CROSSBREEDING STS AND INNOVATION STUDIES

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NOTA BENE: Comments and additions/modifications are welcome. They will be selectively integrated into a new version to be circulated shortly before the workshop.

There are a number of centres, groups, departments that do STS as well as innovation studies – at University of California at Davis this is even reflected in the name, Center for Science and Innovation Studies. There are opportunities and challenges for such centres if they are to mean more than co-habitation under one roof. Exchanges between such centres, most often in the form of interactions of people, occur and could increase. We want to go a step further, and create an international network of Centres of STS and innovation studies. Our argument for this initiative refers to the future of these two heterogeneous fields. Building bridges between STS and innovation studies is important and timely, and making the linkages and overlaps institutionally visible will help us, as well as others, to work towards such a goal. Thus, our initiative has an intellectual as well as an institutional interest. This background paper focuses on the intellectual interest. It is primarily written for actual and potential participants in a workshop to be held at the European University at St Petersburg, so we will also pay attention to institutional interests, indicating the objectives of the workshop as the start of the international network (IN) of Centres for STS and Innovation studies (IN).

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Innovation studies overlap with STS in object (R&D, technology), but differ in style. In addition to a prevalence of qualitative approaches in STS and quantitative methods in innovation studies, the latter tend to blackbox innovation and many related processes, like patenting. (Innovation studies, for instance, studies patenting practices, often quantitatively, but rarely engages with the details, tensions, and instabilities within patent law). STS, on the other hand, wants to open black boxes, but is often content just to show complexities and instabilities. Also, STS has had (though with some early exceptions as the Technology Policy Unit in Aston University) a blind spot when it comes to firms, though maybe that is changing now with the growing interest in STS in emerging technologies. In sum, there are obvious complementarities between these two fields that can be exploited to mutual advantage, if the differences in style can be overcome. These differences are also social, connected to the different institutional niches occupied by these two fields and their practitioners, with mutual stereotyping (STS scholars see innovations studies with their well-defined data sets as drawing valid but substantially empty conclusions; innovation studies scholars see STS as rich but it remains unclear to them whether it amounts to more than interpretive description, and perhaps some "appreciative theory" (Nelson)). There is more than a grain of truth in these stereotypes, but our point here is that they are used as stereotypes, and hide interesting possibilities for mutual enlightenment and collaboration.

To reduce the risk of stereotyping we emphasize that neither innovation studies nor STS are homogeneous. For example, neo-classical economists may treat innovation as a black box, often reducing it to numbers or patents issued or companies established, but evolutionary economists like Nelson and Dosi are interested in different patterns, and have contributed seminal insights that are used widely, and improved upon, in subdomains of STS. Business and organization studies are

interested in management of innovation, including the vicissitudes (cf. Van de Ven on innovation journeys) and contingencies. There is interest in sociological patterns (see for example Garud's work) and in Actor-Network Theory (Czarniawska). Studies of innovation ecologies (cf. Kenney on Silicon Valley) are conceptually congruent with STS approaches, though not necessarily produced by scholars with an obvious STS background or methodological outlook . STS can link up to further traditions within economics, like the quirkier, geographically sensitive work like Alfred Marshall's on industrial districts (e.g. Robinson, Rip and Mangematin). In sum, some bridges between innovation studies and STS are already in place, and opportunities for bridging could be used more frequently and explicitly.

There is a further strand in innovation studies, linking up with STI (Science, Technology and Innovation) policy. This is particularly visible in the topic of national systems of innovation and their evolution over time. Such studies can be descriptive and naïve (cf. the conferences of the international Globelics network), but do open up to broader considerations, particularly when developing countries are studied (e.g. Delvenne and Thoreau). In those latter studies there is an overlap with technology and development studies with a strong (de facto) STS component.

While there is variety in STS, by now there appears to be an intellectually coherent core with its perspectives of pragmatic constructivism and co-production of science, technology and society. And STS scholars invited to offer policy analysis and advice may draw on such a core, as in the EU Expert Group , the Wynne & Felt Report, 'Taking the European Knowledge Society Seriously' – itself a bridging attempt.)[1] This core represents a historically evolved perspective rather than a domain. If one starts with the domain, there is more variety within STS, and interestingly, other disciplines like sociology, political science, geography, anthropology (and in another way natural sciences) study and diagnose what is happening in the domain of science, technology and society, and are sometimes incorporating STS insights and approaches. (One example is how the idiom of ANT has come to pervade, however superficially, a remarkably range of discussions across most of the social sciences as well as business and management schools).

We will briefly expand on the historical evolution of STS as a scholarly endeavour. STS is shaped by its history starting with the universalistic Mertonian approach, going on to the "regional" approach of incommensurable paradigms (cf. 1970s specialty studies), and the local approach of laboratory studies (1980s), and case studies in general. There is now a movement back to meso-level and macro-level studies, also because of the interest in ongoing overall changes (new modes of knowledge production, strategic science, increased scale and spatial dispersion of collaboration, etc). The local is no longer what it used to be, but the good news is that STS can (and should) do multi-level and/or multicentered analyses, as well as studies of work in virtual environments. Also, recent STS has shown that there is no need to wait for black boxes to be established or objects and institutions stabilized before we start opening them up. From synthetic biology to nanotechnology (but also including biotech done in new contexts and countries) STS can study innovation in action, even if there are data and access problems.

Thus, by combining existing insights, there is a de facto multi-level theory available in STS, even if it has not yet been written up properly. For technology studies with a focus on technology dynamics (cf. Rip, Geels on the multi-level model, with links to innovation and sector studies, and with sustainability transition studies), multi-level approaches have been written up. Sectoral level studies, often linked with technological domain studies, are a growth point anyway, independently of the

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[1] The Report also illustrates that when STS addresses innovation, it finds it easier to study and comment on the rhetoric and rationales of innovation policy, and societal concerns and debates than on ongoing innovation, product development etc. It is actually the combination which is important to study (Constructive TA does this from an action perspective).

multi-level model, and they can link up with the longer tradition in innovation studies and economics (e.g. Malerba). Micro-level studies of uptake and domestication of new technologies are another important strand in STS (and in cultural studies), but have remained somewhat distant from innovation studies with their interest in developing and successful introduction of new technologies and products. Also within STS there is a grey zone between the studies of technology dynamics and studies of societal embedding (including their domestication) (cf. the Social Learning project and subsequent book, edited by Williams et al.).

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One conclusion is that there are mutual interests and complementarities that could be pursued, and are already pursued to some extent. But there are differences in style and in institutional interests which limit their exploration and exploitation.[2] An additional tension concerns the increasingly metrics-informed careers that both STS and Innovation scholars may have to negotiate. With the exception of its more pedestrian and uninteresting expressions, cross-disciplinarity has always carried professional risks, blurring field identities, readerships, and modalities of credit. While generally (and generically) praised, cross-disciplinary work has become in fact even more penalized by the narrowing of "legitimate" publication venues to a small set of canonical, high-impact journals – a set that is significantly different for scholars from STS and from Innovation Studies.

In other words, the actualization of these intellectual possibilities need to be supported by institutional developments. That is how we conceived our INSTSIN initiative. Thus, the steps we hope to take in St Petersburg are: (1) A discussion of the intellectual perspectives that may animate this new hybrid field, including those oriented toward practical and policy concerns; (2) The creation of INSTSIN to support the material/institutional development of the hybrid field, and in doing so, also invigorate the parent fields.

We address (1) by identifying a number of topics at the intersection between STS and innovation studies. These represent starting points, to be expanded/contracted through our conversations in St. Petersburg.

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A first bridging topic that can profit from complementarities is the analysis of patterns in technoscience and innovation development in their contexts. An example is the work of Joly, Rip and Callon on new innovation regimes: the pattern of economics of technoscientific promises, and the pattern of socio-economics of collective experimentation. Their idea of ongoing reinvention of innovation allows identification of specific topics, an important one being reinventing the commons (IP is a key element here). Another study of patterns draws on Rip's point that innovation journeys (cf. Van de Ven, and Rip and Schot) occur, and that there some typical shapes of these journeys. The pattern for industrial products and processes is quite different from the pattern for ICT, especially because of the role of software. We emphasize this point here already because it feeds into the further elaboration of bridging topics even when we do not explicitly refer to the variety in patterns of innovation.[3]

A second topic derives from the multi-level perspective, and the recognition of actual multi-level dynamics. Innovation scholar Van Looy has called for "firm in field" analysis, to study the dependence

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[2] Indicative is the struggle between the two European Union Networks of Excellence PRIME and DIME, overlapping in their shared interest in technology and innovation policy, but with an STS and policy analysis style (PRIME) and an economists' style (DIME)

[3] Rip actually claims that there are four typical patterns, the third being agricultural innovation journeys (and more generally, innovation where the performance depends on living organisms at work) and the fourth, large technical systems and infrastructures (long term, public/private).

of firms on field-level developments (sector as well as technology) and their active role in shaping field developments.

A third topic is the importance of recognizing variety and diversity of practices, institutions and overall patterns of societies. In the small (not so small, actually) as for different patterns of innovation journeys, and in the large, co-existing innovation regimes and their links with society-level patterns and their development. For the latter, one can think of the Freeman and Perez (and Louça) analysis of long waves, and add insights from the 'varieties of capitalism' literature.

A fourth topic is the role of anticipation, and broader, of strategy articulation, in actual practices. There are expectations, promises, imaginaries (in the business world, with policy makers, in society) and tools like road-mapping. There are attempts to anticipate on uptake and embedding of technology (e.g. Constructive TA of nanotechnology). And anticipatory governance (because technological developments co-construct social and political order). Foresight has become a business in its own right, with little reflection on what it is actually doing (and assuming). Taking up the limitations and the promise of foresight could be an entrance point to study the topic.

A fifth topic is the opening up of science and technology, and innovation. While 'technological democracy' (Callon et al.) is an important strand, it is not the whole story. There is the pressure for participation ("inclusive governance" as the EU has called it). And the UK interest in "upstream" public engagement (if it were to make a difference, it would revive the linear model). For science, there is the general move towards re-contextualisation, and some deprofessionalisation (cf. European Science Foundation's Policy Brief project, Futures of Science in Society, workshop 2). For enactors of technology & innovation, "social licence to operate" has become important (cf. also present move towards Responsible Research and Innovation). There is lots of interest in participation exercises and co-construction projects, but these have also to be seen as part of longer-term developments.

A sixth topic is the role of users in innovation (cf. Von Hippel, and Oudshoorn and Pinch) and the partly overlapping move towards open source and copyleft (this complex was called 'collective experimentation' by Joly, Rip and Callon). The role of users and the issue of the 'commons' works out differently for the different types of innovation dynamics, for example with large systems and infrastructures, users may have input in design, but not easily in development of the innovation. In agriculture, there are innovative practices "on the ground" that are not always visible for their contribution. A further development is the rise of "do it yourself" biology.

Continuing this line of thinking, one can raise questions about the de facto research agendas in STS and Innovation studies – especially the kind of things we end up not researching, but without meaning to avoid them. What about innovations in the *media* of work, collaboration, and publication – from online environments and social media to open access publications which may render obsolete peer review, one of the alleged pillars of the technosciences? These developments do not fit traditional approaches to innovation, which were shaped by a focus on industrial products and processes while treating information technologies as aids to, rather than conditions of possibility of, innovative work. (At the scholarly level, these areas are actively engaged by digital new media studies and legal and internet studies and, at the practical level, by scientists and policy makers, but STS, with a few exceptions, has not been at the forefront of these debates. Innovations studies has been a lot more involved in this developments, but often with a celebratory, technophilic attitude). And what about large technical systems and infrastructures? Historians have done important work in this area (e.g. Hughes, Edwards), but innovation scholars do not appear to engage them, at least not at the appropriate scale. STS approaches to large technical systems have also been underdeveloped, limiting themselves to policy aspects and controversies). This range of topics could be expanded to include, among other things, the challenges posed by studying emergent forms of innovation based

on big-data and data mining. But for the moment let's group all these challenges together and call it a seventh topic: redressing the lacunae in the de facto research agendas.

An eighth topic is to rethink what are sometimes called "framework conditions for innovation and innovation systems", like law and regulation (including market regulation), as technologies, as bodies of knowledge and techniques that are changed, challenged, and temporarily stabilized during innovation processes – whose flow they are asked to regulate (cfr Chander on "Electronic Silk Road" and Pottage & Sherman "Figures of Invention"). What is being done already , and has become visible also in relation to the financial crisis (cf. MacKenzie), is to look at financial markets (and their components, like rating firms) as technologies rather than a stable component of the infrastructural machinery of capital (cf. also Callon and others on performativity).

A ninth topic (or cluster of issues) concerns space or 'effects of space' (space is socio-material, a use of the concept that is visible in recent geography). There are regional innovation studies, taking Silicon Valley as an exemplar, but there is now also interest in the places where innovation occurs.[4] Rather than declaring the micro-spatial perspective of laboratory studies as insufficient as that of the macroscopic focus on "the economy" and go for a "middle way" (however important that may be), we might need to rethink the question of the spatiality of innovation altogether. A further consideration is about innovation and cyberspace, even if the latter may be little more than a spatial-sounding term for something that has very few of the features of what we tend to call space. All this could also be an area where innovation studies, and its quantitative approaches, may have something to teach to STS.

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The goal of the discussion we will have in December is not to push these topics and canonize them at the expense of others. We rather want to show that an intellectual agenda can be formulated and expanded or modified with your help, creating opportunities to do important work as well as to support institutional visibility. In that spirit, the present text can already now raise comments and suggestions. We hope you will circulate them, and on that basis, we (Arie and Mario) would then create a next version, to function as the theme paper for the December workshop. This would allow us to be more productive in the workshop, and profit from the fact that such a set of experienced people has come together and in discussion, can spark off further insights and ideas.

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[4] This may involve the study of new, previously unstudied spaces like garages (the topic of a conference that Lepinay and Biagioli are organizing at EUSP next year) or the kitchens of DIY biology, but it goes well beyond that.