Эпистемология и философия науки
2019. Т. 56. № 4. С. 200–218
УДК 167.7

Epistemology & Philosophy of Science
2019, vol. 56, no. 4, pp. 200–218
DOI: DOI: 10.5840/eps201956476

POPULISM AND SCIENCE

Harry Collins – PhD, Distinguished Research Professor.
School of Social Sciences, Cardiff University.
Glamorgan Building, King Edward VII Avenue, Cardiff CF10 3WT, UK;
e-mail: collinshm@cardiff.ac.uk

Robert Evans – PhD, Professor, Director of Teaching and Learning.
School of Social Sciences, Cardiff University.
Glamorgan Building, King Edward VII Avenue, Cardiff CF10 3WT, UK;
e-mail: evansrj1@cardiff.ac.uk

The risk of populism is ever-present in democratic societies. Here we argue that science provides one way in which this risk can be reduced. This is not because science provides a superior truth but because it (a) preserves and celebrates values that are essential for democracy and (b) contributes to the network of the checks and balances that constrain executive power. To make this argument, we draw on Wittgenstein's idea of a form of life to characterize any social group as being composed of two opposing elements: an organic aspect that defines what the group has in common and an enumerative aspect that describes the differing ways in which the organic core can be displayed. Whilst the organic faces of science and democracy are clearly different there are significant overlaps that include values such as disinterestedness, universalism and honesty. This overlap in values is the first way in which science can prevent populism: by providing moral leadership. The second, its role in a network of checks and balances, also depends on these values. Science does not contribute to the checks and balances because it provides epistemically superior knowledge; it contributes because it provides morally superior knowledge that, alongside institutions such a free press, independent judiciary and additional tiers of government, support the democratic ecosystem. Failures of democracy occur when this ecosystem is damaged – too much science leads to technocracy, but too little creates the conditions for populism. To prevent this, we argue that citizens must (re)learn the value of democratic values. These include endorsing an independent judiciary and other state institutions, even when these hinder policies of which they might approve and, of particular concern in this context, recognizing that independent experts, of which scientists are the exemplar, are part of this network of checks and balances.

Keywords: populism, science, expertise, democracy, checks and balances

Популизм и наука

Гарри Коллинз – доктор философии, заслуженный профессор.
Школа социальных наук, Университет Кардиффа. Glamorgan Building, King Edward VII Avenue, Кардифф, CF10 3WT, Великобритания; e-mail: collinshm@cardiff.ac.uk

Роберт Эванс – доктор философии, профессор.
Школа социальных наук, Университет Кардиффа. Glamorgan Building, King Edward VII Avenue, Кардифф, CF10 3WT, Великобритания; e-mail: evansrj1@cardiff.ac.uk

Популизм представляет извечную угрозу для демократии. Однако, как считают авторы статьи, наука может минимизировать эту угрозу. Причиной тому является вовсе не способность науки продуцировать абсолютную истину. Наука защищает и поддерживает ключевые ценности демократии, а также способствует утверждению системы сдержек и противовесов для ограничения исполнительной власти. С целью обоснования этого тезиса авторы обращаются к концепции форм жизни Витгенштейна и описывают социальные группы в двух измерениях – с точки зрения «органического» аспекта, который фиксирует то, что объединяет группу, и с позиции количественного аспекта, который состоит в различных способах выражения «органического» ядра. Хотя «органические» измерения науки и демократии явно различаются, здесь все же существуют значительные совпадения в таких ценностях, как бескорыстие, универсализм и честность. Подобное совпадение ценностей является залогом того, как наука может предотвратить популизм путем реализации морального лидерства. Кроме того, ее роль в системе сдержек и противовесов также зависит от этих ценностей. Наука способствует поддержанию сдержек и противовесов не потому, что она обеспечивает эпистемологически наилучшее знание. Она вносит свой вклад, поскольку обеспечивает морально наилучшее знание, что наряду с такими институтами, как свободная пресса, независимая судебная система и дополнительные уровни управления, способствует поддержанию демократической экосистемы. В свою очередь, неудачи демократии связаны с повреждением этой экосистемы – избыток науки приводит к технократии, но ее недостаток создает условия для популизма. Чтобы предотвратить это, граждане должны (заново) осознать значение демократических ценностей. Здесь требуется признание независимости судебной системы и других государственных учреждений (даже если это мешает проведению желаемой политики), а также признание того, что независимые эксперты, образцом которых являются ученые, являются частью этой сети сдержек и противовесов.

Ключевые слова: популизм, наука, экспертиза, демократия, сдержки и противовесы

Introduction

Turning into populism is one way for democracy to go wrong.[1] Science can help to stop it happening. This is not because science provides a superior truth. It is because science embodies, preserves and celebrates values that are essential for the successful reproduction of democratic institutions. Science also contributes to the checks and balances that constrain

[1] This paper is based on a book manuscript – *Populism, Science and Democracy* by Collins, Evans, Durant and Weinel – which is currently under submission.

the exercise of power but too much respect for the truth and efficacy of science can cause democracy to fail in another way by turning into technocracy. Focussing on the values and the independence of scientific opinion avoids this risk and no more damages democracy than focussing on the values and independence of the judicial system.

In what follows, we start by explaining the continuities and differences between populism and democracy in sociological terms. We draw on our work on the nature of expertise, which comes under the heading of 'elective modernism', to argue that, in democracies, even if one holds a social constructivist understanding of science, the values and the check-and-balance role of science remain vital reasons for defending the institution.

Defining Democracy and Populism

Democracy and populism are both 'rule by the people' but the difference between them can be understood sociologically. All societies and every social group has two faces. One face – the organic face – is made up of the uniform actions that give a culture or group its identity. These uniform actions include the language spoken by its members, including local dialects and 'practice languages' when we come to small groups, the way members of that society behave in their public spaces, their standards of clean and dirty, and so on.[2] The other face – the 'enumerative face' – is the varying opinions about less uniformly agreed matters expressed by individuals, with the ability to disagree resting on the shared agreements provided by the organic aspects of their society. The sociological insight is that both the organic and the enumerative aspects of the social group are essential: the organic sets the boundaries of what counts as 'normal', the enumerative describes how the choices that exist within these boundaries are distributed. Neither the organic nor the enumerative aspects of any society or social group are ever totally fixed, and both can, and do, change over time but the organic will generally change much more slowly than the enumerative; the organic feels fixed when compared to the enumerative. Successful revolutions result in rapid changes to the normal sluggish organic face.

In any genuinely democratic society, the idea that citizens should play a role in determining how they are governed is constitutive of that society's organic face. For these democratic ideals to be put into practice, however, 'the people' must be treated in the enumerative way, that is, as a set of individuals whose preferences over other issues are varied and

[2] For more on the idea of uniformity as it applies to social groups see Collins and Evans (2017a).

changeable. More or less frequent enumerative exercises reveal the changing distribution of these preferences, with the conflicting views aggregated according to agreed procedures in order to produce a government or other form of decision that represents 'the majority'. Crucially, democratic principles require that minority views continue to be respected and any majority party or coalition is expected to operate in a way that takes minority concerns into account.

In contrast, under populism, 'the people' that the government claims to represent are no longer all citizens but only the sub-set that expressed a particular view – usually the majority view. Crucially, once expressed, this view is treated as a fixed, uniform, and collective view that encapsulates the legitimate aspirations and concerns of the entire society and which can be understood and represented by a single leader or party in perpetuity. The corollary of this is that minorities or others who oppose this vision are treated as deviants, with their refusal to accept the legitimacy of the populist claim denounced as a betrayal of this organic view of the people. Under populism, the democratic principles of freedom and equality that uphold respect for minorities are set aside and the diversity that democratic societies permit and even celebrate is seen as a sign of failure or danger.[3]

Given that populism almost always builds on views held by at least some of the people, and usually a large number of the people, the rise of populism is a constant risk in any democratic society. All that has to happen is for those in power to give too much weight to their own supporters and to ignore (or worse, actively suppress) those who disagree with them and the outcome will be an increasingly populist regime. One of the ways in which democratic societies seek to protect themselves against such outcomes is to institutionalise a system of checks and balances – opposition parties, bi- or multi-cameral systems, a free press and an independent judiciary and so on – that safeguard minority views and maintain the mechanisms that allow the changing distribution of preferences to be reflected in the policies or actions of that society.[4] In contrast, when democracy slides into populism, these checks and balances are lost as the government confirms, reinforces and maintains one fixed and eternal 'will of the people'.

There are, of course, many variants of democracy and of populism and some of them merge into each other at the edges. But the difference is clear so long as we stick with the ideal types. These ideal types help us

[3] In the UK, for example, the political debate following the referendum on leaving the UK often has this quality, with those in favour of leaving frequently describing the 52% majority as representing 'the will of the people' and pro-Brexit newspapers regularly chastising the judiciary and politicians who do not subscribe to this view as 'traitors' or 'enemies of the people'.

[4] For a review of the many different ways in which democratic societies and institutions can be organised see Held (2006).

understand the crucial features of different societies and the meaning of events within them. We should also add that we favour the kind of democracy that we discuss here even though we know it is not perfect and has been, and continues to be, corrupted and abused by many of those who claim to defend it. Likewise, we acknowledge that societies with a long history of democratic rule are far from perfect with, for example, huge divisions between the rich and the poor, the continued exploitation of the weak by the powerful, and elections in which there may little difference in the choices offered to the people. Nevertheless, we still prefer this kind of democracy to other forms of social organisation because it means we are able to say these things freely and because remaining within such a democracy holds out the possibility that these problems might be ameliorated. In contrast, other political systems that once appeared to be potentially more just and more fulfilling in theory have not turned out to be so in practice.

Elective Modernism

We now turn to the role of science in democratic societies. As noted in the introduction, our argument is that advocates of democracy should defend and value science not as an activity that generates knowledge but as an activity that reinforces the values needed for democratic societies to survive. We call this position elective modernism – a choice to value science.[5] To make this argument, we first set out what kind of activity we understand science to be and then explain how it can be valued for its moral contribution to society rather its more obvious outputs such as knowledge, technology or economic gain.

Three Waves of Science Studies

Taking a broad brush approach, there can be said to have been three periods in the history of social studies of science – three waves.[6] The first wave, the apogee of which followed the successes of the products of science in World War Two and thereafter, with the promise of nuclear power being the icon, took science to be self-evidently the pre-eminent generator of knowledge. The job of the philosophical analyst of science was to explain the secret of science's epistemological success – to explain 'the logic of scientific discovery'; Karl Popper's work probably represented the high point of this wave, at least in terms of acclaim.[7] The job of the

5 Elective modernism is first set out in Collins and Evans (2017b).
6 The 'three wave' heuristic is introduced in Collins and Evans (2002).
7 See e.g. Popper (2002).

social analyst was to explain the social conditions which could best nurture science; Robert Merton's norms of science, with their similarity to the norms of democracy, is the model of this kind of work.[8]

The second wave, building up as the 1960s turned into the 1970s, questioned what was then the standard model promulgated under Wave One. Kuhn's notion of 'paradigm revolution' opened up the possibility that there was more to science than logic – that, as his critics put it, 'mob psychology' was involved in the acceptance and rejection of ideas and findings, the true and false.[9] Wave Two gained pace with the extension of the sociology of knowledge to science and mathematics, from which realms it had previously been excluded, and for a period the 'sociology of scientific knowledge' (SSK) was dominant in social studies of science, intellectually if not institutionally.[10]

SSK brought detailed 'naturalistic' studies of scientific procedures to the analysis of science. Studies of scientific controversies showed that they could not be settled by any 'logic' of science, such as experimental replications because, to look at things from the most elevated perspective, 'rules do not contain the rules for their own application', as Wittgenstein pointed out, so the meaning of formal procedures and any data they gave rise to, was open to endless 'interpretative flexibility'.[11] This meant that the epistemology of science, at least when examined under the lens of the actual day-to-day procedures of science, was not so special after all; SSK, and what followed, resulted in a levelling out of the epistemological playing field and the findings became folded into post-modernism in general.

Unsurprisingly there was a reaction to the second wave, anticipated by the critics' 'mob rule' interpretation of Kuhn, and the 1990s was notable for the'Science Wars' that pitted rationalist philosophers (whose *amour propre* was under threat), and scientists, against social analysts of science.[12] Unfortunately, the science warriors were unwilling to acknowledge that SSK and the like presented a problem for them as much as anyone else and the only solution they were willing to contemplate was a complete rejection of all the new sceptical analyses and empirical findings and a return to Wave One. But the genie was now out of the bottle and, across the humanities and social sciences, the newfound relationship between specific pieces of scientific research and social pressures was leveraged into the development of new kinds of institution designed to

8 See Merton (1973).

9 The idea of a paradigm is introduced by Kuhn in his *Structure of Scientific Revolutions* (Kuhn, 1962). There was, of course, a 1930s precursor to these ideas in Ludwik Fleck's notion of 'thought collective'; see Fleck (2008).

10 See e.g. Bloor (1973; 1991), Collins (1974; 1975; 1992); for other approaches see Knorr-Cetina and Mulkay (1983), Latour and Woolgar (1979).

11 This is the idea of the experimenters' regress; see Collins (1992).

12 The tenor and tone of the science wars is exemplified by books such as Gross and Levitt (1998) and Koertge (2000). For a more positive exchange see Labinger and Collins (2001).

that scientific research was socially responsible and answerable to political choices.[13]

Wave Three of science studies was an attempt to preserve the findings of Wave Two while looking for ways to maintain the special status of science in spite of the new puzzles about its epistemological status.[14] Wave Three involved an aspiration along with a self-denying ordinance: science should be defended but not on the grounds of its epistemological pre-eminence or material success for that would be a return to Wave One. The first move was to replace the social analysis of truth with the social analysis of expertise. We knew from close examination of scientific controversies that in the short term anyway, truth appeared to be indefinitely contestable. The question of who was and was not an expert was, however, less contestable.

The crucial thing here was to break with typical philosophical and psychological treatments of expertise by separating what it meant to be an expert from what it meant to be right.[15] We knew from studies of science that experts typically disagree so that meant that a good proportion of experts will ultimately turn out to have been wrong. This presents a puzzle for the typical philosophical treatment of expertise but was the starting point for what became known as 'Studies of Expertise and Experience' (SEE). The idea was to identify experts without getting mixed up with the enormous problem of identifying truth. Instead, SEE defined experts as persons who have been socialised into communities of practice and have been recognised as doing so by their peers. This fits with our common sense about experts in that becoming an expert takes time and practice and judging high-level performance often requires considerable skill if it is to be done reliably. Seen this way, the difference between expertises like driving a car, baking a soufflé and doing theoretical physics are sociological rather than epistemological; that is, what distinguishes them is not their epistemic qualities but their accessibility and status within a society.[16]

[13] Examples of this work include Rip et al. (1995), Nowotny et al. (2001) and Douglas (2009).

[14] For a more detailed account of Wave Three and its approach to expertise see Collins and Evans (2002; 2007).

[15] Within the STS community, the distinction between Wave Two and Wave Three can be seen as distinguishing between a descriptive analysis of how expert status is achieved or denied and a normative analysis of how expertise in a given domain is distributed regardless of how local actors attribute expert status.

[16] For more on this 'three dimensional' model of expertise see Collins (2013).

Valuing Scientific Values

The trouble with simply replacing truth with expertise, defined as the property of those socialised into an expert community is that, whilst it does distinguish experts from non-experts, it does not distinguish one kind of expertise from another: astronomy is an expertise but so is astrology; econometric modelling of economies is an expertise but so is tea-leaf reading; weather-forecasting is an expertise but so is the reading of entrails. To narrow down the range of expertises that might be considered as relevant when tackling some problem, we can start by including only those that are directed toward the subject we want resolved and demand that the body of experts chosen has long experience in trying to resolve such problems. But this does not narrow things enough as there will be those with long and extensive experience of using tea-leaf reading and astrology to bear on the problems in question! A solution is to value certain kinds of expertise for reasons that do not relate to epistemic value.

We advocate favouring expertise and experience that is built up while adhering to the values that constitute the organic face of the scientific community. We argue that *better* decisions will be made if more weight is given to the opinions of those who have tried to generate knowledge in this way than in other ways.[17] This involves a new interpretation of the Mertonian norms.[18] Effectively, Merton justified his norms by reference to their efficaciousness: in so far as science helped to bring about victory in WW2 it flourished best in democratic countries, giving them an advantage: the 'ought' of adherence to the norms of science and democracy was justified by the 'is' of science's beneficial products. In contrast, we expand the list of norms, treating the 'logic' of scientific discovery and norms such as corroboration and falsification as 'formative aspirations' that constitute the 'form of life' of science, but make no attempt to justify them with any 'is': we simply claim that it is self-evidently better to try work out ways in which claims could be shown to be wrong than not to try to work them out; that it is simply better to try to corroborate claims than not to try to corroborate them; that it is simply better to ignore personal attributes when assessing a truth claim than not to ignore them; that it is simply better to avoid self-interest when making truth claims; that it is simply better when making truth claims to act with honesty and integrity than not to act with honesty and integrity; and

[17] This does not necessarily mean giving special weight to the profession of science as other groups may also act scientifically. In addition, as explained in more detail below, acting 'scientifically' also requires those who are scientists to apply norms such as universalism and so be attentive to concerns raised from outside their own discipline or community.

[18] This is set out in more detail in Collins and Evans (2017b).

so on.[19] If further justification were needed, it is possible to imagine a society in which the opposite aspirations were dominant and we think it is obvious that any such society is a dystopia.[20] In either case, however, the argument is moral, not empirical – we do not claim that there would be more or less economic growth, technology, jobs, leisure time etc. on under either scenario; the point is simply that attempting to understand the natural world in a way that is supported by the norms of science is better than other ways of trying to understand it, such as those that involve arbitrary authority or discrimination against certain groups; it is better in just the same way as governing a country is done better if it does not involved arbitrary authority or discrimination.[21]

Elective modernism thus makes three important claims about the values of science and, hence, of the communities that choose to value those principles. First, it is the adherence of scientists to these values that makes science distinctive and special. Interestingly, this holds whatever one's views about the social analysis of science as it is the ideology of science itself – namely that it seeks to establish truths about the natural world – that commits its practitioners to these norms irrespective of the actual out-turn of the work; this approach values and defends science even when the science is inefficacious. Second, the formative aspirations of science that we have identified – Merton's norms along with ideas such as falsification, honesty, clarity *etc*. – have a strong overlap with the norms of democratic societies. This means that the institutions, practices and culture of science can act as a role model and leader for democratic societies in public debate. Third, that in order to preserve this role, science, and scientists, should be wary of accepting and/or encouraging the other roles that politicians in Western democracies appear more comfortable with citing as justification for supporting science with tax-payers' money – namely science as a form of entertainment, as with astronomy, cosmology and space science, or science as a source of competitive advantage in free market capitalism, as in, say, biological start-up companies.

Identifying Fringe Science

One more thing that has to be accomplished if a common sense notion of the special nature of science is to be maintained is to distinguish between

[19] Formative aspirations are similar to the formative intentions described in Collins and Kusch (1998).

[20] Showing this is more like the work of the novelist than the philosopher or sociologist, with Orwell's *1984*, with its 'Ministry of Truth', being a good example of such work.

[21] There is some resonance between this argument and an analysis of holocaust survivor testimony by Martin Kusch, in which he draws on Wittgenstein's *On Certainty* to explain how ordinary language fails to convey the horrors of the Holocaust.

mainstream science and 'fringe' science; science would cease to exist if all the claims made by fringe scientists were taken seriously even though large numbers of fringe scientists are undoubtedly experts and mostly they adhere to all the norms of science that have been discussed so far. The solution to this is, once more, sociological – to compare the forms of life of fringe science and mainstream science and find the ways in which they differ. The most revealing difference is, perhaps, that which concerns the interpretation of what Kuhn called 'the essential tension' – the tension between adherence to the authority of a paradigm and work within certain limits versus the imperative to be creative and question everything; both of these are necessary in a science but they are in tension. We find that fringe scientists value originality and invention above adherence to a paradigm much more than mainstream science. The scales are tipped sufficiently far for there to be little coherence even within specialist fringe meetings. This provides one among a number of other sociological demarcation criteria, all based on the notion of the form of life rather than any logic of science.[22]

Science versus Populism

So far, we have tried to do identify the sociologically salient aspects of democracy, populism and science and then to justify giving scientific expertise a special status or role in democracies. We have, we believe, found ways of talking about science as a special contributor to Western democratic culture without referring to its epistemological pre-eminence or its efficaciousness. Released from Wave One's model of science, under which truth and efficacy are what define science and justify its special status, we argue that the crucial, distinguishing features of science are its formative aspirations – the norms and values that make up its organic face – and that its contribution to democratic societies if found in resonance between these norms and core democratic values such as freedom and equality.[23]

We now want to argue that this particular aspect of science – its potential to provide leadership in the realm of values – emerges with particular clarity when democracy is contrasted with populism. We can do this for two reasons. First, because under the post-Wave-Two model of science we do not need to establish first that a science we wish to defend is true or efficacious and this is important given that experts disagree and that both the policy and political significance of science has to be understood long before disagreements are resolved and long before what is true

[22] This analysis is found in Collins, Bartlett and Reyes-Galindo (2017).

[23] See Collins and Evans (2017b) for an extended version of this argument.

and efficacious has been established even if we believe it will be established in the long term. Second, recent developments in democratic societies have provided something close to a breaching experiment in which previously taken for granted norms of civic epistemology have been overturned and revealed the tacit assumptions and understandings on which democratic institutions rest.[24]

The role of scientific expertise in democracy, we can now see, is to contribute to the network of checks and balances needed to resist slipping, under the pressure of events, into more authoritarian styles of rule. Science, we are claiming, fulfils the same kind of role as a 'loyal opposition', a second chamber, a free press and an independent judiciary. Scientific expertise, when it is working properly, and when it is understood properly, makes it more difficult for a government to do just what it wants. Those with a tendency toward populism understand this and that is why they are likely to be dismissive of scientific expertise and to find ways of undermining its credibility by, for example, suggesting it is driven by the interests of particular social groups or emphasising its uncertain and provisional nature; claims that are at least superficially similar to ideas developed within the social constructivist analysis of science.[25]

Populism distrusts and discards the idea that a consensual or agreed truth might emerge with disinterested research and analysis. Instead, truth is that which created by the leader's interpretation of the will of the people and other models of truth can only weaken the state. Politicians in democratic societies may lie, dissemble and cherry pick the evidence they use to support their policies but they try to hide and deny these activities, accepting them to be corrupt. Under populism, by contrast, there are no lies, selection of evidence and no corruption, only the organic will of the people interpreted by the leadership; the concept of a mistake disappears from public life.

All this is revealed with particular clarity in the breaching experiment led by President Trump. Consider, for example, the claim made immediately after Trump's inauguration speech that a larger crowd had attended it than had attended Obama's inauguration. The claim was backed up by his counsellor, Kellyanne Conway who, in the face of the consensus among experts that the photographic evidence showed the claim to be untrue, remarked that their version of events was an 'alternative fact'. This statement is to be understood as an attempt to relocate the 'locus of legitimate interpretation' of facts such as this from bodies of experts such

[24] The Guardian commentator Jonathan Freedland highlights similar issues; see Freedland (2017; 2018).

[25] Although not driven by a populist desire to undermine democracy, similar tactics have been used to thwart action by the US government on climate change and other issues [Oreskes and Conway, 2010].

as those, in this case, who take and interpret photographs, to the political elite who understand the will of the people.[26]

It cannot be stressed enough that the blatant nature of the claim should not be dismissed as foolishness; the lack of any attempt to hide the evidence is not itself an error but part of the strategy. The idea of'alternative facts' is intended to redefine the balance of power between the political leadership and independent experts when it comes to the production of truth. It is an attempt to establish the basis for more portentous claims such as Trump's denial of climate change in which expert evidence will again be dismissed because it is does not fit with the interpreted will of the people. The attack on experts is part of the aggregation of power to the centre justified, under populism, by the leadership being the embodiment of the will of the people, the will of the people being the ultimate authority even on technical matters irrespective of the views independent experts.[27]

Defending Democracy, Defending Science

How can democracy be stopped from sliding down this slippery slope? There are fascinating analyses of the way the Trump regime has come to power explaining it in terms of the increasing polarization of party politics in the US and the determination of the Republican Party in seeking victory at all costs, including an orderly democracy.[28] But we want to add to this a new suggestion analogous with the second law of thermodynamics and, in particular, the conservation of energy; it is called the'law of conservation of democracy'. It states that democracy cannot take out of political society more than it puts in. In other words, citizens must understand the meaning of democracy and must actively and continually put that understanding into practice if democracy is to last.

Put more sociologically, we might say that democracy is not just an idea, it is a practice; or, drawing once more on Wittgenstein, that

[26] The 'locus of legitimate interpretation' is described in more detail in Collins and Evans (2007). In summary, it refers to the idea that cultural practices can be distinguished by the social networks that are able to evaluate their legitimacy. In art, for example, almost all audience members can have a legitimate view or interpretation of the piece, in which case we would say the locus of legitimate interpretation has moved a long way from the producers. In contrast, one characteristic of science is that the locus of legitimate interpretation remains close to the producers in the sense that scientific research must be seen as credible by other experts in the same field if it is to have any wider legitimacy.

[27] We might note in passing the resonance between this view and the democratisation of science favoured by many salient academics in contemporary science and technology studies.

[28] This is argument is detailed in Levitsky and Ziblatt (2018).

the meaning of democracy is revealed through the actions in which it is enacted. This obviously includes the participation of citizens in elections to choose their representatives, but it also goes much deeper. Preserving democracies needs citizens who understand and recognize what democracy implies in a wide range of areas and who are willing call to account a government's or a leader's non-democratic actions.

The empirical evidence for the importance of understanding democracy as a form of life in which ideas and actions reinforce each other is the fragility and short duration of democratic regimes in societies that have no tradition of democracy nor any substitute for it in the form of intense programs of civic education. We see many examples of in recent decades of the formation of newly democratic societies which soon fall victim to authoritarian regimes.[29] Frighteningly, even in the USA the recent election of a populist leader and his lasting popularity with a wide section of the electorate in spite of a continuing series of actions that, not long ago, would have been thought to be impossible in a democratic state, seems to indicate that there is a deficit in the understanding of democracy among a substantial proportion of the population of that supposed icon of democracy, the USA.[30]

Public Understanding of Science

A proper understanding of the role of science in democratic societies is part of the understanding needed by citizens. Insofar as the contribution of science to democracy is concerned, the crucial element is recognizing the role of scientists and other independent experts as a legitimate constraint on the convenient preferences of politicians. This, in turn, means a radically new approach to the aims and methods associated with the public understanding of science that reflects what SSK and others social constructivist approaches had taught us about the nature of science but which does not reduce everything to demands for more public engagement.

[29] The fate of democracy in Russia following, what in the West at least, was a period of post-Glasnost optimism illustrates the pattern with particular clarity. That no lessons were learnt from this is revealed by the naïve optimism that greeted the so-called Arab spring. In Europe, the increasingly populist and/or authoritarian regimes found in Poland and Hungary show how democratic norms can wither even in what appears to be a very supportive context.

[30] Arguably there was also a failure on the part of the mainstream politicians to recognise the concerns of these groups. In other words, the success of Trump is, at least in part, due to the alienation that the majority class had allowed to develop over a period of time. The same could also be said of the Brexit referendum in the UK, when it became clear that those seeking to defend the status quo were seen as part of the problem by those they needed to persuade to support them.

Again, the three wave modules is helpful is summarizing the main dimensions of the debate. Starting in the 1970s and 80s, fears that science was losing respect in Western societies gave rise to a concern with the 'public understanding of science'.[31] Some scientists, drawing on what we would now call a Wave One model of science, took the view that the public would respect science more if they understood it better, giving rise to what became known as the'deficit model' of scientific understanding and to calls to build public support for science through programs of popular education. Quite rightly, the deficit model became the whipping boy of social analysts of science: on the one hand, it assumed that the scientists framing of the problem was correct and rendered illegitimate or irrelevant any of the other concerns that the public might have; on the other, there was the problem that, if the science was controversial – as it mostly is in cases that cause public concern – then the scientists themselves would disagree about the value of this or that initiative, making it unclear what more public education about the contested facts could achieve.[32]

In each case, the mistake being made was to think the important deficit was in the public understanding of the substance of science whereas, actually, it was a deficit in the public's understanding of the process of science, a deficit encouraged by scientists' own Wave-One models of the science. The public are encouraged by cartoon-like models of science to expect perfection from experts whereas, like social analysts of science, the public need to understand science as a craft practice with the failures and uncertainties associated with all craft practices; the danger is that expecting a kind of 'magic' infallibility of science encourages a reaction when the magic fails – as it always will.[33] This deficit is still being encouraged by the way scientists present their results.[34]

A better way to understand the role of science in society is with a more sociological model of the citizen. Citizens cannot live in society without a level of 'sociological meta-expertise'. This is the ubiquitous expertise that is needed to know that one should go to a garage when one's car is broken and to a hospital when one's limb is broken, and to know that taxis are a generally reliable means of transport even though the drivers are complete strangers and so on and so on. To conserve democracy, we are arguing, citizens must understand that the judiciary should be in-

[31] In the UK, the creation of the Committee for the Public Understanding of Science (COPUS) and the Bodmer report are the key events; Miller (2001) provides a summary of these developments.

[32] The collection edited by Irwin and Wynne (2003) provides a representative selection of the concerns raised by scholars working in what we have called the 'Wave Two' tradition.

[33] The Golem series can be seen as an attempt to promote this more sociological understanding of scientific work; see Collins and Pinch (1993; 2005; 2010).

[34] For example, the way in which the detection of gravitational radiation was announced; see Collins (2017).

dependent, that the press and other media should be free to criticize the government without fear, that elections should offer a genuine choice between candidates, preferably offering alternative policies, and that a newly elected leader should be seen to give up their business interests so that they cannot make choices that benefit their own financial interests, should not favour the interests of their own families, not prefer them for public offices, and so on. We are arguing that citizens, as part of their ubiquitous meta-expertise, should also understand that scientific experts should be consulted on technical matters and their views on the degree and content of any consensus established before policy decisions are made.[35]

Another way of saying this is that democratic societies require a particular civic epistemology that defines their normative expectations about the networks and institutions that are granted the privilege of making authoritative knowledge.[36] This is a serious responsibility with a clear moral dimension. Our argument is that one necessary condition for these institutions to be granted this role is that they endorse and enact the values we have associated with the scientific community. To repeat, they do this not because it ensures the outcome is more likely to be right but because the responsibility associated with making truth demands that it be done with the utmost integrity and this is what adhering to scientific values brings about.

To be clear, there are two things we are *not* saying when arguing that independent experts are a necessary element of a truly democratic society. First, we are not saying that scientists are the only experts: on technical questions that relate to decision-making in the public domain there will be many other experience-based experts who will also have knowledge that needs to be considered and, in addition to these technical matters, there will be many other important domains and institutions that do not depend on science at all. Second, even when the problem does concern technological decision-making in the public domain, the role of experts in is only ever advisory; to give them more power than this is to replace populism with technocracy. Instead, our plea is that democratic institutions do not ignore, distort or deny the advice of scientific experts. If they want to overrule a strong consensus, that is their choice, but they should be clear it is a choice they choose to make. Likewise if, as often seems to be the case in economic policy, politicians want to take a big gamble on

[35] Meta-expertise is expertise about expertise. The term is introduced in Collins and Evans (2007).

[36] The term civic epistemology is drawn from Sheila Jasanoff's work [e.g. Jasanoff, 2007] and refers to the culturally specific ways in which legitimate knowledge is project in the public sphere. Jasanoff uses the concept in a descriptive way to highlight how the'same' task is performed differently in different societies; we use it more normatively to argue that this particular task should be performed in a particular way.

what may be very uncertain and contested evidence, they should at least be clear that there is an alternative and not deny the legitimacy of the alternative view.[37]

Summary

By drawing on Wittgenstein's idea of a form of life, we have argued that any social group can be characterized as a balance between two opposing elements: the organic aspect that defines what the group has in common and thus gives the group its identity as a group, and the enumerative aspect that describes the differing ways in which the organic core can be displayed and enacted.

We have further argued that the organic aspects of democracy and science share similar values and commitments, particularly notions such as disinterestedness, universalism, honesty and so on, and that these values are best defended on moral and not utilitarian grounds. Democratic societies are just better than authoritarian ones and science is just a better way of making knowledge than divine revelation or oracular pronouncement. One consequence of this overlap of values is that it creates the possibility for science to provide moral leadership in democratic societies as, to the extent that scientists and other experts succeed in acting scientifically, the reproduce the values needed for both science and democracy to thrive.

Science with integrity contributes to the maintenance of democracy is through its role in the system of checks and balances needed to prevent the capture of democratic institutions by a single interest group. Science cannot do this alone, and neither can the press, judiciary or additional tiers of government. Instead, democratic societies survive by ensuring the institutional ecosystem that includes all these different functions and cultures remains healthy. Failures of democracy occur when the balance and health of the ecosystem is damaged – too much science leads to technocracy, but too little helps create the conditions for populism.

Finally, we have argued that preserving and extending democratic societies is a practical and not an ideological task. By this we mean that democracies thrive only when citizens are enabled to put democratic practices into action and actually take the opportunity to do so. Taking part in elections is part of this but only a part. Other actions include endorsing an independent judiciary and other institutions of state even when these prevent the government enacting policies of which they might approve. Most importantly of all in this context, one necessary element of

[37] In other publications, this view has been called the 'minimal default position'; see Weinel (2010).

democratic societies is the recognition that independent experts, of which science may be the exemplar, are part of this network of checks and balances, providing an important form of constraint in addition to that provided by the other institutions.

Список литературы / References

Bloor, 1973 – Bloor, D. "Wittgenstein and Mannheim on the Sociology of Mathematics", *Studies in History and Philosophy of Science Part,* 1973, vol. 4 (2), pp. 173–191. DOI: 10.1016/0039–3681(73)90003–4.

Bloor, 1991 – Bloor, D. *Knowledge and Social Imagery*, 2nd ed. Chicago: University of Chicago Press, 1991, 211 pp.

Collins, 1974 – Collins, H.M. "The TEA Set: Tacit Knowledge and Scientific Networks", *Science Studies*, 1974, vol. 4 (2), pp. 165–85.

Collins, 1975 – Collins, H.M. "The Seven Sexes: A Study in the Sociology of a Phenomenon, or the Replication of Experiments in Physics", *Sociology, 1975*, vol. 9(2), pp. 205–24. DOI: 10.1177/003803857500900202.

Collins, 1992 – Collins H.M. *Changing Order: Replication and Induction in Scientific Practice*. Chicago: University of Chicago Press, 1992, 207 pp.

Collins, 2013 – Collins, H.M. "Three Dimensions of Expertise", *Phenomenology and the Cognitive Sciences,* 2013, vol. 12(2), pp. 253–273. DOI: 10.1007/s11097–011–9203–5.

Collins, 2017 – Collins, H.M. *Gravity's Kiss: The Detection of Graviational Waves*. Cambridge, Mass: MIT Press, 2017, 416 pp.

Collins, Evans, 2002 – Collins, H.M. & Evans, R. "The Third Wave of Science Studies: Studies of Expertise and Experience", *Social Studies of Science,* 2002, vol. 32 (2), pp. 235–296. DOI: 10.1177/0306312702032002003.

Collins, Evans, 2007 – Collins, H.M. & Evans, R. *Rethinking Expertise*. Chicago: University of Chicago Press, 2007, 172 pp.

Collins, Evans, 2017a – Collins, H.M. & Evans, R. "Probes, Surveys, and the Ontology of the Social", *Journal of Mixed Methods Research*, 2017, vol. 11 (3), pp. 328–341. DOI: 10.1177/1558689815619825.

Collins, Evans, 2017b – Collins, H.M. & Evans, R. *Why Democracies Need Science*. Cambridge, UK; Malden, MA: Polity Press, 2017, 200 pp.

Collins, Kusch, 1998 – Collins, H.M. & Kusch, M. *The Shape of Actions: What Humans and Machines Can Do*. Cambridge, Mass: MIT Press, 1998, 224 pp.

Collins, Pinch, 2010 – Collins, H.M. & Pinch, T. *The Golem at Large: What You Should Know about Technology*. *6. Print*. Cambridge: Cambridge University Press, 2010, 225 pp.

Collins, Pinch, 1993 – Collins, H.M. & Pinch, T. *The Golem: What Everyone Should Know about Science*. Cambridge [England]; New York: Cambridge University Press, 1993, 164 pp.

Collins, Pinch, 2005 – Collins, H.M. & Pinch, T. *Dr. Golem How to Think about Medicine*. Chicago: University of Chicago Press, 2005, 246 pp.

Collins, Bartlett, Reyes-Galindo, 2017 – Collins, H.M., Bartlett, A. & Reyes-Galindo, L. "The Ecology of Fringe Science and its Bearing on Policy", *Perspectives on Science,* 2017, vol. 25. [http://arxiv.org/abs/1606.05786, accessed 09.03. 2017].

Douglas, 2009 – Douglas, H.E. *Science, Policy, and the Value-Free Ideal*. Pittsburgh, Pa: University of Pittsburgh Press, 2009, 256 pp.

Fleck, 2008 – Fleck, L. *Genesis and Development of a Scientific Fact*. Repr. 11. Aufl (First published in German in 1935). Sociology of Science. Chicago, IL: University of Chicago Press, 2008, 222 pp.

Freedland, 2017 – Freedland, J. "The Year of Trump Has Laid Bare the US Constitution's Serious Flaws", *The Guardian*, 2017, 30 December. UK Edition. [https://www.theguardian.com/commentisfree/2017/dec/30/trump-us-constitution-weakness-founding-fathers, accessed on 02.03.2017]

Freedland, 2018 – Freedland, J. "Brexit Reveals Our Political System Is Failing. The 48% Must Have a Voice", *The Guardian*, 2018, 2 September. UK. [https://www.theguardian.com/commentisfree/2018/feb/09/brexit-political-system-failing-48-per-cent-theresa-may-corbyn-betrayed, accessed on 20.02.2018].

Gross, Levitt, 1998 – Gross, P.R. & Levitt, N. *Higher Superstition: The Academic Left and Its Quarrels With Science*. Johns Hopkins Paperbacks ed. Baltimore: Johns Hopkins University Press, 1998, 348 pp.

Held, 2006 – Held, D. *Models of Democracy.* 3rd ed. Stanford, Calif: Stanford University Press, 2006, 400 pp.

Irwin, Wynne, 2003 – Irwin, A. & Wynne, B. (eds.). *Misunderstanding Science? The Public Reconstruction of Science and Technology*. 1st Paperback ed. Cambridge: Cambridge University Press, 2003, 244 pp.

Jasanoff, 2007 – Jasanoff, S. *Designs on Nature Science and Democracy in Europe and the United States*. Princeton, N.J.: Princeton University Press. [http://site.ebrary.com/id/10477123, accessed on 10.04.2015]

Knorr-Cetina, Mulkay, 1983 – Knorr-Cetina, K. & Mulkay, M. (eds). *Science Observed: Perspectives on the Social Study of Science*. London: Sage Publ., 1983, 263 pp.

Koertge, 2000 – Koertge, N. (ed.) *A House Built on Sand: Exposing Postmodernist Myths about Science.* New York: Oxford University Press, 2000, 336 pp.

Kuhn, 1962 – Kuhn, T.S. *The Structure of Scientific Revolutions*. Chicago, Ill: University of Chicago Press, 1962, 212 pp.

Labinger, Collins, 2001 – Labinger, J.A. & Collins, H.M. (eds.). *The One Culture?* Chicago, IL: The University of Chicago Press, 2001, 296 pp. [http://www.-press.uchicago.edu/ucp/books/book/chicago/O/bo3634845.html, accessed 02.03.2017].

Latour, Woolgar, 1979 – Latour, B. & Woolgar, S. *Laboratory Life: the Social Construction of Scientific Facts*. Beverly Hills: Sage Publications, 1979, 296 pp.

Levitsky, Ziblatt, 2018 – Levitsky, S. & Ziblatt, D. *How Democracies Die*. 1st edition. New York: Crown, 2018, 320 pp.

Merton, 1973 – Merton R.K. *The Sociology of Science: Theoretical and Empirical Investigations*. Chicago: University of Chicago Press, 1973, 636 pp.

Miller, 2011 – Miller, S. "Public Understanding of Science at the Crossroads", *Public Understanding of Science,* 2011, vol. 10 (1), pp. 115–120. DOI: 10.1088/0963–6625/10/1/308.

Nowortny, 2001 – Nowotny, H., Scott, P. & Gibbons, M. *Re-Thinking Science: Knowledge and the Public in a Age of Uncertainty*. Cambridge: Polity, 2001, 288 pp.

Oreskes, Conway, 2010 – Oreskes, N. & Conway, E.M. *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*. 1st U.S. ed. New York: Bloomsbury Press, 2010, 368 pp.

Popper, 2002 – Popper, K.R. *The Logic of Scientific Discovery*. London, New York: Routledge, 2002, 544 pp.

Rip, Misa, Schot, 1995 – Rip, A., Misa, T.J. & Schot, J. (eds.). *Managing Technology in Society*. London: Pinter Publishers: Distributed in the United States and Canada by St. Martin's Press, 1995, 361 pp.

Weinel, 2010 – Weinel, M. *Technological Decision-Making Under Scientific Uncertainty: Preventing Mother-to-Child Transmission of HIV in South Africa*. PhD. Cardiff University, Cardiff, UK. [http://orca.cf.ac.uk/55502/, accessed 15.03.2017].