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**Citation:** Balmer, A., Calvert, J., Marris, C., Molyneux-Hodgson, S., Frow, S., Kearnes, M., Bulpin, K., Schyfter, P., Mackenzie, A. & Martin, P. (2016). Five rules of thumb for post-ELSI interdisciplinary collaborations. *Journal of Responsible Innovation*, 3(1), pp. 73-80. doi: 10.1080/23299460.2016.1177867

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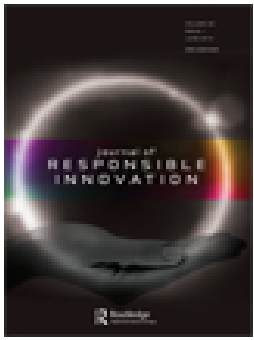
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**Link to published version:** <https://doi.org/10.1080/23299460.2016.1177867>

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**To cite this article:** Andrew S. Balmer, Jane Calvert, Claire Marris, Susan Molyneux-Hodgson, Emma Frow, Matthew Kearnes, Kate Bulpin, Pablo Schyfter, Adrian Mackenzie & Paul Martin (2016): Five rules of thumb for post-ELSI interdisciplinary collaborations, Journal of Responsible Innovation, DOI: [10.1080/23299460.2016.1177867](https://doi.org/10.1080/23299460.2016.1177867)

**To link to this article:** <http://dx.doi.org/10.1080/23299460.2016.1177867>



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Accepted author version posted online: 25 Apr 2016.  
Published online: 07 Jun 2016.



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## Five rules of thumb for post-ELSI interdisciplinary collaborations

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### ABSTRACT

In this paper we identify five rules of thumb for interdisciplinary collaboration across the natural and social sciences. We link these to efforts to move away from the 'ethical, legal and social issues' framework of interdisciplinarity and towards a post-ELSI collaborative space. It is in trying to open up such a space that we identify the need for: collaborative experimentation, taking risks, collaborative reflexivity, opening-up discussions of unshared goals and neighbourliness.

### ARTICLE HISTORY

Received 4 October 2015

Accepted 7 April 2016

### KEYWORDS

Interdisciplinarity;  
collaboration; post-ELSI;  
Integration; synthetic  
biology; introduction

## Introduction

In recent years, dissatisfaction has grown with the 'ethical, legal and social issues' (ELSI) framework for interdisciplinary collaboration between natural and social scientists in sociotechnical knowledge production and innovation. In particular, critics from the field of science and technology studies argue that such projects place too much emphasis on the promises surrounding sociotechnical innovation rather than on its practices, resulting in 'speculative ethics' (Nordmann and Rip 2009) and that there is a danger of such work becoming little more than a box-ticking exercise (Jasanoff 2007). All of this can result in social scientists being positioned as 'nay-sayers', the voice of negative criticism (Fortun 2005). This is partly a product of how our critical apparatus is often integrated into scientific and governance practices through ELSI-style processes of engagement in order to address funders' and government's requirements to anticipate 'negative consequences', thereby placing us in the role of 'foreteller' (Balmer et al. 2015). This significantly constrains opportunities for bringing about changes in practice and for productive relations between natural and social scientists.

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In trying to overcome such limitations, to move the integration (Fisher and Maricle 2015) of social science upstream, and attend to practices of research and innovation, science and technology studies (STS) researchers have sought to inhabit more collaborative, reflexive and, coproductive roles (Calvert and Martin 2009). Several forms of integration have been developed to help accomplish such a shift, amongst them: upstream public engagement (Wilsdon and Willis 2004); constructive technology assessment (CTA) (Schot and Rip 1997); anticipatory governance and real time technology assessment (Barben et al. 2008); human practices (Rabinow and Bennett 2012); and responsible innovation (Owen, Bessant, and Heintz 2013). However, much less has been said regarding the everyday struggles to bring about changes in such relations as we seek to move towards more collaborative practices (Balmer et al. 2015; Balmer, Bulpin, and Molyneux-Hodgson 2016; Fitzgerald and Callard 2014; Rabinow and Bennett 2012).

In this article, we draw on our experiences of and reflections on interactions with natural scientists and engineers in the context of synthetic biology, which amount collectively to more than 48 researcher years of entanglement. We extend our previous comments on this topic (Balmer et al. 2012, 2015) to put forward five 'rules of thumb' for developing 'post-ELSI forms' of collaboration (Balmer and Bulpin 2013; Rabinow and Bennett 2012). Rules of thumb offer a general guide based on practice rather than theory – a flexible and adaptable sense of *how* to approach a subject rather than a strict set of procedures to follow.

## Collaborative experimentation

Our first rule of thumb is that experimentation with post-ELSI forms of integration should be developed collaboratively with scientists and engineers. In this regard, commitments to working together should be practical and rooted in the everyday situations in which they are to be implemented. They should be sensitive to the everyday nature of academic and industrial work. For example, they might have to take account of the time required and costs incurred in attempts to collaborate, ensuring that adequate resources are devoted to experiments with novel practices. Experiments should be sensitive to context: not all sociotechnical research and innovation practices can be integrated with social science practices in the same fashion. General approaches, as developed in CTA and so forth can be useful but may need to be refashioned within the specific set of social, technical, legal and political relations within a given project, field, or discipline. Researchers should experiment with different approaches, bringing together different orientations into novel combinations in order to explore new ways of working together.

The onus in collaborations tends to be on social scientists to work towards integrating themselves. However, it is important to emphasise the need for scientists and engineers themselves to experiment with how they conduct their everyday work, make knowledge and develop technical innovations as part of an interdisciplinary mix. If this commitment cannot be ensured then efforts on all parts are likely to fail. As such, clear commitments to experiment with working collaboratively should be made before grant applications are awarded and time devoted to these experimental processes. This has implications for research funders, who must ensure that social science is being integrated in a sensible and productive fashion, and that there are clear commitments to experimentation on both sides written into the structures of calls and funded grants. Social science cannot

merely be an ‘add-on’, separated from the day-to-day work of innovation, and certainly should not be added to the grant at the last minute (Viseu 2015).

In order to fulfil our side of the bargain, social scientists have to take responsibility for how we enter into collaborations. Last-minute invitations to collaborate must often be refused. Moreover, we have to find ways in which our expertise can form a part of mutually productive collaborative relationships rather than acting only as external critics. This form of critique has its place as well, but alone will not be adequate to the task of achieving more substantive forms of integration and changes in practices on both sides. Much like experiments in science, we must be adventurous and playful, willing to explore the unknown, tinker with our methods and be resilient in the face of failure. In this regard, we have to take risks. Failures should not be considered as disastrous but as lessons to be learned from.

### Taking risks

Experimenting with collaborative relationships often requires that social scientists move from role to role, sometimes shifting into more external positions, and at other times into more coproductive and collegial alignments (Balmer et al. 2015). These shifts of position come with shifts in the kinds of risks one is required to take and with what is put at risk. Collaborative positions involve more risk, professionally and personally, than do external positions (Balmer, Bulpin, and Molyneux-Hodgson 2016). For example, the risks taken with one’s career are more significant, since to experiment with collaboration can cost time and effort. Interdisciplinary outputs are generally awarded less value than single discipline scholarly contributions in academic life (Klein 1990). Professional risks such as these are most acute for those whose jobs are funded by grants led by natural scientists, and most particularly for junior researchers in such positions. In this regard, the various roles one can take involve different levels and different kinds of vulnerability. These must be acknowledged by research funders, universities, policy-makers and principal investigators on collaborative grants. Ensuring that there are practical protections for those at risk is an important part of ensuring that collaborative experiments can be productive for all those involved.

Nonetheless, we believe it is vital that we take risks. For example, we must take more risks with how we represent our research and findings. Even in the most coproductive and collegiate collaborations, scientists and engineers do not invest as much time in understanding social science as do social scientists in understanding science and engineering. Natural scientists and engineers often challenge our writing style, arguing that it is opaque and overly technical. Clearly there is a power differential at work in these challenges: scientists expect our knowledge to be transparent, but are happy enough for their own literature to remain inaccessible to outsiders. Attempts to shift this, and to engage scientists and engineers in the academic literature generally end in frustration. Using art and design, creative and playful methods, as well as experimenting with different forms of textual representations is thus going to be an important part of how more substantive integration is accomplished. This will involve experimenting with how our research is integrated and how critical commentary is developed and deployed. There are some emerging examples of this kind of work in the context of synthetic biology (Balmer and Bulpin 2013; Ginsberg et al. 2014).

## Collaborative reflexivity

Such experiments in form and practice can also help to bring about collaborative reflexivity. We view reflexive practice as vital to fruitful collaborations with scientists and engineers and to the possibility of making the move from instrumental and imposed roles to more coproductive and chosen ones. In this regard, helping to integrate reflexivity in science is an important outcome for collaborations, but we must also be reflexively attuned to how our collaborations themselves are enacted in day-to-day practice and to how they are awarded credibility. Collaborative reflexivity thus means engaging all collaborative partners in reflections on collaborative relationships, regarding how they are experienced; how this might be related to organisational, material, or social factors; how risks are being taken and vulnerabilities managed; and how contributions to collaborations are being valued.

Furthermore, much like collaborative experimentation, collaborative reflexivity has to be situated and specific. What practicing reflexivity entails in one collaboration might be irrelevant in another and so it should be actively negotiated between practitioners, modified as collaborations develop, and evaluated based on conditions particular to the context. These encounters must be supported by all parties. Making reflexivity a collaborative enterprise might also help to free social scientists from being positioned either as foretellers or 'yes men' (Balmer et al. 2015). Indeed, regular engagement in collaborative reflexivity can help to talk about such issues, about the constraints faced by all parties, to discuss similarities and differences and to generally clear the air. On this note, it is important to be frank during collaborative reflections and to open-up discussions of unshared goals.

## Opening-up discussions of unshared goals

The integration of social sciences into science and engineering research is often understood to be important to ensuring national economic impact and successful innovation. But these might be less immediate goals for social scientists in such integrated positions, or at least those social scientists keen to bring about such impacts will generally hold a richer, more critical appreciation of the relations between science, innovation and the nation. As such, we think it is important to continue to negotiate expectations around what we hope to achieve from these collaborative experiments and what a successful impact might look like. Negotiating differences whilst maintaining relationships can often mean very frank discussions that – although they might not produce shared goals – can produce shared interests and more mutual understanding. Some have argued that, at least in some contexts, the answer lies in being comfortable with a degree of concealment about one's aims in a collaboration (Fitzgerald et al. 2014). However, when working in long-term collaborations concealed goals and dispositions can become unbearable, leading to significant emotional burden and frustration. We thus argue that as a rule of thumb it is generally worth the risk of being open and of opening-up such discussions, even if this sometimes comes at the cost of continued relationships.

## Neighbourliness

To develop these new ways of collaborating, and to stick with collaborations even when there are differences, the concept of neighbourliness might be a useful rule of thumb

for ethical decision-making. The concept has a long tradition, which in the West is rooted in the Christian bible and epitomised in the story of the good Samaritan. The concept has long since been secularised and plays a role in English Common Law (van Rijswijk 2012). Moreover, in contemporary feminist and post-structuralist research, it has been explicitly connected to questions of power, vulnerability, community and difference (Derrida 2000). Neighbours in Christianity are not necessarily related through their physical or emotional connection to each other but rather through their commitment to God (Painter 2012), and in its feminist and post-structuralist manifestation they are related through a necessary commitment to a certain notion of justice; although the everyday meaning of being a neighbour does imply a geographical relation. For our purposes, the concept can bring some of these aspects together to serve as a rule of thumb, that reminds us to link questions of ethics in practices of collaboration to issues of power, vulnerability and proximity.

This all relates to the question of difference between natural and social scientists, their paradigms of research, theories of life and so forth. Studies of 'boundary work' and 'boundary objects' (Gieryn 1983; Star and Griesemer 1989) have shown how differences between groups seeking to work together are managed through objects and practices which all parties can use in their own ways. Such boundaries can make interdisciplinary communication and to some degree an interdisciplinary community, possible. But good fences do not make good neighbours. Attempts to collaborate and to bring about the integration of reflexivity demand more than these well-established ways of managing our differences.

To be neighbourly, then, would mean to recognise our differences and to respect them, whilst seeking to welcome each other without losing our sense of ourselves and our own commitments, responsibilities and proclivities. It is fundamentally an ethical disposition, which does not mean shying away from conflict, but rather making conflicts and their causes part of how we collaborate. In this regard, to be neighbourly to each other in an interdisciplinary collaboration would involve working together to identify our differences, to explore how we are differently vulnerable and how there might be different relations of power involved in our collaborative work. By doing so, we can make this relevant to the decisions that we make not only about how our collaborations are organised but also about the research and innovation itself.

Neighbourliness can be a style of ethical engagement in collaborative experimentation that emphasises the need to remain close and to work together in the face of open differences and contestation. It is also a general disposition, rather than a set of rules or procedures, and so can be adaptable to shifting relations in moves towards collaborative post-ELSI dynamics. We have to work harder to find commonalities, to identify interests, hopes and worries that we can share whilst attending to our differences in vulnerability and to power relations. To be neighbourly, therefore, means attending to the ethics of the collaboration itself, not simply to the ethical implications of different technologies or scientific practices. This orientation to the double movement of ethics, towards publics and other actors but also inwards into the collaboration is what will help to make collaborations more productive and enable us to move past the ELSI models of interdisciplinarity.

Ultimately, however, there will be structural impediments to bringing about neighbourly relations, which have to do with how power is organised at a more institutional level, in universities, research funding structures and in government. This is because



our collaborations involve not only social and ethical relations but also political ones. There are political impediments to moving towards integrated positions that continue to position social scientists in more impoverished roles, and which often require us to empathise with those in power but rarely demand that those with power empathise with us (Balmer et al. 2015). Being proximal to our colleagues in the natural sciences and engineering should not come with the requirement to 'get on board' with the aims of the project or to 'be more positive'. As such, being neighbourly should not imply that we should accept inequalities and suffering (van Rijswijk 2012). Rather we should use our proximity and pursuit of collaborative relations to try to overcome such inequalities to the extent that this work is tolerable. We do not need to suffer unendingly if things are not working, and should make sure that our participation in collaborations is fruitful for our ends too.

## Acknowledgements

We would like to thank all of the participants of the ESRC Seminar Series on Synthetic Biology and the Social Sciences and all of those with whom we have sought to collaborate in the natural sciences and engineering.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

We are grateful to the research funders that made the work possible, including: Economic and Social Sciences Research Council [RES-451-26-0871], [RES-061-25-0208], [RES-145-28-0003]; Biotechnology and Biological Sciences Research Council [BB/M017702/1], [BB/M018040/1], [BB/F018746/1]; Engineering and Physical Sciences Research Council [EP/J02175X/1], [EP/H01912X/1], [EP/G036004/1], [EP/K020781/1], [EP/H023488/1], [EP/F007388/1]; European Research Council [ERC 616510-ENLIFE]; the European Commission Framework Programme 7 [FP7-KBBE-2011-5]; the Australian Research Council [FT130101302], [CE140100036]; the White Rose Scholarship fund.

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