Submission to House of Commons Science and Technology Committee enquiry on Science Communication

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Executive summary: nine evidenced trends in British science culture

- Increasing trust in scientists 'to tell the truth' since 2000.
- Increase in 'no option trust' in those who govern science from 2005 to 2014, but no so in Scotland.
- Clearly Increasing knowledge and familiarity with science since 1980s.
- Positive evaluation of science remains stable or is slightly increasing since 2000; less so among the WWII generation.
- Decreasing interest in science since 1989; not so among Generation X (born 1964-1977).
- Increasing overall UK media coverage of science since 1990; a potential turning point in 2007/08.
- Increasing mobilisation of scientists for science communication: impact agenda
- Cultivation of an unrealistic image of science in British media
- Relentless optimism about computing and solar energy since 1991; changing views on space technology (declining), biotechnology (declining and recovering) and nuclear power (recovering in 2000s, but unlikely after 2011);
- Public views of a stable hierarchy of sciences distinguish 'hard' and 'soft' science; psychology is a hybrid that is neither 'soft' nor 'hard'.

One might ask whether this confluence of diverse trends in science culture constitutes an entirely 'healthy cocktail'; in particular the raise of a putative **'acquiescence with technocracy'** in combination with an unrealistic image of science deserve closer analysis.

Submitting person

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news as indicators of public attention to science. See project link: http://www.macas-project.com/project-leaders/

Here I summarise work in progress which points to emerging trends of a changing 'science culture' in the UK since the 1980s. With this personal submission I seek to address questions 1 and 2 posed by the enquiry.

1 Increasing trust in veracity of scientists from 1997 to 2014

Source: MORI veracity index

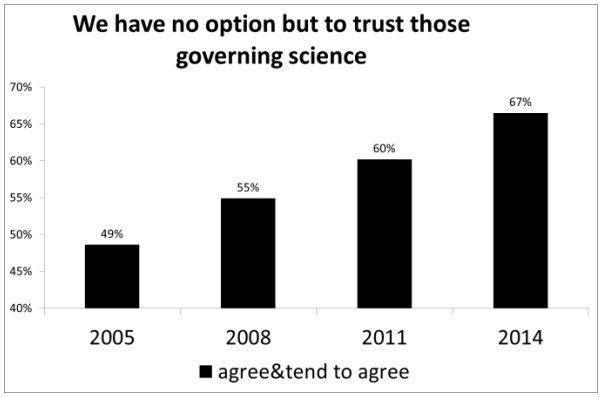
1.1 IPSOS Mori publishes its veracity index since the 1990s, asking annually, whether people belief whether public actors are 'telling the truth'. Since 2000 an increasing proportion of the UK public grants scientists increasing veracity. Their veracity increased from 65% in 1997 to 85% in 2014. The increase is continuous, which suggests a robust trend. Over the same period, the 'veracity' across many different professions remained stable, while that of the clergy declined from 80% to 70%. It seems that what science gains, the clergy is losing in public standing over the past 25 years.

1.2 Whether these trends are the identical for different segments of the public remains unclear; MORI has not yet made public the data files to answer this question; and they have to date also not provided the analysis themselves.

2. 'Resigned trust' in the governance of science from 2005 to 2014

Source: BIS 2014

2.1 The new series of data on British attitudes to science since 2005, sponsored by BIS, has carried a series of question regarding the governance of science in the UK. One of these questions shows a robust upward trend over the past 10 years. While in 2005, 49% of British agreed (or totally agree) to the statement '*we have no option but to trust those governing science'*, this ratio increased to 67% in 2014 (+/- 2%). The increase is stronger among women than among men; it is stronger in Northern Ireland than in other regions; however, not at all the case in Scotland, where the figures have hardly moved.



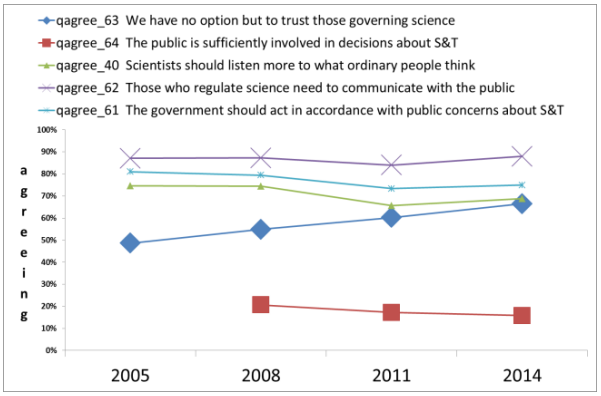


Figure 1 and 2: attitudes to governance of science, BIS-MORI 2005-2014

2.2 This trend towards what is called 'resigned trust in the governance of science' is more accentuated among the WWII generation (born before 1950), and among Gen X (born 1965-1976), and less strong among the Baby Boomer (1950-1964) or Millennials (born after 1977).

2.3 If we compare the 'resigned trust' question with other questions on the governance of science, the following pictures emerges: Agreement on 'those who regulate *science need to communicate with the public'* remains stable and high at about 90%. The statements *'the government should act in accordance with public concerns over science and technology*' and *'scientists should listen more what ordinary people think'* receive agreement in the area of 80%, but slightly less so in 2014 compared to 2005 on a declining trend. The statement *'people are sufficiently informed on decisions on science and technology'* remains low around 20% with a declining trend from 2008 to 2014.

2.4 These trend items form a complex of opinions which one might call an index of **'acquiescence with technocracy'**: increasing 'resigned trust' suggests an increasing willingness to defer decisions, moving together with decreasing expectations to be listened to by decision makers, and a suspicion that the public is insufficiently informed. Depending on one's views on technocracy as a form of governance, this is either a problematic trend or not.

3 Increasing familiarity with science since 1980s

Source: EB General Science 1989-2013, British Social Attitudes 1988, and BIS 2005-2014

3.1 Several indicators of public literacy pertaining to familiarity with scientific facts are pointing to a continuous increase since the 1988 in the UK. The BIS survey of 2014 compares to an earlier British Social Attitude survey: in 1988 only 14% of the public got three out of

'three quiz items' correct; while in 2014, the same items are answered correctly by 29%. The percentage of people who got all three items wrong declined from 22% to 5%.

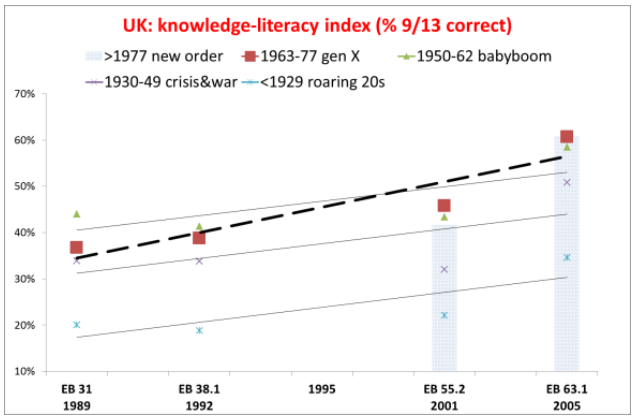


Figure 3: increasing familiarity with science, source: EB General Science Attitudes 1989-2005

3.2 A similar knowledge index of the Eurobarometer Science Series based on 9 quiz items confirms this increase in familiarity: a continuous rise for the UK. The increase is observable across all generations, but the gradient is accelerated for Generation X (born between 1963 and 1977) and for the Millennials (born after 1977).

4. Positive evaluation of science remains stable; reservations are declining

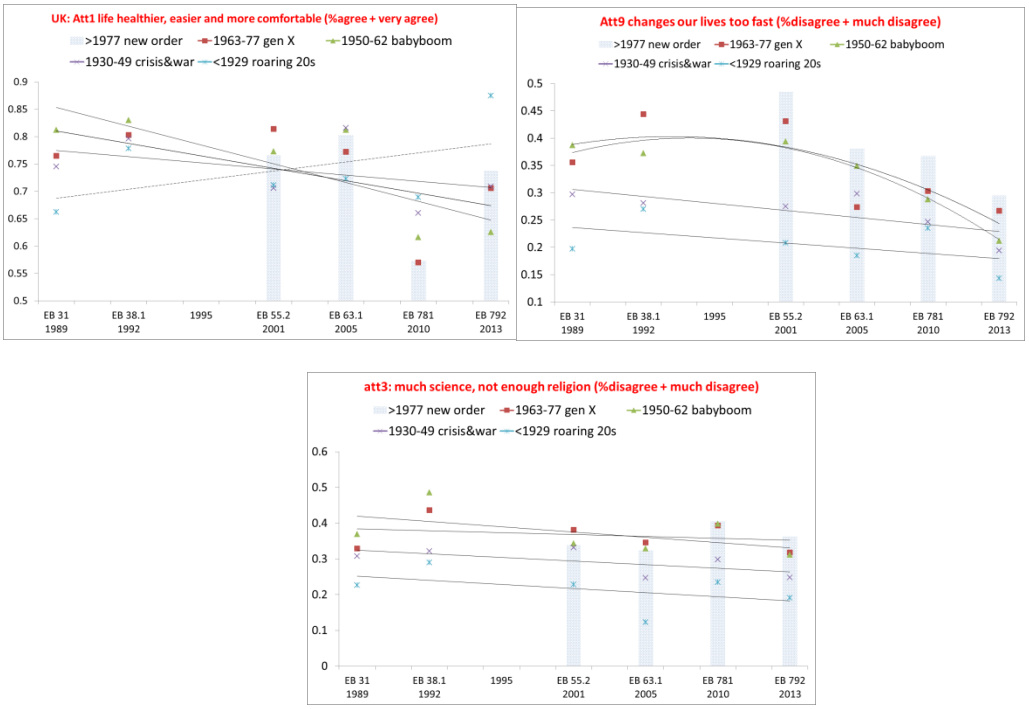
Sources: EB 1989-2013, BIS 2005-2014

4.1 Overall it is fair to say that the UK public appreciates the utility of science, expressed in agreements to items such as '*science will makes life easier and more comfortable'* or '*science will offer more opportunities for future generation*s' (see figures 5, 6, and 7). While these indicators can be erratic from year to year, the trend is either stable (in Eurobarometer data) or shows an increase (in BIS-MORI data) in favourable evaluation since the 1980s.

4. 2 Reservations such as '*science and technology changes our life too fast'* and '*we depend too much on science and not enough on faith'* find less agreement. Compared to the 1980s, British people are less worried about science interfering with religion and they have become more impatient with the rate of change in their life.

4.3 For these indicators of utility and reservations, generation effects are in evidence. While most generation groups offer increasing agreement that science makes our lives healthier, easier and more comfortable, the WWII generation (born before 1950) tends increasingly to disagree with this statement. On the utility of science, a generation gap is

manifest, the young becoming more positive, the older less positive (Eurobarometer 1989-2013).



Figures 4, 5, and 6: utility of science and reservations about science (Eurobarometer data)

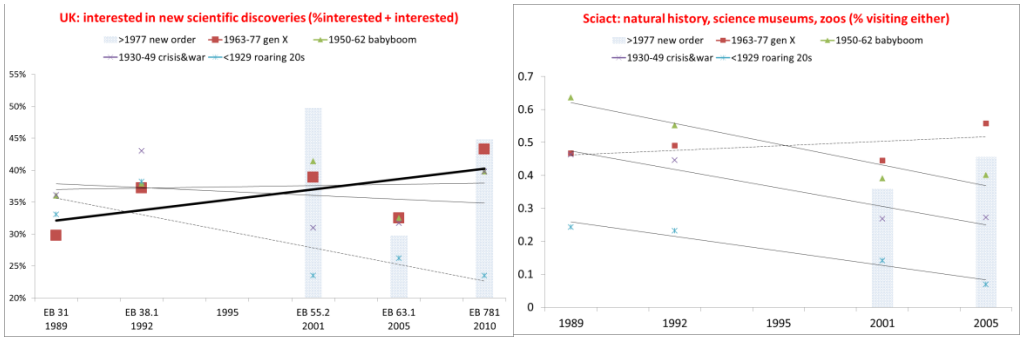
4.3 The declining reservations are found across all generation groups; the gradient is accentuated for millennials (born after 1977) who have become much more impatient with the rate of change since 2005 than the other generation groups.

5. Decreasing interest and engagement with science

Source: Eurobarometer 1989-2013

5.1 Overall, the index of interest in science, being somewhat or very interested in new discoveries of science, remains stable and so does the index of feeling informed.

5.2 Different generations show diverse trends. While for most, the trend is stable or slightly declining for the WWII and older generations, interest in science is increasing among Generation X, but not among the Millennials (see figure 8). The feeling of being informed [not shown] is equally increasing among Generation X while not among others; but here the Millennials show a marked increase since 2005. Generation X is becoming more interested and more informed; maybe Millennials are less interested, because better informed.



Figures 8 and 9: interest and engagement with science

6. Increasing media coverage and at the same time a crisis of science journalism

Source: project MACAS, http://www.macas-project.com/project-leaders/

6.1 The communication of science is a booming affair into the new Millennium, while the state of independent science journalism is jeopardized by a declining daily press (Bauer et al, 2012 http://www.scidev.net/en/content/our-learning-series/#X346620B030F0470C9BD5FB18DC433272

6.2 If the 'call to arms' of the Royal Society's Public Understanding of Science Report of 1985 had an impact, it might well be the successfully mobilisation of British mass media, print and broadcasting alike, into more coverage of science and technology. Science news has increased since 1990, and as the evidence suggests to historically unprecedented level of coverage (Bauer, 2012). However, this trend seems broken by about 2007/08 when we found a turning point in overall science coverage (MACAS project).

6.3 While science communication in the wider sense of drawing attention to science in public is booming, science journalism as a profession seems to shows elements of crisis (Bauer & Bucchi, 2007; Bauer, 2013 for a review). This reversal of the trend is manifest objectively in stagnating or declining full-time position for science journalists in the UK print and broadcast media, and subjectively in the sizable pessimism among science journalists about the future of their profession (see Bauer et al 2012 global SciDev study including UK). This crisis arises from difficulties of the traditional business models of newspapers in a world of digital media; Legacy media have been the main employment opportunity for independent science journalists. This independence is jeopardized by a strengthening of the communication functions in British Universities and Research Institutes who offer strategically prepared information and compete for public attention nationally and globally.

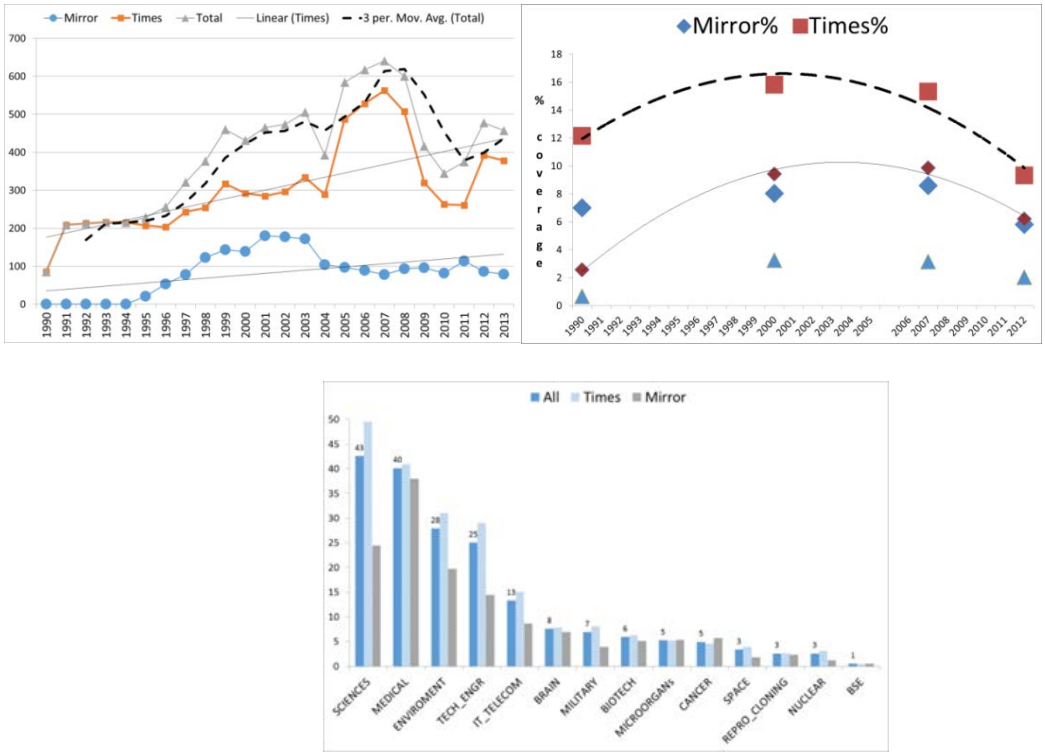


Figure 10: Science intensity and themes in the British Press, 1990 to 2013 (overall)

6.4 The profile of science remains slightly different in popular and quality coverage even into the new millennium. Science news in the popular press is clearly medicalised, a trend that is in evidence since the 1970s, the quality press continues to balance medical with more scientific-technical reportage (project MACAS).

7 Mobilisation of scientists: supporting the impact agenda

Source: HEFCE REF results 2014

7.1 REF 2014 scored UK research units on 'impact'. While news coverage of research did not count as 'impact', it is clear that mass media attention is a pathway to impact, and likely to become part of the strategic management of impact. It is therefore not surprising that many universities and research institutes are professionalising their communication function.

7. 2 The question is open on whether the mobilisation of scientists has broadened or intensified among those already doing it; an effect that has been observed in France's CNRS (see Jensen, 2011). There is limited systematic evidence for the UK on this mobilisation of resources, and the communication function is likely the preservation of more senior staff of Departments and Institutes (Bauer & Jensen, 2011).

8 An increasingly unrealistic image of science in the UK public

Source: EB 2005 and 2010; BIS 2014

8.1 Eurobarometer 2005 and 2010 asked question about the image of science such as '*science and technology can sort out any problem'*, *'new inventions will always be found to counteract any harmful consequences of scientific and technological developments, 'one day we will have a complete picture of how nature and the universe works', and 'there should be no limits to what science is allowed to investigate'*. One might consider agreement to these items as harbouring an image of science that is idealistic rather than realistic about modern science. A book about modern myths of science might carry these statements as titles of different chapters. Agreements or disagreements to these four items are highly correlated; it can be said that therefore they form an index of 'myth of science' (Bauer, 2015).

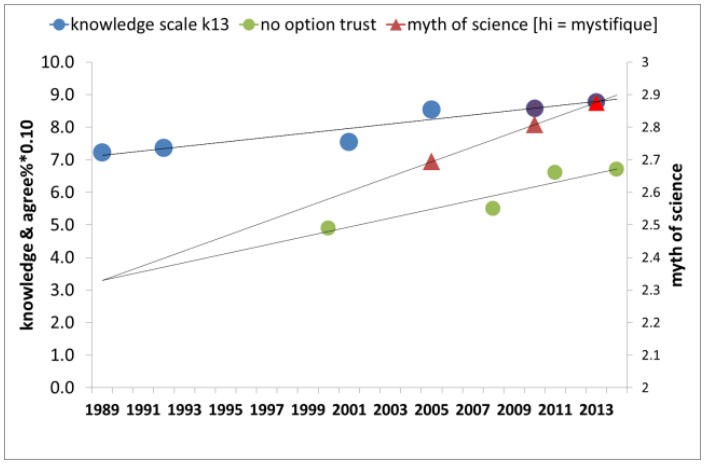


Figure 11: myth of science and knowledge (Eurobarometer), and resigned trust (BIS-MORI).

8.2 Holding to myths of science is positively correlated with familiarity with science in Turkey, while in the UK the correlation is negative: the more familiar with science, the less the British subscribe to these images.

8.3 Eurobarometer 2005 and 2010, and BIS 2014 suggest that agreement to these items is increasing in the UK, while at the same time familiarity with science is increasing, and so is the ratio of 'resigned trust' (see section 2 above).

8.4 This suggests that in a culture of increased science communication, of increased strategic mobilisation of scientists, of increased familiarity with science, the increased acquiescence with technocracy is based on an unrealistic image of science is cultivated.

9 Relentless optimism about some, changing views on other developments

Source: EB Biotech 1991-2010; Royal Society of Chemistry 2015

9.1 Eurobarometer carried the item '*I am going to read out a list of areas in which technologies are currently developing. For each of these areas, do you think it will improve our way of life in the next 20 years, it will have no effect, or it will deteriorate our way of life'*. The responses are collected for computing and information technology, solar energy, space technology, biotechnology and nuclear for several waves between 1991 and 2910, which constitutes an indicator of general optimism across several developments.

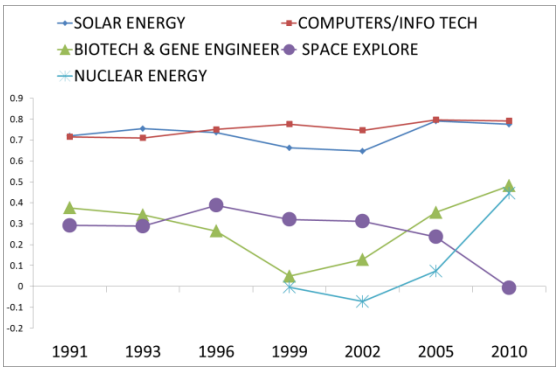


Figure 11: Optimism index for five developments 1991-2010 (Eurobarometer)

9.2 UK optimism about the future is unbroken when it comes to Computing and Information Technology. Around 80% of British expect improvements for everyday life arising from these developments.

9.3 Optimism about Space Technology is on a lesser level and declining. Optimism about Biotechnology was on a similar level as on Space, then declined and recovered somewhat since 2000. Optimism about Nuclear Power recovered from a very low level in the 1990s [it is important to note, that this series ends before the Fukushima nuclear accident in 2011; it is unlikely that optimism about nuclear power declined or stalled in 2011].

9.4 Another aspect of an image of science is the hierarchy of scientific disciplines in public eye. Eurobarometer carries questions on 'how scientific is x, y or z' and collected responses on economics, medicine, physics, biology, astronomy, history, psychology and astrology/horoscopes in 1992 and again in 2005.

9.5 The hierarchy of knowledge is a stable representation of science in the UK. All generations distinguish 'hard' (physics, biology, astronomy) and 'soft' sciences (economics and history). Medicine is considered 'hard'; psychology is a hybrid between 'hard' and 'soft' sciences; while economics and astrology compete at the similar levels of public appreciation

as ‘a science’. A recent survey by the Royal Society of Chemistry (2015) confirms Chemistry among the ‘hard’ sciences in public perceptions.

9.6 It is noteworthy that the differentiation between ‘hard’ and ‘soft’ sciences is sharper among the younger than among the older generations.

Sources of data mentioned

- BIS 2014 - British Attitudes to Science, IPSOS Mori
- RSC 2015 - Royal Society of Chemistry
- Eurobarometer 1989-2013 [collated database project MACAS]
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Appendix

Eurobarometer_ General Science Attitudes, UK samples

		YEAR AND ROUND NUMBER							Total
		EB 31	EB 38.1	EB 55.2	CCEB 2002.3	EB 63.1	EB 731	EB 792	
		1989	1992	2001	2002	2005	2010	2013	
	UK	1276	1374	1304	0	1307	1311	1306	7878

Eurobarometer_ Biotech, UK samples

	1991	**1993**	**1996**	**1999**	**2002**	**2005**	**2010**	**Total**
BE	1021	1034	1006	1001	1074	1000	1012	7148
DW+E	**2077**	**2090**	**2032**	**2053**	**2045**	**1557**	**1531**	**13385**
DK	**1000**	**1000**	**1000**	**1000**	**1000**	**1031**	**1006**	**7037**
ES	**1000**	**1000**	**1000**	**1000**	**1000**	**1025**	**1004**	**7029**
FR	**1070**	**1004**	**1003**	**1004**	**1004**	**1012**	**1018**	**7115**
UK	**1365**	**1374**	**1391**	**1358**	**1320**	**1321**	**1311**	**9440**

UK media corpora; Project MACAS [mapping the cultural authority of science]

Corpus	**Size (text units)**	**Unique Word forms**	**Total word count**	**Source**
C1: odd years only, 1991-2013 [test]	8,031	88306	~4 Million words	NEXIS/LEXIS Default Power search
C2: all years 1990-2014	16,779	123,731	~8 Million words	NEXIS/LEXIS Default Power search
C3: KW_310_P1 scrape, odd years 1991-2013	56448	194,877	~27 Million words	NEXIS/LEXIS KW_310_P1
C4: Economist, 1990-2010	95,000	461,815	~52 Million words	Complete corpus ECON database

Note: Size of different MACAS corpora; unique words forms are before lemmatisation