2

THE TIMELINES

A broad-brush analysis

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The chapters compiled in this book bear witness to the development of science communication in 39 countries. The objective was twofold: to present the reader with a global understanding of the pathways different countries followed, and then to provide a means of comparison. The timelines at the end of each national chapter were constructed with this in mind, using indicators that are both comparable and recognised.

They reflect three conceptions of science communication:

- as an area of practice (indicators such as the date of establishment of an association of science writers or journalists or communicators, or the first interactive science centre)
- as a media subfield (indicators include the date when the first significant radio or television programs on science were broadcast)
- as an academic field (indicators include the dates when university courses to train science communicators were established, or when the first master's or PhD students in science communication graduated).

Other indicators were also collected, such as the date when the first national government program to support science communication was established, or the launch of the first significant initiative or report on science communication.[1]

1 At the risk of oversimplifying, science communication exists at the point of articulation of autonomous or semi-autonomous fields in interaction with one another: the academic field, the media field and domains of practice, all linked to specific fields or as sets of practices in a process of autonomisation. (Cf. Schiele, 2019; Gascoigne et al., 2010.)

In the introduction, we urged caution when considering the timelines. We said the timelines should be objects of scepticism and question, not intended as a definitive account of 'the way things unfolded'. In short, they are a beginning, perhaps a controversial one, not an end. Readers might look back at the introduction to check our reservations.

The world is complicated. Actors in science communication changed the role they played and intervened on several fronts, and any categorisation is in itself an oversimplification (as is the creation of indicators). They may, for instance, have performed in several different roles at the same time: as journalists, radio or television hosts; promoting or contributing to the institutionalisation of science communication by establishing or supporting an association; and advocating for university training (by creating programs or becoming university professors).

Therefore, the story is more complicated and cannot be reduced to 14 indicators. Trying to read the picture of science communication through these indicators makes it difficult to grasp the complexity of particular situations that governed its emergence and development. Only the chapters can do that.

However, an analysis of the timelines does show us which areas of activity have been significant from one country to another in the development of science communication, and when. It sheds light on each country's important fields of activity and their moments of significance. Therefore, we can deduce the anchor points of the actions of actors in science communication and how from there they have interacted with the other fields. And it is on this basis that a comparative approach can be undertaken.

A second limitation is the way authors interpreted the 14 questions and their knowledge of their country's history of science communication. For example, the San Francisco Exploratorium (United States) and the Ontario Science Centre (Toronto, Canada), both inaugurated in 1969 and both dedicated to visitor engagement through a hands-on approach (and thus breaking with the passive approach of traditional science museums), are commonly held to be the first interactive science centres. Or does that position belong to the Palais de la Découverte (Paris, France), which opened in 1937 and was deliberately designed without a permanent collection? Even within a country there can be debates: was the first interactive centre in France the Palais, or the Cité des Sciences et de l'Industrie, which opened in 1989 specifically with a hands-on approach?

Such questions arise on nearly all issues. Associations of science communicators are formed, dissolved and re-formed. Which date is the most significant, that of a foundation or of a re-foundation? Science communication university programs are created, cancelled and re-created. Again, which date is the appropriate one to record? In the end, we decided to acknowledge this uncertainty by accepting the dates as they were nominated in the chapters, although we are fully aware of the limitations of such an approach. This is why we regard the largely descriptive analyses that follow as offering only a general overview, an overview that could be refined with further research.

You will notice the graphs include phases of development. A 'phase' is when dates are clustered together. They are separated from the next phase by a gap of at least five years, so each cluster of dates (or 'phase') is separated by at least five years from the next one. Phases give a useful indication of concentrations of activity.

Table 2.1: Country international codes.

Aotearoa New Zealand	**NZ**	Iran	**IR**	Portugal	**PT**
Argentina	**AR**	Ireland	**IE**	Russia	**RU**
Australia	**AU**	Israel	**IL**	Singapore	**SG**
Brazil	**BR**	Italy	**IT**	South Africa	**ZA**
Canada	**CA**	Jamaica	**JM**	South Korea	**KR**
China	**CN**	Japan	**JP**	Spain	**ES**
Colombia	**CO**	Malaysia	**MY**	Sweden	**SE**
Denmark	**DK**	Mexico	**MX**	Taiwan	**TW**
Estonia	**EE**	Netherlands	**NL**	Thailand	**TH**
France	**FR**	Nigeria	**NG**	Turkey	**TR**
Germany	**DE**	Norway	**NO**	Uganda	**UG**
Ghana	**GH**	Pakistan	**PK**	United Kingdom	**GB**
India	**IN**	Philippines	**PH**	United States	**US**

1. Indicators of practice areas

1.1. First interactive science centre

All countries except Jamaica nominate a date for the creation of the *first interactive science centre*. Although the range is extensive, from 1914 in Norway to 2009 in Ireland, the trend really starts in 1975. Before that date, countries that opened science centres displayed major economic and cultural differences. How to account for the fact that although the USSR was a scientific powerhouse, symbolised by the 1957 success of Sputnik, Russia only built its first science centre in 2005?

Four stages are apparent:

- Precursors: Norway 1914, and the United States 1936
- Phase 1: Taiwan 1956, and India 1959
- Phase 2: Canada 1967, and Mexico 1970
- Phase 3: From 1975 until 2009, when all other countries developed their centres, with an average of two new science centres opening each year between 1977 and 2001.

The creation of a science centre is symbolic of the newfound importance of science and technology in a society. Although countries compete with one another to stress unique qualities of their own science centre, it is more likely that centres share strong similarities in concept, format and activities.

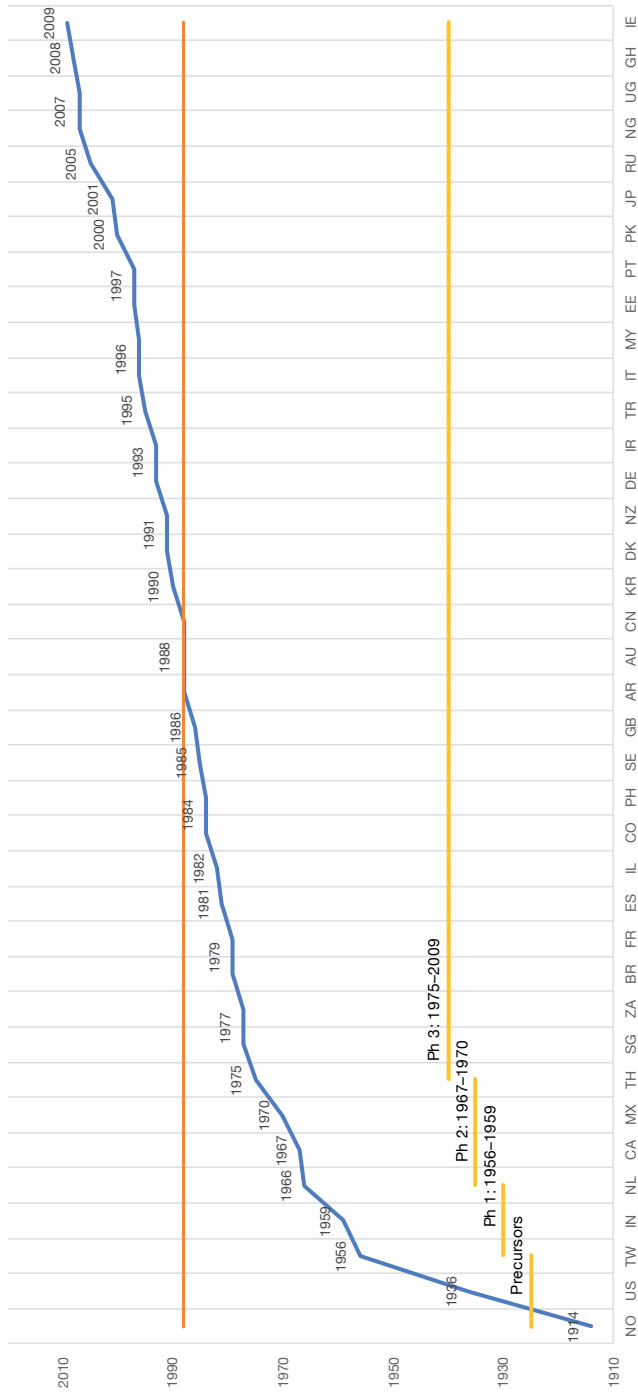

Figure 2.1: Date the first interactive science centre was established.

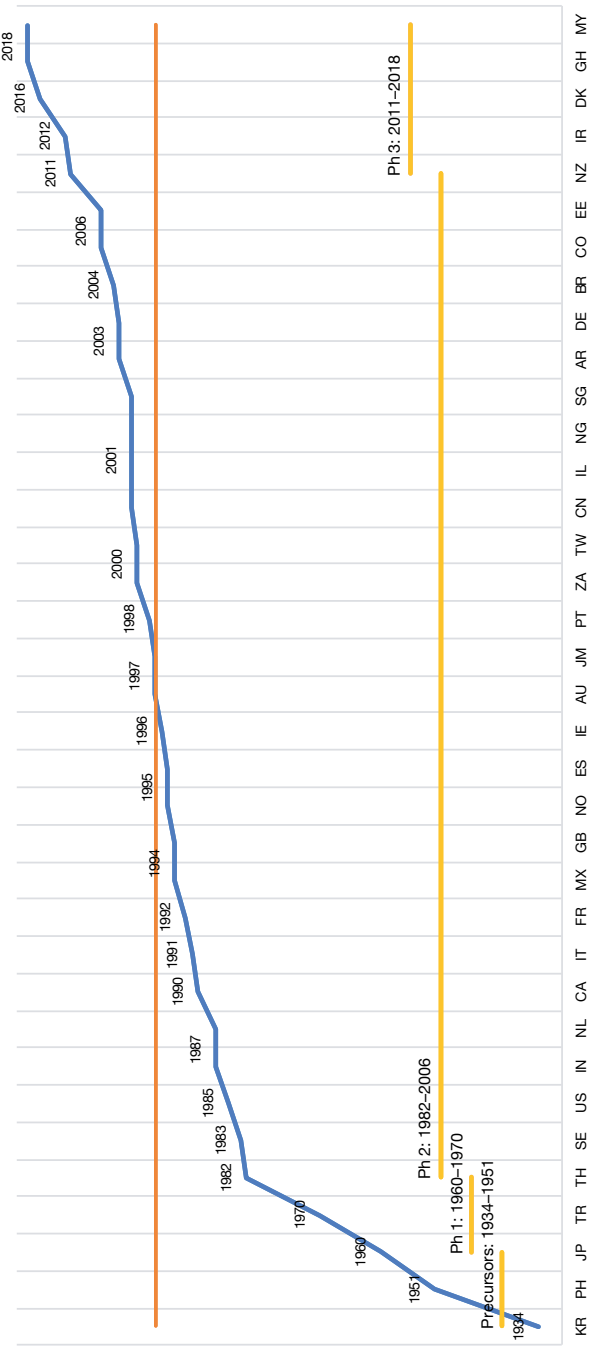

Figure 2.2: Foundation date of national science week.

1.2. National science week

Thirty-six countries report that they hold a science week, with South Korea claiming the first in 1934 and Malaysia the most recent in 2018. Pakistan, Russia and Uganda do not provide a date. The gradual creation of science weeks follows the pattern of the development of science centres.

There were four stages of activity:

- Precursors: South Korea 1934, and the Philippines 1951
- Phase 1: Japan 1960, and Turkey 1970
- Phase 2: 1982–2006: a period over which 27 countries stated a science week, and peaking between 2000–2006
- Phase 3: 2011–2018: five more countries.

The first countries to build science centres were not the first to hold a national science week. There is apparently no coordination between science communication initiatives: the development of flagship science communication initiatives like science centres does not immediately stimulate other events on a national or even regional scale. There is a time gap, of 20 years on average, between the creation of the *first science centre* and the *first national science week*, with the science centres generally being formed first. The median (mid-point) for the founding of science centres is 1988, compared to a median of 1997 for science weeks.

Most countries chose to launch a *science centre* before they inaugurated their *national week,* but eight countries began with the science week: South Korea 1934; the Philippines 1951; Japan 1960; Turkey 1970; Sweden 1984; Italy 1991; Ireland 1996; and Nigeria 2001. It is interesting to note that many of the pioneers were lower-income countries; perhaps their national science week was an expression of commitment to science communication in a context of limited resources.

1.3. First science festival

As with the science week, 36 out of 39 countries reported that they organise science festivals or science fairs, the exceptions being India, Portugal and Uganda. In some countries these coincide with the *national science week*, the two events being mutually reinforcing. With the exception of the *science fair/ festival* in the United Kingdom in 1881 (a precursor and not on the graph), the movement started in the Philippines in 1951.

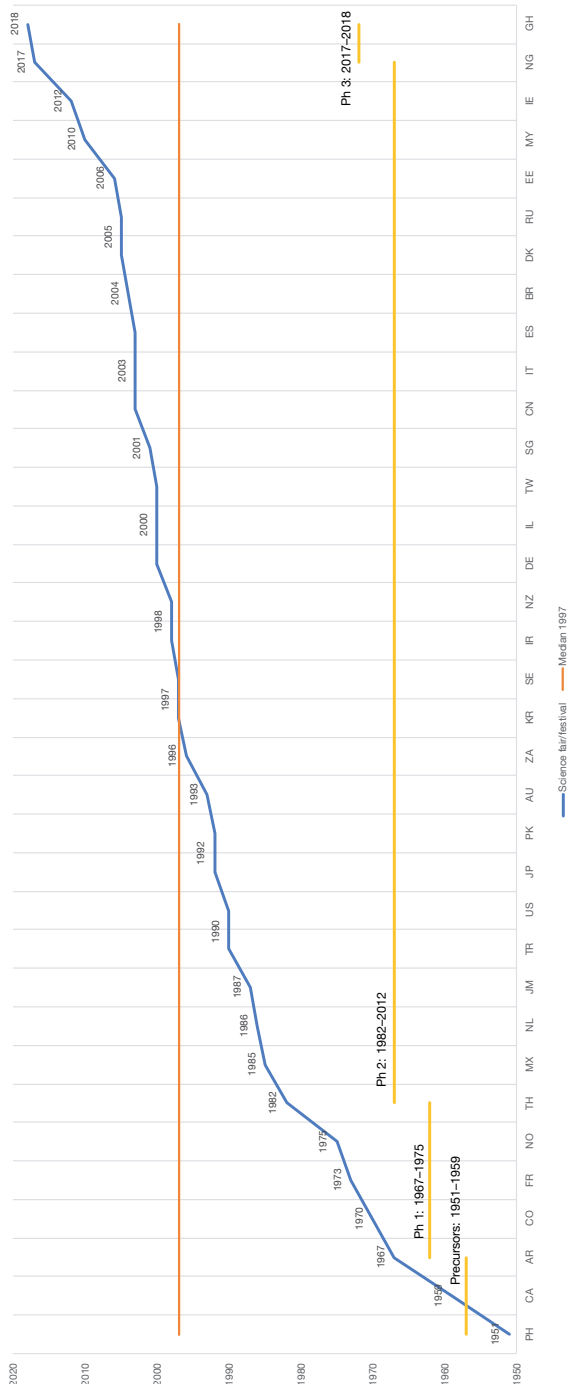

Figure 2.3: First national (or large) science fair/festival.

Science festivals progressed in four stages, following one in the UK in 1831 (not shown on graph):

– Precursors: 1951–1959: the Philippines and Canada
– Phase 1: 1967–1975: Argentina, Colombia, France and Norway
– Phase 2: 1982–2012: the longest, with 27 countries, starting in 1982 with Thailand and ending in 2012 with Ireland
– Phase 3: 2017–2018: Nigeria 2017 and Ghana 2018.

The organisation of a science festival was a marker for any country seeking to express its interests in science communication, since the event ensures science a greater visibility in the public sphere (media coverage, school trips, museum programs and so on). The creation of science festivals generally took place in a country after they had built a science centre, and the median date across the 36 countries is 1997. This is the same as the median for the creation of *national science weeks* and suggests the two events are linked or have strong ties to one another, since a science week can be the pretext for a festival. Out of the 36 countries, 15 created their science festival after the turn of the millennium, and 11 between 2000 and 2006.

1.4. Association of science writers

Thirty-three countries have an association for science writers and journalists, with the exceptions of Iran, Israel, Jamaica, Malaysia, Pakistan and Singapore. The foundation of such an association signals two things: that an emerging profession has recognised itself as such and claims its own specificity and legitimacy; and that by discussing scientific issues, a subset of writers and journalists are specialising in science.

There were four stages:

– Precursors: 1929–1934: Germany in 1929, followed by the United States in 1934
– Phase 1: 1946–1955: Seven countries founded associations (it is noteworthy that this second phase started at the end of WWII)
– Phase 2: 1962–2005: 22 countries founded associations
– Phase 3: 2014–2016: Ghana 2013, Portugal 2014, and Russia 2016.

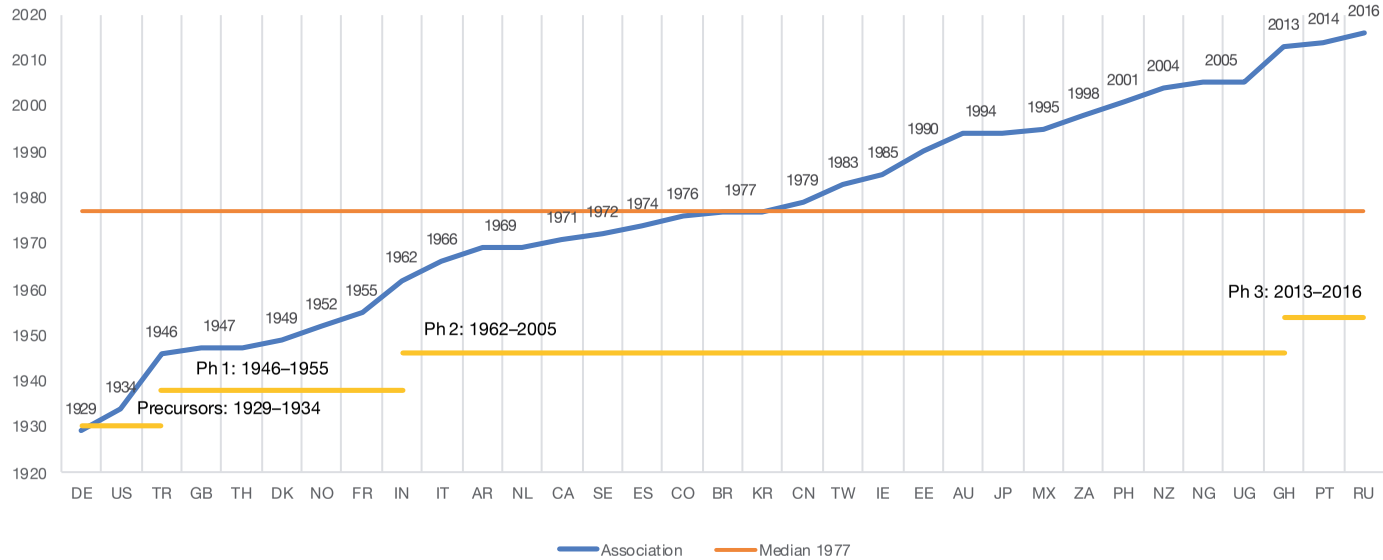

Figure 2.4: Association of science writers or journalists established.

The median year was 1977. It can be argued that the field of science communication began as a grouping of actors engaged in science writing. Popularisation or vulgarisation—expressions used to refer to science communication until the turn of the 1960s—enjoyed a golden age in the 19th century. The written medium was the dominant form, although lectures were also important (especially for natural science museums) and live demonstrations of physical or chemical phenomena were held during fairs.

The written format, governed by the rules of publishing or journalism, has left its mark on the professionalisation of science communication, if only by nominating the criteria for becoming a member. Although preceded by the first science centres, the origins of science communication are linked to the foundation of associations for science writers and journalists.

1.5. Science communication awards

Thirty-five countries have created an award for science communication by scientists, journalists and others, with only four countries not mentioning it in their national timelines (Jamaica, Japan, the Netherlands and Singapore).

Again, the chronology progressed through four stages:

- Precursor: US 1946 (Westinghouse AAAS Science Journalism Award)
- Phase 1: Sweden 1972, and Canada 1973 (Ortho-Award for print science journalism)[2]
- Phase 2: 1978–1996: involved 19 countries
- Phase 3: 2001–2018: involved 13 countries.

If we ignore the five-year gap between 1996 and 2001, new prizes are constantly being created. They signal not only a newfound appreciation for the work of science communicators and the legitimacy of the field and the role it plays in society, but also the specialisation of the field. By creating such prizes, countries want to stress the importance of science communication.

2 The *Association des communicateurs scientifiques* (Science Communicators Association, Quebec) will follow suit with the creation of the Fernand-Séguin scholarship for young science journalists. A third prize was created for the promotion of science in 2001 by the National Science and Research Council of Canada.

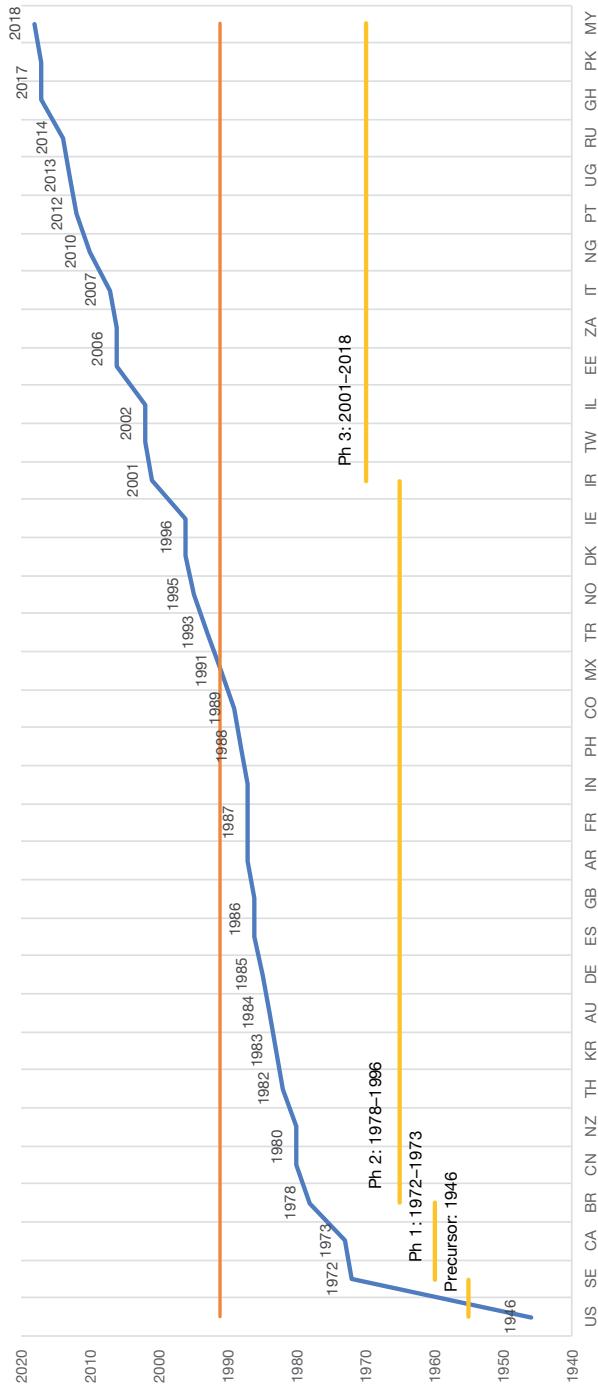

Figure 2.5: Award for scientists or journalists or others for science communication.

The median year of 1991 is slightly later than the median year for the creation of *science centres* (1988), while significantly later than the median year for creation of a *journal devoted to science communication* (1956) and of an *association for science writers and journalists* (1977). The creation of a prize signals that the constitution of a social group (science communicators) is well advanced, since the existence of such an award implies rules of communication and issues specific to this group, complementing other activities such as the journal and the association, and affirming this specific social and cultural activity.

1.6. Journals of science communication

Only 20 countries mention a journal completely or substantially devoted to science communication.[3] Although the dates for the creation of new journals can be pinpointed, they do not easily fit into phases of development. Scandinavia, whose countries, people, culture and language have close and historical ties, established its journals in 1854 (Denmark), 1877 (Norway) and 1911 (Sweden), but it cannot be said that creation of one influenced the creation of the other. The fourth journal was founded in China in 1933, 22 years later, illustrating the point that creating new journals is a slow process.

If we try to fit this activity into phases, three stages after the precursor emerge:

– Precursors: Denmark, Norway and Sweden
– Phase 1: 1938–1952: six journals were created with an average interval of three years: Australia 1938; New Zealand 1942; Argentina 1945; Thailand 1948; Brazil 1949; India 1952
– Phase 2: 1975–1979: three journals created: Mexico 1975; Colombia 1977; the United States 1979
– Phase 3: 1992–1997: the United Kingdom 1992; Spain 1995; the Netherlands 1997.

3 France mentions that examples of such journals date back to the 19th century, although it is difficult to date them accurately.

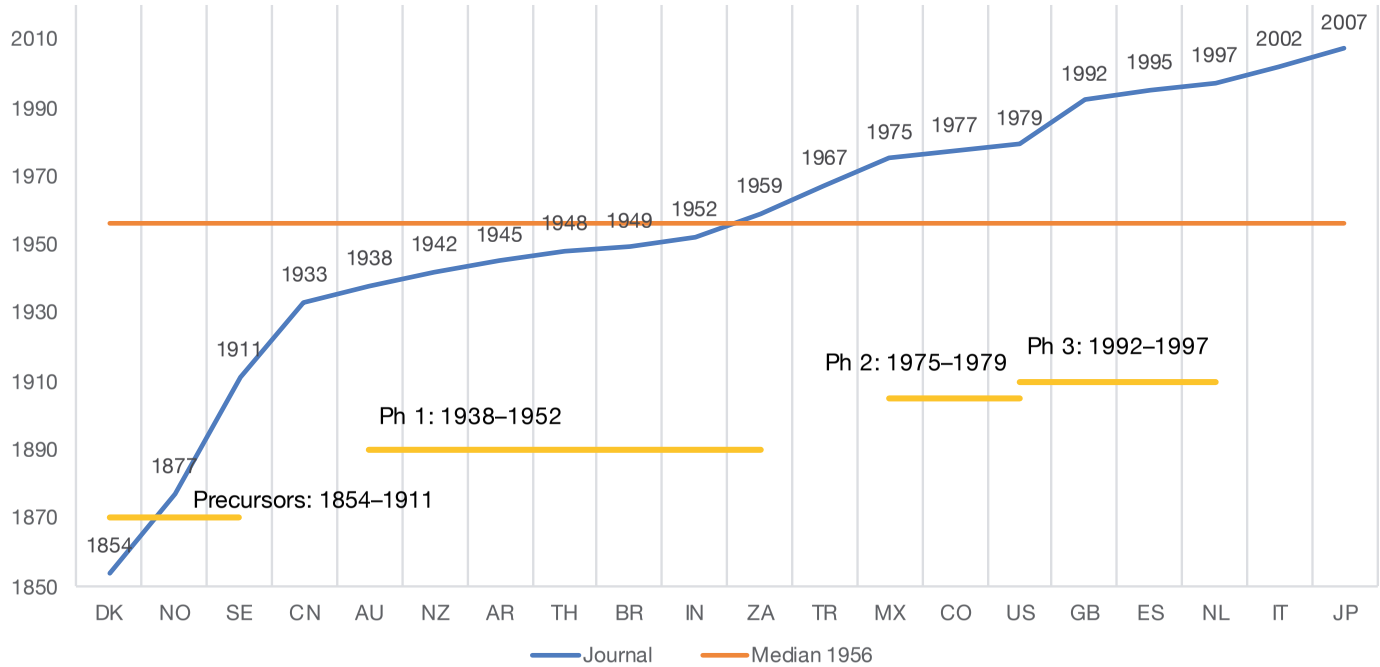

Figure 2.6: Journal completely or substantially devoted to science communication.

Other countries were scattered across the period as indicated in Figure 2.6. The median was 1956 but there does not seem to have been any general movement, as was the case for *science centres*, *national weeks*, *science fairs*, *associations* and *awards*. Half the countries surveyed (19) have no journal. While the creation of a journal may signal the beginning of the institutionalisation of science communication in any given country, the sample is too limited to draw definitive conclusions.

2. Indicators of the media subfield

2.1. Radio programs on science

The second group of indicators concerns the media field, specifically the date of the *first significant radio program on science* and the first *significant television program on science*. Radio (Figure 2.7a) came into being before television, and the majority of countries have created radio science broadcasts, or at the very least have programs that raise questions pertaining to science. Only the chapters on Japan,[4] Malaysia and Singapore do not nominate dates.

The creation of science radio broadcasts happened in seven phases extending over nearly a century, from the United States in 1920 to Ghana in 2014, with 1964 as the median year. Science radio broadcasts took off in the aftermath of WWII, and specifically from 1949 for 23 out of 39 countries.

The seven phases were:

- Phase 1: 1920–1933
- Phase 2: 1941
- Phase 3: 1949–1952
- Phase 4: 1957–1966
- Phase 5: 1976–1983
- Phase 6: 1990–2003
- Phase 7: 2010–2014.

The four most significant phases were 1, 4 and 6, each involving at least four countries.

4 The authors stated that it was very difficult to date the first science radio broadcast.

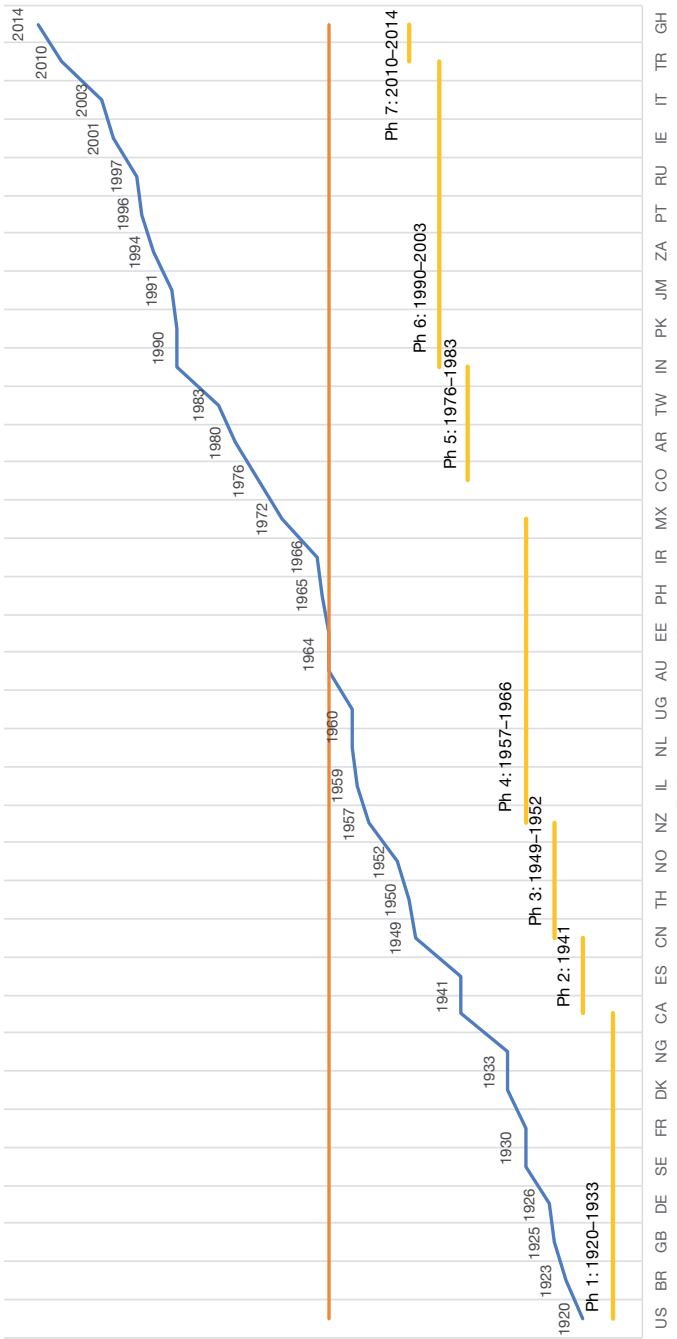

Figure 2.7a: First significant radio program on science.

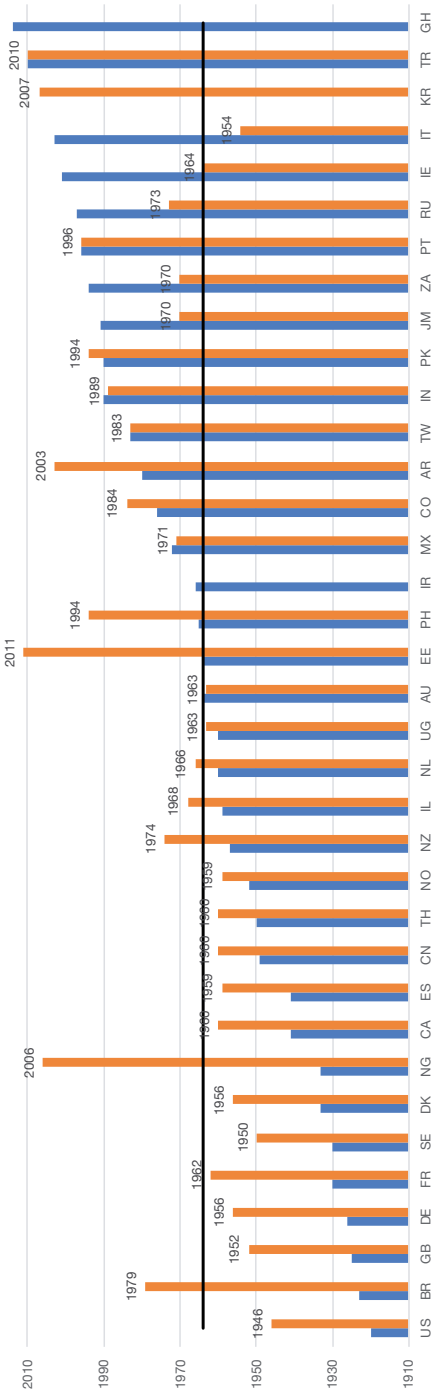

Figure 2.7b: First significant radio program on science compared to the first significant TV program on science.

The development was not continuous, nor did it seem to be evident that science topics should be raised on radio. It is significant that, although television came later, the median year for science TV broadcasts is a mere six years later than the median for science radio broadcasts, in 1970. This small difference emphasises the point that science content was not self-evident for radio producers.

2.2. Television programs on science

In contrast, the development of science TV broadcasts was more compressed. Television had huge appeal because it made it possible to show pictures of science to audiences while talking about researchers, their science and its applications. The effect was to expose viewers to worlds beyond their daily experience.

After the first burst of activity, the creation of new TV broadcasts followed at an unequal pace. There were four phases:

– Phase 1: 1946 and 1974: the first and most important phase, with 23 countries. In this period a science TV broadcast was created on average every two years
– Phase 2: 1983–1989
– Phase 3: 1994–1996
– Phase 4: 2003–2011.

Some countries did not identify dates for the first science broadcasts on either radio or TV, perhaps because they were difficult to identify or perhaps because that particular medium does not carry broadcasts on this subject. According to the authors, Singapore's (1972) and Korea's (2007) first science broadcasts were on television. Neither identified a date for radio. Neither Japan[5] nor Malaysia identified a date for the creation of TV broadcasts.

A last element: as noted, the random nature of the arrival of science on radio contrasts with the systematic nature of its arrival on television, a fact that suggests the quick realisation of television's potential (Figure 2.8a). The US, according to the authors, were the first to adopt radio (1920) and television (1946). A handful of countries even started using radio decades after adopting television, such as Jamaica (1970, 1994) and South Africa (1970, 1991).

5 The authors stressed that it was very difficult to date the first TV broadcast on science.

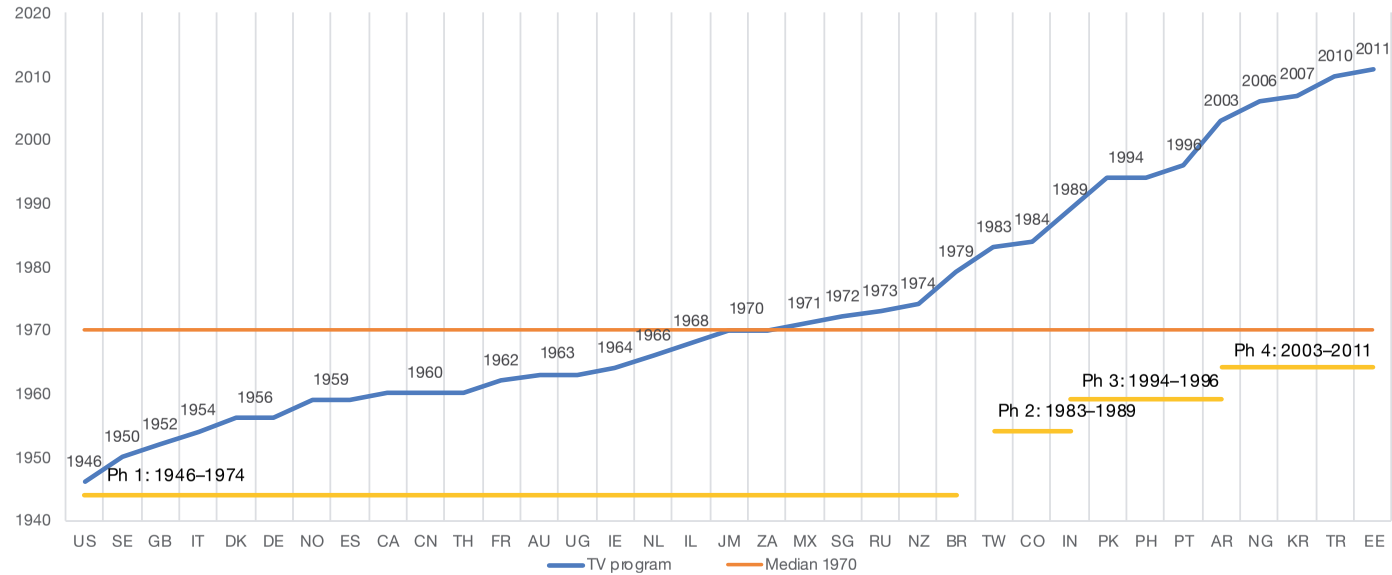

Figure 2.8a: First significant television program on science.

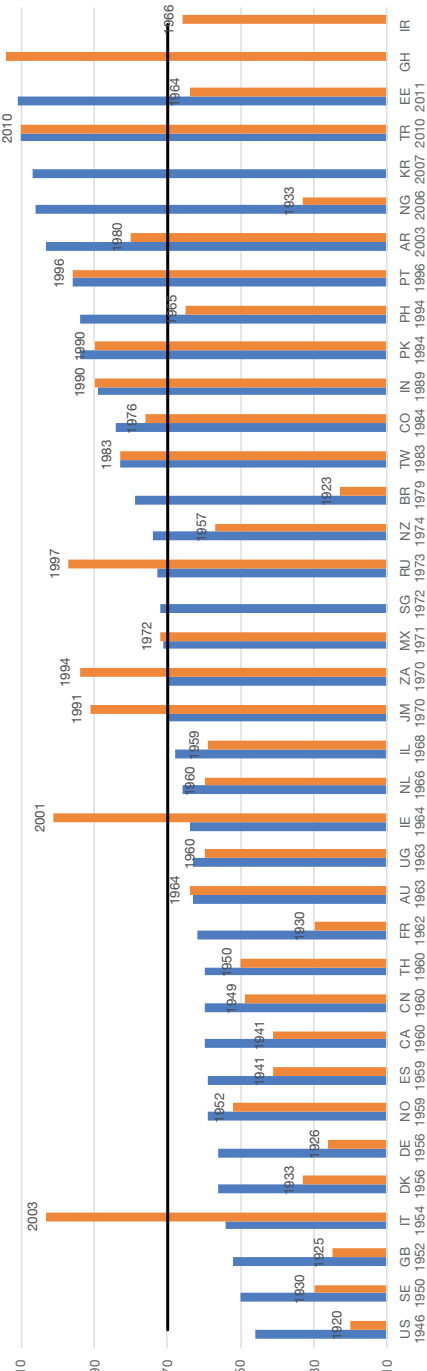

Figure 2.8b: First significant television program on science compared to the first significant radio program on science.

3. Indicators of the academic field

3.1. Courses at universities

The beginnings of systematic training in science communication, pioneered by the Philippines and the United States in 1960, are an indicator of the slow, yet continuous, professionalisation of the field over the next 60 years. Ghana (2019) is the most recent country to offer courses. Figure 2.9 shows that 35 countries offer university courses, with the exception of Malaysia, Pakistan, Singapore and Uganda.

These may be master's courses, or units in science or journalism (or other disciplinary areas) degrees, or certificate or diploma courses. Only one country identified a full undergraduate course in science communication (France).[6] In 1984, Denise Devèze-Berthet set up the first training courses (bachelor's and graduate) focused on 'communication and scientific, technical and medical information'. One year later, in Tours (France), Jean Lagoutte and colleagues created bachelor-level training at the Institute of Technology (IUT) in Tours, focused more on scientific mediation.

This development took place in one extended phase, following a lone precursor:

– Precursor: 1960
– Phase 1: 1976–2019: a new program created every 15 months on average.

The necessity of systematic training gradually became self-evident. The creation of university programs coincided with the development of academic research on questions of science communication[7] and the growing interest of states for the dissemination of scientific thought.[8]

6 We could consider this apparent absence of undergraduate courses as a possible effect of the wording of the question asked: *First university courses to train science communicators*. The dates people identified here can be seen as a combination of several things: master's degrees, or units of degrees in science or journalism or other undergraduate courses, or perhaps diplomas or certificate courses.

7 Among others: Withey, 1959; Kriegbaum, 1967; Funkhouser and Maccoby, 1970; Jurdant, 1970.

8 As a reminder: the various studies commissioned by the European Council in view of the organisation of the Strasbourg Conference of 1969 or the 1970 UNESCO report on the diffusion of sciences.

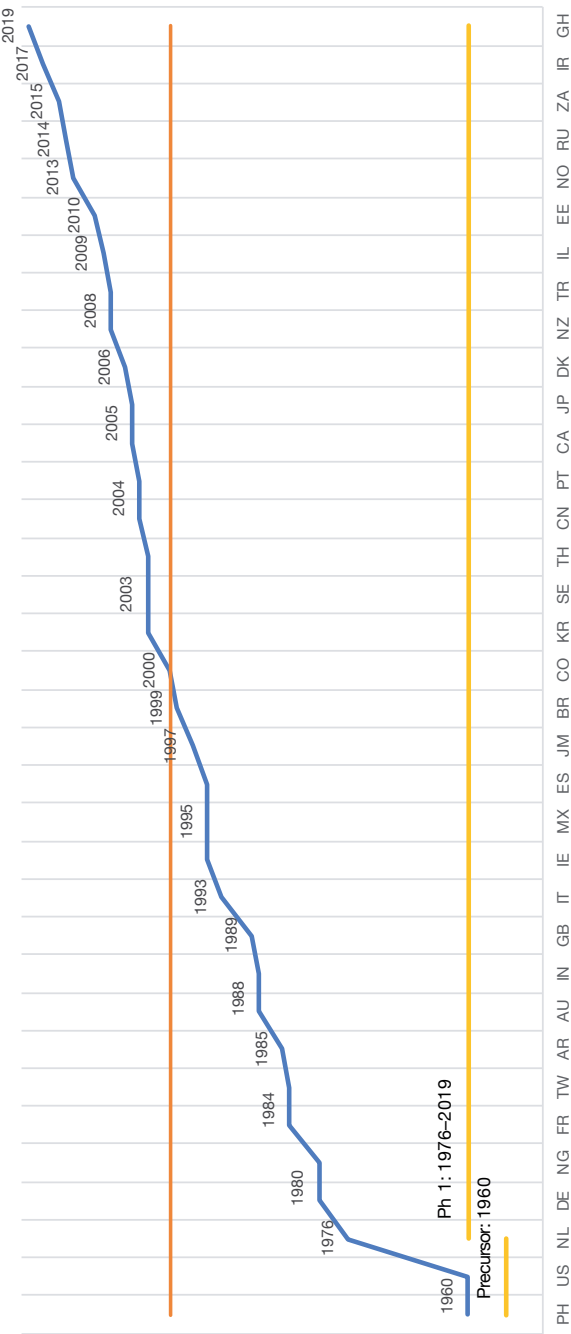

Figure 2.9: First university courses to train science communicators.

Seventeen countries began some form of training in science communication before 1999. The median year is 2000, with 18 countries commencing their training after that date.

Almost all countries report that they offer training in science communication at some level. There are five broad possibilities for this:

1. units, subjects or certificates as part of a degree in disciplines such as science or journalism
2. a diploma, as an extra qualification for a person holding a bachelor's degree
3. an undergraduate degree in science communication (we found only one report of such a degree, in France)
4. master's degree
5. PhD.

A few countries do not offer any training or research training in science communication, but people reported that they travelled overseas to undertake training (usually to earn a postgraduate qualification) before taking up positions in their home country.

3.2. First master's and PhD programs

Figures 2.10 and 2.11 should be analysed together with Figure 2.9, since they make clear not only the professionalisation of the field of science communication but its academic legitimisation. Although the development of a master's program (Figure 2.10) reflects the gradual development of criteria of competence sanctioned by training, PhD programs entail a more systematic participation in the academic field (journals, conferences, research programs and so on), and convey additional legitimacy and autonomy.

Figure 2.10 shows that the first master's in science communication was offered in the United States in 1960. There was a 24-year gap separating that from the second (France 1984). We do not have enough details to draw conclusions as to whether master's programs are an extension of undergraduate courses, which might be units in science or journalism or other degrees. Nor do we know what prerequisites were required to enter the master's program: a degree in science, social sciences or another discipline.

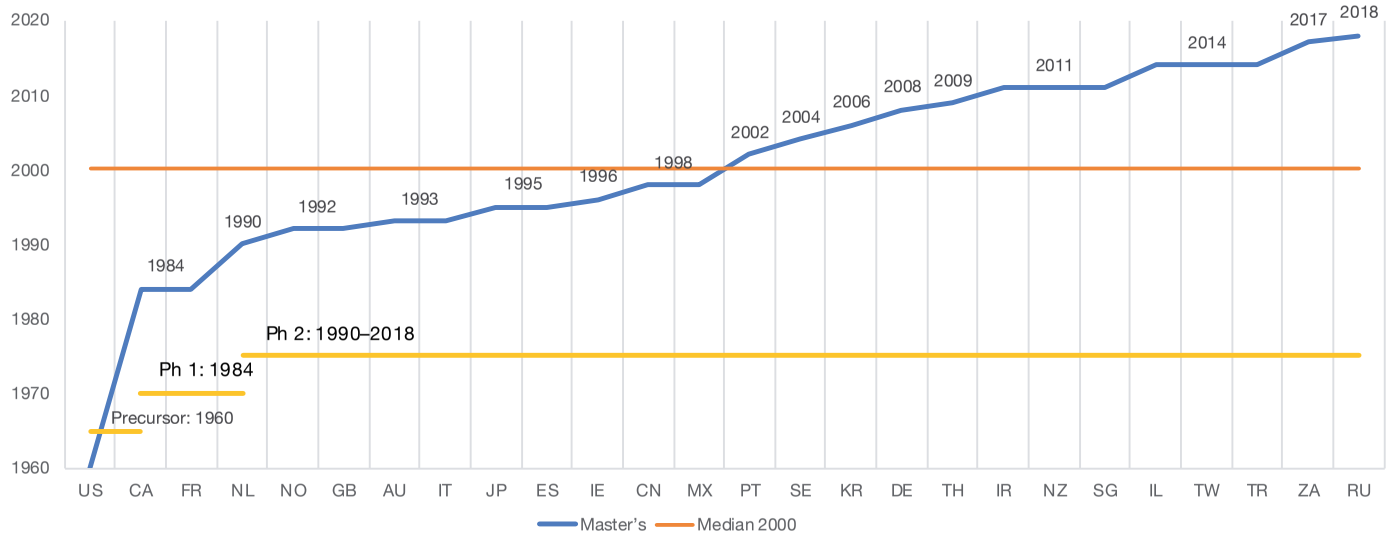

Figure 2.10: First master's degree in science communication to graduate.

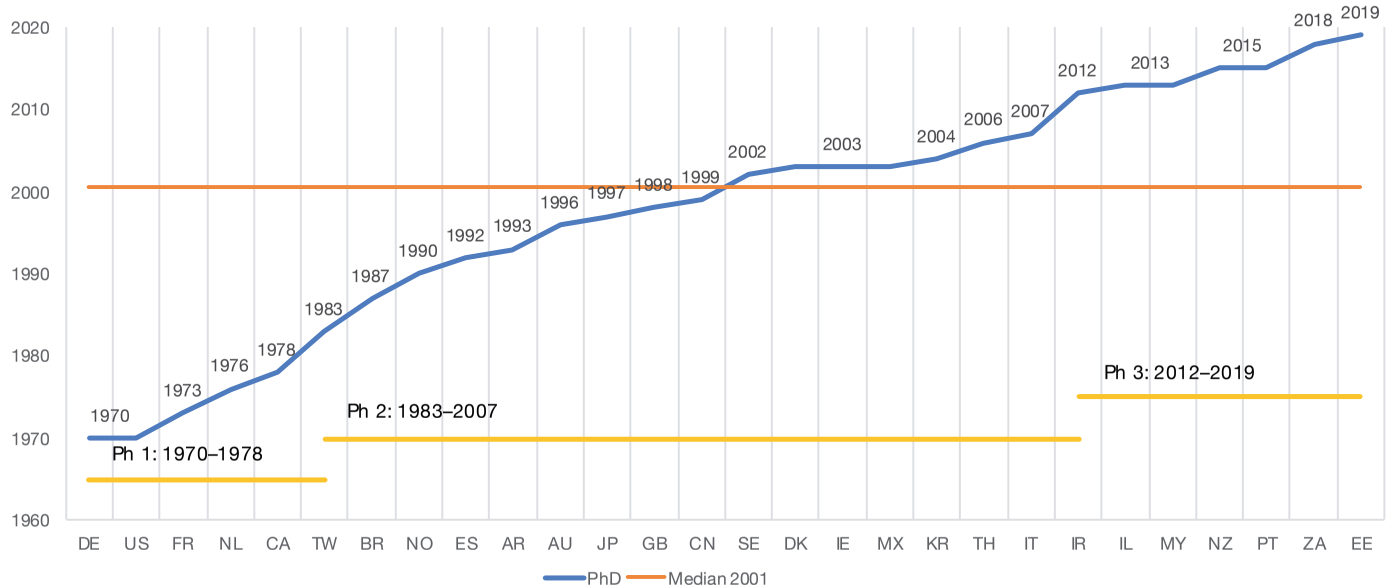

Figure 2.11: First PhD in science communication to graduate.

Twenty-six countries award master's degrees, with a median year for starting these courses of 2000. Figure 2.10 shows that it is possible to distinguish two major phases after the precursor:

– Precursor: 1960
– Phase 1: 1984
– Phase 2: 1990 on, accelerating to an average of a new country every 14 months.

Figure 2.11 shows that the development of PhDs took place in three phases:

– Phase 1: 1970–1978
– Phase 2: 1983–2007
– Phase 3: 2012–2019.

A handful of countries created PhD programs before creating a master's course. These include Canada and France (both in 1984). A comparison of the graphs tracks the patterns in the establishment of master's courses and PhDs. The differences are insignificant.

3.3. National conferences

Thirty-two countries reported having organised a national conference on science communication. This suggests a consolidation of the field since it brings together actors in this field, giving them a venue to collectively debate issues of importance. Beyond their affirmation as a group, it also gives them a visibility within society while distinguishing them from other groups of social actors.

Canada (1933) and the United Kingdom (1943) began the process, and the four subsequent phases were:

– Phase 1: Spain 1958, and Germany 1960
– Phase 2: France 1969, Colombia 1969, and US 1970
– Phase 3: 1990–1996: the movement gained momentum with six countries
– Phase 4: 2002–2019: after a six-year gap, 17 countries followed suit.

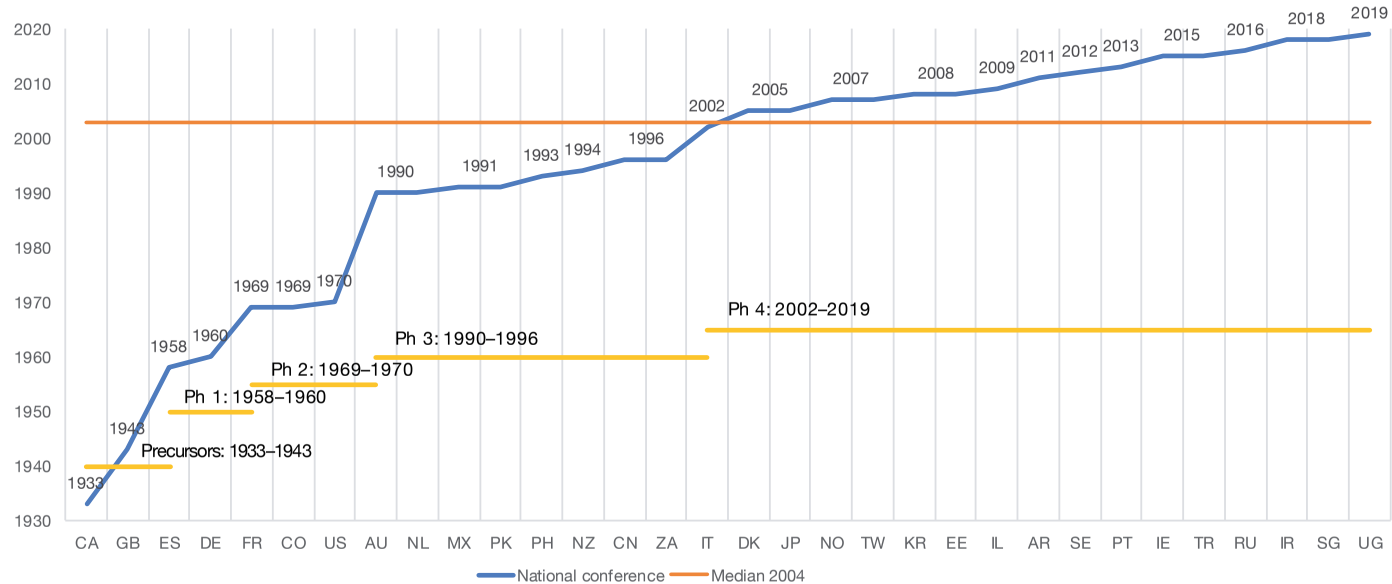

Figure 2.12: First national conference on science communication.

The first conference of the Network for the Public Communication of Science and Technology took place in Poitiers, France, in 1989. This was after the first national meetings, but perhaps the surge in national events from 1990 and 2002 owes something to having an international example to follow. The arrival of the internet and the web, to link interested parties and publicise events, made the job of organising meetings easier from the mid-1990s.

To an extent, because phases overlap with one another, we observe similarities between the institutionalisation of research and the institutionalisation of training in science communication, strengthening and affirming the community of social actors engaged in the field.

3.4. Initiative or report on science communication

At first glance, the graph on the first initiative or report on science communication differs from others. Only 28 countries make mention of an initiative or report, and Figure 2.14 shows they were discontinuously produced. Between 1933 and 1993, a 60-year period, initiatives are sporadic (one every five years on average), while the five phases that can be observed are so short that their significance may be questioned:

– Precursor: France 1937
– Phase 1: 1953–1957
– Phase 2: Colombia 1965
– Phase 3: Spain 1970
– Phase 4: 1975–1977
– Phase 5: 1985–1988
– Phase 6: Norway 1993
– Phase 7: 1999–2004
– Phase 8: 2009–2015.

The median year is 2001, and from this year the number of reports increases, with a total of 16 (one per year on average). And it is from that date on that we observe a convergence with university training and national conferences, and these dynamics may strengthen one another.

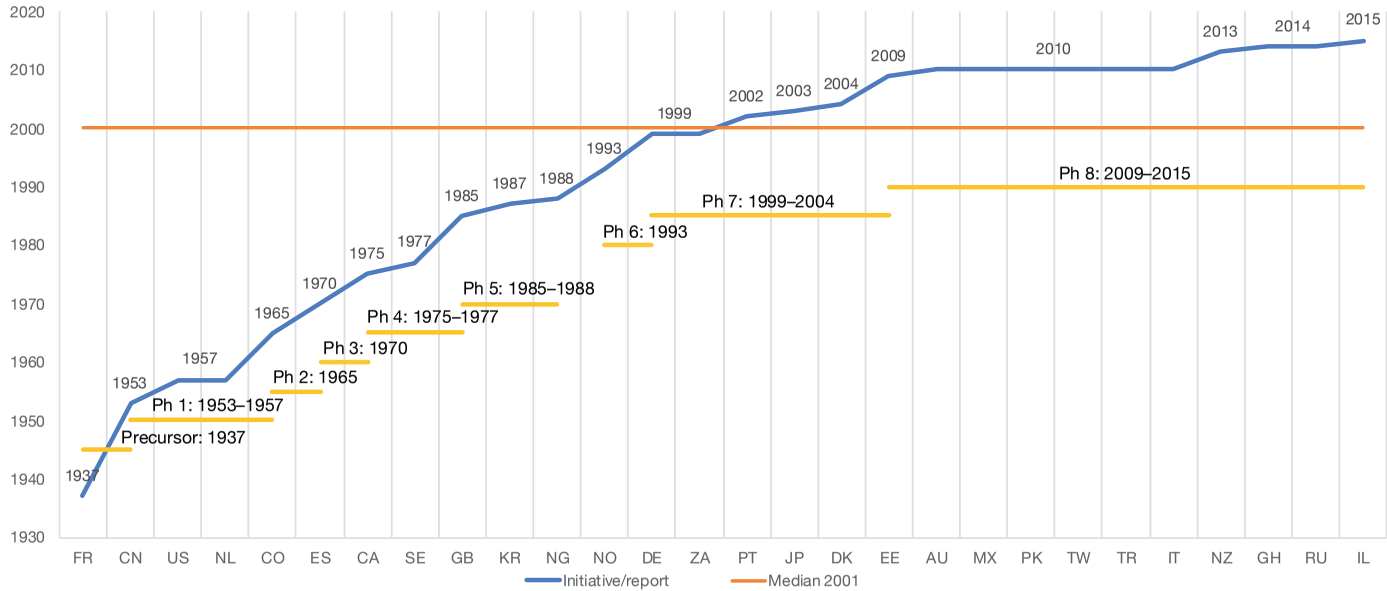

Figure 2.13: First significant initiative or report on science communication.

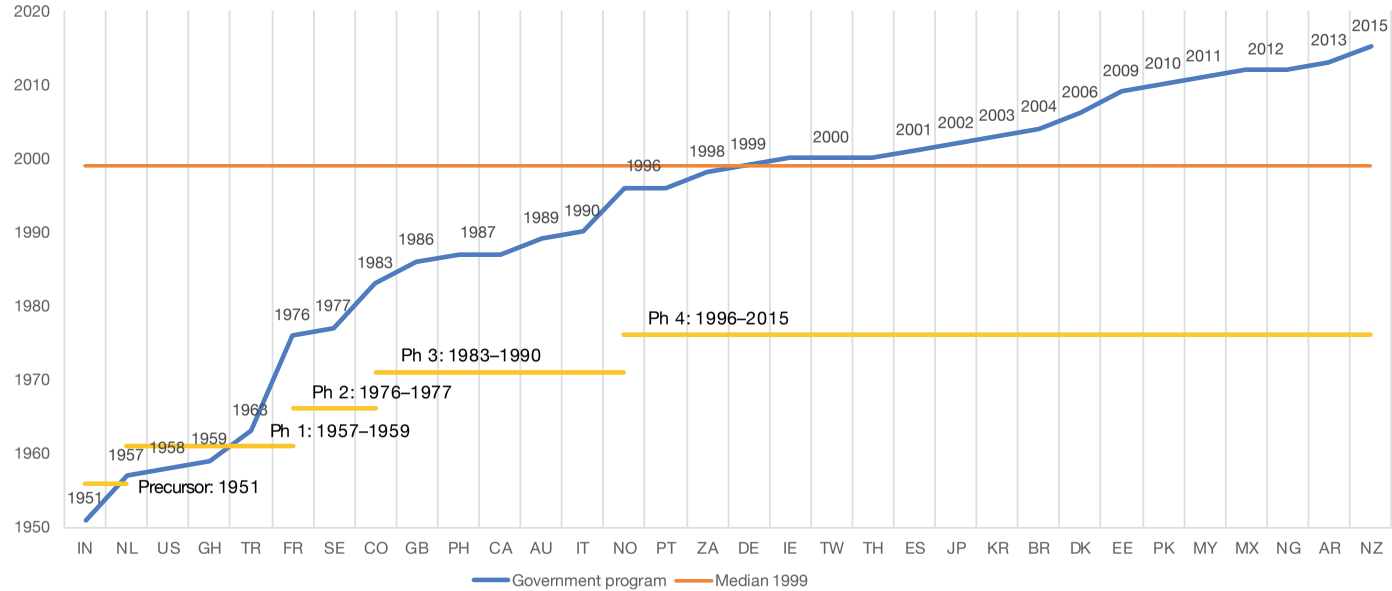

Figure 2.14: National government program to support science communication.

3.5. National programs on science communication

Thirty-two countries reported the development of national programs[9] and the median year is 1999. India 1951 was the precursor. Since 1976, 27 countries have developed national programs in three phases after the precursors:

- Precursor: 1951 India
- Phase 1: 1957–1958
- Phase 2: 1976–1977
- Phase 3: 1983–1990
- Phase 4: 1996–2015.

The 1996–2015 phase saw two national programs being created every year on average, exemplifying not only the newfound interest for science communication but also the support it gathered. Although the sample is smaller, Figure 2.12 (first national conference) and Figure 2.13 (first initiative/report on science communication) express the same newfound willingness to promote science communication through training, research or the publication of reports.

4. Which countries were the pioneers?

Below are ranked the first five countries to adopt or act in each of the 14 areas. Readers are reminded of the cautionary note posted at the beginning of this section on the accuracy and comparability of the data.

Table 2.2 presents chronologically the five first countries for each indicator.

The United States was the first to innovate or adopt in six of the 14 indicators. They were also second twice and third twice. Germany was first twice, third once and fifth twice. France, the Philippines, the United Kingdom, Canada, Norway, India, Denmark and South Korea were first on one occasion each. The Netherlands and Sweden were second twice each.

9 The authors of the chapter on China stressed that it was very difficult to date the first national program.

Table 2.2: First five countries in the 14 areas.

	Ranking				
Indicator	**1**	**2**	**3**	**4**	**5**
Science centre	N0 (1914)	US (1936)	TW (1956)	IN (1959)	NL (1966)
National week	KR (1934)	PH (1951)	JP (1960)	TR (1970)	TH (1982)
Science fair/festival	GB (1831)	PH (1951)	CA (1959)	AR (1967)	CO (1970)
Association	DE (1929)	US (1934)	TR (1946)	GB (1947) TH (1947)	DK (1949)
Award	US (1946)	SE (1972)	CA (1973)	BR (1978)	CN (1980) NZ (1980)
Journal	DK (1854)	NO (1877)	SE (1911)	CN (1933)	AU (1938)
Radio program	US (1920)	BR (1923)	GB (1925)	DE (1926)	SE (1930)
Television program	US (1946)	SE (1950)	GB (1952)	IT (1954)	DK (1956)
University course	PH (1960) US (1960)	NL (1976)	DE (1980) NG (1980)	FR (1984) TW (1984)	AR (1985)
MA graduate	US (1960)	CA (1984) FR (1984)	NL (1990)	NO (1992) GB (1992)	AU (1993) IT (1993)
PhD graduate	DE (1970) US (1970)	FR (1973)	NL (1976)	CA (1978)	TW (1983)
National conference	CA (1933)	GB (1943)	ES (1958)	DE (1960)	FR (1969) CO(1969)
Initiative/report	FR (1937)	CN (1953)	US (1957)	NL (1957)	CO (1965)
National program	IN (1951)	NL (1957)	US (1958)	GH (1959)	TR (1963)

The United States appears 10 times in the table above, the Netherlands six, and Canada, France, Germany and the United Kingdom five times each.

Table 2.3 collates the results for all first-five precursor countries (the total varies from column to column because countries that innovated the same year were similarly ranked).

Table 2.3: Five first precursors.

	Ranking					
Code	**1**	**2**	**3**	**4**	**5**	**Total**
US	6	2	2			**10**
DE	2		1	2		**5**
FR	1	2		1	1	**5**
PH	1	2				**3**
GB	1	1	2	1		**5**
CA	1	1	2	1		**5**
NO	1	1		1		**3**
IN	1			1		**2**
DK	1				2	**3**
KR	1					**1**
NL		2	2	1	1	**6**
SE		2	1		1	**4**
CN		1		1	1	**3**
BR		1		1		**2**
TW			1	1	1	**3**
TR			1	1	1	**3**
ES			1			**1**
NG			1			**1**
JP			1			**1**
AR				1	1	**2**
TH				1	1	**2**
IT				1	1	**2**
GH				1		**1**
CO					3	**3**
AU					2	**2**
NZ					1	**1**
Total	**16**	**15**	**15**	**16**	**17**	**79**

4.1. Median points

Figure 2.15 takes into account all the indicators used to construct the timelines. The orange lines indicate the beginning and end of each element. For example, to the question *When did the first national (or large) science fair/ festival take place*, the line stretches from 1831 to 2018. This is a 187-year period and this number is written in the column on the right side of the graph.

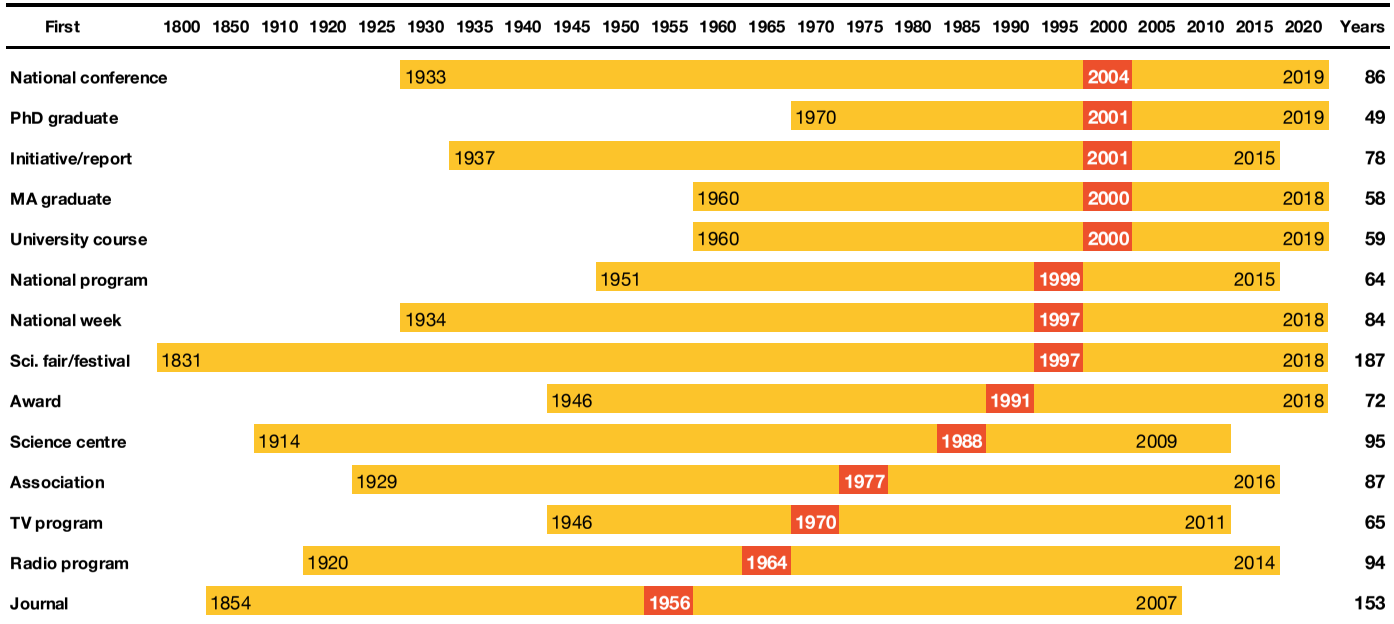

Figure 2.15: Proposed synthesis of the evolution of science communication.

The red cells indicate the median year for each question. For example, the median year for journals was 1956, which appears near the middle of the line. This means the creation of journals was more or less evenly spread, while national conferences only gained momentum in later years.

5. Conclusion

The aggregation of the indicators, ordered chronologically according to the date of the median year, gives an overall picture of the gradual development of science communication. From this data, we can assert that the creation of a journal was a foundational moment, because it anchored in society a specific type of discourse, which the later adoption of radio and television consolidated. Similarly, the award of master's or PhD degrees, located at the top of the graph, suggests that the institutionalisation process is recent and ongoing, thus lending further support to the analysis of Figure 2.13.

It is clear is that the overall pace is quickening. Countries that have not in the past invested resources into science communication increasingly see it as a pathway to prosperity, with economic, social and environmental benefits accruing to countries that apply and use science wisely. This implies an ability of its citizens to appreciate the possibilities and limitations of science. A job for the science communicator.

We conclude with a graph showing which countries have hosted the biennial PCST conference, themselves indicators of the structure and institutionalisation of science communication.

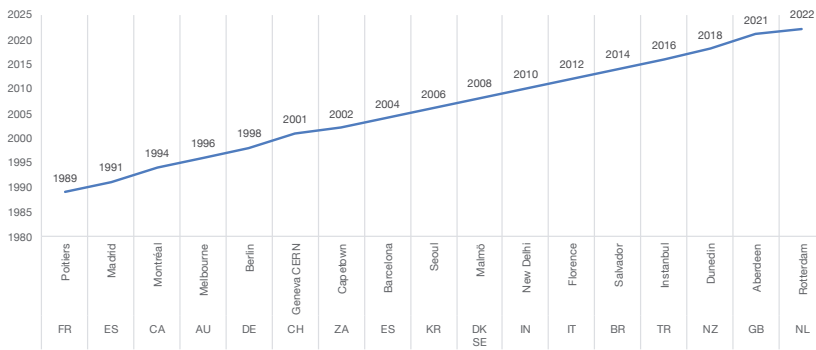

Figure 2.16: PCST conferences.

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