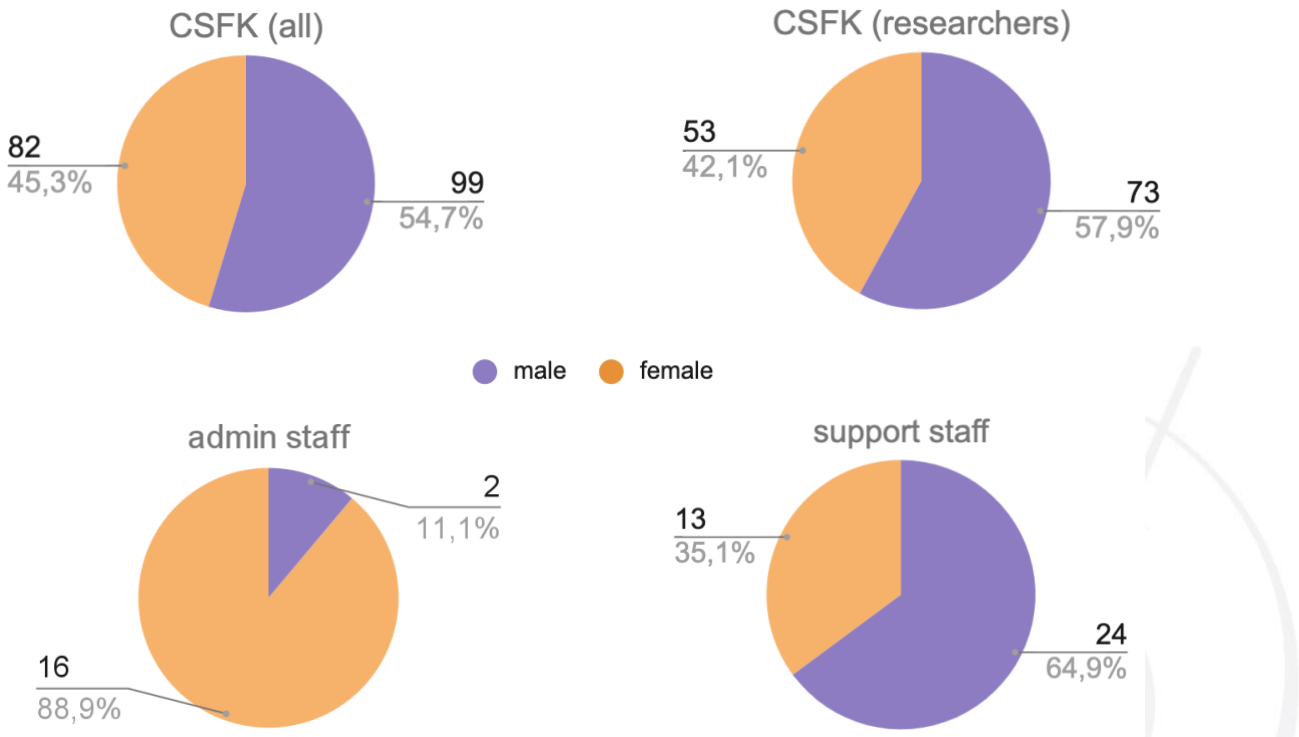
Research Centre for Astronomy and Earth Sciences
H - 1121 Budapest, Konkoly Thege Miklós út 15-17.

CSFK Gender Report as of 2022

This report presents and summarizes some statistics based on gender among the Research Centre for Astronomy and Earth Sciences (CSFK) employees of the Eötvös Loránd Research Network (ELKH), recording the present state of the art to develop its first Gender Equality Plan (GEP). The results presented here are meant to help to identify existing gender imbalances in representation, opportunities, and career progression to facilitate meaningful action from the Research Centre. For this initial report we assumed that the workforce can be split into male and female genders based on first names[1]. Raw data for this report were collected in January 2022 handled by the Directors of the institutes and the members of the Ethics Committee of Konkoly Observatory and were not disclosed further.

Workforce: general statistics

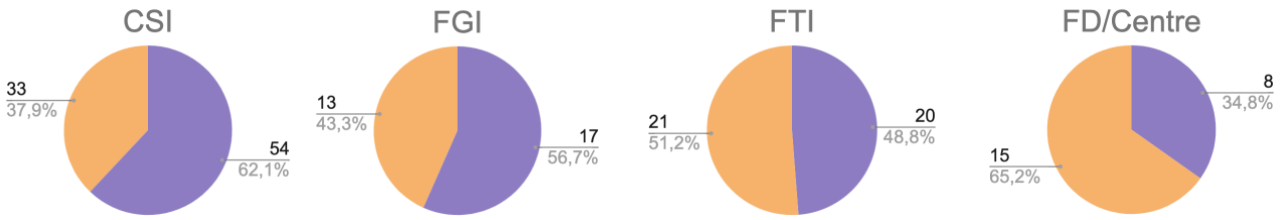
Employees of the research centre can be grouped into three broad categories: researchers, administrative staff, and support staff. Overall, the workforce is more male-dominated, but the ratio is not far from parity, with the research staff having a 58%-42% split. Here we counted full-time employees only. Numbers indicate personnel and percentages, respectively.



[1] We recognize that a simple male/female separation might not be fully representative, but we do not yet possess more detailed gender information regarding the workforce.

The administrative and support staff are overall rather equal (26 males, 29 females) however, the two categories have wildly different compositions. The administrative staff mostly includes personnel from the financial department (accounting, HR, project management, etc.) as well as secretaries, who are almost entirely women. In contrast the support staff includes a variety of tasks, from the IT and engineering departments to gardeners, cleaners, drivers, as well as the staff of the public Svábhegy Observatory, with nearly two thirds of these personnel being men.

The employees are affiliated either with an institute or directly with the research centre, the latter also including most of the financial department (FD) personnel. The ratio between female and male workers is the lowest at Konkoly Observatory (CSI), it is nearly equal at the Geographical Institute (FTI), and highest among the Centre/FD-affiliated employees.



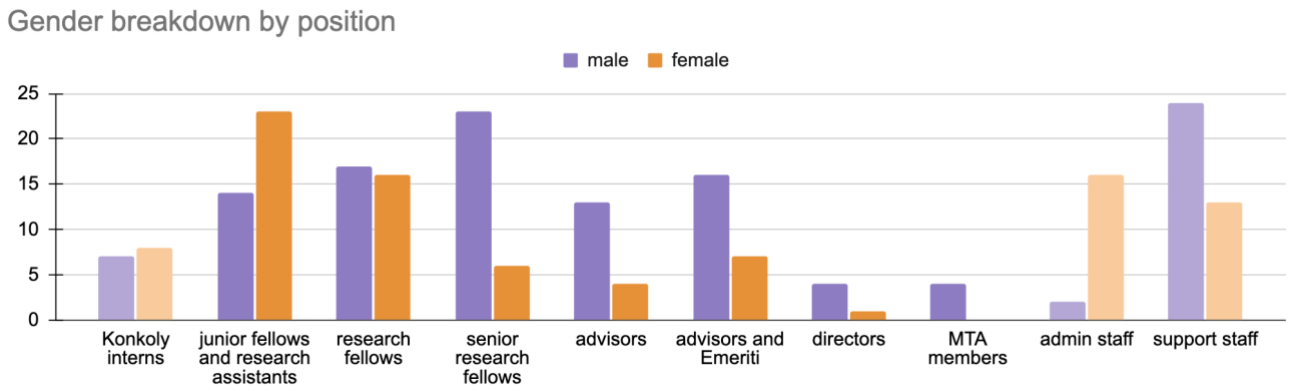
Workforce: positions and career progression

A simple gender breakdown does not reveal all systematic differences within the workforce. It has been long established that gender ratios start out roughly even in STEM (Science, Technology, Engineering and Math) fields during higher education, but diverge in later career stages[2]. This gender gap is often described with the "leaky pipeline" metaphor. Even though the same number, or indeed often slightly more women than men enter the STEM career pipeline at the beginning as undergraduates and PhD students, their number starts to dwindle after obtaining their PhD or starting their first post-doc positions: they leak out from the STEM pipeline. This decrease continues over successive career stages, and only a small fraction of women achieves full professorships and directorial positions.

The same pattern can be clearly identified among the researchers of the CSFK. Women are the majority in the lowest, most junior, pre-PhD category (junior fellows and research assistants, as well as the students employed in the Konkoly intern program). The research fellows (equal to postdoctoral positions) have a nearly equal gender ratio. However, the numbers rapidly skew towards men in later career stages of senior research fellows and science advisors. At the top, all three institute Directors and the Director General are male, and only the Financial Director of the centre is female, as of January 2022. Finally, four male and zero female researchers are members of the Hungarian Academy of Sciences.

[2] see, e.g., the SAGE report: https://www.sciencegenderequity.org.au/gender-equity-in-stem/
- the She Figures 2021 reports by the European Commission: https://ec.europa.eu/assets/rtd/shefigures2021

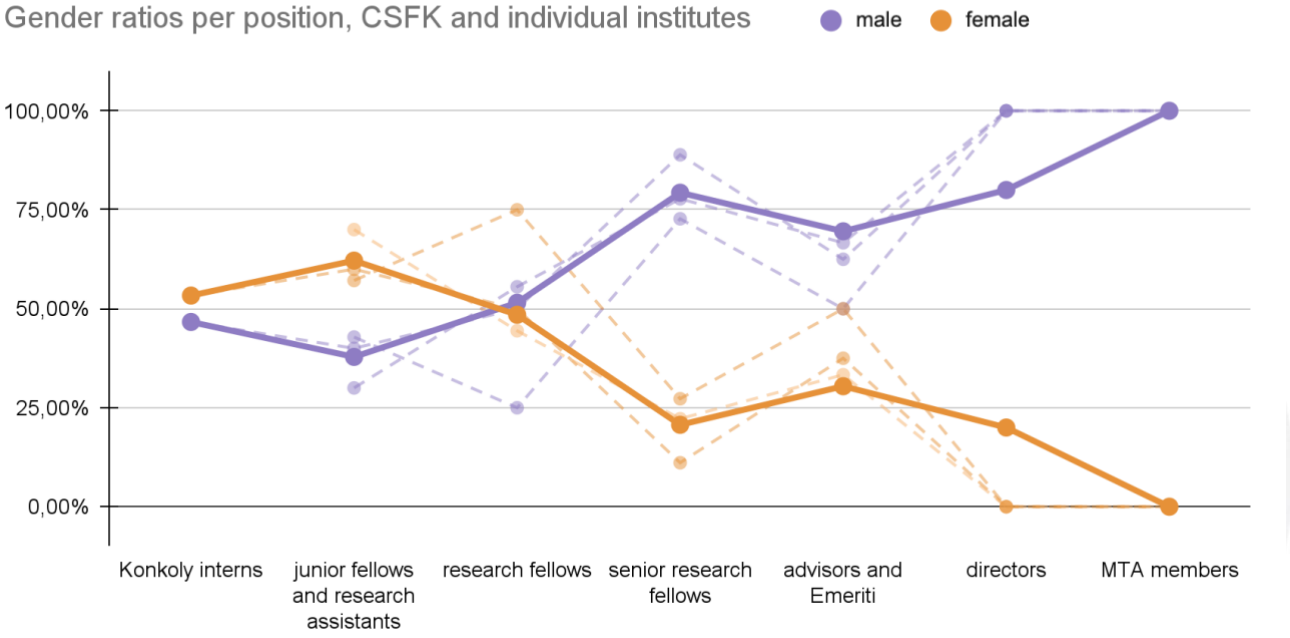
- a similar report by the Council of Canadian Academies: https://cca-reports.ca/reports/strengthening-canadas-research-capacity-the-gender-dimension/



The gender gap is clearly present not only in the aggregated data but also within the research staff in each institute, respectively.

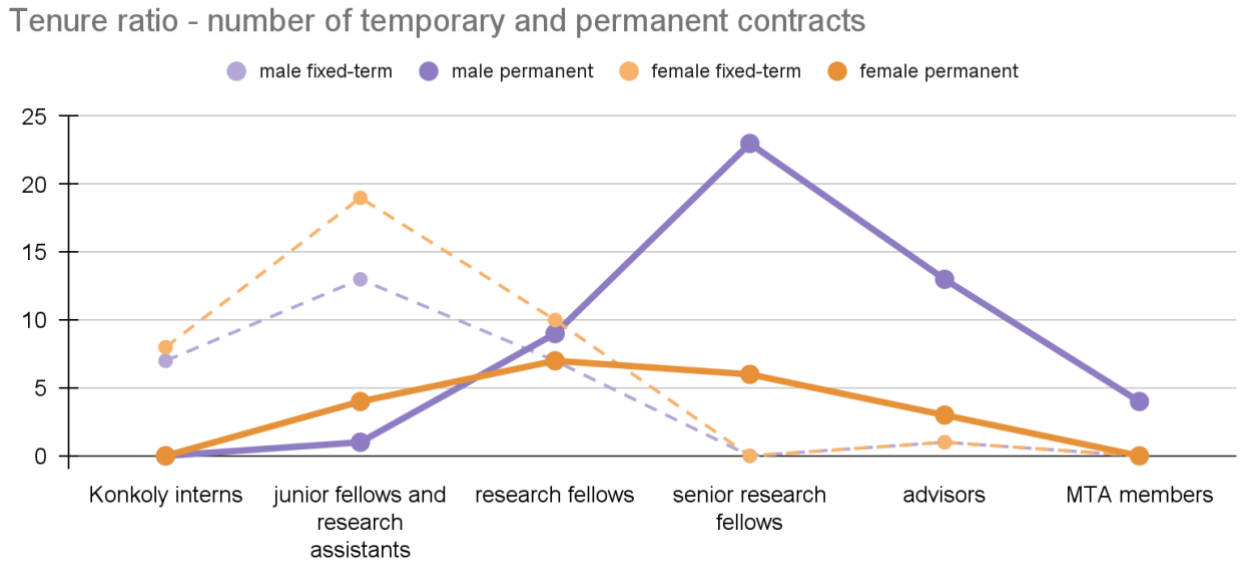
A noteworthy observation is that the transition during postdoctoral work as a research fellow marks other important transitions: from supervised and/or individual researchers to group leaders, grant holders and supervisors, which often also leads to achieving tenure as well. Clearly, significantly more men than women achieve this career step within the CSFK as women do. The reasons behind the "leaky pipeline" phenomenon and women dropping out from academia have been examined thoroughly by others, and can be traced back to several factors, including:

- career delays and disruptions caused by having children and extensive family duties;
- various forms of harassment and gender discrimination;
- gender bias and unconscious bias among hiring and grant evaluation committees, as well as among senior researchers and faculty members;
- gender bias and unconscious bias in publishing, in authorship and citation choices.



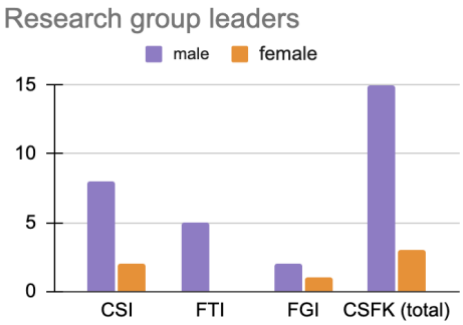
These adverse effects, when coupled with anxieties over precarious employment (short-term contracts and poor salaries) as well as work-life balance issues faced by all early-career researchers, irrespective of gender, can easily lead to decisions to leave academia and pursue other careers instead.

This gender divide affecting the success rate in moving from early career researchers to established, tenured staff can be detected in many ways. The simplest way is to compare the ratios of people employed in fixed term versus tenured positions. Ratios change slowly but mostly in parallel from students and junior fellows up to research fellows. At this stage, at which the workforce is evenly split between men and women, about half of each gender reach tenure. Beyond that, almost everyone is tenured: however, **women comprise less than a quarter of the tenured senior research fellows and advisors.**



The causes of this stark difference can be of course, complex, from differences in frequency and possibility of hiring and tenuring to changes in the applicant pool over multiple decades in each institute. In recent years, for example, the number of early-career researchers employed through fixed-term contracts have risen compared to previous decades.

The difference in the number of established male and female researchers is also present in the number of accredited research group leaders of the CSFK, most of whom are senior research fellows or advisors. Among the 18 group leaders, only three are women: two at the CSI and one at the FGI.



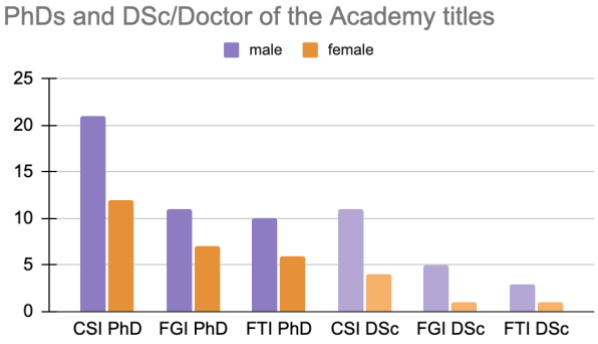
Degrees and titles

The decrease of women towards higher positions and qualifications is also evident in the number of PhD degrees, Doctor of the Academy titles and Academy memberships. Junior fellows, who mostly have university degrees, have a female majority, but this then drops to 36-39% of PhD holders being women, and less than a

quarter (16-26%) having a Doctor of the Academy title. As we established before, all four members of the Academy in the CSFK are men.

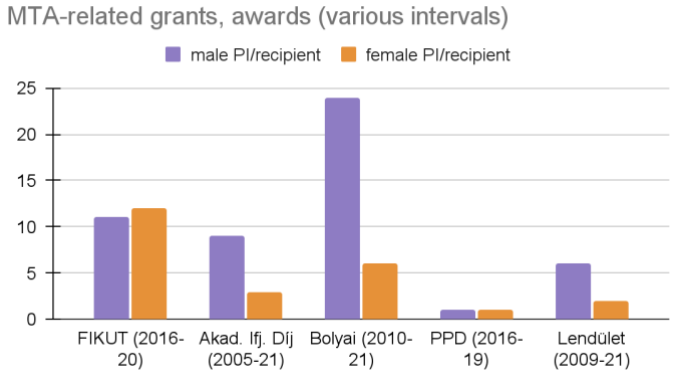
These distributions reflect the skewed ratios in the staff positions but have further effects as well. Many grants require a PhD, and larger grants also require the successful completion of a previous grant (see below).

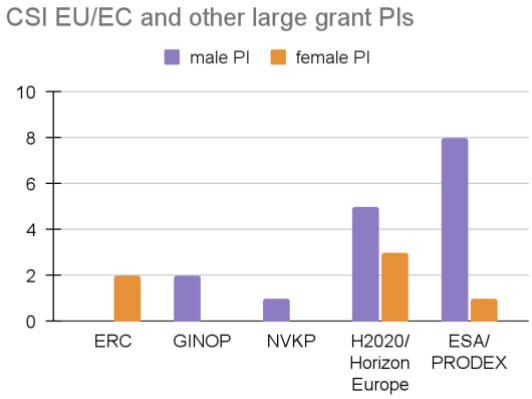
We note that the recently established Academy of Young Researchers included two men and two women representing the CSFK in 2021.



Funding success - Academy and large grants

Research depends on adequate levels of funding, from securing initial jobs to funding large projects through major grant schemes. It's not trivial to compare the outputs of various funding bodies, as schemes and grant amounts vary, and it's easy to run into problems with small-number statistics. One major funding source in Hungary is the Academy of Sciences (MTA). We compiled results from different initiatives for which data were available for different intervals. We also include here various large and/or international grants:





The MTA-related grants start with the FIKUT (fiatal kutató, young researcher) grants, which have been 3- or 4-year positions awarded primarily to graduate students to secure their PhDs. Here the numbers have been almost equal (12 women, 11 men) over the final five years of the program, which has been discontinued by the ELKH. The Academy Youth Prize awards one-time money prizes to early-career researchers based on their own submissions. The Bolyai Scholarship is the most popular and numerous programs of the Academy, a three-year scholarship for postdocs to conduct new research projects.

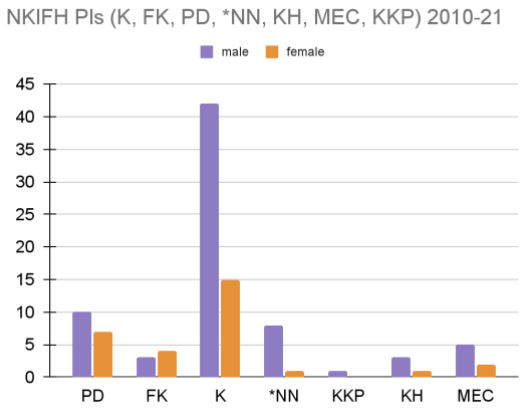
The success rate of the Bolyai scholarship skews 80% to 20% towards men, even though applicants are predominantly research fellows.

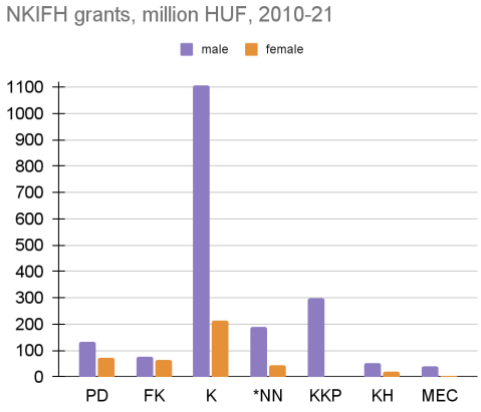
The Premium Postdoctoral program was discontinued after a few years: after that, mostly large research grants and consortial programs remain. The CSFK is able to secure European funding, e.g., ERC grants, ESA/PRODEX projects and Marie Curie Fellowships. We note that the CSFK hosted/is hosting two Lendület and two ERC grants led by female PIs – however, these were secured by the same two women.

Funding success - NKFIH and the OTKA grants

The largest national funding agency is the Hungarian Office for Research, Development and Infrastructure (NKFIH). The agency is currently managing the longest-lived class of research grants, the "OTKA" schemes. Except for the Élvonal (KKP) call that has rather restrictive eligibility criteria, most of these individual (PD, MEC) or group research grants (K, FK, KH, NN) are smaller in budget and scope than the Lendület or ERC grants. To illustrate the differences: current OTKA grants feature budget caps between 28.5M HUF (PD, three years), and 42/48M HUF (FK and K/*NN, four years). The Lendület program offers 200/250M HUF for five years in two categories. The KKP Élvonal grant offers 300M HUF for five years. Finally, an ERC Starting or Consolidator Grant can be as high as to 1.5M and 2M EUR (roughly 540M and 720M HUF) for a five-year grant period, respectively.

Given the large differences in funding levels, it's useful to compare the number of PIs and the amount of money secured in each category side by side. Here we show data since 2010 but note that some grant categories have been established only later.





Here similar differences can be observed as before. In the two early categories, the PD (postdoctoral) and FK (young researcher PI) schemes, the number of grantees is close to equal. However, in both cases male PIs secured higher amounts of funding overall than female PIs, and this can be only partly attributed to some PIs switching funding sources or host institutes. The most popular category, the K grant, is open to any researcher with a PhD. Here:

74% of the PIs are men who secured 84% of the K grant fundings.

While the cost cap of the K grants was raised over the years, the difference in funding levels is still striking:

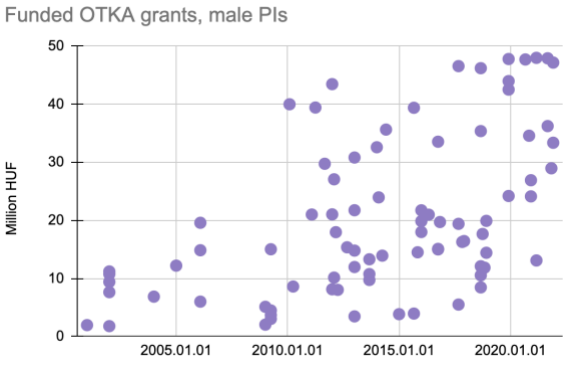
grants with male PIs averaged at 26.4M HUF per grant while female-led grants only averaged at 14.3M HUF per grant.

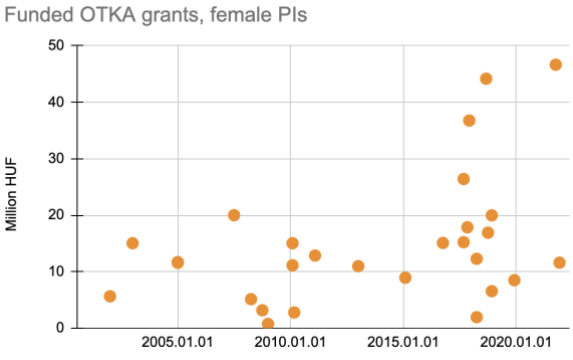
The only categories in which female-led grants exceeded male-led ones are the *NN (international collaboration) and KH (internationally outstanding impact) schemes – however, this is based on 8+3 and 1+1 grants only, compared to the 42 vs. 15 K grants.

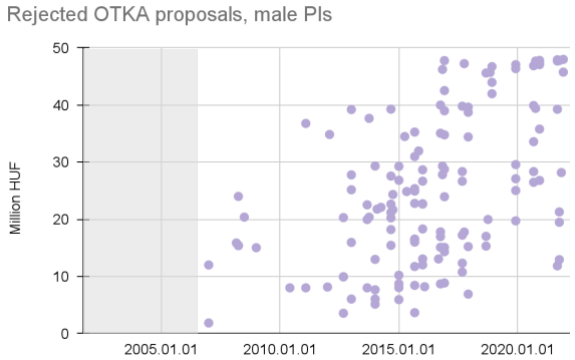
OTKA submission and success rates

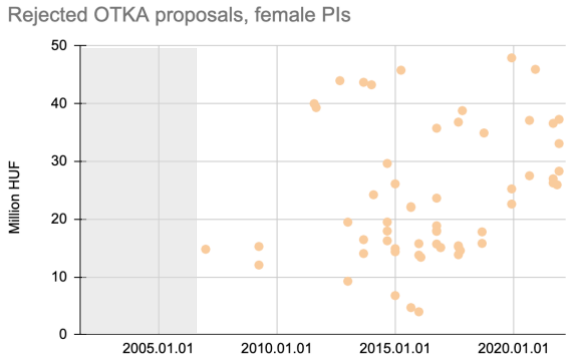
These numbers, however, only illustrate the rate of successful, funded proposals. To understand the reasons for the low success rate for women (29% are PIs vs 36% women among the eligible positions), we should also look at the number of submitted proposals. These can tell us whether women submit less proposals or if those proposals are selected less frequently. For the OTKA grants, we were able to gather CSFK-related data extending back to 2007 (rejected proposals) and 2001 (selected proposals), respectively. Some of these dates back prior to the formation of both the NKFIH and the CSFK, when the four research institutes worked independently, and include proposals related to the Institute of Geophysics and Geodesy (GGKI/GGI) until their separation from the CSFK in early 2021.

We identified 111 (72+28) funded and 200 (141+59) rejected proposals. The proposed/awarded amounts changed according to the following plots over the years:



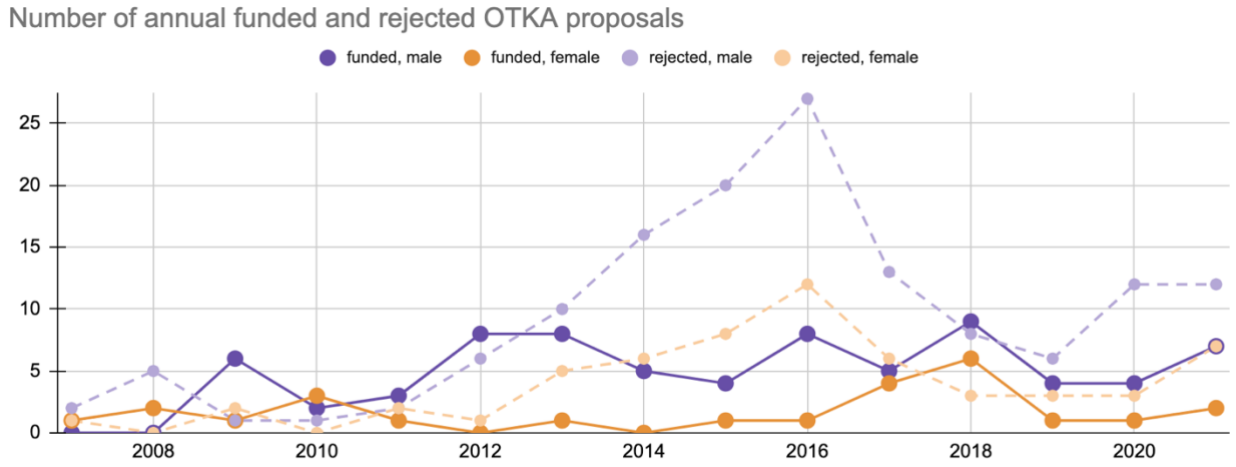




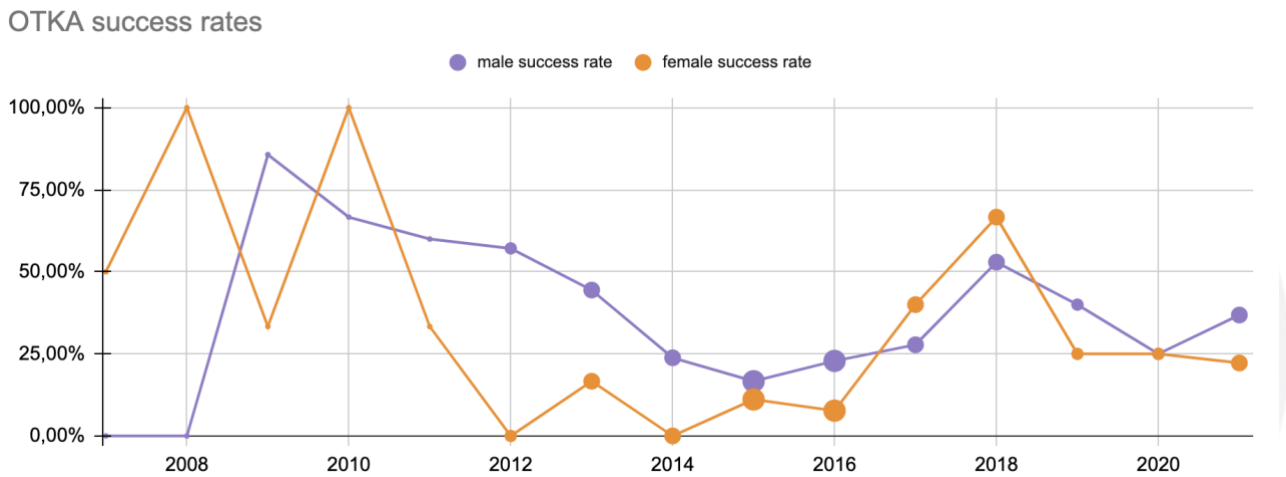


Two important observations can be made from these two plots: first, there was a proposal boom around 2013-2018, when dozens of submissions were made. This surge started a few years after the cost cap for the K grants was raised to 40 million HUF for a 4-year grant, but notably the proposed amounts varied wildly, with the 8-30M HUF range appearing to be the most populated. In more recent years the number of submissions dropped but the funding requests moved closer to the current, 48M HUF cost cap. The other important observation is the difference in securing larger proposals, above 20M HUF, with male and female PIs from the CSFK first achieving it in 2010-11 versus in 2017, respectively.

We can also plot the number of proposals and compute the success rates over the years. This clearly shows that submission rates increased fast until 2016, and quickly dropped back to lower numbers after that. We suspect that this drop can be explained, at least in part, by PIs securing grants after multiple tries, while other proposers either find jobs or funding elsewhere, or become Co-Is in successful proposals, therefore reducing the number of people still seeking funding.



Success rates also varied strongly over this time. Here we scaled the point sizes approximately to the number of submissions.



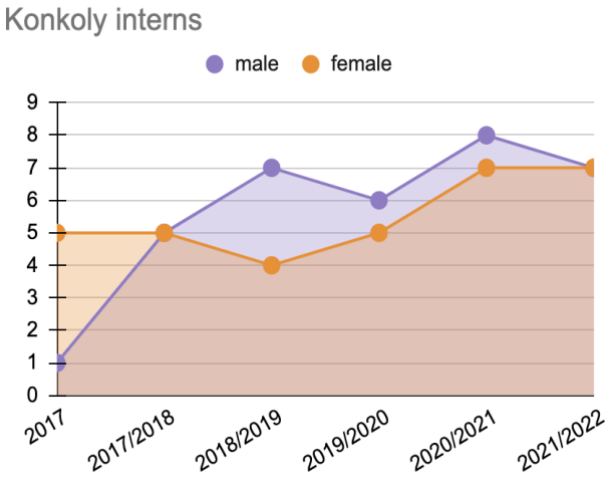
The plot clearly indicates that in the early 2010s the success rate of female PIs was much lower than that of male PIs. In the 2014-2016 period the success rates fell to the lowest values: this can be explained by the large number of submissions. While grant configurations and total budgets have changed over the years, the number of selected proposals is tied more to the money available, therefore more submissions don't lead automatically to more grants secured. Post-2016 the success rate for female PIs briefly exceeded that of the male PIs, but then both returned to the 25-30% range.

On average, notwithstanding the large fluctuations, we find success rates of 25.5% and 28.2% for female- and male-led OTKA-type proposals, respectively.

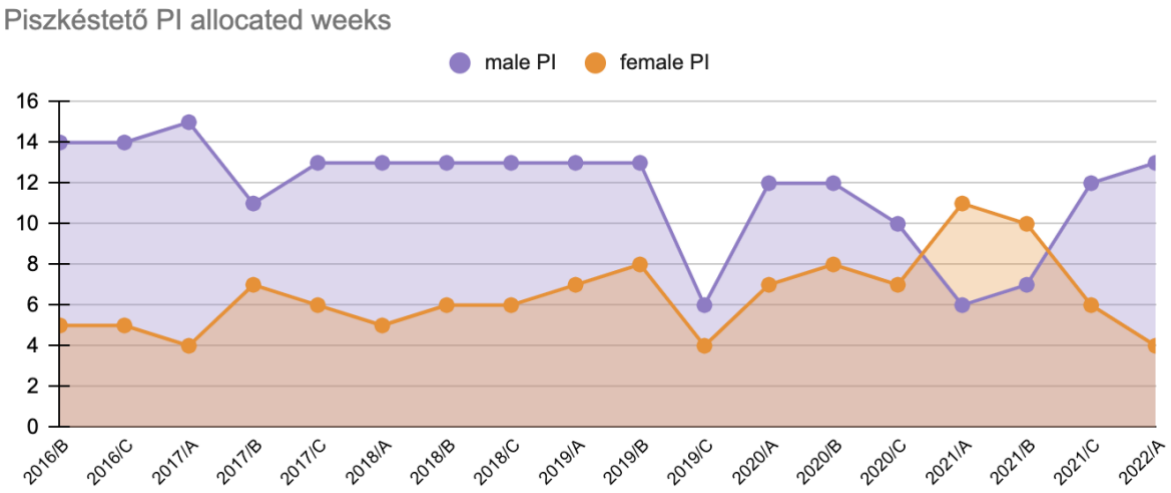
In summary, we can conclude that the slow transition for women from early-career and/or low positions is mirrored in the funding results. Differences appear to be driven largely by low grant submission rates; however, we also detect lower success rates and smaller secured grants, albeit with improvements in the last 5-6 years. But these effects together can easily exacerbate the situation further, with lack of independent funding feeding back into slower career progression. This is also compounded by the fact that large research grants like the Lendület and Élvonal calls are now listing earlier funding success as an eligibility criterion.

In-house applications

We also looked at two indicators of in-house applications. One is the number of undergraduate students selected in the Konkoly Intern Program which funds part-time research for one or two semesters per applicant. While there has been variation of the number of male and female students hired over the years, the program offered almost an equal number of contracts to male and female students (34 and 33 instances).

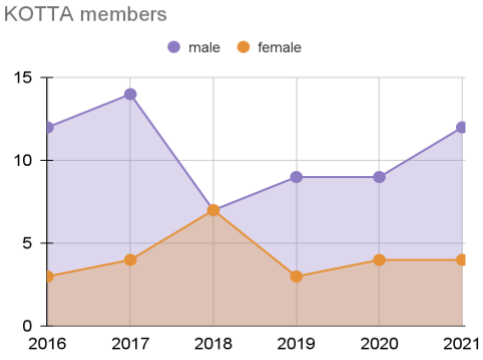


The other indicator we computed is the number of telescope time weeks awarded to male and female PIs at Piszkéstető for the 1m RCC telescope (the one fully available to any proposer). Overall, 36% of the available weeks were secured by women, which is very close to the overall male-female ratio of the CSI. Actual numbers show strong fluctuations, especially in 2021 when for two successive trimesters the number of weeks awarded to women exceeded that of men. Oversubscription of Piszkéstető infrastructure has been low and thus most requests can be accommodated: therefore, the average difference largely reflects the gender gap inherent among the researchers.



Committees

Finally, we investigated the gender statistics of various committees. The CSI has an in-house advisory committee called KOTTA (Konkoly Tudományos Tanács). The number of women in this council, which automatically includes all research group leaders plus a number of annually selected members, varied between 20-50%, but only exceeded 30% once.



A significant project within the centre is the National Atlas of Hungary, a large, multi-volume cartographic project run by the FTI. The Editorial Board of the Atlas, 6 current and 4 prior members plus a project secretary, includes male researchers only. The Cartographic Advisory Council behind the project, with 10 members, is also exclusively male. Editorial boards of the two published volumes (out of four planned) also consist of men only. We only find female participants among the chapter authors: 4 out of the 32 authors, or 12.5% have been women.

Researchers also sit on various external committees, such as observing time/telescope allocation (OPC/TAC) and research grant evaluation committees. Adequate gender representation within these committees can help to combat discrimination and biases towards gender minorities and lower success rates. Unfortunately, in most cases we are faced with very small sample sizes. The OTKA Physics panel and OTKA Collegium has included one male plus two female and one male members from the CSFK in recent years, respectively. The ESO (European Southern Observatory) OPC has included three male and two female members from the CSFK. The names are largely overlapping, meaning that these committees feature mostly the same senior personnel. But overall, the CSFK has little influence over the composition of these panels.

We also looked at the Committee for Astronomy and Space Physics (Csillagászati és Űrfizikai Bizottság, CSŰB), the highest-level committee representing astronomy and astrophysics in Hungary. It is one of the committees of the Physics Section of the Hungarian Academy of Sciences and its members are elected by the members of the public body of the HAS. Therefore, neither the institutional nor the gender composition is directly decided by the CSFK, even though the majority of the committee is affiliated with the CSFK, us being the largest Astronomical institution of the country. The CSŰB currently includes seven male and two female members from the CSFK.

Existing initiatives

Changing the landscape and working towards equity among male and female researchers requires institutional support. There have been positive initiatives within the CSFK towards this already. Flexible working hours and the possibility for remote work for researchers have mostly been the norm even before the pandemic. An anti-harassment policy has been enacted and an Ethics Committee has been established at Konkoly Observatory. A precedent exists for installing a family-friendly office for two female grad students with young children, complete with toys, highchairs, and a changing station. While the effectiveness of these initiatives is not always easy to measure, we can safely say that offering flexible/remote work may help those struggling with work-life balance and family duties enormously. Further, those two female grad students were able to complete their thesis research, and both successfully defended their PhDs.

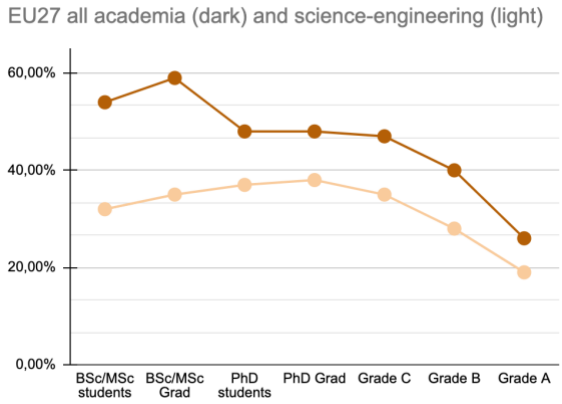
Assessment of the current situation

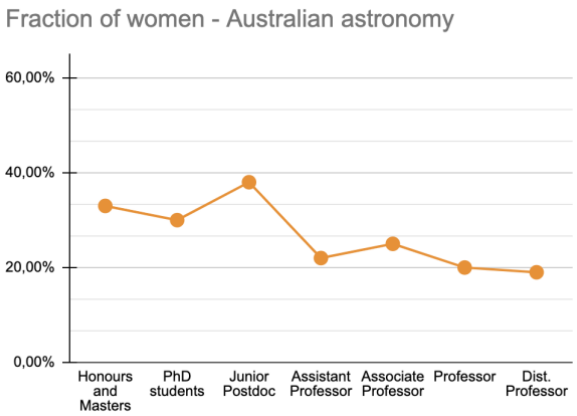
Do these statistics paint a bad picture of the Research Centre? They reveal clear gender differences and biases, but to evaluate them we need to compare them to other surveys. As noted before, the gender gap in the CSFK is actually very similar to those found by other surveys. The She Figures 2021 report of the European Commission found that for a typical academic career the fraction of women drops below 50% during PhD studies and steadily decreases from there on. When looking at science and engineering careers only, the fraction of women never exceeds 40%[3]. In that regard the CSFK is closer to the global average than to the science-engineering subfield.

Another recent study looked at the fraction of women among astronomers throughout Australia[4]. They found a less steep drop indicating better retention of women. However, the fraction does not exceed 40% at any career stage indicating that they start off with a gender gap that already exists at the higher education stage. These comparisons suggest that the CSFK is already attracting young talents at gender parity, and therefore has to focus primarily on increasing retention, promotion and recruitment of female scientists at later career stages.

[3]She Figures 2021 Report: https://ec.europa.eu/assets/rtd/shefigures2021

[4] Kewley, L. J: "Closing the gender gap in the Australian astronomy workforce", Nature Astronomy 5, 615 (2021)





The differences in grant success aren't unique to the CSFK either: they actually agree with findings published by others. It has been shown numerous times that gender bias and unconscious bias in evaluations leads to lower success rate for female applicants[5]. Moreover, even when the success rate is equal, biases can still be detected in the order of funded proposals, with female-led proposals being ranked lower on average[6]. Therefore, lower funding success for female researchers in the CSFK simply fits into the broader, international picture regarding funding and persistent biases around it. Mitigating these biases would require broad action from all parties involved, not just by the CSFK but also by the funding agencies. From an institutional standpoint, possible avenues of action may include promoting more women to senior positions where they have access to more funding options and offering assistance and mentoring in proposal writing and preparation.

The need for institutional action is also underlined by the Australian study that found that although the ratio of women is increasing, this rate is very slow. Without further action, 33% representation at each career level would be impossible to reach within 60 years, and even if strong affirmative actions are implemented, this would still take about a decade to achieve.

We can conclude that the gender situation in the CSFK follows general, worldwide trends. Implementation of corrective actions will also fit into ongoing initiatives elsewhere.

Summary and recommendations

The above summary provides a snapshot of the distribution, successes and career prospects of male and female scientists and employees within the CSFK. We can conclude the following.

[5]see, e.g.: van der Lee, R. & Ellemers, N: "Gender contributes to personal research funding success in The Netherlands", PNAS, 112, 40 (2015)

[6] Bol, T., et al.: "Gender-equal funding rates conceal unequal evaluations", Research Policy, 51, 104399 (2022)

The overall gender distribution is between average and good.

The gender split of the whole workforce is 55% men and 45% women. For researchers this ranges from 38% (CSI) to 43% (FGI) and 51% (FTI) women. In more than half of the EU countries women make up less than 45% of scientists and engineers[7]. This is broadly consistent with our current numbers.

The pipeline is leaking: higher positions are filled disproportionately by men.

The CSFK reproduces the same gender gap diagram that has been concluded by many larger surveys: although slightly more women start their careers as juniors, their numbers dwindle compared to men after earning their PhDs. As there is no reason why talent should not be largely retained throughout a person's career irrespective of their gender, these observations indicate systemic, institutional shortcomings that make it harder for women to remain in academia.

Less women win grants, become group leaders and supervisors than men.

Again, since we assume that talent is abundant among students and juniors who enter academia, we need to conclude that situations where significantly more women either leave academia early/mid-career, or have their careers stalled than men do, have serious knock-on effects. If science in general – and the CSFK in particular – loses talented women who don't win scholarships, don't become grant holders, group leaders, and supervisors, that is going to lessen the overall quality of research being done[8]. It also sets a precedent signaling that women "don't belong" to the top, or that the few who make it either needed superior qualities to reach it or had to give up on other aspects of life, or both.

Recruitment is not a problem, retention of (female) workforce is.

Many existing initiatives focus on raising the awareness of STEM fields and research among children and students in general, and female students in particular. However, as the number of early-career researchers indicate, we are already able to recruit many young talents and achieve gender parity. More emphasis should therefore be given to retaining these people in the long term as well. This may ensure that recruited talent is not wasted by avoidable obstacles that predominantly affect female researchers, such as biases and work-life choices.

[7] She Figures 2015 report by the European Commission: http://www.genderportal.eu/resources/she-figures-2015-gender-research-and-innovation

[8] Studies have shown that business teams including both men and women achieve higher results than male-only teams: Hoogendoorn et al., Management Science 59, no. 7 (2013): 1514-1528.
The same is expected in science: Nielsen et al: "Making gender diversity work for scientific discovery and innovation", Nature Human Behaviour, 2, 726–734 (2018)

Actions need to be institutionalized and monitored for effectiveness over time.

Various initiatives have been taken within the CSFK to support women in the past. However, these have been, more often than not, ad hoc actions or reactions to specific situations, and their effectiveness have been difficult to measure. Individual careers are driven by several factors, so positive or negative outcomes cannot always be directly attributed to the actions the research centre takes. Instead, implementation and results need to be monitored carefully and in a statistical manner instead of focusing on individuals and have to be corrected for outside effects (personal life, funding success, job offers, etc.). This will also make it possible to change or update the needed institutional actions if they are deemed unsuccessful or insufficient.

Equality in science is only achieved if we actively correct for societal factors.

To achieve equal opportunities for all genders in science, in terms of jobs, careers, grants, it is not enough to simply offer opportunities equally, and focus only on talent.

Women face more difficulties driven by societal factors within and outside of science than men, ranging from conscious and unconscious bias, harassment and discrimination to work-life balance choices and caregiving responsibilities. An alternative to the leaky pipeline metaphor – which implies that women and minorities just passively "drip out" from academia – has been suggested recently in the form of academia being a "hostile obstacle course" for historically excluded groups[9]. Removal of the obstacles from female and minority careers implies the need for leadership and institutional actions. Some of these obstacles can be reduced and managed through staff training and institutional policies for inclusive workspaces. Others may require dedicated resources and targeted programs, from mentoring initiatives to funding opportunities to close gaps caused by career disruptions.

Such programs can be formulated and implemented through an accepted Gender Equality Plan for an institution.

This report has been written by László Molnár in February 2022 and has been reviewed and approved by the GEP Task Force of the CSFK.

[9] Berhe et al.: "Scientists from historically excluded groups face a hostile obstacle course", Nature Geoscience,15, 2–4 (2022)