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On the uses, functions and meanings of *homing* in the literature

An interdisciplinary analysis over time

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Abstract

A wide literature exists on the genealogy and the conceptual career of home in social sciences, and beyond. The same does not hold for its derivative term *homing*, though. Despite its circulation in a diverse and multidisciplinary literature over time, no systematization has been done yet of the conceptual, disciplinary and temporal patterns in the usage of homing. This is not irrelevant, since this notion has some circulation in a variety of disciplines. This paper is based on a dedicated and preliminary exploration through two academic databases, with a view to retrieving the main ways to use homing and its associations with specific concepts in different disciplines from 1885 to 2019. This called for a bridging act between natural sciences, where the bulk of the usages of homing lies, and selected sub-areas in social sciences. As a result, a new conceptual map is proposed on the predominant understandings of homing, each of them producing its own insights on home and mobilities.

Keywords: Homing – Academic publications – Natural sciences – Social Sciences – Categorization.

HOMING: THE HOME-MIGRATION NEXUS

HOME AS A WINDOW ON MIGRANT BELONGING, INTEGRATION AND CIRCULATION



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Introduction

Tracing the history of concepts is a very important and ordinary effort at the basis of any research pursuit. Sometimes this is a rather straightforward task, if only because so many have already contributed to it before. On some occasions, whenever a concept entails a novelty (or a claim for it) relative to the preexisting lexicon, the task turns to be less obvious, but no less important. This is precisely the case of this working paper, concerning the academic circulation of *homing* – the concept that inspired ERC HOMInG and lies at the theoretical core of it – over the last century.

The notion of homing, as the *Oxford English Dictionary* reminds us, literally refers to “the action of going home”, “the faculty possessed by animals... of returning home from a distance”, or to “an automatic device for guiding aircraft, missiles etc.”.¹ However, there is far more than these basic meanings in nowadays’ uses of homing in social sciences, let alone natural and life sciences. Yet, while a huge literature exists on the genealogy and the conceptual career of home, the same does not hold for its derivative term *homing*. Despite its circulation in a diverse and multidisciplinary literature over time, no systematization has been done yet of the main ways to use homing in academic publications, and on their temporal distribution, depending on disciplinary histories and research advancements. This may be a minor omission. However, it is not so irrelevant, considering the remarkably different ways in which homing is used across disciplinary domains, and the insights on the meanings of home that this could produce.

We conducted this preliminary exploration through two academic databases, with a view to retrieve the main ways to use the notion of homing and its associations with specific concepts in different disciplines from 1885 to 2019. In doing so, we also aimed to compare the amount of published research over the last 130 years, identify journals that published the most oft-quoted papers on homing and provide insights into the most common topics associated with it. The titles, abstracts and keywords of the selected sub-areas in social sciences were then analyzed for word frequency and relationship between them, through manual inspection of their contents. Existing databases, such as *Scopus* and *Web of Science*, embrace a scientific literature that is as massive as fragmented, and often underexplored. Tracing some key patterns across it is necessary to avoid unnecessary duplications and to provide the right directions for further advancements. Following this premise, our study aims to identify major academic branches and trends regarding the study of homing.

¹ Online version, Oxford University Press, 2020. Last consulted: 18 April 2020.

A methodological background

Source selection and search strategy

At the outset of our literature review, Stefania Yapo searched through the two databases using homing as a keyword. The Boolean operations AND, OR, AND NOT were used in combination with this keyword to refine the results through a stepwise process. The analysis resulted first in an assessment of the predominant ways to use homing among the most cited publications across decades, or temporal clusters. Further, search filter settings were limited to specific subject areas such as Social Sciences, Psychology, Economics, Arts & Humanities, while the other disciplines were purposefully removed to ensure the relevance of the research. The document type was left unrestricted – all types of document available were considered, including journals, conference proceedings and books. The type of source was progressively refined in order to focus only on the subject areas mentioned above, considering only publications in English. The selection refinement of source type was eventually operated manually, in a time-consuming and careful inspection of the section “Title and Abstract” of each entry. From the list of documents thereby obtained, Yapo created a database including Title and Abstract for each entry, and analyzed it with Atlas.ti. The Word Count operation was used to generate the labels for coding.

Handling of data

Our literature review was based on two datasets, *Scopus* and *Web of Science*. Given the close results gained from the analysis in both databases, the following report presents mainly the results from *Scopus*. The results from *Web of Science* are included in a complementary way in the second part of this paper, the one regarding the creation and analysis of a sub-sample dataset of 30 documents.

Search results from the two databases were operated in two ways. First, the information on indexation data was imported from year 1885 to 2019. The first aim of this preliminary study was to investigate the journal-wise distribution of research on homing over such a wide time span. Using the tool for data extraction available on the database websites, frequency tables were generated in both absolute and percentage numbers. A division in decades (or time clusters) helped to identify the most cited publications in the corresponding journals. Within these publications, a manual analysis of both keywords and titles allowed to extract the evolving research trends concerning the semantic use of homing. The second aim of this study was to investigate the use of homing in four specific subject areas, classified in the databases as Social Sciences, Psychology, Economics, and Arts & Humanities. Those areas were selected for being the ones closer to the research purview of ERC HOMInG. The development of publications in these areas was

then comparatively analyzed in terms of temporal trends. The refinement of the analysis led to identify a number of documents that displayed a remarkable proximity in the use of homing, relative to ERC HOMInG itself. From this list of documents, a database including titles and abstracts was eventually constructed in order to examine word relevance and frequency. As said above, the final selection of documents includes entries from both databases.

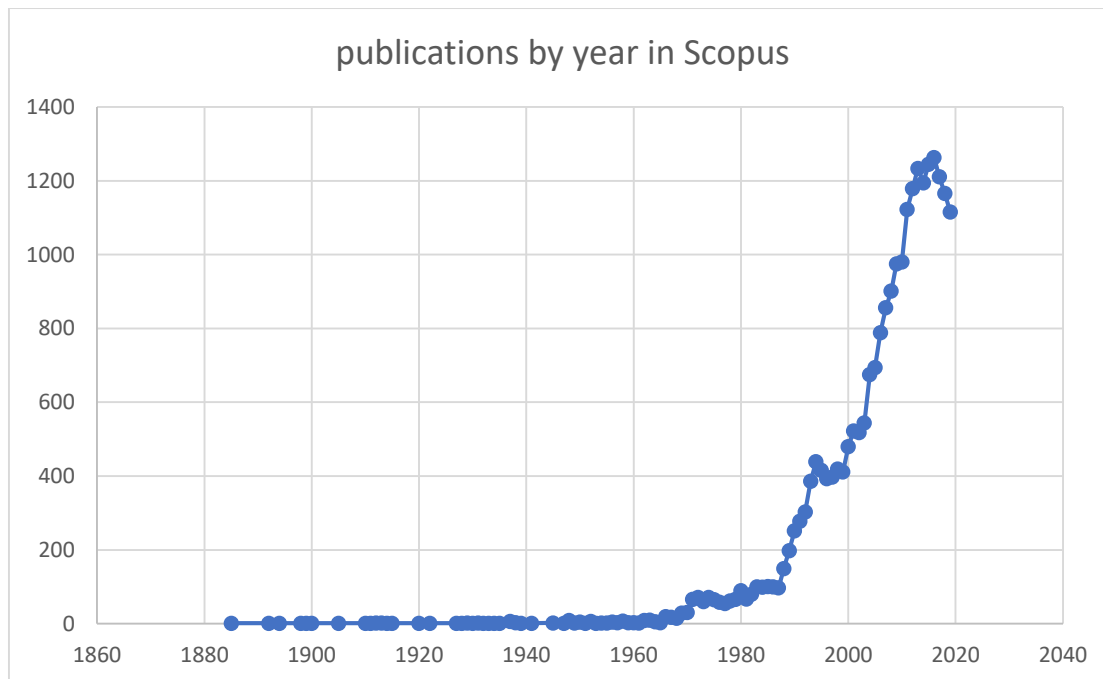
Key findings

Results are presented under the following headings to provide a detailed overview of the sample characteristics and insights into the publication and research trends on homing between 1885 and 2019.

“Homing” in publication trends

The first operation on the database revealed a total number of 24,241 publications. The very first article shown in the database is titled “Homing faculty of hymenoptera” (Romanes 1885) and appeared on *Nature*. For the considered time span, 1885-2019, the most cited article so far has been published in 1994 on *Cell* with the title “Traffic signals for lymphocyte recirculation and leukocyte emigration: The multistep paradigm” (Springer 1994). While the term homing has been used since the very first year of the registered data available in *Scopus*, its usage has increased dramatically over the decades. **Figure 1** illustrates this trend.

Figure 1. Trend of publications with *homing* in Title, Abstract or Key Words in Scopus. Years 1885-2019.



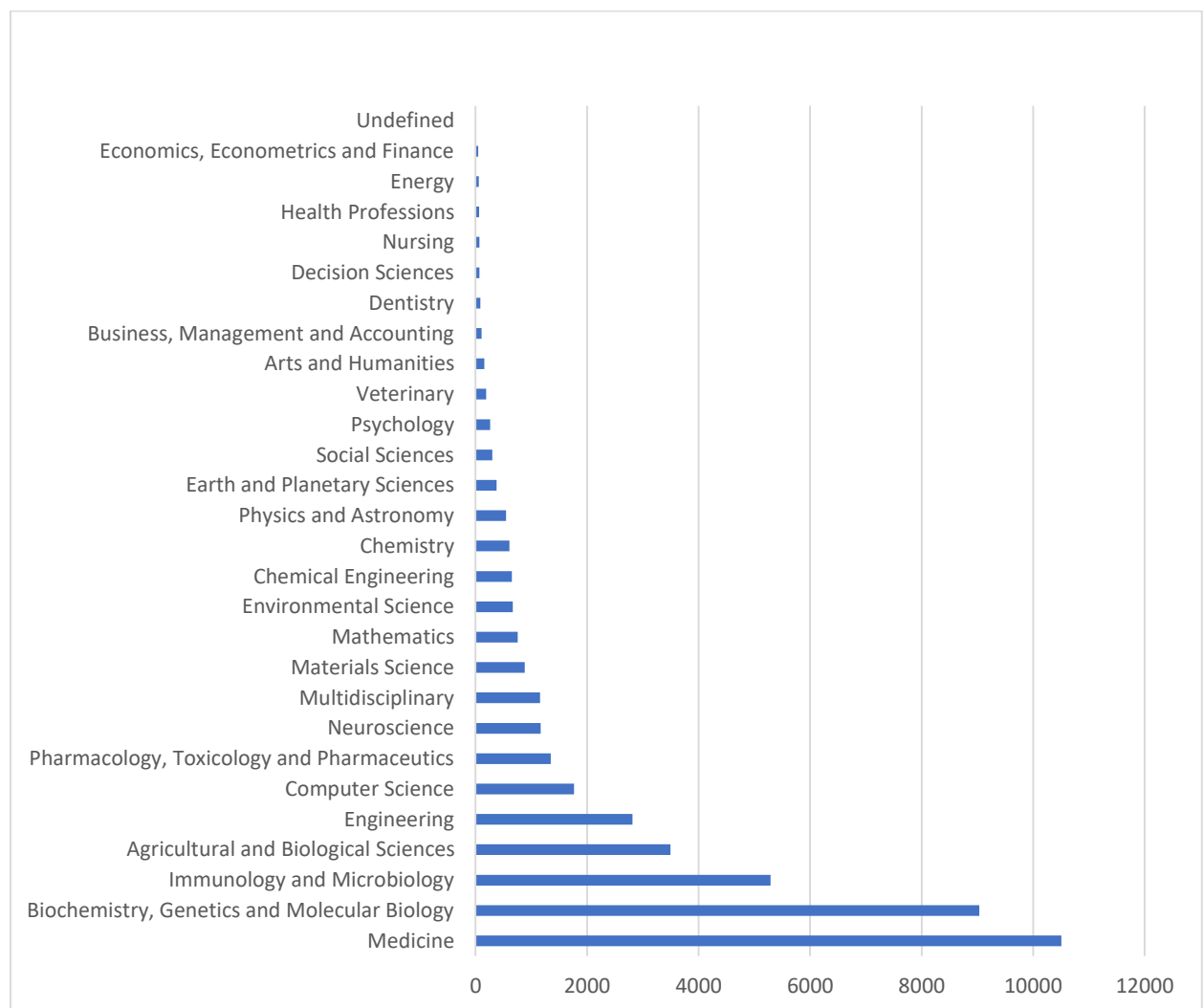
A further analysis (**Table 1**) shows in percentages the steepness of such increase of publications on homing. Out of all the reported documents from 1885 to 2019, only a tiny minority had been published until 1969 (0.81%). Almost half of total publications, instead, is concentrated in the last decade.

Table 1. Publications in Scopus, by decade (or time cluster). Years 1885-2019. Percentages and absolute numbers.

Publications in Scopus		
Years	%	Publications
2010-2019	48.31	11,712
2000-2009	28.69	6,954
1990-1999	15.24	3,694
1980-1989	4.46	1,080
1970-1979	2.29	604
1960-1969	0.46	112
1885-1959	0.35	86

If we rank published research articles on homing by subject area, we can see at the top positions “Medicine”, “Biochemistry, genetics, and molecular biology” and “Immunology and Microbiology”. “Agricultural and biological sciences”, i.e. the area with which homing as instinctual behavior would be more obvious to connect, lies at the fourth position, corresponding to 8.23% of the literature (i.e. 3,496 publications) (**Figure 2**). For instance, the organization of the dataset by “relevance” gives as first entry a publication referring to the “homing abilities of wasps”, measured as the maximum distance (i.e. maximal homing area) from which wasps can return to their nest (Mandal & Gadagkar 2015).

Figure 2. Publications by subject area in Scopus. Years 1885-2019



The following **Table 2** delves more into the data in **Figure 1**. It reports the relative and cumulative weight of the top three subject areas and the weight of the four subject areas in which homing tends to be used with meanings closer to those in ERC HOMInG. The top four subject areas cover almost 68% of the total publications. Instead, the combination of Social Sciences, Psychology, Arts & Humanities and Economics is just above 3%.

Table 2. Weight of selected subject areas: Medicine, Biochemistry, Immunology, Social sciences, Economics, Psychology, and Arts & Humanity in Scopus. Years 1885-2019. Percentages (relative and combined weight)

Years	Subject Area	Percentage (relative weight)	Percentage (cumulative weight)
1885-2019	Medicine	24.73	67,79
	Biochemistry	21.28	
	Immunology	12.45	
	Agricultural & Biological Sciences	8.23	
	Social Sciences	0.70	3.15
	Psychology	0.62	
	Arts & Humanities	0.36	
	Economics	0.11	

In order to get more details on the evolution of the use of homing across subject areas, the whole sample can be analysed by decade or time cluster. By looking at the sample in temporal terms, it is possible to reconstruct the evolution of homing across the different subject areas. Thus, **Table 2** suggests that the meanings of homing, as defined in the top four subject areas, could be the prevalent ones. What follows are a few examples of the uses of homing among the most cited publications in the top four subject areas. As for both Medicine and Immunology, homing stands out mainly as a cell behavior:

“Evidence is growing that dendritic cells in different tissues, as defined morphologically and by a distinct group of cell surface markers, are part of a system connected by movement and homing. Dendritic cells in nonlymphoid organs, such as epidermal Langerhans cells and heart interstitial cells, can give rise to "veiled cells" in the afferent lymph and blood which migrate to lymphoid tissues where they are isolated as "dendritic" or "interdigitating" cells. Coupled with these migratory abilities is the capacity to capture antigens in an immunogenic form in situ” (Steinman 1991:277)

A similar meaning is exploited in Biochemistry, Genetics and Molecular Biology:

“The integration and control of systemic immune responses depends on the regulated trafficking of lymphocytes. This lymphocyte 'homing' process disperses the immunologic repertoire, directs lymphocyte subsets to the specialized microenvironments that control their differentiation and regulate

their survival, and targets immune effector cells to sites of antigenic or microbial invasion.” (Butcher & Picker 1996).

Finally, a confirmation of this prominence on genetics and cell behavior comes also from the subject area of Agricultural and Biological Sciences.

“Recently, the AP2/ERF domain-encoding gene was reported in bacteria, a bacteriophage, and a ciliate genome as a part of homing endonuclease genes, mobile genetic elements that replicate and move in the genome” (Nakano et al. 2006:427)

Further analysis confirmed that for each decade (or time cluster) considered here, the top five subject areas in **Figure 1** published also the most cited publications. To know how those subject areas dealt with homing across the years, the most used keywords were explored within the same decades or time clusters. The results are presented in **Table 3**.

Table 3. List of subject areas, by most used key words, by decade (or cluster of time) and subject area. Years 1885-2019²

Year	Subject Area	Key Words
1885-1959	Multidisciplinary	- Homing behavior of animals - Magnet theory of homing
	Agricultural & Biological Sciences	- Plant and animal behavior - Pigeons
	Psychology	- Plant and animal behavior - Animal behavior - Higher invertebrates
1960-1969	Agricultural and Biological Sciences	- Animal - Animal Behavior - Homing Behavior - (and other combinations with Behavior)
	Engineering	- Aerospace engineering - Manufacture
	Multidisciplinary	- Animal Behavior - Animal - Homing behavior

² We opted for one cluster for the 1885-1959 timespan because of the limited number of relevant publications.

1970-1979	Agricultural and Biological Sciences	<ul style="list-style-type: none"> - <i>Animal</i> - <i>Homing Behavior</i> - <i>Animal Behavior</i>
	Medicine	<ul style="list-style-type: none"> - <i>Animal</i> - <i>Male</i> - <i>Spleen</i>
	Biochemistry, Genetics and Molecular Biology	<ul style="list-style-type: none"> - <i>Animal</i> - <i>Theoretical Study</i> - <i>Homing Behavior</i>
1980-1989	Medicine	<ul style="list-style-type: none"> - <i>Animal</i> - <i>Nonhuman</i> - <i>Mice</i>
	Agricultural and Biological Sciences	<ul style="list-style-type: none"> - <i>Animal</i> - <i>Animal Behavior</i> - <i>Homing</i> - <i>Homing Behavior</i>
	Biochemistry, Genetics and Molecular Biology	<ul style="list-style-type: none"> - <i>Animal</i> - <i>Nonhuman</i> - <i>Human</i>
1990-1999	Medicine	<ul style="list-style-type: none"> - <i>Human</i> - <i>Nonhuman</i> - <i>Receptors, Lymphocyte Homing</i>
	Biochemistry, Genetics and Molecular Biology	<ul style="list-style-type: none"> - <i>Human</i> - <i>Nonhuman</i> - <i>Receptors, Lymphocyte Homing</i>
	Immunology and Microbiology	<ul style="list-style-type: none"> - <i>Human</i> - <i>Nonhuman</i> - <i>Receptors, Lymphocyte Homing</i>
2000-2009	Medicine	<ul style="list-style-type: none"> - <i>Human</i> - <i>Nonhuman</i> - <i>Controlled study</i>
	Biochemistry, Genetics and Molecular Biology	<ul style="list-style-type: none"> - <i>Human</i> - <i>Nonhuman</i> - <i>Controlled study</i>
	Immunology and Microbiology	<ul style="list-style-type: none"> - <i>Human</i> - <i>Nonhuman</i> - <i>Controlled study</i>

2010-2019	Biochemistry, Genetics and Molecular Biology	<ul style="list-style-type: none"> - Nonhuman - Animals - Human - Controlled Study
	Medicine	<ul style="list-style-type: none"> - Nonhuman - Animals - Human - Humans - Controlled Study
	Immunology and Microbiology	<ul style="list-style-type: none"> - Nonhuman - Animals - Human - Humans - Controlled Study

Across the years, the top five subject areas have used homing mainly in combination with words such as “animal”, “animal behavior”, and “homing behavior” until 1990. Since the end of the century, the focus on animals has gone along with an increasing attention to “human”, “nonhuman”, “Lymphocyte Homing receptors” and “controlled study”. Medical dictionaries display comprehensive definitions of homing that are in line with the above mentioned keywords, such as “the movement of a cell towards specific tissues, cytokines, or antigens (Farlex and Partners 2009)”, or “the ability to return to a place of origin (Collins Dictionary of Biology, 3rd ed. Hale and Saunders 2005)”, or “homing receptor is an adhesion molecule on leukocytes that binds to endothelial cells in blood vessels. It is used by white blood cells to guide them to inflamed or infected tissues in the body (Farlex and Partners 2009)”.

Homing in social sciences

The second aim of this Working Paper is to trace the trend in publications on homing in four specific subject areas. By selecting only Social Sciences, Psychology, Economics, and Arts & Humanities, a sample of 670 documents was obtained. The limited number of publications with respect to the original sample confirms the minor weight of those areas in the whole academic production on homing. **Table 4** reports the results of the selection. Among the four subject areas, Social Sciences and Psychology have a much stronger record of publications with respectively the 20.37% and 17.92%, Arts & Humanities have as half as publications with 10.42%, whereas Economics lags behind with a small 3.20%. Moreover, the four areas together cover almost half of this sub-sample. Other subject areas were still present because the same journals within each subject areas can be listed in more than one sub-category, thus resulting in more than one subject area at a time. For instance, the journal *Animal Cognition* is listed in the subject area of *Agricultural and biological sciences* along the sub-category *Ecology, evolution, behavior and systematics*, and simultaneously in the subject area of

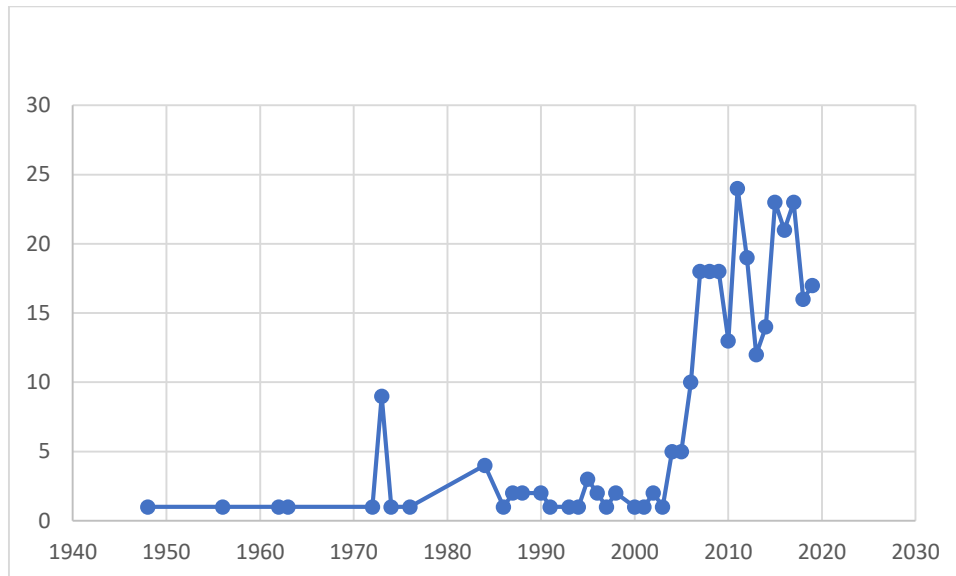
Psychology within the sub-category of *Experimental and cognitive psychology*. This suggested the need for further restriction in our own selection criteria.

Table 4. Publications in Scopus, selecting Social Sciences, Psychology, Economics, Arts & Humanities. Years 1885-2019

Subject area	Publications	Percentage
Social Sciences	299	20.37%
Psychology	263	17.92%
Neuroscience	215	14.65%
Arts and Humanities	153	10.42%
Biochemistry, Genetics, Molecular Biology	104	7.08%
Computer Science	96	6.54%
Medicine	67	4.56%
Agricultural and Biological Sciences	64	4.36%
Engineering	52	3.54%
Economics, Econometrics and Finance	47	3.20%
Business, Management and Accounting	25	1.70%
Environmental Science	24	1.63%
Others*	59	4.02%
Total	670	100%
*includes: Energy, Physics and Astronomy, Mathematics, Pharmacology Toxicology and Pharmaceutics, Earth and Planetary Sciences, Health Professions, Decision Sciences, Veterinary, Nursing, Multidisciplinary, Materials Science		

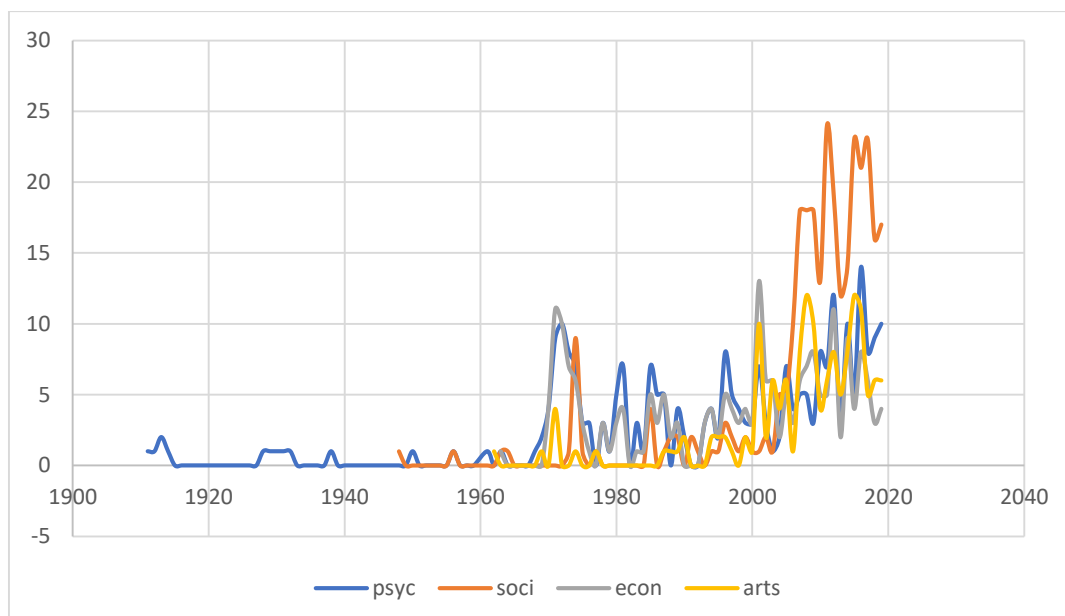
The following graphs show the trends in each one of the four key subject areas, each of them with a different starting point in time. **Figure 3** shows the trend of Social Sciences alone. The first publication on homing appeared in 1948 but the term remained of scarce interest until 2004. Crucially, in the time span of 60 years there has been only one peak of 9 publications on homing in 1973. All of these documents were published on the *American Journal of Physical Anthropology* listed in Socials Sciences sub-category of Anthropology and Medicine in the sub-category of Anatomy. Unsurprisingly, the use of homing was in line with the prevalent one. Each of three publications dealt with the homing behavior of monkeys.

Figure 3. Publications in Scopus by subject area Social Sciences. Years 1848-2019



To get a better picture of the commonalities and differences among these four trends see **Figure 4**. The graph shows clearly that the publications in Psychology date back to year 1912, but the real increase started in the '70s, first in Psychology and Economics and then in Social Sciences. Overall, Social Sciences is the category with the strongest record of publications in the last two decades.

Figure 4. Publications in Scopus by subject areas: Social Sciences, Psychology, Economics, and Arts & Humanities. Years 1948-2019



As we look into each subject area in light of the most cited articles (see **Table 5**), we can see once again the prevalence of meanings of homing revolving around the same topics

treated by Medicine and the other top subjects, with the sole exception of Economics that seems to have developed its own conception of homing.

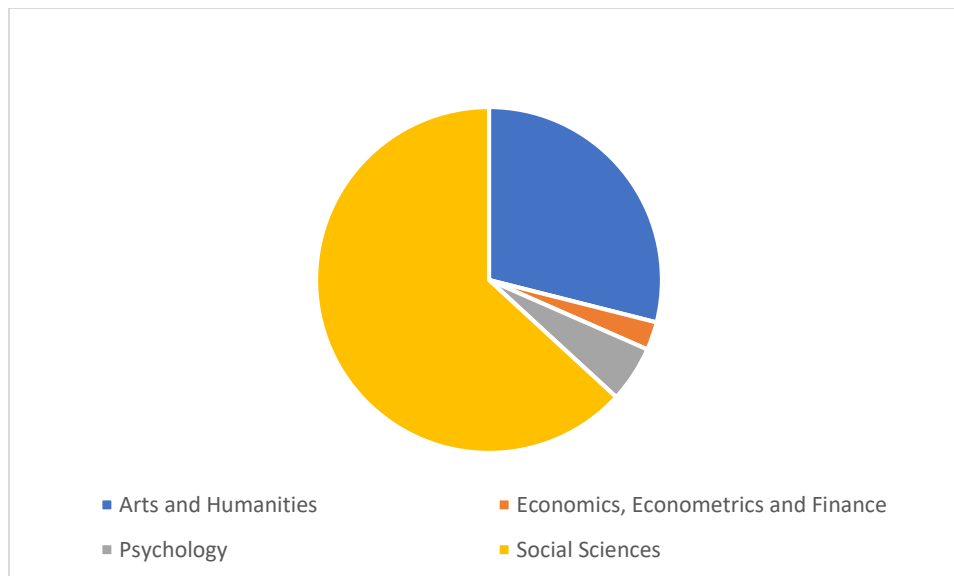
Table 5. Prevalent meanings of homing in Social Sciences, Psychology, Arts & Humanities, and Economics, by year and by most cited articles.

Subject area	Most cited articles (in journals)	Year	Key words
Social Sciences (299 documents)	The ecological role of the callitrichidae [<i>American Journal of Physical Anthropology</i>]	1984	<ul style="list-style-type: none"> - Homing behavior - Animal behavior - Animal
	Comparative locomotor behavior of chimpanzees and bonobos [<i>American Journal of Physical Anthropology</i>]	1993	<ul style="list-style-type: none"> - Homing behavior - Animal - Comparative study - Nonhuman
	Fleet scheduling and dispatching for demand-responsive passenger services [<i>Transportation Research Part C: Emerging Technologies</i>]	2002	<ul style="list-style-type: none"> - Rank-homing heuristic - Demand-responsive - Public transport
	Mobile locations: Construction of home in a group of mobile transnational professionals [<i>Global Networks</i>]	2007	<ul style="list-style-type: none"> - Homing behavior - Home - Mobility - Transnational professionals
Psychology (263 documents)	The retrosplenial contribution to human navigation: A review of lesion and neuroimaging findings [<i>Scandinavian Journal of Psychology</i>]	2001	<ul style="list-style-type: none"> - Human - Homing behavior - Animal behavior - Navigation - Orientation - Space perception
	Natural concepts in pigeons [<i>Journal of Experimental Psychology: Animal Behavior Processes</i>]	1976	<ul style="list-style-type: none"> - Homing pigeons - Animal - Evolution - Pattern recognition
	Idiosyncratic route-based memories in desert ants, <i>Melophorus bagoti</i> : How do they interact with path-integration vectors? [<i>Neurobiology of Learning and Memory</i>]	2005	<ul style="list-style-type: none"> - Homing behavior - Animal behavior - animal experiment - controlled study - home - Route memories

Arts & Humanities (153 documents)	The retrosplenial contribution to human navigation: A review of lesion and neuroimaging findings [<i>Scandinavian Journal of Psychology</i>]	2001	<ul style="list-style-type: none"> - Human - Homing behavior - Animal behavior - Navigation - Orientation - Space perception
	Mast cells: Multifaceted immune cells with diverse roles in health and disease [<i>Annals of the New York Academy of Sciences</i>]	2008	<ul style="list-style-type: none"> - Cell homing - Cancer - Human - Nonhuman - Cell function
	Mechanism of human stem cell migration and repopulation of NOD/SCID and B2mnull NOD/SCID mice: The role of SDF-1/CXCR4 interactions [<i>Annals of the New York Academy of Sciences</i>]	2001	<ul style="list-style-type: none"> - Cell homing - Human stem cell - Nonhuman - Cell migration
Economics, Econometrics and Finance (47 documents)	Pricing and commitment by two-sided platforms [<i>RAND Journal of Economics</i>]	2006	<ul style="list-style-type: none"> - Multi-homing equilibria - Two-sided market - Industry
	An empirical analysis of payment card usage [<i>Journal of Industrial Economics</i>]	2007	<ul style="list-style-type: none"> - Single-homing - Multi-homing - Two-sided market - Consumer
	Tying in two-sided markets with multi-homing [<i>Journal of Industrial Economics</i>]	2010	<ul style="list-style-type: none"> - Two-sided market - Industry - Platforms - Economic agents - Consumer

For sure, the concurring presence of journals listed in multiple sub-categories across all subject areas explains the homogenous use of homing along these lines. As a counter fact, only reported journals of Economics referred exclusively to economic sub-categories. This suggested a need for a further restriction of the selection criteria through a hand-operated refinement. As shown in **Figure 5**, then, the final sample included only documents pertaining to the relevant subject areas.

Figure 5. Research refinement in Scopus by subject areas, Social Sciences, Psychology, Economics and Arts & Humanities



The refinement was done by exploring the Titles, Abstracts, Keywords and Source types. This brought to the progressive exclusion of those journals referring also to subject areas different from Social Sciences, Psychology, Economics, and Arts & Humanities. The reduction resulted in a list of documents that form a coherent group in terms of neighboring usages of homing.

A similar research refinement was conducted on the second database considered, *Web of Science (Core Collection)*. As the results were similar to those obtained with *Scopus*, we decided to omit the analysis on *Web of Science* from this paper. However, we did add to the database created from *Scopus* the few new documents extracted there. The combination of the results from both databases was dictated by the need to intercept all the meanings of homing that could eventually relate (but from different perspectives) to the one advanced within the HOMInG project.

Homing in a list of selected publications: key topics by count number

The new and final dataset includes 30 publications. It was created with one entry per document, including Title and Abstract. What follows is a comprehensive, although succinct, description of the uses of homing in each document. It is rather telling, we believe, about the diversity of uses and meanings of homing, even within a specially selected sub-cluster of documents. The reconstruction of meanings stems from both title and abstract:

- 1) How food facilitates new ways of belonging in a transnational world, exploring concepts of authenticity and hybridity or the practices of inclusion and exclusion through the notion of homing desire. (Asian Australian women; Ahmad & Ramlan 2019)
- 2) How a tunnel in the underground Bucharest is made a long-standing home by a community of homeless drug users through homing practices, as the expression of propositional politics of home and life at the margins. (Bucharest, Romania; Lancione 2019)
- 3) Homing at the borderlands of the rural and the urban as constantly (re)making home, as bordering between generations, and (un)making home in migration. (second-generation Chinese rural migrant women (Li & Chen 2019)
- 4) Homing blogs as feminine forms of self-expression where the home is naturalized as a women's sphere, as the expression of ongoing social, economic, and cultural changes in affluent Western societies. (Finland; Jäntti et al. 2018)
- 5) Diasporic subjectivity in multicultural spaces is to be found in a web of relations and signifiers. The diasporic liminality leads to homing desire, a claim to homeland and a desire to belong. (Caribbeans in the UK (Okuroglu Ozun & Kuzgun 2018)
- 6) The problematization of decisions on return migration brings to questioning the homing desire, often taken for granted, while suggesting the weight of intra-subjectivity comparisons of different parts of people's identity to decide on a potential return. (Estonians in the EU; Saar 2018)
- 7) Home and homebuilding as personal and inward protest of LGBTQ migrants against intersecting forms of systemic violence. (Latinx migrants in California; Borges 2018)
- 8) Homing as simultaneous, complex attachments to multiple homes across transnational fields and as resistance against the homonormative discourse of liberation-nation imposed on SOGI (sexual orientation gendered identity) refugee claimants by the new country of refuge. (Refugees in Canada; Murray 2014)
- 9) Homing as transformation through diasporic consciousness through the use of mass communications connecting diaspora communities to one another, to refugee camps and to the homeland. (Somali Bantu in the US; Deramo 2018)
- 10) Homing as the cognitive burden of home in diasporic consciousness of spatial and metaphysical home, identity, religion, war or memory. (Diasporic writers from Bangladesh; Hasanat 2017)
- 11) Homing desire of diasporic realities as expressed by novels on love and sex, as means to crossing borders-as-barriers and establishing feeling of being-at-home. (Anglophone Lebanese novels; Hout 2016)
- 12) Homing as a political tendency of governments to stimulate feelings of home and belonging in public space to improve social cohesion, integration, and livability. (Netherlands; Duyvendak et al. 2016)
- 13) Homing as individual and collective attempts to feel at home while occupying multiple transient emplacements abroad. (Nigerians in China; Castillo 2016)
- 14) Homing and migrancy. How migrancy, through motherhood and mothering, transforms the meanings of citizenship on translocal and transnational levels. (Eastern European women in Greece; Christou & Michail 2015)
- 15) The memorial reconstructions of song of love-longing and departure of plantation diaspora survivors. Homing as memories of lost homeland. (Fiji Indian plantation diaspora; Mishra 2015)
- 16) Homing as the home-making and the questioning of the ontological security of home. An examination of opposite extreme such as the ontological insecurity and homelessness (Hartmann 2014)
- 17) Re-homing ex-offenders who left the prison homeland and need to shape their own identity following their out-migration. (ex-offenders in the UK; Turner 2013)

- 18) How homing pigeons can blog about current pollution conditions through small sensors (De Costa 2012)
- 19) Homing desire being examined in relation to cultural citizenship and diaspora. Migratory and diasporic subjects negotiate and rewrite their gendered citizenship status within the nation-state with cultural production and cultural acts (Hua 2011)
- 20) Narrative walking practices conceived as homing devices, homing tales and conversive wayfinding are used to study the transnational experiences of the significance of place. (Asylum seekers in the UK; Meyers 2011)
- 21) How creolization offers new analytical insights into the nature of the historical processes of making modern subjects, place and homing modern freedoms. (Caribbean; Crichlow & Northover 2009)
- 22) How identity claims are constructed through the homing space of memory, nation, citizenship and personhood, elucidating the ways in which these may become intertwined in processes of diasporization and creolization. (Cape Verdeans in Portugal; Challinor 2008)
- 23) How extremely mobile transnational professionals constitute their homes as a set of relationships, to both humans and non-humans, to spatial proximity and also distance, to both objects present and excluded. Home as an extended network (Nowicka 2007).
- 24) The question of permanent residency for students enrolled overseas. (Indian students in Australia; Baas 2006)
- 25) Homing desires in geographies of diaspora, an imperial diaspora and a decolonized diaspora, which invoke ideas of imperial masculinity in both imaginative and material terms. (Anglo-Indians in India and Britain; Blunt 2003)
- 26) Homing instincts as the means to challenge the materiality of home and its cultural character. A relational conception of the person provides the theoretical backdrop for an understanding of power relations within the domestic world of settlement. (British Bronze Age; Brück 2005)
- 27) The exploration of lived migration experiences in different diasporic moments (return, n-diasporic return, in homeland) documents feeling of nostalgia, homing, belonging, disillusionment, displacement and exclusion, each of which has a gendered expression and differentiation. (Second generation Greek-Americans and Greek-Germans diasporic populations; Christou & King 2011)
- 28) How a filmmaker destabilizes the discourse of oedipal and homing desire that has been used by Bollywood cinema to dramatize the diaspora's belonging to the motherland. (Indians' return to India; Shina 2012)
- 29) The management of grief shows how homing sorrow contributes to the process of political empowerment and the increasing relevant political role played by diasporas within the multicultural nation state. (Diaspora in multicultural Canada in the '80s; Alonso-Breto 2017)
- 30) The exploration of music as prominent in informing ethno-racial identity, process of homing and integrating in diaspora. (Ethiopian Jews in Israel; Djerrahian 2018)

This analysis was performed through word counting and labeling. The Word Count operation, with a threshold in frequency, was used to select the key topics. Words such as prepositions, articles and names that would not add anything specific to homing were excluded. Each word was retained only if it compared in at least the 10% of the new sample, i.e. in at least three documents. Each time a word was used, the whole sentences was included in the label. The purpose, here, was twofold: first, to have a picture of the relationship between homing and other topics; second, to trace the frequency in use of each word/topic as a measure of the supposed strength of the relationship. As the reading shows, there are recurring themes or words associated with

homing. The following table, which reports the results obtained by coding titles and abstracts with Atlas.ti, makes these recurrences overt.

Table 6. Codes by count number in dataset of 30 documents. Analyses done with software Atlas.ti

Word/topic	Frequency of the label (total number of usages)	Frequency among documents (usage on the total number of documents)
home	56	70%
diaspora	34	43%
homing	30	100%
identity	21	36%
desire	18	36%
belonging	17	40%
homeland	16	43%
transnational	16	23%
women	16	26%
migration	15	40%
politics	13	20%
social	12	26%
homing desire	11	23%
practice	10	30%
citizenship	8	13%
sense of home	7	16%

The categories emerging as relevant in this small sub-sample among the four subject areas were checked for frequency usage in the whole sample, i.e. 24,241 documents. The hyphenated terms re-homing and un-homing were added to the code list and similarly checked (see **Table 7**). The two terms had a low frequency in the database analysed with Atlas.ti, but their usage in context suggested a potentially valuable contribution to the HOMInG research area. Moreover, we want to report a final document, that was excluded from the 30-entry database because it lacked the abstract as a formal

requirement for this examination, Nevertheless, the simple reading of its title, widens the possible reach of homing by means of the expression “homing objects”. As specified in the document’s subtitle, homing objects are “things that have such a strong relationship to a person or place that when lost they find their way “home”” (Lord 2002).

Table 7 Codes usage in the whole sample on homing in Scopus. Years 1885-2019

Total documents 24,241		Frequency on the database
home	5,411	22.00%
homing desire	14	0.05%
homing practices	4	0.01%
homeland	30	0.12%
migration	10,310	42.00%
sense of home	5	0.01%
social	1,340	5.52%
re-homing	45	0.18%
un-homing	5	0.01%
women	998	4.11%
gender	309	1.27%
transnational	31	0.12%
citizenship	25	0.10%
politics	80	0.33%
diaspora	49	0.20%

A trend analysis was eventually processed for the most frequent word used in publications on homing (see **Table**).

Table 8. Trend analysis of words (migration, home, social, and women) in the whole sample on homing in Scopus. Years 1885-2019

Selected words	first mention in	strong usage since
Migration	1927	80s
Home	1929	70s
Social	1930	70s
Women	1927	90s

An analysis of the meanings of those for words within the whole database of 24,241 documents reveals that the most common usages do not coincide with the ERC HOMInG conceptions. For instance, the term migration comes in sentences referring to “migration of cell receptors to/towards/across a specific tissue or organ” or to the effort to explain the mechanisms underlying those movements. Similarly, home is implied as a verb like

“cells home to bone marrow”; while social compares in expressions such as “social dominance” and “social environment” regarding observations and experiments on animals. Only the term women refers to the female human being, as it is commonly used, with no further specifications expressly tailored for usages in medical and natural sciences.

To conclude

Overall, the most widespread usage of homing can be traced in the subject areas with the highest number of publications. These disciplines established a strong linkage between homing and the analysis of animal behavior and animals in general. As a reading of the most cited publications in each subject area reveals, the animals in question include pigeons, salmon, rats, cats, monkeys and invertebrates. The trend evolution, moreover, suggests an increasing interest in the comparison between human and non-human aspects of homing, with a focus on cells and receptors in the study of cancers and diseases. In general terms, the keywords human and non-human usually compared among the Emtree medical terms or the Medical Subject Headings (MeSH) that refer to hierarchically structured, controlled vocabulary for biomedicine and related life sciences. For instance, the most cited document published in the last decade gives a perspective on cancer cell metastasis by examining how cancer cell behavior can be modified by a cell-biological program. This publication lists, among other indexed keywords: cancer, cell homing, human, humans, animals, cancer stem cell and translocation. The prevalent conception in use of homing in these disciplines makes reference to the capacity to target a specific point or object and re-orienting towards a base, which in the animal world is indicated as home. Notably, homing is mentioned not only about pigeons and rats, or cells, but also for missiles and weaponry technologies.

The impact of the four subject areas (Social Sciences, Psychology, Economics and Arts & Humanities), which are the closest to ERC HOMInG, is negligible in purely quantitative terms – 3.15% out of a total sample of 24,241 documents in *Scopus*. Despite its low impact, the increase in relevant publications since the late '90s suggests that homing is gaining momentum in areas other than medical and life sciences. As detailed in the overview of the whole 30-entry database, the selected documents covered a wide range of topics, such as food, transnational memories, homemaking among the homeless, homing blogs as ambivalent spaces for women's agency, or even homing desires in literature and movies. The “traditional” conceptions of homing revolving around diasporas and homelands, as a way of making, feeling, searching for home in exile, in everyday practices and political engagement, are broadened by new strands of research. Thus, reflections on homing reach out to regions once excluded, like in the case of Africans in China, and attempt cross-temporal and inter-generational comparisons that offer new insights on under-explored relations between people and nations.

Likewise, the feminist and queer literature now looks at the interstices of migration in which homing becomes a synonym of resistance, a re-affirmation of femininity within the domestic world, and a renegotiation of refugees' identities outside the liberation-nation narrative. The different ways of building a sense of home, of making home in constant mobility and in transnational memories, encounter new technological possibilities, contradictions and combinations as manifest in the experiences of second-generation migrants across the world.

In this small sample of documents, the use of homing in context makes reference to an ideal sense of home or to the action of bringing back/returning to what is seen and felt as *own*, both in a physical and a metaphorical sense. Along these lines, the elaboration of homing now on its way in ERC HOMInG is consistent, but not completely overlapping with the usages in the current literature. Indeed, it aims to advance them further.

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Annex I - References of the 30 entries in the *new homing database*

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Annex II - References by keywords

Homing desire

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Homing practices

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Homing & Homeland

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Homing objects

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Homing & the sense of home

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Homing & Re-Homing

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Homing & Un-Homing

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