organization that serves consciously or unconsciously to construct a 'difference' between men and women. This is the perspective through which the present text analyses women's gendered positioning in the* Euclid A *journal network.*

Women and Scientific Practices: Present And Past

The under-representation or complete absence of women in various domains of studies and work where techno-scientific knowledge is either used or produced has been well documented as a harsh reality even in well developed post-industrial Western societies (Rossiter, 1995, Ginther, 2001). Despite the systematic endeavours of the US National Scientific Foundation in the early 1960s to attract female commitment to a career in science and engineering, recent evidence indicates that the gender gap still exists. For example, even though the percentage of women receiving Master's degrees has risen from 1.1% in 1971 to 14.0% in 1991 in engineering, and from 22.2% to 35.6% in the natural sciences, these percentages are still very low when compared to men's. Discussing statistical data comparing men and women in terms of enrollment, hiring, and employment between the late 1960s to the 1980s, Margaret Eisenhart and Elizabeth Finkel (2001) argue that *'...although there are currently more opportunities for women to become scientists and engineers than in the past, the opportunities are sfill limited'* (p. 15). Zuckerman (1991), tracing scientists' careers between 1970 and 1990 explains that even when men and women were similarly qualified and employed, their career trajectories tended to be different, to the women's disadvantage—a situation that reflects the women's own historical paths in scientific practices.

Case and Leggatt (2006) agree that even today the situation has not changed dramatically. For example, the American Mathematical Society (AMS), in accordance with committee decisions, regularly reports statistical data and covers

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issues such as gender representation in annual conferences, keynote lecture invitations, postgraduate awards, etc (see Notices of the AMS, From the AMS Secretary, http://www.ams.org). In a recent comparative analysis of data for the years 1994 and 2003, one observes that the percentage of women has increased from 9% in 1994 (15 women of a total of 176 conference participants) to 16% in 2003 (35 women of a total of 224 participants). It is obvious that even though women's participation has increased over ten years, the percentage of the increase does not make the case for a possible closing of the gender gap (see AMS, 2006).

In the past, female membership and participation in networks formed to promote, to communicate, or even to produce science was never an easy task as compared to that of men. Londa Schiebinger (1991) documents the exclusion of women from the national scientific academy and university departments. She also notes that only a few could ensure access to informal scientific networks such as salons or family laboratories, during the 17lh and 1 8" centuries. Those few women were admitted through negotiations, based on either aristocratic origins or sibling relation to a scientist. Despite their difficulties in gaining equal partnership in scientific practices, the role of women as mediators who communicated (via salons) or popularized (via writing science fiction or reading popular science journals) scientific knowledge was better accepted.

For example, in 18lh century England, a periodical called the *Ladies' Diary* (1 704) encouraged women to engage in mathematical problem solving. The *Ladies' Diary* was an annual publication and was one of a number of works aimed at popularizing the mathematical ideas of Newtonian science. These publications permeated the 1 8lh century mathematical instruction in England, while the most popular journal of all was the monthly *Gentleman's Magazine* (1731 onwards), selling 15,000 copies by the early 1740s. All these publications contained complex mathematical queries, problems and explanations, or detailed discussions on natural philosophy. The *Ladies' Diary* enjoyed such a huge success among middle class women that Henry Beighton, a later editor of the magazine, astonished *by* the four to five thousand letters received, full of solutions on geometry, arithmetic, astronomy, algebra, and ' philosophy problems, proudly called these women 'national amazons'. Some well known mathematicians such as Maria Agnesi and Sophie Germain were amongst them. Overall, the magazine was congratulated for its positive influence on mathematical sciences in the UK (Schiebinger, 1991/2006).

Wo/men and Gender: What should we be looking at?

A number of issues arise due to the almost 'utopian' success story of the *Ladies' Diary.* They denote not only differences in the way women and men participated in practicing mathematics in and through the magazine but also identify gendered dimensions (i.e. the effects of 'difference' due to social organization) in the practice itself. *First,* one must note that the *Ladies' Diary* circulated in conjunction with the *Gentlemen's Diary* (1708), edited by the Nottingham writing-master and surveyor Thomas Feat. Although, such a *split* between Ladies' and Gentlemen's affairs reflects a 'natural' choice of that period, nevertheless, it conveys a

gendered dimension in women's and men's participation in such practices. *Second,* this *split* was also reinforced by the choice to render mathematical content for women to a 'feminine' genre. As explained, the first four issues of the *Ladies' Diary* offered a mixture of mathematical problems, medical advice, cooking recipes and marriage tips. The fifth issue then dispensed with all non-mathematical content, and the editor announced that since the ladies prefer mathematics to cooking, the *Ladies' Diary* would henceforth be wholly devoted to puzzles and arithmetical problems. *Third, as* Schiebinger (1991/2006) informs us, women's engagement in mathematical problem solving during the 17^{lh} and 18$^{'h}$ centuries was approved by men, who considered it an investment in the prosperity of the family business. Through mathematics, women developed a good knowledge of accountancy that was to men's interest and benefit. *Fourth,* women's informal education via such popular magazines as the *Ladies' Diary* was controlled by the men who acted as magazine editors and thus were knowledge mediators and gatekeepers. They set the boundaries and rules for women's activities and thus exercised complete control, exerting power over the type of knowledge women acquired. Thus, the disaggregation into Ladies' and Gentlemen's texts subtly marks a disaggregation on a much deeper level that inevitably influenced male and female access to mathematical knowledge itself. In other words, differences in appearance (from clothing and shoes to published books) resulted in differences regarding how men and women were being constructed to be more or less capable of handling the same body of knowledge.

In a different, yet related context, Sfepan (2000) discusses how anthropometric studies were used to make race and gender-powerful 'scientific analogies' in the nineteenth and twentieth century (see Gould, 1981). Data was generated on human physiology, which resulted in categorizing and theorizing human variation, and differences both in body and intellectual ability. Through these studies women and people of colour were constructed as deficient due to lower brain weights. In addition, a number of biographies dealing with the lives of women scientists from antiquity to the twentieth century demonstrate gender struggles not only in gaining access to education but also in getting a job and establishing an approved career (see Hibner-Koblitz 1996).

Based on the above, one may conjecture that even when women appear actively and successfully engaged in mathematical practices, their experiences are situated in the context of asymmetrical power relations that influence their positioning as subjects in the practice. It is only recently that this dimension has been seriously acknowledged as a gendered space. And it is mainly due to a feminist critic that the history of science currently focuses on women's roles as science producers (and not only consumers) by shedding more light on the social and political contexts that either restrict or facilitate women's access and participation in scientific practices. They do so by providing evidence of women's activity in the context of conflicting and contradictory circumstances (Scott, 1991, Walkerdine, 1998).

Euclid A: Text and Network in Greek Mathematics Education

Taking the above insights into account, the present study explores the gendered

spaces of the experiences of women who, beginning in the 1970s, negotiated participation in the *Euclid A* school mathematics journal as authors. *Euclid A* first appeared in 1976, as a collective protest not only addressing the formalism of its predecessor—a mathematical periodical entitled *Deltio,* which focused mainly on training talents for the mathematical Olympiads—but also aiming to 'democratize' the teaching of mathematics, within the prevailing spirit of the new post-dictatorship (1967-1974) environment. As such, *Euclid A* was not only a text that supported school mathematics. It was mainly a network of people aiming to popularize mathematics among students and teachers at the early secondary level and to assist their everyday tasks. This manifested itself mainly by the expantion of the formal textbook's content along interesting and alternative routes at times.

Picture I. *Euclid A: Cover pages.*

Although, during the last five years the editorial board's composition has undergone serious changes, one may argue that the period between the 1970s and the 1 990s represents mainly collective attempts towards a 'new' mathematics curriculum that aims at providing access to more students and teachers, while at the same time it explores alternative ways of presenting mathematical content (theory, problems, exercises) and ways of communicating with its audience. However, these attempts are far from consistent or obvious. A recent analysis shows that despite the *Euclid A* network's claims of a collective, progressive agenda, traditional and progressive 'voices' in the ways men and women write about school mathematics, co-exist creating a hybrid text (see Chronaki and Stamou, 2008, Stamou and Chronaki, 2007). Editorial work is based on volunteer contribution, which takes placeduring weekly meetings when each paper submitted is publicly discussed and corrected.

Gendered Network Relations in Euclid A

Examining the corpus of data for the period 1984-2005, female participation as authors in the *Euclid A* school journal was found to be consistently less than that of men. Specifically, although the editorial board often changed, gender distribution (65-70% men and 30-35% women) remained at similar levels throughout almost all the years. As Lederman and Bartsch (2001) argue this very fact matters because *'...no social endeavor can continue to be successful if half of humanity is un-represented in its practice'* (p. 2). It is thus essential to investigate further and explore the experiences of women in such a network, which, while at first sight, apparently promotes an inclusive and supportive agenda for work and participation, on another tacit level, it does not seem to attract women's contributions at the same rate.

The present paper attempts to provide some insight into such problematisation through the voice of Sofia—a female math educator and member of the Euclid network. Sofia is one of the few women

consistently active on the journal's editorial board since the early 1980s. For her, as she jokingly admits *'the magazine is part of my life'.* As previously stated, women's experiences are framed through gendered spaces. Unraveling the very mechanisms that tend to produce differences, one might possibly be in a position to discuss what subversive knowledge renders them natural and stable.

As Scott (1991) argues knowledge about sexual differences *'...is produced in complex ways within large epistemic frames that themselves have an (at least quasi-) autonomous history [...] Its use and meanings become contested politically and are the means by which relations of power -of domination and subordination -are constructed. Knowledge refers not only to ideas but to institutions and structures, every day practices as well as specialized rituals, all of which constitute social relationships. Knowledge is a way of ordering the world; as such it is not prior to social organization, it is inseparable from social organization* (p. 2). Thus, the aim is to attempt to unravel segments of such complex subtleties by taking into consideration how Sofia talks and positions herself in the realm of her narrative concerning past and present experiences in the *Euclid A* network.

As she talks, Sofia articulates two significant themes; *first,* she identifies the social, supportive, and collective atmosphere of the editorial board, and *secondly,* she analyses her position in relation to the few influential men who mediate her relation to mathematics. The social, supportive, and collective atmosphere of the editorial board is emphasized by Sofia, as this makes her feel that *Euclid A* is her home. As she discloses, a male colleague introduced her to the network in the early days of its creation and from then on she almost never missed a single Friday meeting. She talks at length about time devoted to meticulously correcting papers, discussing the meaning of one word, the wording of a mathematical problem, or the value of a symbol whether during meetings, or even long into the night and early in the morning. Her work with her colleagues—especially in the early period—was collaborative and full of learning experiences (i.e., collaboratively writing and editing articles).

Networking extended after formal meetings to nearby cafes or *ouzeri*—a ritualized activity after every Friday meeting. However, she also stresses the hard work of reading, correcting, and even re-writing, parts of another author's papers and the great disappointment and distress this work overload caused her during recent years. The almost religious commitment of her early days, as she confesses, is now difficult to sustain, especially since a number of the influential *Euclid A* leaders have passed away and another group has taken over the leading roles. All in all, the friendly atmosphere of the formal and informal meetings becomes a caveat for hard work and when the inspiring tone fades away power shifts from providing support towards causing distress.

By Way of a Conclusion

Working out her relation to mathematics and to *Euclid A,* Sofia refers to the Euclid journal context. She reverently identifies three particular men who are the founders of the magazine-the Megaliths as she refers to them. Throughout all these years they have served the *Euclid A* network—not only her but many others—as both mentors and teachers. At some point, she acknowledges the influential power

exercised over her when, referring to one of them, she admitted *'I could buy a computer only years later... when I had overcome his presence'.* Currently, Sofia is greatly disappointed because a less inspiring group of math educators is controlling the journal content, while exercising power over its network in ways that do not correspond to her values and aspirations. However, in both cases Sofia appears to be in a subordinate position, naturalizing this 'masculine' power—a phenomenon strongly identified in gender/science literature. It is important to stop and reflect on the above. Why was Sofia unable to become a leader within the *Euclid A* network after over more than two decades of work and experience? Why is she still positioned as less influential when compared to her colleagues?

While the above questions are difficult to answer, feminist historical research could perhaps shed some light. The absence of women as influential members in scientific practices, holding political power and providing public images of success is not only a normal consequence of a long history of women being excluded from science and university education circles, but also symptomatic of deeply endorsed assumptions regarding scientific practice as a masculine body of knowledge. This leads to naturalizing, not only women's exclusion from scientific practices, but also any resistance to their holding positions of power. Instead of locating the gendered dimensions of this fact, we frequently explain the phenomenon as something women choose. Rositter (1995, 382) claims that between 1968-1972 '*... there was a legal revolution in women's education and employment rights that promised* -even *seemed to guarantee, broad ramifications for women's careers in science and engineering, but its full implementation would require battles in the years ahead'.* One needs to underline that the gender issue in science is not a simple one. Londa Schiebinger (2006) used her historical perspective to observe that the problem consists of epistemic, cultural, political, and even national politic factors, arguing that *'...the ways in which women's exclusion from science has been paved constitutes systemic inequity hidden even from open-minded citizens and, at times, even from women themselves'* (Schiebinger, 2006, 13, my translation).

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