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Pioneer and Mentor: A tribute to Engin Arik and her support for Women in Physics.

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Abstract. - More than 2200 scientists coming from 37 countries participate in the ATLAS experiment. Only 15.6% of these are women. Why is this so? In Turkey, like elsewhere in the Balkans, there is a higher proportion of women physicists than in other European and North American countries. I will address this difference as well as examine the role of women in the ATLAS collaboration. I will also talk about the activities of the ATLAS Women's Network, of which Prof. Engin Arik was a founding member. Since Prof. Arik also worked hard to bring talented young Turkish students to CERN, I will also talk about the Engin Arik Fellowship which was created in memory of Engin and her colleagues, to continue her work offering research opportunities to young Turkish physicists.

Prof. Engin Arik was a pioneer in the field of Particle Physics in Turkey and a mentor for all her students. She worked hard to bring talented young people to CERN to give them opportunities in a special, international laboratory. Prof. Arik was also a founding member of the ATLAS Women's Network. To honor her efforts both as a mentor and as a supporter of women in science, I will present here three topics which I believe were close to her heart:

1. Statistics on the ATLAS Collaboration from a gender perspective
2. The Atlas Women's Network
3. The Engin Arik Fellowship.

1. Gender perspective on the ATLAS Collaboration

The statistics presented here were drawn from the ATLAS authorship database. To qualify as a scientific author, ATLAS collaborators must have contributed to the ex-

periment for at least a year. All statistics presented here are based on this authorship database as of May 8, 2008. Statistics on positions held in ATLAS are based on information gathered through various ATLAS websites, and the minutes of the ATLAS Collaboration Meetings since 2000. Errors are the author's sole responsibility but also include some inaccurate data still in the authorship database.

As of May 2008, the ATLAS Collaboration counted 167 institutes from 37 different countries. In total, there were 2235 scientific authors, 349 of whom were women, that is accounting for 15.6% of the collaboration. Turkey has two institutes participating in the ATLAS Collaboration: Istanbul Bogazici and Ankara Universities. Members of these two institutes represent 0.6% of all collaborators, although 0.9% of the collaborators are Turkish nationals.

The average age on ATLAS is 41.6 years, with men being slightly older on average (42.2 years) than women (37.9 years). This difference, as we will see, has an impact on the role women have played in ATLAS: fewer women have occupied high-level executive positions, and women in general have been nominated in larger numbers to more junior positions. In fact, below 50 years of age, women account for 21.3% of the collaboration while they only represent 11.4% of those above 50.

The fraction of women in the collaboration varies widely from one country to the next. Table 1 presents the situation for all countries participating in ATLAS. The numbers are given according to the country of the institute of hire. One can also look at the same distribution and compare the fractions according to the institute of hire and the nationality of the people working on ATLAS. These numbers are shown in Table 2 for Turkey and countries with the largest statistical samples, and tend to show that some countries seem to be more open to training women than hiring them, while others do the exact opposite.

Interestingly, the countries hiring the highest fractions of women in ATLAS tend to be in the Balkans, Eastern Europe, Italy, the United Kingdom and France. One can note that in all these countries, the salaries tend to be modest. One particularly interesting case is Georgia: only women work in the two Georgian institutes affiliated with ATLAS although elsewhere in the collaboration, there are 11 Georgian males but only one female. In contrast, places where the salaries are much higher, such as the USA, Japan, Switzerland, Austria and CERN, all tend to have very small fractions of women when compared to the average in ATLAS. Although this seems to be a contributing factor, it does not explain the whole situation since countries like Russia (including JINR) and the Czech Republic offer modest salaries to physicists and their fraction of women is low. Nevertheless, such observations have been made elsewhere. In Ukraine for example, the salaries in Information Technology have steadily decreased over the past decade, while the fraction of women in this field has been steadily increasing [1]. This could be explained by the fact that men are still predominantly perceived as the "providers" who have to support their family. Women, on the contrary, are still sometimes assumed to work for their own enjoyment, as if we did not have bills to pay and families to support! A field where the salary is modest will therefore be less attractive to young men as a career choice, creating an environment where women are more easily accepted to fill the empty positions. The proportions

found in ATLAS are consistent with data collected elsewhere on women in physics worldwide [2].

Women working on ATLAS also tend to be fairly isolated in their home institute. Half the ATLAS participating institutes had no women, or only one, in their group. These institutes had up to 46 group members. Brookhaven National Laboratory in the US had 41 qualified authors, none of which were women! note that this group recently hired a woman but she was not yet qualified as an author in May 2008. On average, each institute had nine men and two women.

National laboratories do not seem to try to enforce Equal Opportunity policies more than other institutes and to act as role models. As can be seen from Table 3, many such laboratories had fewer women than their home country institutes.

It is also interesting to examine the role played by women in ATLAS by looking at who has been appointed to various positions over the years. These appointed positions within the ATLAS organisation could be divided into two broad categories which I'll refer to as "Executive tasks" and "Physics tasks". In the first category, one could regroup the higher management level (spokesperson, two deputy spokespersons, resources, and technical coordinators), the Collaboration Chair and Deputy Collaboration Chair, the Project Leaders for each sub-system (SCT, Pixels, TRT, Inner Detector, LAr, TileCal, Muons, TDAQ) and coordinators for each Operation Tasks: run, trigger, computing, data preparation and physics. All these people are members of the ATLAS Executive Board, although they constitute only a sub-set of this board. The second category, "Physics tasks", regroups all people appointed to committees: Speakers, Authorship and Publication committees, as well as Physics and Performance Group conveners. The situation is summarised in Table 4, where the cumulative number of tasks considered is shown for a given period for each of these tasks' sub-categories. For all sub-categories, except for Operation tasks, the fraction of women has been increasing steadily over the years. One contributing factor has been the continuous efforts of the ATLAS management to actively seek out deserving women for these positions. Nevertheless, there is a clear difference between Executive and Physics tasks. This difference can partially be explained by the age distribution on ATLAS, since the majority of women are younger women, less likely to assume senior executive positions. On the other hand, this age difference between men and women contributes to explain why women have assumed Physics tasks in greater proportion than their overall presence in ATLAS.

In summary, the fraction of women is steadily increasing in ATLAS: we now have many young women in our ranks. To date, 26 to 36% physics group conveners and committee members have been women, and this trend is still increasing. These women are gaining visibility and experience, and will be prime candidates for higher positions in the future. For the period spanning roughly from 2000 to 2008, the cumulative fraction of women in "Executive Tasks" has only been 5%, although today, it has reached 14%. On the not so bright side, we still have a leaky pipe, meaning more women leave the field than men, either due to various difficulties encountered or because an average woman is much less likely to survive in science than an average man. One could interpret this as women are subject to a stronger natural selection.

country	women	men	% women	error on %
Georgia	3	0	100.0 %	100.0 %
Columbia	1	1	50.0 %	35.4%
Romania	9	9	50.0 %	11.8%
Serbia & Montenegro	3	5	37.5 %	17.1%
Poland	7	14	33.3 %	10.3%
Spain	23	50	31.5 %	5.4%
Turkey	4	9	30.8%	12.8%
Argentina	2	5	28.6 %	17.1%
Greece	9	24	27.3 %	7.8%
Denmark	3	9	25.0 %	12.5%
Morocco	1	3	25.0%	21.7%
Italy	47	151	23.7 %	3.0%
Brazil	2	7	22.2 %	13.9%
Australia	3	11	21.4 %	11.0 %
Sweden	7	27	20.6 %	6.9%
Slovenia	2	8	20.0 %	12.6%
France	27	113	19.3 %	3.3%
United Kingdom	35	170	17.1 %	2.6%
Norway	3	16	15.8%	8.4%
Israel	5	27	15.6 %	6.4%
Netherland	6	36	14.3 %	5.4%
Germany	37	222	14.3 %	2.2%
Canada	12	74	14.0 %	3.7%
USA	56	385	12.7 %	1.6%
CERN	15	105	12.5 %	3.0%
Austria	1	9	10.0%	9.5%
Portugal	2	21	8.7 %	5.9%
Czech Republic	5	58	7.9%	3.4%
Taiwan	1	12	7.7 %	7.4%
Switzerland	2	25	7.4 %	5.0%
Japan	4	75	5.1 %	2.5%
Russia and JINR	5	105	4.5%	2.0%
Armenia	0	1	0.0%	100.0%
Azerbaijan	0	3	0.0%	100.0%
Belarus	0	4	0.0%	100.0%
Chile	0	5	0.0%	100.0%
China	0	14	0.0%	100.0%
Slovakia	0	12	0.0%	100.0%

Table 1: Percentage of women in ATLAS per country of hiring institute.

country	% women per institute	% women per nationality
Grand total	15.6 %	15.6%
Turkey	30.8%	40.0%
Italy	23.7%	24.1%
France	19.3%	18.0%
United Kingdom	17.1 %	15.3%
Germany	14.3 %	11.2%
Canada	14.0 %	17.9%
USA	12.7 %	10.2%
CERN	12.5 %	-
Czech Republic	7.9 %	8.5%
Switzerland	7.4%	4.3%
Japan	4.9%	5.7%
Russia	4.5%	6.7%

Table 2: Percentage of women in ATLAS per country of hiring institute and per nationality (passport). Some countries such as Italy tend to hire just about as many women as they train, whereas other countries hire more (USA) or less (Canada) than they train.

Laboratory	country	women	men	% women
Argonne	USA	1	18	5.3%
Brookhaven	USA	0	41	0.0%
SLAC	USA	1	16	5.9%
DESY	Germany	8	20	28.6%
JINR	Russia	1	45	2.2%
RAL	United Kingdom	2	21	9.5%
Saclay	France	7	20	25.9%
Frascati	Italy	5	13	27.8%
CERN	Europe	15	105	12.5 %

Table 3: Percentage of women at large national laboratories. Except for DESY, Saclay and Frascati, these national laboratories have a lower fraction of women than their home country institutes.

Task sub-category	period	number of tasks-years	% women
management	2000-2008	58	10.3%
project leaders	2000-2008	72	4.4%
operation tasks	2003-2008	46	4.3%
physics conveners	2004-2009	92	30.4%
performance groups	2005-2008	35	25.7%
committees	2001-2008	126	36.5 %

Table 4: Percentage of women occupying various appointed positions between 2000-2009, depending on data availability in each category. For Physics Groups, conveners have already been appointed for the year 2009. The first three categories belong to "Executives tasks" whereas the last three fall within "Physics tasks".

Finally, women are still very isolated in their home institutes and many national laboratories are not setting an example in their country for gender equality.

2. The ATLAS Women's Network

To increase women's visibility in ATLAS, break their isolation in their home institute, and create a network for all women in ATLAS, a group of women decided to start the ATLAS Women's Network in the Fall of 2005. Prof. Engin Arik was one of the founding member of this group. Our activities so far have been multi-faceted: first, we created a website:

`https://twiki.cern.ch/twiki/bin/view/Atlas/AtlasWomenPage`

and a mailing list to distribute information and reach every woman working on ATLAS. We hold special meetings at large collaboration meetings, usually around a meal with informal discussion and presentations. We also hold weekly lunch meetings at CERN to provide a place where all women can drop by for a chat, meet other women from ATLAS and create a network among women. From these meetings, three major initiatives were launched:

1. The CERN Ombudsperson Initiative: we developed the idea of having a CERN-wide code of conduct and an Ombudsperson who could deal with any type of discrimination or harassment, regardless of the status of the individuals involved, be they CERN staff or Users. The CERN Human Resources office is now working on developing this code-of-conduct but the current Director General has opposed the creation of an Ombudsperson position.

2. The CERN Childcare Initiative: we distributed a questionnaire to all members of ATLAS, LHCb and CMS Collaborations to evaluate the needs of young parents coming to work at CERN. We drafted propositions and recommendations for CERN to improve the situations, particularly for Users coming to work at

CERN on a short-time basis. We are currently working with the Advisory Committee of CERN Users (ACCU) on these issues, eventhough we have received no favorable response from the current CERN administration.

3. The Engin Arik Fellowship: to continue the work started by Prof. Engin Arik to bring promising young Turkish students to CERN, we initiated a fellowship with the help of many others. More details are given in the next section.

The ATLAS Women's Network will continue to work to increase women's visibility in the collaboration and ensure that deserving women keep being promoted to various positions. Over the past few years, four women have been appointed to some of the highest positions in ATLAS. These are Fabiola Gianotti, who will become spokesperson in March 2009; Kerstin Jon-And, Chair of the Collaboration Board, Pippa Wells, former Project Leader for the SCT system and recently appointed Inner Detector Project Leader, and Isabelle Wingerter, LAr Project Leader.

Nevertheless, the ATLAS Women's Network still faces lots of reluctance from both male and female colleagues in the Collaboration, the latter often fearing being labeled as feminists or not wanting to be identified with a discriminated group. Other women still do not think there is discrimination for women in science and cultural differences also play a role. Nevertheless, we will keep working to improve the situation for women in ATLAS and at CERN in general, joining forces with others along the way.

3. The Engin Arik Fellowship

Prof. Engin Arik was undoubtedly a great mentor for all her students. She constantly sought opportunities for young people and encouraged many to undertake a career in high energy physics. To honor her memory and pursue her tireless efforts, a special Fellowship was started in her name. This was initiated by the ATLAS Women's Network with support from John Ellis from CERN, Konstantin Zioutas from Patras University, spokesperson of the CAST experiment, and Peter Jenni from CERN, spokesperson of the ATLAS Collaboration. This fellowship is intended for deserving Turkish students, selected among the best applicants to the CERN Summer Students Program for Non-Member States [3]. The Fellowship has received financial support from individuals and institutes, such as Patras and Athens Universities, the ATLAS Collaboration and CERN. Prof. Arik's own family has also pledged money to keep the fellowship forever once the other funds are exhausted. In parallel, under the initiative of Bilge Demirkoz from CERN, Akbank, a leading Turkish bank, has provided financial support for two students in 2008 and this will also continue in the future for some years. The selected students will join the CERN Summer Students Program, which admitted 143 students last year, plus 70 students from the Non-Member States Program, providing prime opportunities for young people to get involved in first class research and attend lectures given by outstanding CERN scientists. The 2008 Engin Arik Fellowship recipients were Seda Persembe for the CERN-based Fellowship, and Mesut Arslandok and Cemile Ezer, for the Akbank Fellowship. Judging from what

the Fellowship recipients had to say about their experience, we can already say the fellowship has met its goal:

- Seda Persembe: "As a woman in science, Engin's personal and professional level in physics impressed me very much. From her eyes, you could easily understand that she believed in science. She was the one who motivated me to take on the challenge of physics. She was the source of inspiration for me and other young physicists. She had endless enthusiasm for teaching. Engin believed in particle physics and performed it well. She fought with great devotion to promote particle physics in Turkey. As I always say, Engin's blue-eye's light is still over my shoulder and will continue to be with me.. Now my goal is to find a challenging Ph.D. program on ATLAS to launch my scientific career.

  On 14^{th}April 2008, Okay Çakiroglu, president of the Turkish Atomic Energy Authority visited CERN. Çakiroglu and CERN's director-general, Prof. Robert Aymar, signed an international cooperation agreement. This is an important milestone towards Turkey's membership at CERN given that Turkey has been an observer state at CERN since 1961... The Turkish physicists at CERN are working hard towards increasing the Turkish impact at CERN and all of us is looking forward to the day when the Turkish flag will also be flying by the CERN gate."

- Mesut Arslandok: "I can honestly say that participating in the Summer Student Program is the best experience I ever had. I worked on the Time Projection Chamber detector for the ALICE experiment. Thanks to this project, I have been accepted to the Helmholtz Research School in Germany. That is to say, it has had the best impact on my career. In addition I met many people from different countries and the social activities were wonderful. Participating in the CERN Summer School made my dreams come through."

- Cemile Ezer: "The Engin Arik scholarship thought me so many things. In the summer school, we were around 256 students from 52 different nations. Every one of us came there just for the love of science. We had the opportunity to take lectures from the experts and ask all questions puzzling us. Then I met the greatest team of CERN: they were quite friendly to me. I worked on Micromegas ADC signal analysis. Actually, it was quite hard for me to adapt to programming. Before coming to CERN, I was doing theoretical physics. Now my scientific point of view is quite changed. I like doing experiments and the taste of working with big groups of people, together. Before, I never thought about doing something just for the sake of science and I was not that comfortable with myself. Now I am."

With the Engin Arik Fellowship, my hope is that through all the bright, young Turkish students who will keep coming to CERN, our ties with the Turkish physics community will keep expanding, continuing the work pioneered by Prof. Engin and keeping her and her students, Berkol Dogan and Engin Abat's spirit alive.

REFERENCES

[1] Iryna Vavilova, Academy of Science, Ukraine, Statistics presented at the 14th International Conference of Women in Engineering and Science, Lille, France, July 2008.

[2] Statistical Research Center, International Study of Women in Physics. Data from 1996-2000

[3] For more information, see:

https://ert.cern.ch/browse_intranet/wd_map?p_web_site_id=1&p_format=full&p_class_type=Programme&p_class_value=Special%20Programmes&p_title=Students

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