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Abhay Maurya

Mizoram University, abhaymaurya17@hotmail.com

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Scientometric Study of Nobel Laureate of Chemistry Department, Massachusetts Institute of Technology (MIT)

Abhay Maurya

Research Scholar, Mizoram University

ABSTRACT

The present study aims to bring out the contributions made by the Nobel Laureates associated with the Department of Chemistry, MIT at any time in their academic career. Further, it views the impact of the scholarly publications produced by these Nobel Laureates, all the publication data were retrieved from the Scopus database for analysis. The study focuses on Publication per year, Bibliographic forms of publications, Authorship pattern, Degree of collaboration, Co-Authorship, Citation analysis, Channel of communication, h-index and Language pattern of research publications.

Keywords: Scientometrics, Bibliometrics, Nobel laureate, Publications, Chemistry Department, Massachusetts Institute of Technology, MIT, Scopus

1. INTRODUCTION

The Massachusetts Institute of Technology (MIT) is a private research university established in Cambridge, Massachusetts, with an urban campus that extends more than a mile (1.6 km) alongside the Charles River. MIT incorporated on April 10, 1861, and its motto is “Mens et manus” which means “Mind and hand”. Till March 2019, MIT produce 93 Nobel laureates, 26 Turing Award winners, and 8 Fields Medalists are alumni, faculty members, or researchers also 58 National Medal of Science recipients, 29 National Medals of Technology and Innovation recipients, 50 MacArthur Fellows, 73 Marshall Scholars, 45 Rhodes Scholars, 41 astronauts and 16 Chief Scientists of the US Air Force have been affiliated with MIT. According to the QS World University Ranking MIT holds number 1 position. This institution has a strong entrepreneurial culture, and the aggregated annual revenues of companies founded by MIT alumni (\$1.9 trillion) would rank roughly as the tenth-largest economy in the world (2014). MIT is a member of the Association of American Universities (AAU).

The Chemistry Department of MIT is one of the top university faculties in the world. Member of MIT Chemistry department (Students, Researcher, Faculties, and Scientists) covers all fields of chemistry such as organic chemistry, biological chemistry, materials science, physical chemistry, inorganic chemistry, environmental chemistry, and nanoscience. The Chemistry Department of MIT established since the Institute opened its doors in 1865. It started with two professors, Charles W. Eliot and Francis H. Storer, and a class of 15 students. The department moved in 1866 and open new quarters in the basement of the Rogers Building in Boston. First Ph.D. was awarded in 1907 in the field of physical chemistry to three students.

2. REVIEW OF LITERATURE

Kademani, et al (2002) in their study on Department of Atomic Energy, Bhabha Atomic Research Centre admitted that publication productivity is one of the most necessary indicators to identify career advancement of the scientists with additional responsibilities and found that publication productivity of BARC is very high. The publishing behavior indicates that scientists were favorably selective in publishing their research results in highly specialized journals. Sevukan, Nagarajan, and Sharma, (2007) studied publications in plant sciences published by teaching staff in central universities of India and the year-wise output varies. It registers an increase in one year and next year down. BHU faculties research output is top followed by JNU, AMU, and PU. Other universities have very insignificant contributions. Research collaboration is 30.41%, 29.86%, and 21.37% of articles written by two, three and four authors respectively. The contributions of teaching staff are fairly collaborative, the nature of collaboration is local most of the time. Nandi and Bandyopadhyay (2009) conducted study on the Chemistry Department of the University of Burdwan during 1960-2000. Study shows that the University of Burdwan mostly focus on inorganic chemistry research. Researchers published his/her paper is highly specialized and high impact factor journals also majority of researchers published in Indian journals because it is easier for publication.

Sudhier and Kumar (2010) gave an interesting and important findings-based information source used by scholars and identified important areas of research and salient features of research publications. This study allows conclusions about the research approach and citation behavior. Jeyshankar, Babuand Rajendran (2011) analysed that the performance of institutional research and development activities brings light on the contribution of the individual scientists and the

institution CECRI research. The study indicated that the research trend in the electrochemistry is collaborative by nature like other disciplines. Nagarkar (2014) attempted a quantitative study of articles published by the teaching staff of the Chemistry department, University of Pune. The study indicates that teaching staffs are very productive in research and their contribution is well known at international and national level. They prefer core journals having high impact factor to publish their research. The number of their contributions is growing especially in the years 2010-2012. Though the main area of research is physical chemistry the faculty members also do research in interdisciplinary areas like computational chemistry, nanotechnology, etc. Nagarkar, Veer, and Kumbhar (2015) performed a quantitative study of articles published by teaching staff of Departments Life Science of SPPU, which indicates that the teaching staff are very productive in research in areas not only Life sciences also in interdisciplinary areas like biochemistry, biophysics, engineering, and medical sciences and environmental sciences.

Neelamma (2015) studied literature published on Crystallography during 1999-2013, reveals that Crystallography literature's growing average rate of 1.001. The relative growth rate of research output slowly decreases. Doubling time slowly increases. English is the most preferred language; China and the USA are the major contributors, further, research article is the most preferred form of literature to communicate scientific work. China is encouraging research activities in the field of Crystallography. It shows Crystallography is one of the emerging research areas in Basic Science. Siwach and Kumar (2015) investigated the research productivity of Maharshi Dayanand University, Rohtak and found that chemistry has been the front runner as research subject in the university. Radhakrishnan and Velmurugan (2015) focus on the scholarly contributions of the faculty members during 1998 and 2014 of Periyar University. He found the publication growth rate was very low till 2004 and there has been a balanced growth of research publications since 2005. Researchers felt that the Periyar University has provided the necessary facilities to enhance its research productivity towards knowledge production. Siwach and Parmar (2018) studied the research contributions of CCS Haryana Agricultural University, Hisar and stated that CCSHAU Hisar is ranked fourth in the ICAR ranking of Agricultural Universities, 2016-17. The major publication of the university falls under the subject category of agricultural and biological sciences.

3. SCOPE OF STUDY

The study is confined to draw a scientometric portrait of Nobel Laureates in the field of Chemistry awarded. Following Table displays, the Nobel Laureates in the field of Chemistry covered under study.

Table1: List of Nobel Laureates awarded

SN	Nobel Laureates	Year	Awarded for his work	Affiliation at the time of the award
1	Robert B. Woodward	1965	“organic syntheses”	Harvard University
2	Robert S. Mulliken	1966	“For his fundamental work concerning chemical bonds and the electronic structure of molecules by the molecular orbital method”	University of Chicago
3	Geoffrey Wilkinson	1973	“For their pioneering work, performed independently, on the chemistry of the organometallic, so called sandwich compounds”	Imperial College, London
4	Charles J. Pedersen	1987	“For their development and use of molecules with structure-specific interactions of high selectivity”	Du Pont, Wilmington, DE, USA
5	Sidney Altman	1989	‘For their discovery of catalytic properties of RNA”	Yale University
6	Thomas R. Cech			University of Colorado
7	Elias J. Corey	1990	“For his development of the theory and methodology of organic synthesis”	Harvard University
8	Mario Molina	1995	“For their work in atmospheric chemistry, particularly concerning the formation and decomposition of ozone”	MIT
9	K. Barry Sharpless	2001	“For his work on chirallycatalysed oxidation reactions”	The Scripps Research Institute, USA
10	Aaron Ciechanover	2004	“For the discovery of ubiquitin-mediated protein degradation”	Israel Institute of Technology, Israel
11	Richard R. Schrock	2005	“For the development of the metathesis method in organic synthesis”	MIT

4. OBJECTIVE/CRITERIA OF THE STUDY

For measuring the research performance of Scientists, the study covers the following aspects:

- | | |
|--|-----------------------------|
| 1. Publication per year | 5. Co-Author |
| 2. Bibliographic forms of publications | 6. Citation |
| 3. Authorship pattern | 7. Channel of communication |
| 4. Degree of collaboration | 8. h-index |
| | 9. Language |

5. METHODOLOGY

The study is confined to the scientometric analysis of the research performance of scientists associated with the Department of Chemistry, Massachusetts Institute of Technology, USA. The data were obtained from the Scopus database. The study covers all the eleven scientists those who are alma mater, are working in the department as well as retired faculty member also.

6. ANALYSIS

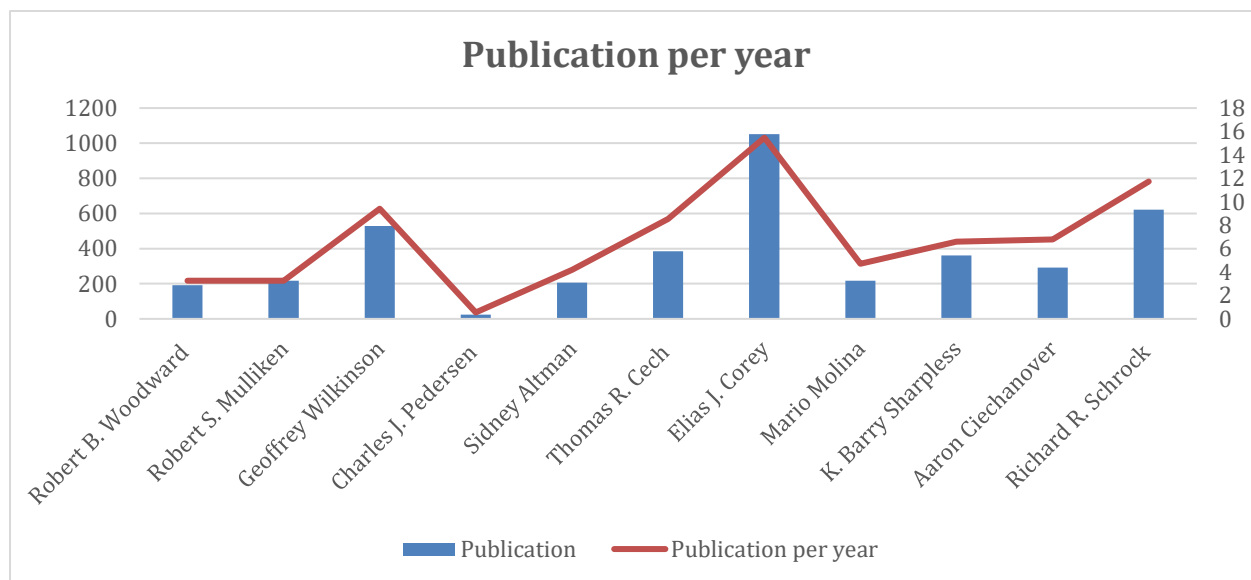
6.1 Publication per Year

From Table 2, It show that Elias J. Corey has highest number of publication 1052(25.67%) followed by Richard R. Schrock 622(15.18%) and Geoffrey Wilkinson 528(12.88%) also Publication per year is highest of Elias J. Corey 15.47(20.77%) followed by Richard R. Schrock 11.73(15.74%) and Geoffrey Wilkinson 9.42(12.64%).

$$\text{Publication Per Year} = \frac{\text{Total Publication}}{\text{Year [Last – First]}}$$

Table 2: Publication per year of research publications

S N	Nobel Laureates	Duration	Publication	%	Cum. Pub.	Publication per year	%
1	Robert B. Woodward	1934 – 1993	192	4.68	192	3.25	4.36
2	Robert S. Mulliken	1920 – 1987	218	5.32	410	3.25	4.36
3	Geoffrey Wilkinson	1951 – 2007	528	12.88	938	9.42	12.64
4	Charles J. Pedersen	1949 – 1992	24	0.58	962	0.55	0.73
5	Sidney Altman	1970 – 2019	206	5.02	1168	4.20	5.63
6	Thomas R. Cech	1973 – 2018	384	9.37	1552	8.53	11.45
7	Elias J. Corey	1951 – 2019	1052	25.67	2604	15.47	20.77
8	Mario Molina	1973 – 2019	217	5.29	2821	4.71	6.32
9	K. Barry Sharpless	1964 – 2019	362	8.83	3183	6.58	8.83
10	Aaron Ciechanover	1976 – 2019	292	7.12	3475	6.79	9.11
11	Richard R. Schrock	1966 – 2019	622	15.18	4097	11.73	15.74
	Total		4097	100		74.48	



6.2 Bibliographic Forms of the Publication

Table 3 depicts the forms of research publications out of the total of 4097 research publications published by scientists. The preferred forms of research publications have been identified from the research publications of scientists. These are an article, reviews, short surveys, editorial, erratum, conference paper, letter, note, book chapter, and book. From the observation of Table 2, it has been found that scientists preferred “Journal article” as the highest used forms of research publications 3389(83.79%) followed by “letter” 258(6.25%) and “review” 139(3.39%).

Elias J. Corey published highest journal article 888(25.20%) followed by Richard R. Schrock 538(15.87%) and Geoffrey Wilkinson 475(14.01%). Highest number of review by Aaron Ciechanover 55(40.28%) followed by Thomas R. Cech 26(18.70%) and Sidney Altman 17(12.23%). There is no review given by Geoffrey Wilkinson. Highest number of short surveys produced by Thomas R. Cech 14(41.17%) followed by K. Barry Sharpless 9(26.47%). Highest number of editorial written by Thomas R. Cech 10(23.25%) followed by Elias J. Corey and K. Barry Sharpless 9(20.93%). Robert B. Woodward, Charles J. Pedersen, and Elias J. Corey have not written a short survey. Highest number Erratum searches and corrected by Elias J. Corey and Richard R. Schrock 10(19.23%). The table also shows that highest Conference Paper produced by Richard R. Schrock 19(34.54%). Highest number of Letters written by Richard R. Schrock 99(38.37%) followed by Robert B. Woodward 40(15.50%). Four-person (Robert B. Woodward, Geoffrey Wilkinson, Charles J. Pedersen, and Sidney Altman) have not to produce conference papers. Highest number of notes written by Elias J. Corey 20(25.97%) followed by Geoffrey Wilkinson 15(19.48%). K. Barry Sharpless has not to write the note. Highest number of Book Chapter written by Geoffrey Wilkinson 20(54.05%) followed by Aaron Ciechanover 7(18.91%). Lastly the highest number of books written by Elias J. Corey 6(50%). The above analysis shows that the most productive author is Elias J. Corey.

Table 3: Forms of research publications

SN	Nobel Laureates	Article	Review	Short Survey	Editorial	Erratum	Conference Paper	Letter	Note	Book Chapter	Book	Total
01	Robert B. Woodward	144	2			3		40	3			192
02	Robert S. Mulliken	169	3	2		3	3	32	6			218
03	Geoffrey Wilkinson	475		1	1	3		12	15	20	1	528
04	Charles J. Pedersen	18	1			3		1	1			24
05	Sidney Altman	169	17	5	3	3		5	3	1		206
06	Thomas R. Cech	311	26	14	10	6	5	5	5	2		384
07	Elias J. Corey	888	13		9	10	7	99	20		6	1052
08	Mario Molina	192	2	3	2	2	8	6	1	1		217
09	K. Barry Sharpless	304	7		3	2	4	31	9	2		362
10	Aaron Ciechanover	182	56	8	9	7	9	2	7	7	5	292
11	Richard R. Schrock	538	12	1	6	10	19	25	7	4		622
	Total	3389	139	34	43	52	55	258	77	37	12	4097
	%	82.79	3.39	0.83	1.04	1.26	1.36	6.25	1.87	0.90	0.29	

6.3 Authorship Pattern

Table 4 displays the authorship pattern of Scientists. It has been observed that out of total 4089 research publications, the maximum belongs to two authors 1284(31.40%) followed by three authors 849(20.76%) and five to ten authors 806(19.71%). The “single-authored” research publication is 416(10.17%). The “eleven to fifteen authored” research publications 75(1.83%) and “sixteen to twenty authored” research publications 18(0.48%) are less preferred amongst faculty members whereas more than twenty authored research publications are the least preferred 18 (0.44%). From the observation of Table 3, it is inferencing that Robert S. Mulliken has the highest number of “single-authored” research publications 161(38.70%) followed by Richard R.

Schrock 47(11.29%), and Thomas R. Cech 45(10.81%) while in the case of “two authored” research publications, Elias J. Corey has the highest number of research publications 515(40.10%) followed by Thomas R. Cech 149(11.60%), and Geoffrey Wilkinson 129(10.04). In the case of “three authored” research publications, Elias J. Corey have the highest number 255(30.03%) of research publications followed by Geoffrey Wilkinson 146(17.19%), and Richard R. Schrock 133(15.66%). There is no publication in three authored by Charles J. Pedersen. In the case of “four authored” research publications, Geoffrey Wilkinson has the highest number 133(21.41%) of research publications followed by Richard R. Schrock 132(21.25%), and Elias J. Corey 113(18.19%). There is no publication in four authored by Charles J. Pedersen. In the case of “five to ten authored” research publications, Richard R. Schrock has the highest number 194(24.06%) of research publications followed by Elias J. Corey 130(16.12%), and Geoffrey Wilkinson 103(12.77%). There is no publication in five to ten authored by Charles J. Pedersen. In the case of “eleven to fifteen authored” research publications, K. Barry Sharpless have the highest number 23(30.66%) of research publications followed by Mario Molina and Aaron Ciechanover 15(20%). There is no publication in eleven to fifteen authored by Robert B. Woodward, Robert S. Mulliken, Charles J. Pedersen. In the case of “sixteen to twenty authored” research publications, Mario Molina has the highest number 8(40%) of research publications followed by Aaron Ciechanover 6(30%). There is no publication in sixteen to twenty authored by Robert S. Mulliken, Geoffrey Wilkinson, Charles J. Pedersen, Sidney Altman, Elias J. Corey.

Table 4: Authorship Pattern

S N	Author	Author								Total	%
		1	2	3	4	5-10	11-15	16-20	>20		
1	Robert B. Woodward	22	80	31	24	31		2	2	192	4.69
2	Robert S. Mulliken	161	38	15	2	2				218	5.33
3	Geoffrey Wilkinson	16	129	146	133	103	1			528	12.91
4	Charles J. Pedersen	20	4							24	0.58
5	Sidney Altman	27	77	38	28	31	3		2	206	5.03

6	Thomas R. Cech	45	152	75	52	53	4	1	2	384	9.31
7	Elias J. Corey	31	515	255	113	130	7		1	1052	25.72
8	Mario Molina	6	32	36	37	80	15	8	3	217	5.28
9	K. Barry Sharpless	6	114	67	49	101	23	2		362	8.85
10	Aaron Ciechanover	35	44	53	51	81	15	6	7	292	7.04
11	Richard R. Schrock	47	107	133	132	194	7	1	1	622	15.21
	Total	416	1292	849	621	806	75	20	18	4097	
	%	10.17	31.4	20.76	15.18	19.71	1.83	0.48	0.44	100	

6.4 Degree of Collaboration

Subramanyam (1983) proposed the Degree of Collaboration in research publications can be measured with the help of the number of single-authored and multi-authored publications by using the Subramanyam formula

$$\text{Degree of Collaboration (C)} = Nm / (Nm + Ns)$$

Where C = Degree of Collaboration

Ns = Number of single authors

Nm = Number of multiple authors

Table 5: Degree of Collaboration in research publications

S N	Nobel Laureates	Single Authored (Ns)	Multi-Authored Publications (Nm)	Total (Ns+Nm)	Degree of Collaboration
1	Robert B. Woodward	22	170	192	0.88
2	Robert S. Mulliken	161	57	218	0.26
3	Geoffrey Wilkinson	16	512	528	0.96
4	Charles J. Pedersen	20	4	24	0.16
5	Sidney Altman	27	179	206	0.86
6	Thomas R. Cech	45	339	384	0.88
7	Elias J. Corey	31	1021	1052	0.97
8	Mario Molina	6	211	217	0.97

9	K. Barry Sharpless	6	356	362	0.98
10	Aaron Ciechanover	35	257	292	0.88
11	Richard R. Schrock	47	575	622	0.92
	Total	416	3681	4097	

From Table 5, it is observed that Degree of Collaboration is the highest and very strong K. Barry Sharpless(0.98) followed by Elias J. Corey (0.97) and Mario Molina (0.97), while it was moderate for Robert B. Woodward (0.88). There has been weak Degree of Collaboration found for Robert S. Mulliken (0.26), while the weakest was found for Charles J. Pedersen (0.16) The overall Degree of Collaboration for all faculty members was found good.

6.5 Co-Authorship

From table 6, Robert B. Woodward, Geoffrey Wilkinson, Sidney Altman, Thomas R. Cech, Elias J. Corey, Mario Molina, K. Barry Sharpless, Aaron Ciechanover, Richard R. Schrock has highest co-authorship 150(10.68) followed by Robert S. Mulliken 50(3.56%). Geoffrey Wilkinson has co-authorship with Michael B. Hursthouse 148(23.87%) followed by Mario Molina with Luisa T. Molina 121(19.51%) and Richard R. Schrock with Amir H. Hoveyda 86(13.87%).

Table 6: Co-authorship

S N	Nobel Laureates	Co-author	%	Total number	%	Top co-author	Number	%
1	Robert B. Woodward	266	5.23	391	5.51	Sondheimer, Franz S.; Gostei, Jaques	9	1.45
2	Robert S. Mulliken	50	0.98	86	1.21	Rieke, Carol A.; Ermler, Walter C.	6	0.96
3	Geoffrey Wilkinson	355	6.98	1087	15.34	Hursthouse, Michael B.	148	23.87
4	Charles J. Pedersen	4	0.07	4	0.05		1	0.16
5	Sidney Altman	300	5.90	364	5.13	Guerrier-Takada, Cecilia	36	5.80
6	Thomas R. Cech	475	9.34	572	8.07	Zaug, Arthur J.	47	7.58

7	Elias J. Corey	935	18.39	1044	14.73	Austen, K. Frank	54	8.70
8	Mario Molina	530	10.42	751	10.59	Molina, Luisa T.	121	19.51
9	K. Barry Sharpless	585	11.50	764	10.78	Fokin, Valery V.	54	8.70
10	Aaron Ciechanover	993	19.53	779	10.99	Schwartz, Alan L.	58	9.35
11	Richard R. Schrock	591	11.62	1244	17.55	Hoveyda, Amir H.	86	13.87
	Total	5084		7086			620	

6.6 Citation Analysis

From table 7, based on Scopus database citation analysis, Elias J. Corey has highest citation 76827(23.76%) followed by K. Barry Sharpless 74527(23.04%) and Richard R. Schrock 46594(14.41%). K. Barry Sharpless's paper "Click Chemistry: Diverse Chemical Function from a Few Good Reactions" has the highest citation 8808(21.66%) followed by Robert S. Mulliken's paper "Electronic population analysis on LCAO-MO molecular wave functions. I" citation is 8303(20.32%).

Table 7: Citation Analysis

S N	Nobel Laureates	Total Publication	Duration	Citation	%	Highest Citation in a Paper	%
1	Robert B. Woodward	192	1970 - 2020	3487	1.07	2457	6.01
2	Robert S. Mulliken	218	1970 - 2020	1879	0.58	8303	20.32
3	Geoffrey Wilkinson	528	1970 - 2020	13729	4.24	1433	3.50
4	Charles J. Pedersen	24	1970 - 2020	3019	0.93	3984	9.75
5	Sidney Altman	206	1970 - 2020	10616	3.28	1770	4.33
6	Thomas R. Cech	384	1973 - 2020	38619	11.94	1912	4.68
7	Elias J. Corey	1052	1970 - 2020	76827	23.76	2496	6.11
8	Mario Molina	217	1973 - 2020	16960	5.24	2714	6.64
9	K. Barry Sharpless	362	1970 - 2020	74527	23.04	8808	21.56
10	Aaron Ciechanover	292	1976 - 2020	37087	11.46	5841	14.30
11	Richard R. Schrock	622	1970 - 2020	46594	14.41	1127	2.75
	Total	4089		323344	100	40845	100

6.7 Channel of Communication

From table 8, it is found that Aaron Ciechanover used the highest number of journals as a channel of communication, which is 112(18.51%) followed by Elias J. Corey 84(13.88%) and Thomas R. Cech 75(12.96%). In top preferred journal, Journal of the American Chemical Society is most preferred by Elias J. Corey 383(33.68%) followed by Richard R. Schrock used Journal of the American Chemical Society 189(16.62%) and Geoffrey Wilkinson used Journal of the Chemical Society, Dalton Transaction 133(11.69%). Overall Journal of the American Chemical Society most preferred journal 790(69.48%).

Table 8: Channel of Communication

SN	Nobel Laureates	Journal	%	Top Preferred Journal	Ns	%
1	Robert B. Woodward	24	3.81	Journal of the American Chemical Society	122	10.74
2	Robert S. Mulliken	22	3.49	1. Physical Review, 2. The Journal of Chemical Physics	57	5.02
3	Geoffrey Wilkinson	39	6.20	Journal of the Chemical Society, Dalton Transaction	133	11.71
4	Charles J. Pedersen	10	1.58	Journal of the American Chemical Society	10	0.88
5	Sidney Altman	59	9.37	Proceedings of the National Academy of Sciences of The United States of America	40	3.52
6	Thomas R. Cech	75	11.92	Biochemistry	48	4.22
7	Elias J. Corey	92	14.62	Journal of the American Chemical Society	383	33.74
8	Mario Molina	59	9.37	Journal of Physical Chemistry A	30	2.64
9	K. Barry Sharpless	61	9.69	Journal of the American Chemical Society	84	7.40
10	Aaron Ciechanover	116	18.44	Journal of Biological Chemistry	39	3.43
11	Richard R. Schrock	72	11.44	Journal of the American Chemical Society	189	16.65
	Total	629			1135	

6.8 H - Index

From the following graph, it is shown Elias J. Corey's h-index is highest 144 followed by K. Barry Sharpness 119 and Richard R. Schrock 111.

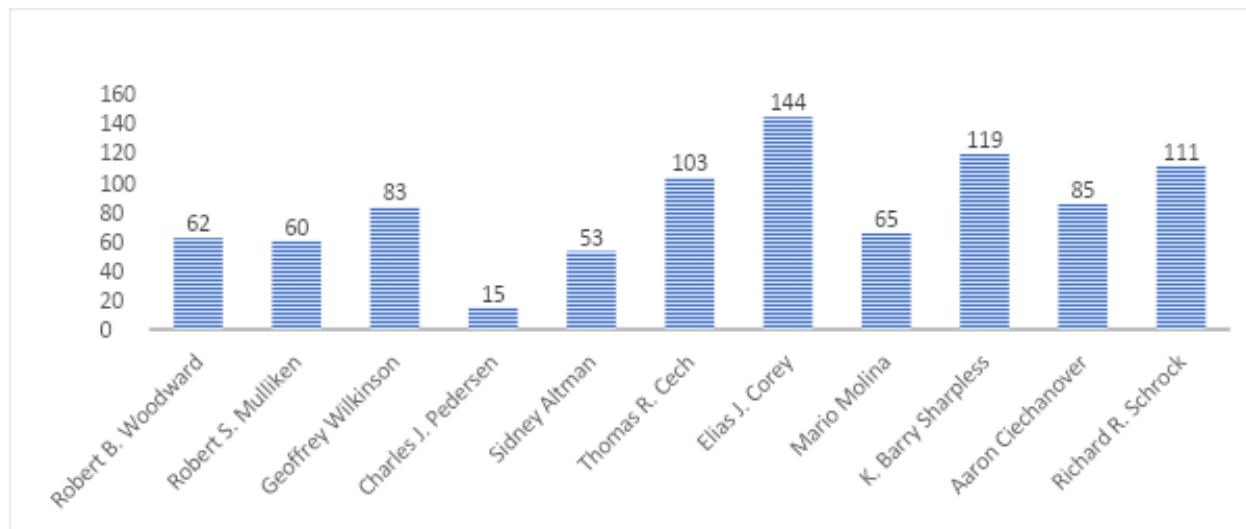


Fig 2. h-index

6.9 Language

From table 9, English appears to be the most preferred language. It holds around 99.43% (4066) of total publications. The second most preferred language is German 15(0.36%) and the third is Spanish 3(0.07%). Elias J. Corey has written the highest number of papers in English 1048(25.77%) followed by Richard R. Schrock 622(15.29%) and Geoffrey Wilkinson 528(12.98%). Robert S. Mulliken, Geoffrey Wilkinson, Charles J. Pedersen, and Richard R. Schrock published only in English, not written in other languages. Mario Molina published one paper "The human climate" published in English and same paper published in Spanish with title "Clima de Los Humanos" also Aaron Ciecharover publish in English and Spanish with title "Intracellular protein degradation: From a vague idea through the lysosome and the ubiquitin-proteasome system and onto human diseases and drug targeting [La degradación intracelular de proteínas. desde una vaga idea, a través del lisosoma y el sistema ubiquitina-proteosoma a las enfermedades humanas y el blanco de las drogas]".

Table 9: Language

S N	Nobel Laureates	Language							Total
		English	German	French	Russian	Spanish	Chinese	Hebrew	
01	Robert B. Woodward	182	10						192
02	Robert S. Mulliken	218							218
03	Geoffrey Wilkinson	528							528
04	Charles J. Pedersen	24							24
05	Sidney Altman	204		1	1				206
06	Thomas R. Cech	384							384
07	Elias J. Corey	1048	3	1					1052
08	Mario Molina	215	1			1			217
09	K. Barry Sharpless	359	1			1	1		362
10	Aaron Ciechanover	290				1		1	292
11	Richard R. Schrock	622							622
	Total	4066	15	2	1	3	1	1	4097
	Rank	I	II	IV	V	III	V	V	

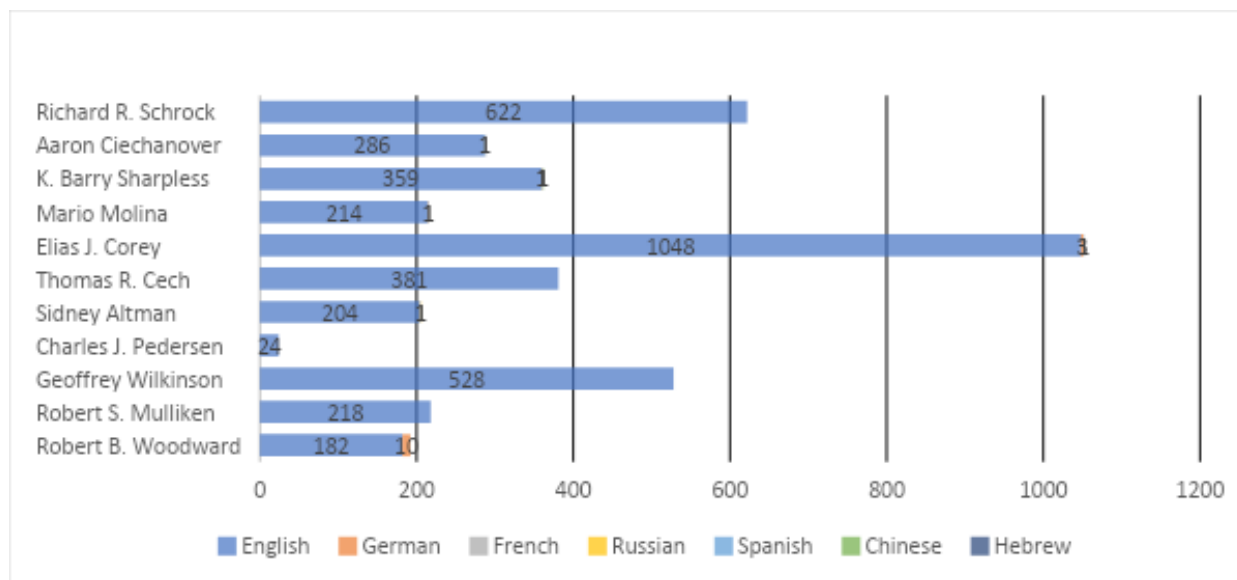


Fig 2. Language ranking

7. CONCLUSIONS

This study focuses on the scholarly contributions of the Nobel laureates affiliated to the Chemistry department, MIT at any time. In terms of publication productivity, Elias J. Corey (20.93) has the highest number of Publications per year and K. Barry Sharpless (0.98) highest no of degree of collaboration while the lowest was found for Charles J. Pedersen (0.16). Scientists have enough source that provided by administrative body of MIT to enhance its research possibility towards knowledge production. MIT is a 167 years old institution among the other reputed institutions in the USA strives for excellence in the humanities and science disciplines.

REFERENCES

<http://www.mit.edu/>

<https://chemistry.mit.edu/>

- Jeyshankar, R., Babu, B. R., & Rajendran, P. (2011). Research output of CSIR-Central Electro Chemical Research Institute (CECRI): A study. *Annals of Library and Information Studies*, 58(December), 301–306.
- Kademani, B. S., Kumar, V., Kumar, A., Sagar, A., Mohan, L., Surwase, G., & Gaderao, C. R. (2005). Publication productivity of the Bio-organic Division at Bhabha Atomic Research Centre: A scientometric study. *Annals of Library and Information Studies*, 52(4), 135-145.
- Nagarkar, S. (2014). A bibliometric analysis of publications of the Chemistry Department, University of Pune, India, 1999-2012. *Annals of Library and Information Studies*, 61(June 2014), 85–92.
- Nagarkar, S., Veer, C., & Kumbhar, R. (2015). Bibliometric Analysis of Papers Published by Faculty of Life Science Departments of Savitribai Phule Pune University during 1999-2013. *DESIDOC Journal of Library & Information Technology*, 35(September), 368–375. <https://doi.org/10.14429/djlit.35.5.8429>
- Nandi, A., & Bandyopadhyay, A. K. (2009). Research contributions in chemistry at the University of Burdwan: an analytical study. *Annals of Library and Information Studies*, 56(September), 141–149.

- Neelamma, G. (2015). RESEARCH TRENDS IN CRYSTALLOGRAPHY: A STUDY OF SCIENTOMETRIC ANALYSIS. *International Journal of Information Sources and Services*, 2(2), 71–83.
- Radhakrishnan, N., & Velmurugan, C. (2015). Scholarly Publications by the Faculty members of PeriyarUniversity,Salem,India: A Scientometric approach. *Library Philosophy & Practice*.
- Sevukan, R., Nagarajan, M., & Sharma, J. (2007). Research output of faculties of plant sciences in central universities of India: A bibliometric study. *Annals of Library and Information Studies*, 54(348), 129–139.
- Siwach, A. K. & Kumar, S. (2015), Bibliometrics analysis of research publication Maharshi Dayanand University (Rohtak) during 2000-2013. *DESIDOC Journal of Library and Information Technology*, 35 (1), 17 – 24.
- Siwach, A. K., & Parmar, S. (2018). Research contributions of CCS Haryana agricultural university, Hisar: A bibliometric analysis. *DESIDOC Journal of Library and Information Technology*, 38(5), 335–342. <https://doi.org/10.14429/djlit.38.5.13188>.
- Sudhier, K. G. P., & Kumar, V. D. (2010). Scientometric Study of Doctoral Dissertations in Biochemistry in the University of Kerala, India. *Library Philosophy & Practice*, 1–16.