

# From Tehran to the World Stage: The Inspiring Mathematical Legacy of Maryam Mirzakhani (1977-2017)

Susanta Koley<sup>1,\*</sup>, Bimal Kanti Sen<sup>2</sup>

<sup>1</sup>Librarian, Central Library, Dr. B. C. Roy Engineering College, Jemua Road, Fuljhore, Paschim Burdwan, Durgapur, West Bengal, INDIA.

<sup>2</sup>Chairman, Expert Committee on Bibliometrics, DST, Government of India, Shivalik Apartments, Alaknanda, New Delhi, INDIA.

## ABSTRACT

**Aim:** This study analyzes 35 publications by Maryam Mirzakhani from 1995 to 2016, focusing on her research output and collaboration with 20 co-authors. **Background:** Maryam Mirzakhani was an outstanding Iranian mathematician and the first woman to win the “Fields Medal”. This award is one of the highest honors in mathematics and is often compared to the “Nobel Prize”. **Results:** She has authored a total of 35 publications, including 15 single-authored and 20 co-authored works. Her research career began early, with her first paper published in 1995 at the age of 18. Her most productive period was between 2010 and 2014, during which she published approximately three papers per year while aged 33 to 37. Notably, her productivity coefficient peaked at 1.0 in the years 1999, 2009, 2011–2012, and 2014–2015. Among her collaborators, A Eskin was the most active or core collaborators. She used 26 communication channels to disseminate the results of her research of which arXiv preprint server (6 papers) top of the list followed by *Annals of Mathematics* (2), *International Mathematics Research Notices* (2), *Inventiones Mathematicae* (2), and *Journal of Modern Dynamics* (2). Her publication concentration is measured at 53.85, with a publication density of 1.35. The most commonly used keywords in her research are “Moduli space” (appearing nine times) and “Hyperbolic surfaces” (six times), reflecting her primary areas of scholarly focus. **Conclusion:** Her achievement made history and inspired many people around the world, especially women, to study mathematics. Her untimely demise is a universal loss in mathematical research.

**Keywords:** Field Medal, Fields Medalist, Geometry and Dynamical Systems, Iranian Mathematician, Maryam Mirzakhani, Mathematics, Moduli spaces, Nobel Prize, Riemann surfaces.

## Correspondence:

**Dr. Susanta Koley**

Librarian, Central Library, Dr. B. C. Roy Engineering College, Jemua Road, Fuljhore, Paschim Burdwan, Durgapur-713206, West Bengal, INDIA.  
Email: shayanikoley.2013@gmail.com

**Received:** 12-02-2026;

**Revised:** 07-04-2026;

**Accepted:** 25-05-2026.

## INTRODUCTION

Female scientists have played a major role in the development of mathematics, even though historically they faced barriers such as limited access to education, social restrictions, and lack of recognition. Their contributions have helped shape many areas of modern mathematics. Here are some key roles and impacts (O'Connor & Robertson, 2008; Murray, 2016; AMS, n.d.). Many women have made groundbreaking mathematic discoveries and theories such as Hypatia (4<sup>th</sup>–5<sup>th</sup> century) was one of the earliest known female mathematicians and contributed to astronomy and geometry. Emmy Noether made fundamental contributions to abstract algebra and theoretical physics. Her work led to Noether's Theorem, connecting symmetry and conservation laws. *Sofia Kovalevskaya* contributed to analysis, differential equations, and mechanics.

Women have helped develop and expand several modern mathematical disciplines. This includes Maryam Mirzakhani, made major contributions to *geometry and dynamical systems* and became the first woman to win the Fields Medal in 2014. It also may include a name that is Neena Gupta, a Kolkata-based female mathematician who won Infosys Prize in 2014 for *Cracking the Zariski Code*, one of Math's long-lasting problems. Apart, *Julia Robinson*, American mathematician, played a key role in solving *Hilbert's Tenth Problem*, a famous question in number theory and logic. Female mathematicians have worked as *professors, mentors, and researchers*, inspiring future generations and contributing to mathematical education and academic institutions. For example, an American mathematician, *Katherine Johnson*, used advanced calculations to help guide space missions for NASA, demonstrating how mathematics can be applied to real-world scientific challenges. Women mathematicians have also helped break stereotypes and encourage more girls to pursue mathematics and science. Their success has led to initiatives promoting gender equality in STEM fields. Female scientists in mathematics have contributed to theoretical discoveries, applied mathematics, education, and social progress. Despite historical



DOI: 10.5530/irc.3.2.18

### Copyright Information :

Copyright Author (s) 2026 Distributed under  
Creative Commons CC-BY 4.0

Publishing Partner : Manuscript Technomedia. [www.msttechnomedia.com]

obstacles, their achievements continue to inspire new generations and strengthen the development of mathematics worldwide.

This episode starts along with the Maryam Mirzakhani, an Iranian mathematician and a professor of mathematics at Stanford University who was considered to be one of the history's great mathematicians. Her research topics include Teichmüller theory, hyperbolic geometry, ergodic theory, and symplectic geometry. Mirzakhani won the Fields Medal in 2014, the highest and prestigious award in mathematics, equivalent to the Nobel Prize, for her outstanding work on the dynamics and geometry of Riemann surfaces and their moduli spaces (McMullen, 2014; Peer, n.d.; White, 2017; AMS, 2017). Till today, Mirzakhani was the only woman as well as the first Iranian who received the Fields Medal since its inception in 1936. She was known to her colleagues as a genius in the dynamics and geometry of complex surfaces ("science-fiction- mathematics"), and as an artist to her young daughter, Anahita. In her own home, when Mirzakhani would spend many hours on the floor with large paper and draw casually on the paper, and write mathematical formulas around the drawings, seeing this her daughter exclaimed her mother was "painting" (Math.stanford.edu, n.d.; Wikipedia, 2017). According to Mirzakhani's speeches (Lamb, 2017), she did not grow up to be a mathematician. When she was child, she loved to read and make up stories and thought she might be a writer. During the period of middle school, she eventually discovered a passion for mathematics and proved to be brilliant at it. Finally, she became a pioneer in mathematics. It is to be noted that Artur Avila, Manjul Bhargava, and Martin Hairer (all males) were also awarded the 2014 Fields Medal, along with Maryam Mirzakhani (IMU, 2015).

## LITERATURE REVIEW

Over the years, many bibliometric and scientometric studies have been carried out by librarians and information scientists to analyze the research contributions of well-known scholars from different fields. These studies show a continued interest in measuring the academic impact and intellectual output of eminent personalities. Harold W. Kroto was studied by Kademani *et al.* (2002), who analyzed his research output. Sen and Karanjai (2003) prepared a bibliometric profile of Biman Bagchi. Srimurugan and Nattar (2008) examined the research productivity of K. Veluthambi. Sangam and Savanur (2010) conducted a study on Eugene Garfield, a key figure in bibliometrics and scientometrics. Mukherjee (2013) analyzed the work of Lalit Singh. Manjunath and Ramesha (2015) studied C. V. Raman, focusing on his life and scientific contributions. Koley and Sen (2016) analyzed the work of V. L. Kalyane, who is well known for conducting many bibliometric studies. Mondal, Raychoudhury, and Sarkhel (2018) presented a profile of P. C. Mahalanobis. Dutta (2019) documented the academic contributions of B. K. Sen. In recent years, the scope of such studies has expanded

further. Teli and Maity (2021) analyzed Stephen Hawking. Huded *et al.*, (2023) studied Madhav Gadgil. Koley (2024) extended this work to include personalities from law and mathematics, such as Fali Sam Nariman and Raj Chandra Bose. Behera and Meher (2024) examined the scholarly impact of Raghuram Rajan. Most recently, Koley (2025) studied Suprabhat Mukherjee. In the same year, Koley and Goswami (2025a) analyzed the contributions of Somenath Dutta, who is recognized for his work on micro-RNA therapy to prevent harmful Zika virus effects related to liver cancer. In 2024, Victor Ambros and Gary Ruvkun received the Nobel Prize for their discovery of microRNA and its function in gene regulation (Nobelprize.org, 2024), work that aligns closely with Dutta's research.

These studies show that bibliometric research is expanding across many disciplines. However, to the best of my knowledge, no biobibliometric study has yet been conducted on Maryam Mirzakhani, the first woman Fields Medal winner. This gap creates an important opportunity to evaluate her research output and impact, making such a study both timely and valuable for the field of mathematical sciences.

## Early Life and Education

Mirzakhani, a Persian woman, was born on 3 May 1977 in Tehran, Iran. Actually, she was an Iranian, later she took nationality of America. Her father was Ahmad Mirzakhani, an electrical engineer and mother Zahra Haghighi (ResearchGate, 2017; Mirzakhani M., 2017; CV, n.d.). She was married in 2005 to Jan Vondrak, a Czech computer scientist at IBM, and an associate professor of applied mathematics at Stanford University, and their daughter is Anahita (now six, born 2011). As Vondrak was not a Muslim, the Iranian government did not recognize their marriage. She lived in Palo Alto, California, United States (Roberts, 2017; Wikipedia, 2017). From her childhood, Mirzakhani was very much interested to write fictions. Yet, her talent as a mathematician looked automatic from very young age. She went to high school in Tehran at Farzanegan, National Organization for Development of Exceptional Talents (NODET). While as a teenager, Mirzakhani won gold medals in the 1994 and 1995 International Mathematical Olympiads for high school students, attaining a perfect score in 1995. She became the first Iranian student to achieve perfect score and to win gold medal. In 1999 she received BSc degree in mathematics from the Sharif University of Technology in Tehran. She then went to the United States for her PhD from Harvard University, where she worked under the supervision of the Fields Medalist Curtis T. McMullen. Five years later she earned a PhD in 2004 from the University for her thesis "Simple Geodesics on Hyperbolic Surfaces and Volume of the Moduli Space of Curves" (Wikipedia, 2017; CV, n.d.; AMS, 2017; Myers & Carey, 2017; Phippen, 2017).

## Professional Career

Mirzakhani served the Clay Mathematics Institute as a research fellow (2004-08) and an assistant professor at Princeton University. She also joined the faculty of Stanford University in 2008, where she served as a professor of mathematics until her death in 2017 (Wikipedia, n.d.; Math.stanford.edu, n.d.; Wikipedia, 2017). This apart, she used to deliver invited lectures at Yale and Rice University and has given several invited talks during 2005-2006. She worked as a referee for *Duke Mathematical Journal*, *Journal of Differential Geometry*, *Mathematical Research Letters*, United States Israel binational scientific foundation; organizer for: Teichmüller Theory and Kleinian Groups August 20, 2007 to December 14, 2007, Mathematical Sciences Research Institute, Berkeley, CA (Wikipedia, n.d.; AMS, 2017).

## Research Contributions

Mirzakhani was a highly original mathematician and made significant contributions to geometry and dynamical systems. Her work encompasses several mathematical disciplines such as hyperbolic geometry, complex analysis, topology, and dynamics. She gained recognition for her early discoveries in hyperbolic geometry i.e. the "*prime number theorem for simple closed geodesics*." The viewpoint developed in that work led to a proof of a conjecture that had been made by string theorist Edward Witten (1990 Fields Medalist). The conjecture was first proved in 1992 by Maxim Kontsevich (1998 Fields Medalist); 15 years later, Mirzakhani provided a new proof that came from a very different and totally unexpected viewpoint. These works led her to the study of dynamical systems associated with spaces of Riemann surfaces, where she and her collaborators made fundamental breakthroughs. Her more recent work (with A. Eskin and A. Mohammadi) constitutes one of the most sought-after advances in the area known as Teichmüller dynamics. She proved a rigidity theorem that is an analogue, in this non-homogeneous context, of the celebrated Ratner rigidity theorem in homogeneous dynamics (Wikipedia, 2017; McMullen, 2014; AMS, 2017).

## Awards and Honours

Maryam received several awards and honours (Wikipedia, 2017; Wikipedia, n.d.; AMS, 2017) from across the world. Some of these are:

- **1995-99:** PM Fellowship, Tehran, Iran.
- **2003:** Merit Fellowship, Harvard University.
- **2003:** Harvard Junior Fellowship, Harvard University.
- **2004-2008:** Clay Mathematics Institute Research Fellow.
- **2009:** AMS Blumenthal Award.
- **2010:** Invited to talk at the International Congress of Mathematicians.

- **2013:** AMS Ruth Lyttle Satter Prize in Mathematics.
- **2014:** Named one of *Nature* magazine's ten "people who mattered" of 2014.
- **2014:** Clay Research Award.
- **2014:** Plenary speaker at the International Congress of Mathematicians (ICM).
- **2014:** Fields Medal (equivalent to Nobel Prize of mathematics).
- **2015:** Elected foreign associate to the French Academy of Sciences.
- **2015:** Elected to the American Philosophical Society.
- **2016:** Elected member and foreign associate to National Academy of Sciences.
- **2017:** Elected to the American Academy of Arts and Sciences.

## Objectives

The main objectives of this study are:

- To find out the year- and age-wise distribution of publications.
- To study the authorship pattern.
- To look into the time span of authorship.
- To analyze the position of Mirzakhani in the byline of authors.
- To examine the author productivity and its peak period.
- To measure the collaboration coefficient.
- To identify the research team.
- To check the place of publication of the papers, and,
- To examine keyword frequency.

## METHODOLOGY

This study covers 35 publications of Mirzakhani published in national and international communication channels during 1995-2016. The publication year of two works is unknown. Mirzakhani has published numerous papers across journals and conference proceedings. By consulting sources such as Google Scholar, her research guide's records, her curriculum vitae, preprint servers (e.g., arXiv.org), the Scopus database, ResearchGate, and other formal channels, a list of 35 publications was compiled.

## Statistical Analysis

The data collected from Mirzakhani's publications were organized and analyzed using Microsoft Excel and Word. Descriptive

statistics such as total publications, authorship patterns, journal distribution, and citation counts were calculated. Bibliometric indicators including authorship count, collaboration index, and publication trends were derived to quantify her research output and impact. For authorship, each contributor was given full credit regardless of their position as primary author or co-author.

## RESULTS

### Year- and age-wise distribution of papers

Table 1 and Figure 1 show the year- and age-wise distribution of papers of Mirzakhani i.e. 35 with the degree of collaboration and publication productivity age. Out of which two papers do not have date of publications.

Significantly, 50% of her total publications (i.e., 17.5 or 18 papers) were completed by the beginning of 2011, at which point her productive academic age was 17 years, considering her publishing journey began at age 18. Using this data, her Productivity Coefficient (Sen & Gan, 1990) is calculated as:

$$\text{Productivity Coefficient} = \frac{\text{50th Percentile Productive Age}}{\text{Total Productive Age}} = \frac{17}{22} = 0.799$$

Additionally, her average annual output (Sen & Gan, 1990) stands at:

$$\text{Average Yearly Contribution} = \frac{\text{Total Publications}}{\text{Total Productive Years}} = \frac{35}{22} = 1.59 \text{ papers per year.}$$

**Table 1: Year- and age-wise distribution of papers of Mirzakhani.**

Year	Authorship status as					No. of papers	MA	CA	DC = MAP/TP	CT	Age	PPA
	Single author	1 <sup>st</sup> author	2 <sup>nd</sup> author	3 <sup>rd</sup> author	4 <sup>th</sup> author							
1995	1		1			2	1	1	0.50	2	18	1
1996	1					1	1			3	19	2
1998	1					1	1			4	21	4
1999			1			1		1	1.00	5	22	5
2003	3					3	3			8	26	9
2007	3					3	3			11	30	13
2008	2		1			3	2	1	0.33	14	31	14
2009			1			1		1	1.00	15	32	15
2010	1	1				2	2		0.50	17	33	16
2011			2	1		3		3	1.00	20	34	17
2012			1		1	2		2	1.00	22	35	18
2013	1		2			3	1	2	0.67	25	36	19
2014		2				2	2		1.00	27	37	20
2015		2	1			3	2	1	1.00	30	38	21
2016	1	2				3	3		0.67	33	39	22
YNI	1	1				2	2		0.50	35	-	-
Total	15	8	10	1	1	35	23	12	0.57	-	-	-
%	42.85	22.86	28.57	2.86	2.86	100			-	-	-	-

### Author Productivity

Table 2 and Figure 2 represent quinquennium wise distribution of her papers during 1995-2016 showing different indicators.

### Authorship Pattern

Tables 3 and 4 represent authorship pattern showing collaborative and non-collaborative publications during 1995-2016 along with time span of paper productions.

### Status in the Byline of Authors

Table 5 shows the position of Mirzakhani in the byline of the authors in her collaborative paper.

### Research Team

Table 6 reveals names of collaborators and their paper publication with her during 1995-2016.

### Validation of Lotka's Law

An analysis of the co-authorship data reveals that out of 21 individual collaborators, 14 co-authors (66.66%) have contributed to only one publication, while 5 co-authors (23.81%) have authored two papers, and 1 co-author (4.76%) have contributed to eight papers. The frequency of authorship exhibits an inverse square relationship typically described by Lotka's Law, which

states that the number of authors publishing  $n$  papers is about  $1/n^2$  of those publishing a single paper.

**Type of Publication Channels**

Table 7 and Figure 3 show type of publication channels into three groups like journal articles, conference papers, preprints, and books/festschrifts. It also counts country wise papers publications and other metrics (Kalyane & Sen, 1998) such as :

**Publication Density (PD) and Publication Concentration (PBC)**

PD is the frequency of papers per channels is found to be 1.35, whereas 50% of the contributions 18 appeared in first 14 communication channels, and thereby PBC is 53.85 [i.e.  $(14 \div 26) \times 100$ ].

**Bradford's Law**

According to Bradford's Law, if journals (or channels) are arranged in descending order of productivity, they should form zones containing approximately equal numbers of articles, and the number of journals in each zone should follow a geometric progression of the form  $1 : n : n^2$ .

In this case, although the total of 35 papers is divided into three zones, the distribution is uneven: the first zone contains 12 papers (32.28%) across 8 channels, the second zone contains 17 papers (48.57%) across 11 channels, and the third zone contains 7 papers (20%) across 7 channels. These percentages do not approximate the expected one-third ( $\approx 33.33\%$ ) distribution per zone, particularly with the second zone being disproportionately large and the third zone significantly smaller. Furthermore, the ratio of communication channels across the three zones (8 : 11 : 7) simplifies to approximately 1 : 1.4 : 0.87, which does not follow the

**Table 2: Mirzakhani's productivity.**

Quinquennium	Age (Years)	No. of Publications	Productivity per year
1995-1999	18-22	05	1.0
2000-2004	23-27	03	0.6
2005-2009	28-32	07	1.4
2010-2014	33-37	12	2.4
2015- [2019]	38-[42]	06	1.2
YU	-	02	-
Total		35	

**Table 3: Authorship pattern.**

Authorship Paper Type	Single	Two	Three	Four	Five	Total
Non-collaborative	15					15
Collaborative		12	05	02	01	20

**Table 4: Time span of authorship pattern.**

No. of authors	One auth.	Two auth.	Three auth.	Four auth.	Five auth.
No. of papers	15*	12	05	02*	01
Time span	1995-2016	1995-2016	2010-2015	*	2004-2004
Time span in years	22	22	6	*	1

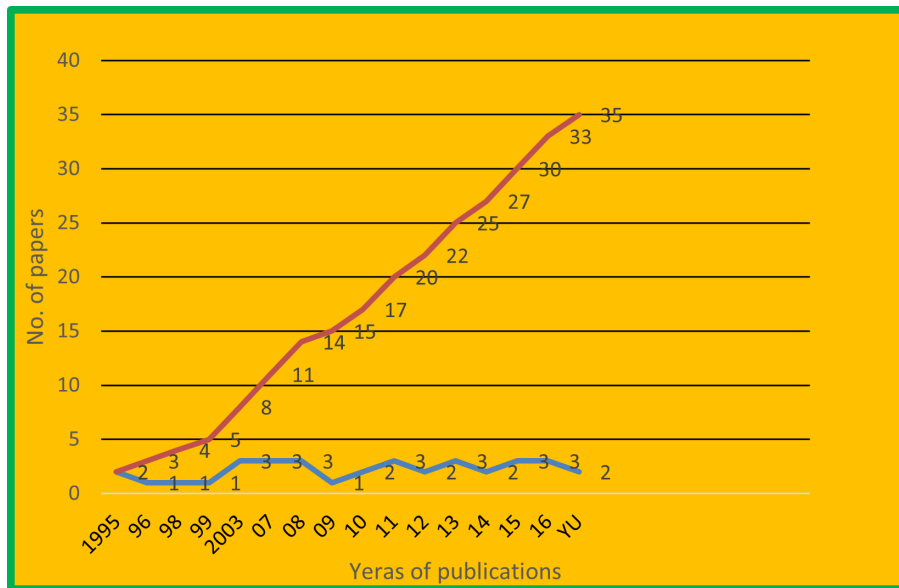
\* Year of publication of two papers is unknown.

**Table 5: Rank of Mirzakhani in the byline of authors.**

Publications	Positions				Total
	First	Second	Third	Fourth	
Two-authored	5	7			12
Three-authored	1	3	1		05
Four-authored	1			1	02
Five-authored	1				01
Total	08	10	01	01	20

**Table 6: Mirzakhani and her collaborators.**

Sl. No.	Author	Single	Position in byline of authors															MA	CA	TA	Period	
			Two		Three			Four				Five									FYP	LYP
			I	II	I	II	III	I	II	III	IV	V	I	II	III	IV	V					
1	Mirzakhani, M	15	5	7	1	3	1	1			1	1					23	12	25	1995	2016	
2	Eskin, A		3		3					1	1						6	2	8	2011	2015	
3	Athereya, J							1	1								1	1	2	**	**	
4	Bufetov, A								1	1								2	2	**	**	
5	Mohammadi, A					2												2	2	2013	2015	
6	Vondrak, J			2														2	2	2015	2016	
7	Wright, A			2														2	2	2015	2016	
8	Aghili, S V				1												1		1	2011	2011	
9	Ashrafzadeh, A					1												1	1	2010	2013	
10	Ashrafzadeh, H					1												1	1	2010	2010	
11	Bagher, M												1					1	1	2014	2014	
12	Beheshti, Roya		1														1		1	1999	1999	
13	Hedayati, M T		1														1		1	2009	2009	
14	Lindenstrauss, E		1														1		1	2008	2008	
15	Mahmoodian, ES		1														1		1	1995	1995	
16	Mirzakhani, F														1			1	1	2014	2014	
17	Modanloo, Y															1		1	1	2014	2014	
18	Rafi, K					1												1	1	2014	2014	
19	Sadeghi, M R															1		1	1	2014	2014	
20	Soltanifar, M				1													1	1	2011	2011	
21	Zograf, P			1														1	1	2015	2015	
1-21	Total	15	12	12	5	5	5	2	2	2	2	1	1	1	1	1	35	32				



**Figure 1:** Year-wise distribution and cumulative no. of papers.

**Table 7: Use of publication channels.**

Sl. No.	Communication channels	Country	Papers	%	CT (%)	Period	
						FYP	LYP
<b>Gr. A</b>	<b>Journal &amp; Periodicals (J&amp;P) (54.26%)</b>						
1	Annals of Mathematics	USA	2	5.70	5.70	2008	2015
2	International Mathematics Research Notices	UK	2	5.70		2008	2008
3	Inventiones Mathematicae	Germany	2	5.70		2007	2015
4	Journal of Modern Dynamics	USA	2	5.70	22.8	2011	2011
5	American Mathematical Monthly	USA	1	2.86	25.66	1998	1998
6	Bulletin of the Institute of Combinatorics and its Applications	Canada	1	2.86		1996	1996
7	Contemporary Mathematics	USA	1	2.86		2007	2007
8	Duke Mathematical Journal	USA	1	2.86		2012	2012
9	Eastern Mediterranean Health Journal	Switzerland	1	2.86		2009	2009
10	European Journal of Social Sciences	Australia	1	2.86		2011	2011
11	Geometric and Functional Analysis	Germany	1	2.86		2015	2015
12	Journal of Differential Geometry	Switzerland	1	2.86		2013	2013
13	Journal of Mazandaran University of Medical Sciences	Iran	1	2.86		2014	2014
14	Journal of the American Mathematical Society	USA	1	2.86		2007	2007
15	Mathematical Applications.	Netherlands	1	2.86	54.26	1995	1995
<b>Gr. B</b>	<b>Conference Proceedings (CP) (8.58%)</b>						
16	Proceedings of the International Congress of Mathematicians	India (Hyderabad)	1	2.86	57.12	2010	2010
17	Proceedings of the Twenty-Sixth Annual ACM-SIAM Symposium on Discrete ...	USA	1	2.86		2014	2014
18	4th International Conference on Distance Learning and Education (ICDLE)	USA	1	2.86	62.84	2010	2010
<b>Gr.C</b>	<b>Preprint (PP) or (online) (31.44%)</b>						
19	arXiv preprint arXiv	Online	6	17.14	79.98	2012	2016
20	Weil-Petersson volumes and the Witten-Kontsevich formula. Preprint	Online	1	2.86	82.84	2003	2003
21	Research prospectus. Preprint (Mirz2.pdf)	Online	1	2.86		2003	2003
22	Short closed geodesics on random hyperbolic surfaces of large genus. Preprint	***	1	2.86		***	***
23	Simple geodesics on hyperbolic surfaces and the volume of the moduli space of curves. Preprint	Online	1	2.86		2003	2003
24	Proceedings of the Ahlfors-Bers Colloquium. Preprint	***	1	2.86	94.28	***	***
<b>Gr.D</b>	<b>Books / Festschrift (5.72%)</b>						
25	Elementary number theory, challenging problems (Farsi),	Iran	1	2.86	97.14	1999	1999
26	Combinatorics Advances	Canada	1	2.86	100	1995	1995
	Total		35	100			
1-26							

\*\*\*could not be ascertained.

**Table 8: Keyword frequency.**

Keywords	Frequency
Moduli space	9
Hyperbolic surfaces	6
Weil-Petersson volumes	5
Closed geodesics	4
Curves	3
5-cycles	2
Affine invariant submanifold	2
Ergodic theory	2
Large genus	2
Measured laminations	2
Riemann surfaces	2
Simple geodesics	2
SL (2, R) action	2
Sperner's colorings	2
Tripartite graphs	2

required geometric progression (1 : n : n<sup>2</sup>). Instead of increasing multiplicatively, the number of channels fluctuates irregularly, with the third zone even showing a decrease rather than the expected expansion.

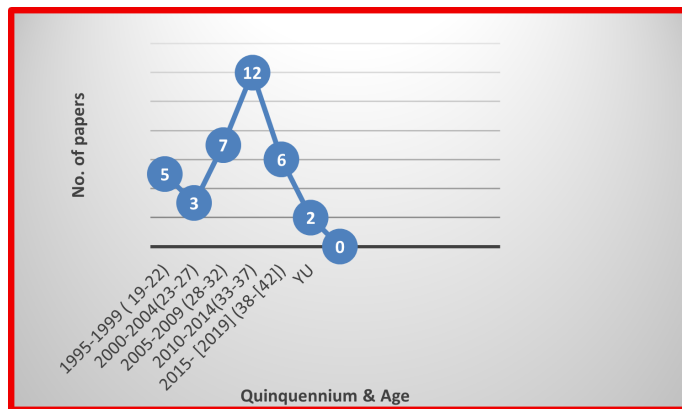
Therefore, due to both the unequal distribution of articles among zones and the failure of channel ratios to follow a geometric progression, the dataset does not satisfy the fundamental conditions of Bradford's Law.

**Keyword Frequency**

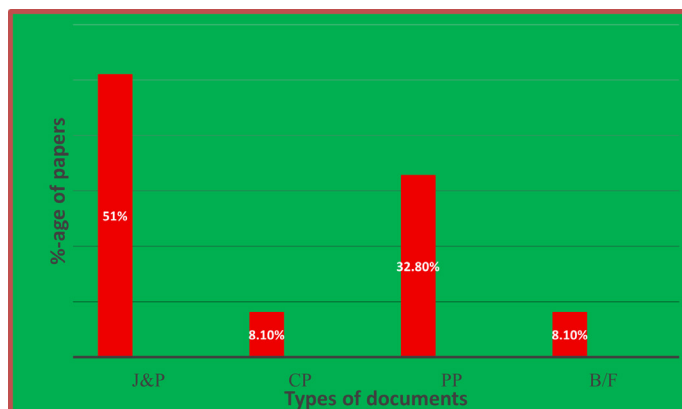
Table 8 depicts the keyword frequency => 2. Out of them, 10 keywords have appeared more than two times.

**DISCUSSION**

During 1995-2016, she has produced 35 papers in total, out of which two papers do not have date of publications. However, out of them, Mirzakhani is the first author in 8 papers, second author in 10 papers, third and fourth author in one paper each. Overall, she has published 12 papers as co-author. Mirzakhani's first paper was published when she was 18 and her scientific productive life spanned 22 years. The 50-percentile productivity life was 17 while chronological age was 34. During 1997, 2000 to 2002 and 2004-2006, there was no publication. It is also observed that she has produced the largest number of papers as single author (n=15). Mirzakhani's maximum single-authored papers are 8, produced during 2007-2016. Most of the collaboration took place during 2008-2016. Of the collaborated papers, maximum are first- and second-authored papers. During 1999, 2009, 2011-2012 and 2014-2015, all her papers were collaborative and hence collaboration coefficient was one. Overall, it is 0.57.



**Figure 2:** Quinquennium & Age- wise publications.



**Figure 3:** Communication channel wise publications.

This distribution of co-author's publications aligns with Lotka's Law, which suggests an inverse-square relationship between the number of authors and their productivity. Hence, the data set in Table 4 supports Lotka's Law.

The dataset does not conform to Bradford's Law because results show that the distribution of articles across communication channels deviates significantly from the expected pattern.

In the first quinquennium of her active carrier, her productivity was 1 per year which gradually increased up to 2.4 in fourth quinquennium 2010-2014 (age 33-37) and peaked. After that it declined and she did not complete the last quinquennium (Table ) due to her untimely death in 2017. Year of publication of last two papers could not be ascertained.

The author contributed 15 papers without any collaboration during her productive career. The rest 20 papers are produced with collaboration. Of the collaborative papers, 12 were two-authored, 5 three-authored, 2 four-authored and only one was five-authored. Among the collaborative papers, two-author collaboration has generated the largest number of papers i.e. 12 with the time span of 22 years. Three-author collaboration has generated five papers in a time span of six years, four-author collaboration two papers and five author-collaboration one paper in a time span of one year. As year of publication could not be ascertained for one each

of one- and four-authored papers, figure of span in one-authored paper has been shown excluding one year and of span in four authored papers could not be ascertained.

In case of by line status, Mirzakhani appeared as the second in the highest number of papers i.e. 10. She occupied the first position in eight, third and fourth position in one paper each. She had no paper as fifth author.

Mirzakhani collaborated with 20 researchers till 2016 and produced as many as 9 papers in collaboration with A Eskin. A Eskin had seven papers as main and two papers as co-author during 2011-2015. A group of five collaborators of Mirzakhani includes J Athereya, A. Bufetov, A Mohammdi, J Vondrak, and A Wright and they produced two papers each. Another group of 14 collaborators had one paper each.

Mirzakhani used 26 communication channels to disseminate the results of her research of which arXiv preprint arXiv (a Preprint server) tops of the list (6 papers) followed by *Annals of Mathematics* (2), *International Mathematics Research Notices* (2), *Inventiones Mathematicae* (2), and *Journal of Modern Dynamics* (2). Here, publication concentration, and publication density are to be as 53.85 and 1.35 per year respectively.

Majority of her papers appeared in American journals. Her publications also emanated from UK, Germany, Switzerland, Canada, Iran, and India.

The keyword *Moduli space* ranks first indicating her concentration on the topic. This is followed by *Hyperbolic surfaces* ( $n=6$ ), *Weil-Petersson volumes* ( $n=5$ ), *Closed geodesics* ( $n=4$ ), and *Curves* ( $n=3$ ). These apart, another 41 keywords have been used only once in the titles of her publications.

## CONCLUSION

Maryam Mirzakhani demonstrated a remarkable and focused research trajectory, reflected in her total of 35 publications, comprising 15 single-authored and 20 collaborative works. She began her scholarly journey at an exceptionally young age, publishing her first paper in 1995 at just 18. Her most productive phase occurred between 2010 and 2014, when she consistently produced around three papers per year during the age range of 33 to 37, highlighting a period of sustained intellectual maturity and output.

Her productivity coefficient reached its peak value of 1.0 in multiple years—1999, 2009, 2011–2012, and 2014–2015—indicating periods of optimal scholarly contribution. Among her collaborators, Alex Eskin emerged as her most significant and frequent research partner, playing a central role in her collaborative work.

Mirzakhani disseminated her research across 26 communication channels, with arXiv leading as the most utilized platform (6 papers). Other prominent journals include *Annals of*

*Mathematics*, *International Mathematics Research Notices*, *Inventiones Mathematicae*, and *Journal of Modern Dynamics*, each contributing two publications.

Her publication concentration was calculated at 53.85, with a publication density of 1.35, indicating a relatively focused yet impactful dissemination pattern. The most frequently occurring keywords in her work “Moduli space” (nine occurrences) and “Hyperbolic surfaces” (six occurrences) underscore her deep engagement with complex geometric structures, firmly establishing her as a leading figure in modern mathematical research.

Her achievements, crowned by the prestigious Fields Medal in 2014, stand not only as a personal triumph but also as a beacon of possibility for future mathematicians. Even in the face of adversity, she remained committed to knowledge and discovery, embodying the true spirit of scientific inquiry.

Mirzakhani was very modest, and hesitant to take credit. After achieving the Fields Medal in 2014 she acknowledged saying, “I will be happy if it encourages young female scientists and mathematicians” (Phippen, 2017). She was diagnosed with breast cancer in 2013. In 2016 the cancer spread to her bone marrow and liver. It is extremely sad to note that the most prolific and the brightest young star in mathematics died on 14 July 2017 at the age of 40 at a hospital in California (Wikipedia, 2017). Her untimely demise is a universal loss in mathematical research. This study is offered as a humble tribute to her extraordinary life and contributions. It also carries a message of deep respect and sympathy to her loved ones, especially her daughter Anahita, whose mother’s legacy will forever illuminate the path of mathematical research. In remembering Mirzakhani, the global academic community honors not just a remarkable mathematician, but a timeless inspiration whose light continues to guide and uplift the world of science.

## ACKNOWLEDGEMENT

This work is dedicated with deep respect to my teacher and co-author, Late Prof. B. K. Sen, whose guidance, constant encouragement, and steadfast support instilled in me the values of diligence and perseverance. His mentorship continues to inspire my academic journey and motivates this effort to honor the contributions of great minds in science.

## ABBREVIATIONS

**CA:** Co-author; **CT:** Cumulative total; **DC:** Degree of collaboration; **MA:** Main author; **MAP:** Multiple authorship papers; **TP:** Total papers; **PPA:** Paper productive age; **YU:** Year Unknown; **FYP:** First year of publication; **LYP:** Last year of publication; **J&P:** Journal and Periodical; **CP:** Conference Proceedings; **PP:** Preprint; **B/F:** Books/Festschrift; **PD:** Publication Density; **PBC:** Publication Concentration.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## SUMMARY

Maryam Mirzakhani had a distinguished yet focused research career, producing 35 publications, including 15 single-authored and 20 collaborative works. Beginning her scholarly journey at the age of 18 in 1995, she reached her peak productivity between 2010 and 2014, maintaining a consistent output and achieving a productivity coefficient of 1.0 in several years. Her most prominent collaborator was Alex Eskin. She disseminated her research across 26 communication channels, with arXiv being the most frequently used, followed by leading journals such as *Annals of Mathematics* and others. Her work primarily focused on “Moduli space” and “Hyperbolic surfaces,” highlighting her deep engagement with complex geometry. Her contributions were globally recognized with the prestigious Fields Medal in 2014. Known for her humility, she hoped her achievement would inspire young women in science. Despite being diagnosed with breast cancer in 2013, she remained dedicated to her work until her untimely passing in 2017 at the age of 40. Her death marked a profound loss to the mathematical community. This study stands as a tribute to her extraordinary legacy, which continues to inspire future generations and honor her enduring impact on science.

## REFERENCES

- AMS. (2017, July 18). Maryam Mirzakhani, 1977-2017. American Mathematical Society (AMS). [http://www.ams.org/news?news\\_id=3617](http://www.ams.org/news?news_id=3617)
- AMS. (n.d.). Maryam Mirzakhani: 1977-2017. Biographies of Women in Mathematics. American Mathematical Society (AMS). <https://mathwomen.agnesscott.org/women/mirzakhani.htm>
- Behera, M., & Meher, D. (2024). Scientometric Portrait of Dr Raghuram Rajan: An Economist and 23rd RBI Governor. *Journal of Data Science, Informetrics, and Citation Studies*, 3(2), 206-15.
- CV (n.d.). Curriculum Vitae Maryam Mirzakhani. (n.d.). <https://cap.stanford.edu/profiles/viewCV?facultyId=56535&name=Maryam...>
- Dutta, B. (2019). Bibliometric Portrait of B K Sen: A Librarian, Information Scientist and scientometrician. *Malaysian Journal of Library and Information Science*, 24(1), 1-21.
- Huded, S., Vanjari, R., Alam, A., & S., T. (2023). Professor Madhav Gadgil: A Bibliometric Portrait. *Journal of Data Science, Informetrics, and Citation Studies*, 2(3), 243-54.
- IMU. (2015). IMU Prizes 2014. <http://www.mathunion.org/general/prizes/2014/>
- Kademani, B. S., Kalyane, V. L., & Kuma, V. (2002). Scientometric Portrait of Nobel Laureate Harold W. Kroto. *SRELS Journal of Information Management*, 39(4), 409-43
- Kalyane, V. L., & Sen, B. K. (1998). Scientometric Portrait of C. R. Bhatia, an Indian Geneticist and Plant Breeder. *Malaysian Journal of Library and Information Science*, 3(1), 25-42.
- Koley, S. (2024, July-December). Dr. Raj Chandra Bose, American-Indian Mathematical Statistician, One of Suler Spoilers: A scientometric Portrait. *JIM: Journal of Information Management*, 11(2), 99-104.
- Koley, S. (2024, November). Bio-Bibliometric Portrait of Justice Fali Sam Nariman, 1959-2024, India's First Additional Solicitor General. *Calcutta University Journal of Information Studies*, XXV, 90-118.

- Koley, S. (2025). A Bio-Bibliometric Analysis of Dr. Suprabhat Mukherjee, a Pioneer of Innovative Approach for Colon Cancer Treatment Using Fluids of Custard Apple (*Annona Reticulata*) Seeds. *Research & Review: Journal of Statistics*, 14(1), 49-62.
- Koley, S., & Goswami, S. (2025a). Dr. Somenath Dutta, discoverer of Micro-RNA (MiRNA) therapeutic to prevent harmful zika virus for liver cancer. *International Journal of Virus Studies*, 2(2), 22-36.
- Koley, S., & Sen, B. K. (2016). Biobibliometric portrait of V L Kalyane, a stellar biobibliometrician. *Annals of Library and Information Studies*, 63, 161-175.
- Lamb, E. (2017, July 17). Mathematics World Mourns Maryam Mirzakhani, Only Woman to Win Fields Medal. *Scientific American*. <https://www.scientificamerican.com/article/mathematics-world-mourns-maryam-mirzakhani-only-woman-to-win-fields-medal/>.
- Manjunath, M., & Ramesha. (2015). Bio-bibliometric profile of Sir. C. V. Raman as seen through Google Scholar. *International Journal of Library and Information Studies*, 5, 41.
- Math.stanford.edu. (n.d.). Maryam Mirzakhani: Some Papers and Submitted Preprints. <http://math.stanford.edu/~mmirzakh/Research.html>
- McMullen, C. T. (2014, August 18). The work of Maryam Mirzakhani. [www.math.harvard.edu/~ctm/papers/home/text/papers/icm14/icm14.pdf](http://www.math.harvard.edu/~ctm/papers/home/text/papers/icm14/icm14.pdf)
- Mirzakhani, M. (2017). Maryam Mirzakhani, RIP. The Reference Frame: <http://mots.blogspot.in/2017/07/maryam-mirzakhani-rip.html>
- Mondal, D., Raychoudhury, N., & Sarkhel, J. (2018). Scientific contribution of Professor Mahalanobis: a bio-bibliometric study, *Current Science*, 115 (8), 1470-1476.
- Mukherjee, B. (2013). A Scientometric Profile of Prof. Laljit Singh as seen through Web of Science and Scopus. *Annals of Library and Information Studies*, 60(3), 195-203.
- Murray, M. (2016). *Women Becoming Mathematicians: Creating a Professional Identity in Post-World War II America*. MIT Press, 2000
- Myers, A., & Carey, B. (2017, July 15). Maryam Mirzakhani, Stanford mathematician and Fields Medal winner, dies. *Stanford News*. <http://news.stanford.edu/2017/07/15/miryam-mirzakhani-stanford-mathematician-and-fields-medal-winner-dies/>.
- Nobelprize.org. (2024). Nobel Prize in Physiology or Medicine 2024. <https://www.nobelprize.org/>
- O'Connor, J. J., & Robertson, E. F. (n.d.). MacTutor History of Mathematics Archive. University of St Andrews. <https://mathshistory.st-andrews.ac.uk/>
- Peer, J. (n.d.). About - Preprints - What is a Preprint? <https://peerj.com/about/preprints/what-is-a-preprint/>
- Phippen, J. W. (2017, July 15). The First Woman to Win Math's Highest Award Dies at 40. *The Atlantic*. <https://www.theatlantic.com/news/archive/2017/07/miryam-mirzakhani/533799/>
- prizes/medicine/2024/summary/?
- ResearchGate. (2017, July 17). In Memory of our Beloved Maryam Mirzakhani. <https://pbs.twimg.com/media/...>
- Roberts, S. (2017). Maryam Mirzakhani's Pioneering Mathematical Legacy. *The New Yorker*. <http://www.newyorker.com/tech/elements/miryam-mirzakhani-pioneering-mathematical-legacy>.
- Sangam, S., & Savanur, K. (2010). Eugene Garfield: A scientometric portrait. *COLLNET Journal of Scientometrics and Information Management*, 41(4), 41-51.
- Sen, B. K., & Karanjai, A. (2003). Dr. Biman Bagchi: Bibliometric Portrait. All India Conference IASLIC, 24th, 15-18 December, 2003. Dehra Dun.
- Sen, S., & Gan, S. (1990). Biobibliometrics: Concepts and application in the Study of Productivity of Scientists. *International Forum on Information and Documentations*, 15(3), 13-21.
- Srimurugan, A., & Nattar, S. (2008, Jan-Jun). Dr. K. Veluthambi: A Biobibliometric study. *Indian Journal of Information Science and Service*, 2(1), 23-30.
- Teli, S., & Maity, A. (2021, June). A Bio-Bibliometric Portrait of Stephen William Hawking. *IASLIC Bulletin*, 66(2), 122-128.
- White, M. L. (2017, July 15). Maryam Mirzakhani: Iranian mathematician. *Encyclopædia Britannica*. <https://www.britannica.com/biography/Maryam-Mirzakhani>
- Wikipedia. (2017, July 19). Maryam Mirzakhani. Wikipedia, the free encyclopedia: [https://en.wikipedia.org/wiki/Maryam\\_Mirzakhani](https://en.wikipedia.org/wiki/Maryam_Mirzakhani)
- Wikipedia. (n.d.). Maryam Mirzakhani: Curriculum Vitae pdf (References in Maryam Mirzakhani). Wikipedia, the free encyclopedia: [https://en.wikipedia.org/wiki/Maryam\\_Mirzakhani](https://en.wikipedia.org/wiki/Maryam_Mirzakhani)

**Cite this article:** Koley S, Sen BK. From Tehran to the World Stage: The Inspiring Mathematical Legacy of Maryam Mirzakhani (1977-2017). *Info Res Com*. 2026;3(2):168-77.