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Fifty years of the Journal of Adhesion

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The Journal of Adhesion (JA) is completing 50 years dedicated to the science of adhesives and its practical applications. It was launched by Dr Lou Sharpe in 1969, a pioneer of adhesion science. Throughout these years, the journal has sought to provide a forum for discussions about the phenomenon of adhesion. Its mission is to help scientists, engineers, and all academic and industrial researchers alike, keep abreast of the most recent developments in the various aspects of adhesion science and technology. The purpose of the present editorial is to celebrate 50 years of JA showing how it has contributed to the dissemination of adhesion with key indicators. Data from Web of Science (WoS) and Scopus were considered. [Table 1](#) shows the categories in which JA is indexed and its position in the ranking of each of them.

[Figure 1](#) shows the evolution of the Impact Factor (IF) of JA, with and without journal self-citations, published by the Journal Citation Report (JCR)/ISI Web of Science. This indicator represents the average number of times articles from the journal published in the past two years have been cited in the JCR year. As we can observe, the IF of JA has grown significantly in the last five years and is now at 2.366, which reflects the increase of its importance in the academic environment. In addition, the total citations has grown over the last few years from 1,474 in 2015 to 2,172 in 2018.

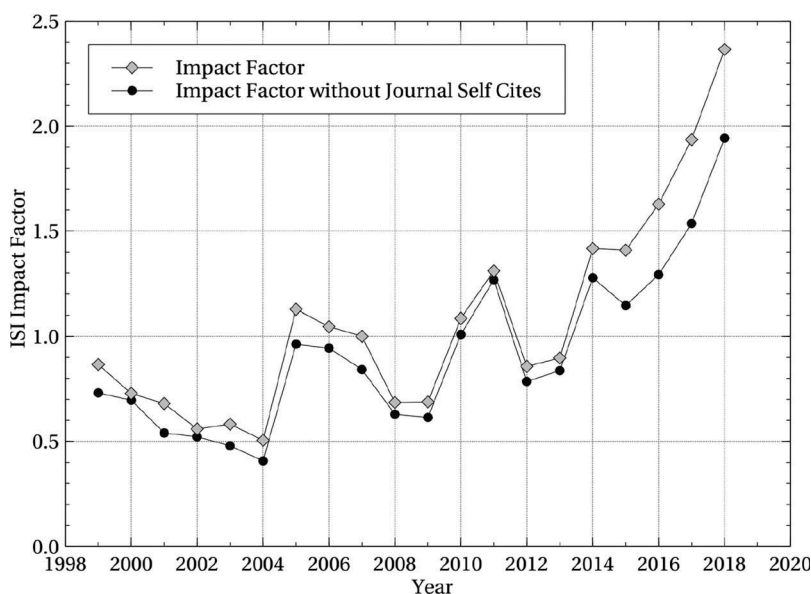
The records of the publications in JA, from their first issue, were obtained in Web of Science database. Documents that have not been characterized as scientific articles and reviews, such as notes and editorials have been removed from the query. In total 2,343 records were obtained. [Figures 2](#) and [3](#) show the evolution of the publications in JA since 1969.

The countries, institutions, and authors with the highest number of publications can be seen in [Figures 4–6](#).

[Table 2](#) lists the authors with greater number of articles and reviews in each decade.

Table 1. Indexing in the Web of Science and Scopus with respective positions in the ranking within the respective areas.

WoS (IF 2.366)	Scopus (SJR 0.695)
Engineering, Chemical (Q2 – 60/138)	Chemistry: General Chemistry (Q2 – 119/371)
Materials Science, Multidisciplinary (Q2 – 139/293)	Engineering: Mechanics of Materials (Q2 – 108/352)
Mechanics (Q2 – 44/134)	Materials Science: Materials Chemistry (Q2 – 77/271)
	Surfaces, Coatings and Films (Q2 – 36/116)
	Physics and Astronomy: Surfaces and Interfaces (Q2 – 19/53)

**Figure 1.** Evolution of Journal Impact Factor on ISI/Web of Science.

The list of articles or reviews most cited in JA with their references and number of citations received are given in [Table 3](#).

[Table 4](#) lists the main Web of Science categories that cited articles of JA reflecting the scope of the journal.

In turn, the journals that most cited articles published in JA are listed in [Table 5](#) with their respective Impact Factors.

The evolution of the main themes studied over the decades can be observed through the main keywords that marked each period as illustrated in [Figure 7](#). It is clear from the keywords shown in [Figure 7](#) that most of the papers were related to mechanisms of adhesion. Fifty years ago, the theories of adhesion were the main focus of research, with, for example the works of K. W. Allen and D. H. Kaelble. Next, surface treatments and surface analysis have been developed (see work of J. Watts), especially for aluminum alloys in

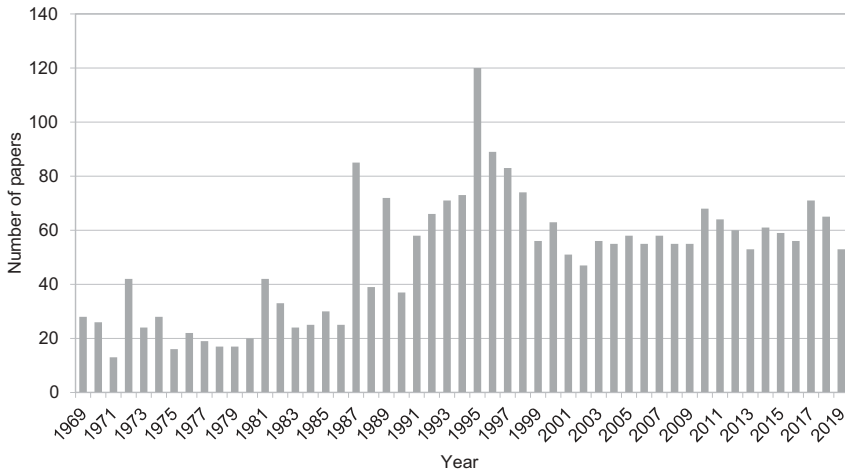


Figure 2. Number of articles and reviews per year.

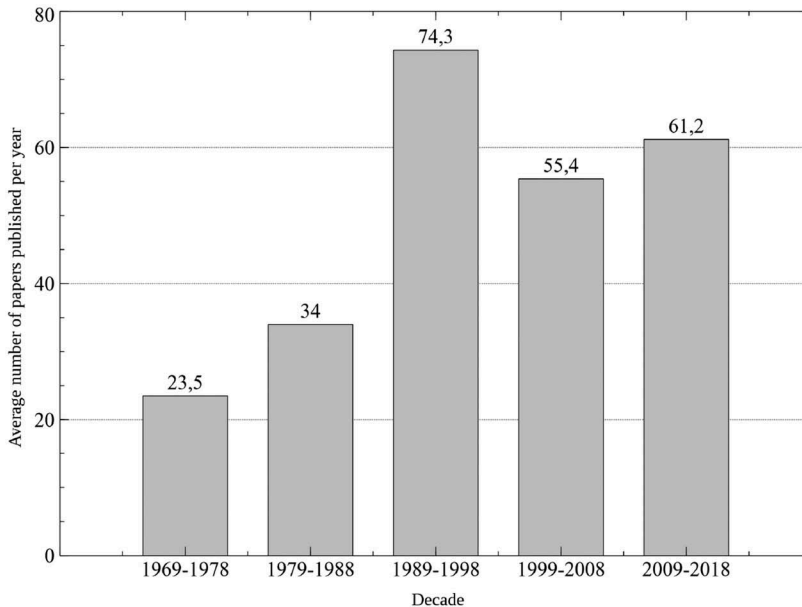


Figure 3. Average number of articles and reviews, per year, during each decade.

the aeronautical industry. Structural bonding and finite element analysis started strongly in the 80s, especially with R. D. Adams. The adhesive manufacturers provided toughened structural adhesives and fracture mechanics with A. Gent and A. Kinloch and played an important role in understanding the damage mechanisms of rubber modified adhesives. Design with fracture mechanics concepts has been considered, especially by D. Dillard. But the combination of continuum mechanics and fracture

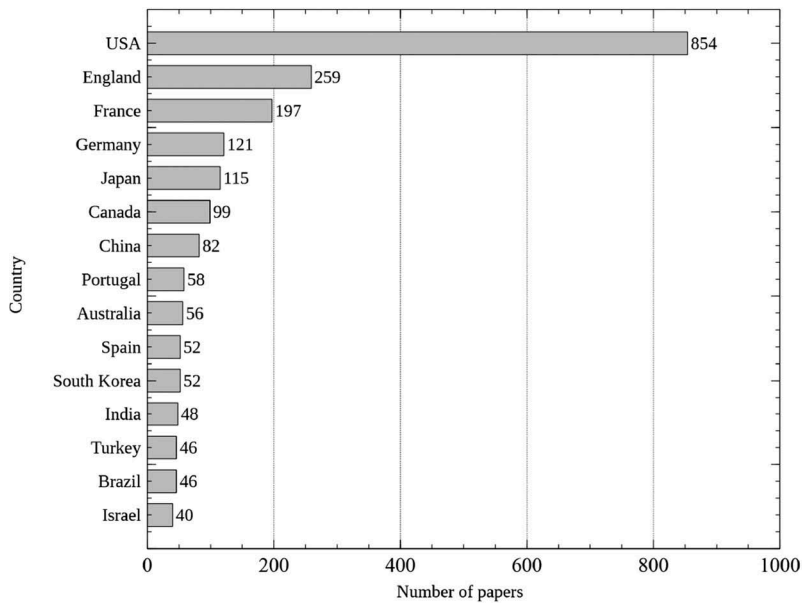


Figure 4. Number of articles from each country.

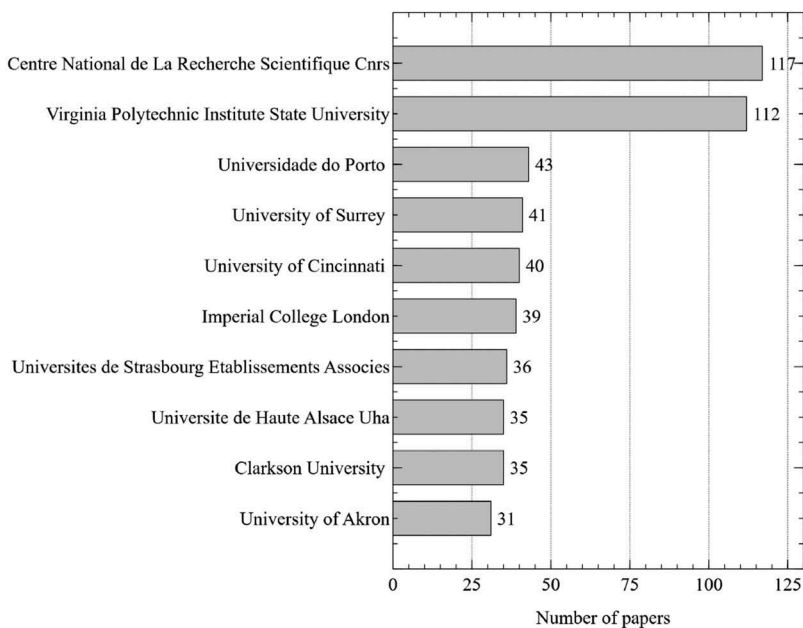


Figure 5. Number of articles from institutions.

mechanics, i.e. damage mechanics, seems to be the most promising technique for designing adhesive joints and many groups in the world are working on the development of cohesive zone models for designing under impact, fatigue or creep conditions (see work of A. Crocombe, for example). More recently,

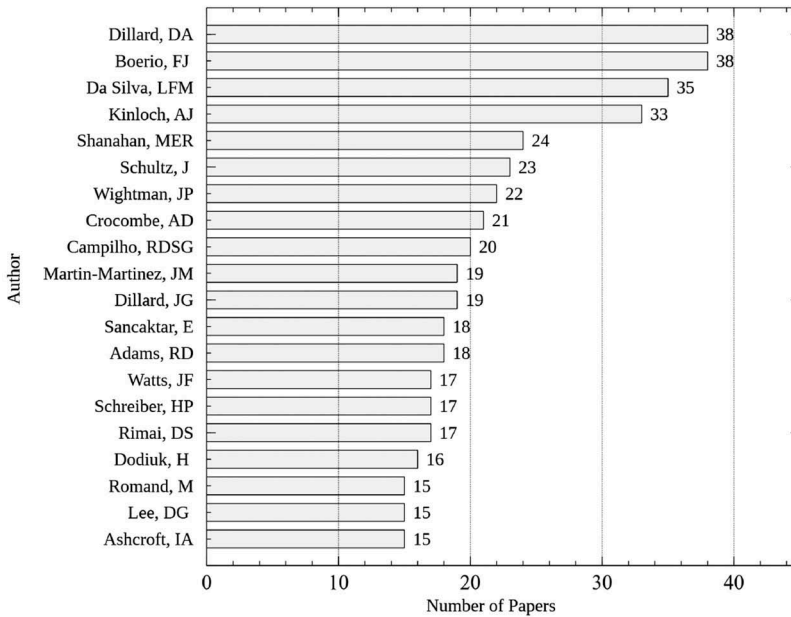


Figure 6. Number of articles from authors.

Table 2. Main authors and respective number of publications in each decade.

1969–1978	1979–1988	1989–1998	1999–2008	2009–2018
Kaelble DH (11)	Kinloch AJ (9)	Dillard DA (19)	Boerio FJ (17)	Da Silva LFM (32)
Dynes PJ (6)	Allen KW (8)	Wightman JP (17)	Dillard DA (15)	Campilho RD (24)
Allen KW (5)	Adams RD (7)	Boerio FJ (15)	Martin-Martinez JM (10)	Banea MD (22)
Anand JN (5)	Johns WE (7)	Kinloch AJ (15)	Ashcroft IA (8)	De Barros S (10)
Bascom WD (5)	Boerio FJ (6)	Lee DG (14)	Pethrick RA (8)	Pizzi A (10)
Keller DV (4)	Dodiuk H (6)	Schultz J (12)	Watts JF (8)	Poh BT (9)
Kendall K (4)	Schultz J (6)	Rimai DS (11)	Crocombe AD (7)	Abenojar J (9)
Mostovoy S (4)	Packham DE (5)	Sancaktar E (11)	Dillard JG (7)	Ashcroft IA (7)
Ripling EJ (4)	Sancaktar E (5)	Demejo LP (10)	Abel MI (6)	De Moura MF (7)
Wake WC (4)	Wightman JP (5)	Dillard JG (10)	Dillingham RG (6)	Li WD (7)
		Dodiuk H (10)		

chemists have been formulating special adhesives that can be dismantled or can self-heal. The adhesion technology is nowadays well mastered, and engineers do not hesitate to apply adhesives in any field: transport structures, wood structures, electronics, shoes, furniture, sport goods, etc.

In turn, [Figure 8](#) illustrates the growth of the number of countries with articles submitted to JA over the years.

It is also interesting to observe the co-authorship relations between different countries represented in [Figure 9](#). From [Figures 8](#) and [9](#), it is clear that adhesion is a global phenomenon, with researchers all over the world.

It is clear from the data presented above that JA is gaining importance in the field of adhesion. More papers are being published, by more countries and with increased impact which shows the increase in importance and

Table 3. Most cited articles on ISI/Web of Science (data collected on 14 June 2019).

Authors	Title	Year	Times Cited	Average Citation per Year
Kaelble, D.H.	Dispersion-polar surface tension properties of organic solids	1970	725	14.50
Lavielle, L., Martin, C.	The role of the interface in carbon fiber-epoxy composites	1987	437	13.24
Gent, A.N., Schultz, J.	Effect of wetting liquids on strength of adhesion of viscoelastic materials	1972	422	8.79
Wu, S.	Polar and nonpolar interactions in adhesion	1973	355	7.55
Drzal, L.T., Rich, M.J., Lloyd, P.F.	Adhesion of graphite fibers to epoxy matrices. 2. The effect of fiber finish	1983	334	9.03
Kaelble, D.H., U y, K.C.	A reinterpretation of organic liquid-polytetrafluoroethylene surface interactions	1970	307	6.14
Lakrout, H., Sergot, P., Creton, C.	Direct observation of cavitation and fibrillation in a probe tack experiment on model acrylic pressure-sensitive-adhesives	1999	215	10.24
Liston, E.M.	Plasma treatment for improved bonding: A review	1989	214	6.90
Waite, J.H., Andersen, N.H., Jewhurst, S., Sun, C.	Mussel adhesion: Finding the tricks worth mimicking	2005	202	13.47
Fritz, J.L., Owen, M.J.	Hydrophobic recovery of plasma-treated polydimethylsiloxane	1995	185	7.40

Table 4. Main WoS categories that cited articles of JA (data collected on 14 June 2019).

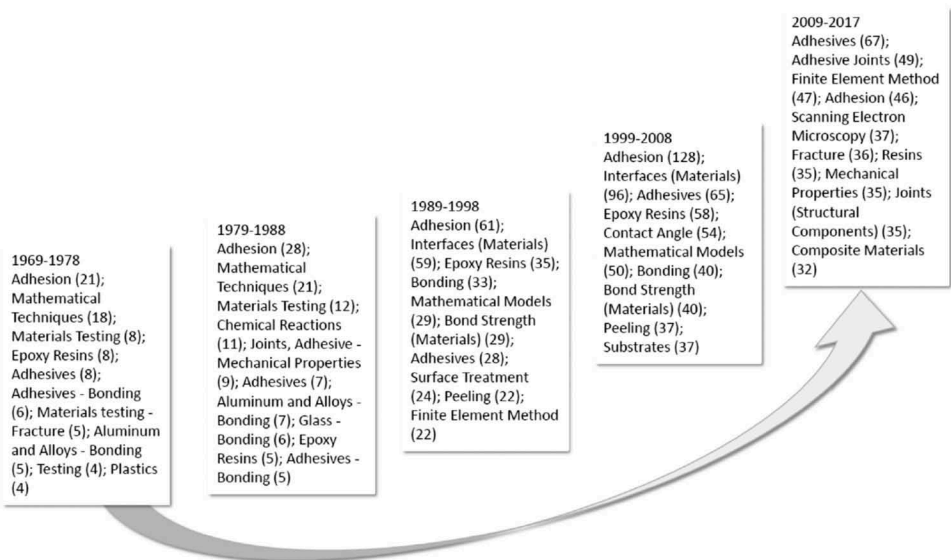
Web of Science categories	Number of citations
Materials Science Multidisciplinary	7,491
Engineering Chemical	4,319
Polymer Science	3,987
Mechanics	3,451
Chemistry Physical	2,781
Physics Applied	1,700
Materials Science Composites	1,620
Chemistry Multidisciplinary	1,506
Materials Science Coatings Films	969
Physics Condensed Matter	878
Engineering Mechanical	804
Nanoscience Nanotechnology	779
Engineering Electrical Electronic	484
Engineering Manufacturing	417
Chemistry Applied	395

quality of the papers published. The themes treated remain quite broad with a trend in structural bonding in recent years. That shows that adhesion technology is becoming increasingly used for manufacturing engineering structures typically found in mechanical devices such as cars, trains or airplanes but also in civil engineering applications.

If the trend seen the last 50 years are extrapolated for the next 50 years, the adhesion community have reasons to be optimistic and important advances can be foreseen such as smart adhesives with multiple functions such as

Table 5. Main journals that cited articles of JA (data collected on 14 June 2019).

Journal	Number of citations	Journal Impact Factor (2018)
Journal of Adhesion Science and Technology	1,033	1.210
International Journal of Adhesion and Adhesives	940	2.501
Journal of Applied Polymer Science	707	2.188
Langmuir	566	3.683
Polymer	331	3.771
Journal of Materials Science	329	3.442
Journal of Colloid and Interface Science	311	6.361
Applied Surface Science	259	5.155
Composites Science and Technology	238	6.309
Macromolecules	227	5.997
Polymer Composites	191	2.268
Composites Part A – Applied Science and Manufacturing	188	6.282
Composite Structures	183	4.829
Polymer Engineering and Science	179	1.920

**Figure 7.** Evolution of the focus of the articles.

graded properties as a function of the stress distribution, self-healing properties, poor adhesion detection or dismantling capacity. One of the main challenges is to formulate a bioadhesive that is as strong and durable as a synthetic adhesive. But the holy grail of adhesion technology is to find a suitable non-destructive technique to detect poor adhesion. The adhesion community has used JA to disseminate the most recent advances in adhesion and adhesives for 50 years. This editorial is to celebrate 50 years of existence of JA and thank all the authors that contributed to this wealth of knowledge.

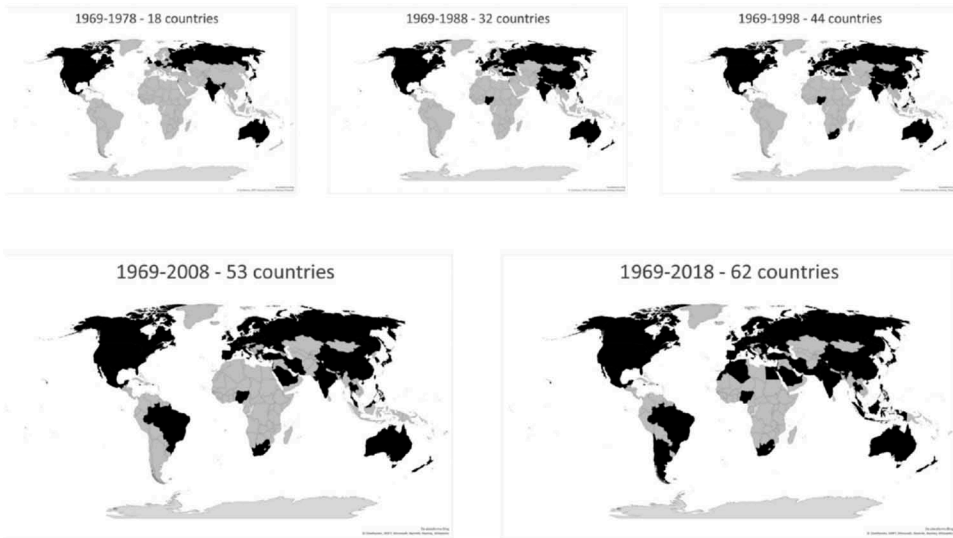


Figure 8. Evolution of the number of countries publishing on Journal of Adhesion.

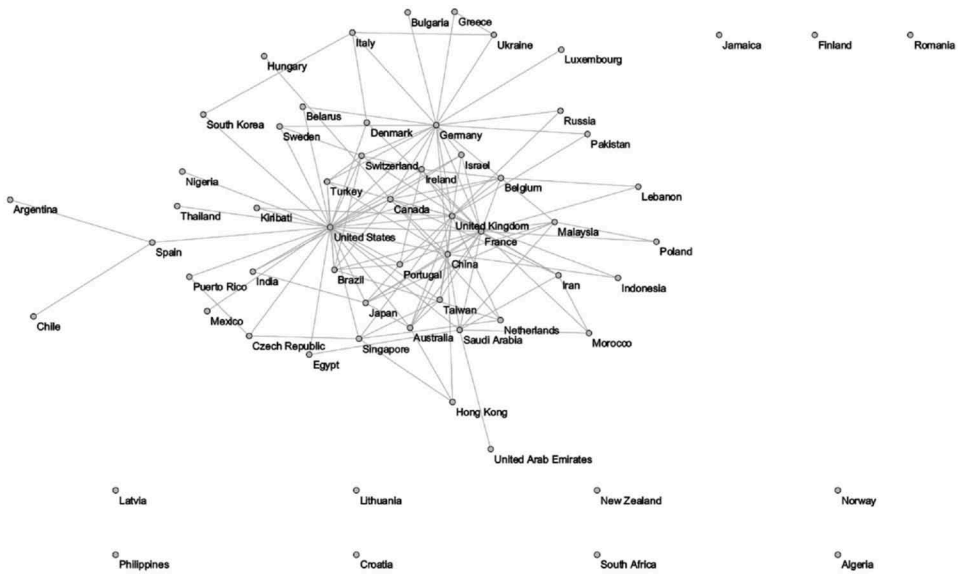


Figure 9. Co-authorship relations between different countries.