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Evaluation of participatory science and research

PROCEEDINGS

webinar

5 July 2021

introduction

Presentation of the collective work on the evaluation of participatory science and research within the Sorbonne University Alliance

Laure Turcati

Research associate in participatory science
Sorbonne University

Science Together was initially a web portal developed by the Sorbonne University Alliance (SUA), a group of several institutions including the Sorbonne University and the Muséum national d'Histoire naturelle (MNHN), which had several participatory science projects to promote. It is primarily a showcase to present the different projects to interested citizens, as well as journalists. Currently 42 projects are presented, compared with 29 when the portal was launched in November 2019.

The projects are quite diverse in terms of disciplines. More than half are devoted to biodiversity, but there are also projects on music, health, languages, history and environmental sciences. Their territorial roots are also quite varied, though most concern metropolitan France. Almost all the projects are deployed with partners from associations and/or local authorities, of which there are 130 in total.

Science Together is also a business network that allows project leaders to exchange information with each other. This can be done via the Internet; however, Alexandra Villarroel and I also run this portal, as well as organising monthly workshops that allow for more regular and fluid exchanges. Initial discussions led to the need to work on evaluation, as quantitative data did not reflect the richness of participatory science and research (PSR) projects. After internal reflection, a series of seminars was organised in autumn 2020 on the following themes:

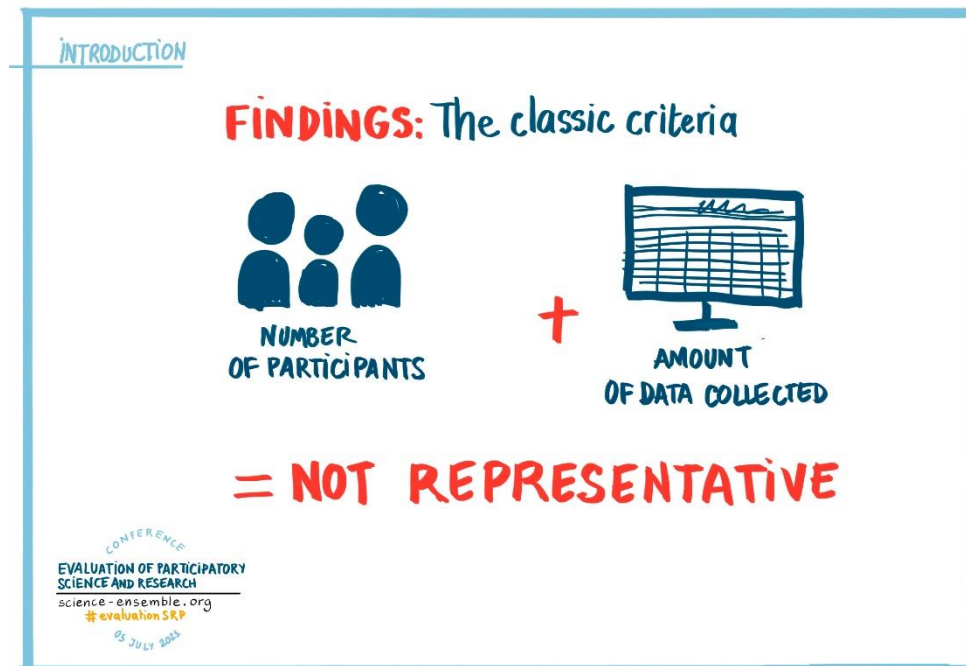
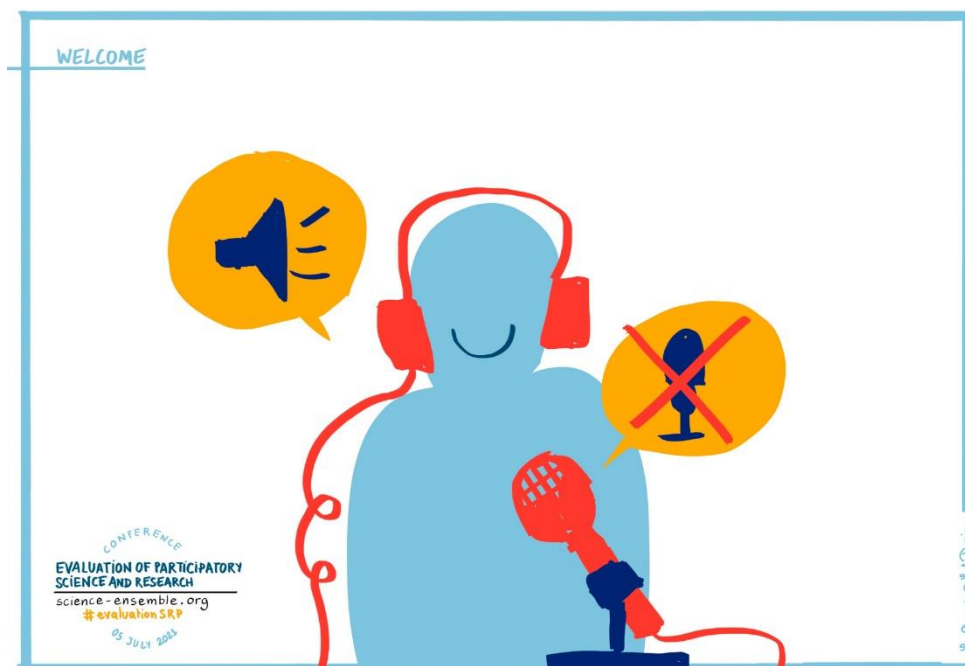
- Social and human sciences perspective on project evaluation and PSR institutionalisation;
- Research programme donors;
- PSR project holders.

This initial work led us to draw up the position paper and create an evaluation grid, with today's seminar intended to collectively enrich and validate this initial approach.

Today, a working session will be held on this evaluation grid. Its targets are project leaders, funders and institutions, and it enables project leaders to carry out self-evaluations. The evaluation grid provides a temporal vision: before, during and after the project. Its second entry is thematic and concerns the conduct of the project in participatory mode and the impacts generated. It is not a question of proposing a fixed reference but of continuing to develop the evaluation grid, which is very broad, given the diversity of PSR projects: it is therefore not necessary to expect all the projects to fulfil all the evaluation items.

Alexandra Villarroel

Coordinator of the Vigie Muséum and Particip-Arc networks
National Museum of Natural History



opening

Work on evaluation in other participatory science and research networks



Cyril Fiorini

Coordinator of 'Sciences Citoyennes'

This seminar is particularly important for Sciences Citoyennes, as we have been working on evaluating participatory research practices for several years. We would therefore like to exchange with other associations on this issue.

In parallel with my function as Sciences Citoyennes Coordinator, I am also a PhD student at the Conservatoire National des Arts et Métiers (HT2S-Cnam), in the field of STS. My PhD focuses on the co-production of knowledge between researchers and associative actors. The aim of the Sciences Citoyennes Association is to promote the democratic reappropriation of science by citizens for the common good. It was created in 2002 and had about 200 members in 2020. It relies on a team of five employees, supported today by two students on civic service. Its objectives are as follows:

- Reorienting research and democratising research policy making;
- Empowering research and expertise;
- Producing a critical analysis of technosciences;
- Mobilising it within civil society;
- Strengthening the scientific third sector.

Within the framework of this fifth objective, Sciences Citoyennes has been working since its inception on the development and visibility of the mechanisms we call "Science Shops" and the evolution of participatory research. Since 2004, we have participated in the setting up of third-sector science forums (the production of knowledge outside of public and industrial research). In 2005, our association also supported the establishment of PICRI (Partenariat Institutions-Citoyens pour la Recherche et l'Innovation) by the Île-de-France Regional Council, working with various researchers, before publishing the first report on the state of participatory research in France in 2013. In 2016, we produced a second report on participatory research, and to date we have participated in several European projects, with the TeRRIFICA project currently underway.

For Sciences Citoyennes, participatory research practices, which it considers as a genuine approach to the **co-production of knowledge**, are drowned out by numerous notions in circulation: collaborative research, cooperative research, partnership research, action research, participatory action research, community research, citizen science and participatory science...

This terminological fog is evidenced by the blurring of different approaches presented in several reports: Boëuf et al. (2012), Sciences Citoyennes (2013), Houllier et al. (2016), Alliss (2017) or Juan (2019). Yves Bonny evokes a 'proliferation of terminology' in 2017, as do other works, notably the collective work directed by Marta Anadon (2007).

We therefore wanted to provide a theoretical anchor for the notion of participatory research by taking up the definition developed by Michel Callon in his 1998 article where he refers to the co-production of knowledge as a third model of technical democracy, challenging the monopoly of scientists and encouraging the involvement of lay people in the development and implementation of knowledge and know-how. He also insists on the fact that within this framework, the co-production of knowledge is not limited to the 'accumulation of primitive' data. These elements are echoed in Callon, Lascoumes and Barthe's (2001) *'Acting in an Uncertain World'*, which calls into question the production of knowledge by delegation to researchers.

For our association, participatory research is characterised by the co-production of knowledge within a research collective composed of researchers, attached to a public research institution, and the collective actors concerned (scientific third sector), in order to respond to a social demand of general interest. According to Callon, Lascoumes and Barthe (2001), it is thus a meeting between 'confined research' and 'open-air research'.

According to the definition of participatory research by Sciences Citoyennes, collaboration between researchers and actors of the scientific third sector (associations, collectives, etc.) must take place throughout the research process. Participatory research therefore has the dual objective of advancing scientific research by making use of original results and responding to field problems corresponding to orphaned research subjects. For Sciences Citoyennes, participatory research practices must be based on two particular principles: the equal recognition of knowledge and the reduction of power asymmetries.

In 2013, Sciences Citoyennes published its first report on **the state of participatory research**, one of its proposals being to identify avenues for the evaluation of this type of project, as a response to the request of the donor, the Fondation de France.

Two general recommendations were made:

- The constitution of evaluation committees composed of researchers and non-researchers;
- The redefinition of evaluation criteria for participatory research projects *ex ante* and *ex post*.

This report also proposed to the Fondation de France the idea of developing a **multi-criteria quantitative and qualitative evaluation grid** for participatory research projects to measure the degree of participation.

After this first study, a second report was published by Sciences Citoyennes in 2016, again with the support of the Fondation de France, to propose the establishment of a participatory research platform and work on its evaluation procedures. On this second point, it proposed the following avenues:

- Share the evaluation criteria in the call for projects;
- Develop a project co-construction stage prior to submission for a call for proposals;
- Evaluate the co-construction phase of the research project;
- Form multi-actor evaluation committees;
- Evaluate the impacts over the long term;
- Study the feasibility of an iterative approach in the use of the evaluation grid;
- Propose self-evaluation by the project partners;
- Observe the evolution of the research project by providing support through a third-party monitor.

Sciences Citoyennes was then able to contribute to the implementation of the '**CO³.Co-construction of knowledge**' scheme. This participatory research support system stems from an agreement between Sciences Citoyennes and ADEME (The Agency for Ecological Transition), leading to two seminars bringing together funders in 2017 and then an initial first meeting of the first circle of donors. Created in 2018, the CO³ system is now supported by a multi-donor steering committee led by Sciences Citoyennes.

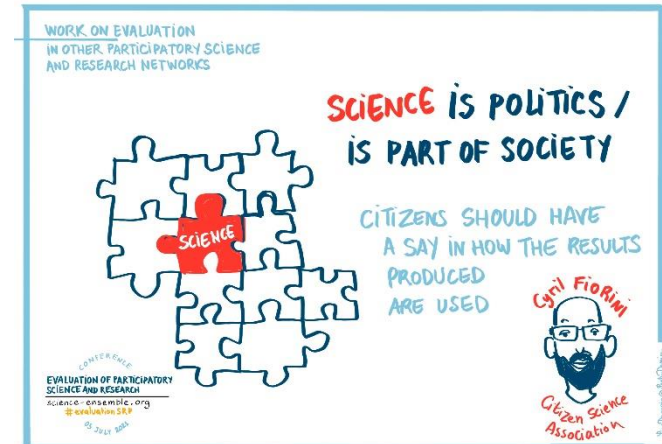
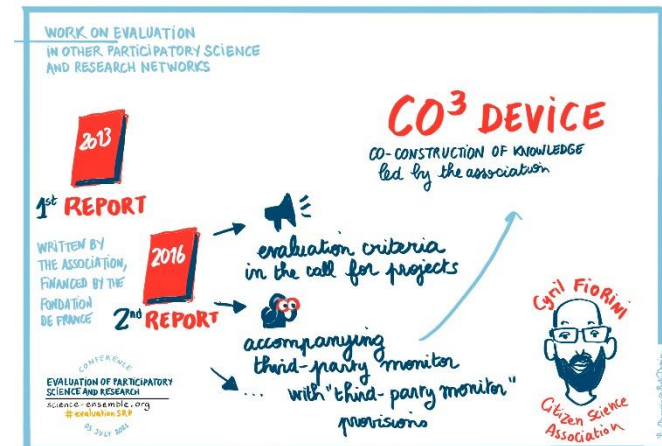
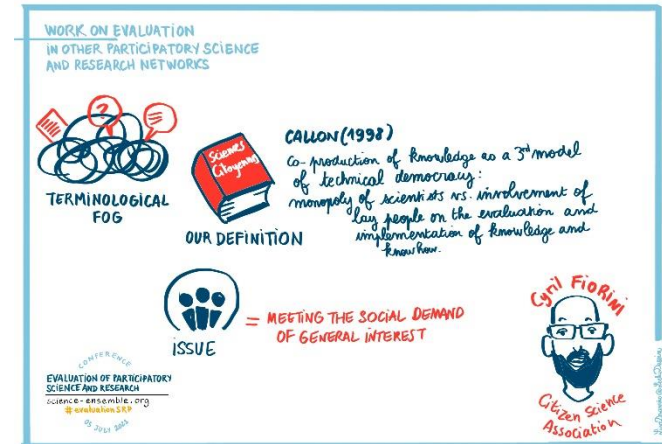
One of the outcomes will be the launch in 2021 of the third call for CO³ participatory research projects entitled 'Transforming agricultural and food systems towards greater resilience, environmental sustainability and social justice'. The challenges of the CO³ scheme are as follows:

- Support for participatory research projects;
- A third call for research projects in 2021;
- Support for two types of projects: "emerging" projects (one year, 20,000 euro maximum) and "consolidated" projects (three years, 150,000 euro maximum);
- A third-party monitoring system to support participatory research;
- A joint evaluation committee: public research and the voluntary sector;
- The role of facilitator entrusted to Sciences Citoyennes.

Five main criteria were selected to constitute the project evaluation grid within the framework of the CO³ experimental scheme. They were mentioned explicitly in the text of the call for research projects, in order to ensure transparency for project leaders. The five criteria were: 1/ the relevance of the project to the text of the call; 2/ the participatory quality of the project; 3/ the scientific quality of the project; 4/ the reliability, coherence and organisation of the project; 5/ the dissemination of results and the transformative impact of the project. Beyond the evaluation grid, the text of the CO³ call for research projects highlighted the evaluation process itself and the selection criteria established by the donors, which may differ.

In conclusion, I would like to ask the following questions:

- How can we continue to reflect on the evaluation process of participatory research projects and avoid working in silos?
- How can we link the reflection on the evaluation of participatory research projects with that of the social and environmental responsibility of researchers and research systems?
- How can participatory research practices be valued in the evaluation of researchers?
- How can we evaluate the written output of participatory research projects?



I work in the Department of Information Science at the Faculty of Science, Open University of the Netherlands and have been involved in various citizen science programmes in the humanities. I am also a member of the Citizen Science working group.

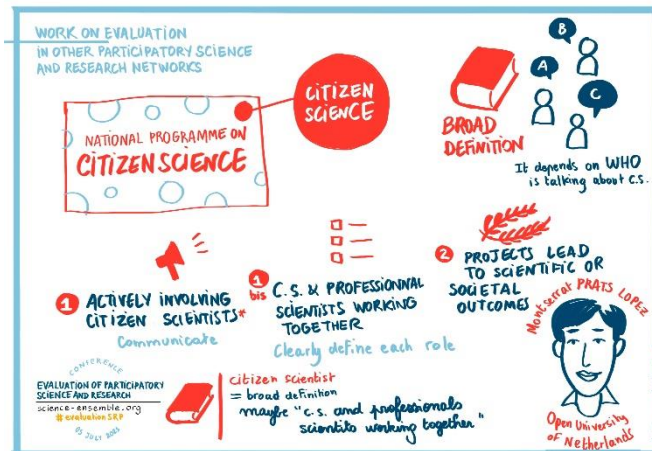
In 2017, the Netherlands launched a programme called **Open Science** to coordinate and promote the transition to open science. Participating organisations are responsible for the development of this form of science, and the programme is divided into three areas, of which citizen science is one. In 2019, after an inaugural conference, the latter became the subject of a working group which was asked, by the national programme, to produce a report on citizen science in the Netherlands; we identified two main topics on which we wanted to work and act:

- The creation of a national Citizen Science network;
- A proposal to develop tools to improve the quality of Citizen Science projects.

We wanted to look at quality factors in order to provide support to citizens or scientists involved in citizen science projects, but also to donors, especially in terms of evaluation: but how and when to launch such a project? What issues should be taken into account to ensure that quality is achieved?

We have adopted a broad view of citizen science, based on internationally recognised definitions, and have taken into account all disciplines. The issue of quality has multiple aspects. For an educator, it is about teaching; for citizens, it is about how citizen science can help them achieve certain goals; for researchers, it is about how these projects can provide relevant data.

Our working group has adopted the definition provided by the European Citizen Science Association (ECSA) and its ten principles of evaluation.



Montserrat Prats Lopez

Assistant Professor

Open University of the Netherlands

We have created a table to assess the quality of projects based on the ten principles to be evaluated during their preparatory, inception, implementation and final phases.

The table also looks at how these quality factors are used by both donors, organisers and other stakeholders, as well as helping stakeholders become fully aware of their role and assisting them in making better decisions.

The first principle consists of **involving citizen-researchers** in the development of new knowledge at all stages of the project, from its preparation to its conclusion. This includes involving under-represented groups, guiding the process according to their expectations and preparing the final papers, and taking into account the expectations of participating citizens. Another aspect is to ensure that researchers and citizens are able to fully contribute to the project by outlining the roles of all stakeholders from the outset, clarifying their expectations and involving them by sharing the results.

The second principle involves guaranteeing the projects' **scientific or societal results**, notably by carrying out a literature review, showing how the project will contribute new knowledge, assuring the quality of the data and sharing the results. The third principle is that of sharing the benefits among all stakeholders, be they the citizens involved, the researchers or society in general.

The fourth principle is **participation in the different stages** of the scientific process. The fifth principle is to receive and provide feedback throughout the project from participating citizens, though especially from researchers. At the results stage, unexpected or unsatisfactory findings should also be made known.

The sixth principle recalls that citizen science is an approach to research that involves risks and limitations, which must be listed in the preliminary phase and be controlled, or even compensated for, during the process itself. The seventh principle is that data and metadata should be publicly available. The eighth principle is that everyone's role should be **recognised** through all project-related communications, including publications.

The ninth principle is project evaluation. The **evaluation process** should be foreseen from the very beginning of the projects' preparation, as should the evaluation items. During the project, continuous evaluation should take place with regard to scientific impacts and the risks and impacts on participants; a final evaluation of the impacts of the project should take place during its restitution phase. The tenth principle is legal and ethical issues. In addition, we have added an eleventh principle to those retained by the ECSA: planning and financial continuity.



datathon

Présentation and datathon
on the proposed
evaluation grid



Renaud Debailly

Sociologist

Senior Lecturer Sorbonne University

I am going to send you a web link to a questionnaire that will allow all participants to test the grid that came out of the workshops, which took place during the first part of 2021. The aim of this datathon is to gather feedback and make improvements to the grid itself. Participants are therefore invited to think about one of their projects and answer the questionnaire with it in mind, just as an example. All the questions allow for comments in addition to the quantitative answers, which will enable the grid to be fine-tuned in light of the participants' experiences.

The first part of the questionnaire deals with your role (project leader, donor, etc.). This is followed by a number of questions about the grid and then questions about the impact of the projects. This last part obviously only concerns completed projects.

From 6 July 2021, an internal Science Together working group will use the participants' answers to rework the evaluation grid proposed today. The proceedings of this seminar will therefore include a revised version of this grid.

The virtual room is divided into four groups, so that the participants can answer the questionnaire before being brought back together in a single virtual room.



theme 1

Contributions of participatory science and research to the construction of new knowledge

Pascale Frey-Klett
Research Director at INRAE
Head of the CiTIQUE programme

The CiTIQUE programme aims to mobilise researchers and citizens to better understand the ecology of ticks and the pathogens they transmit. It is led by INRAE and the ARBRE laboratory of excellence in partnership with the Centre Permanent d'Initiatives pour l'Environnement de Nancy, the University of Lorraine, ANSES and the Tous Chercheurs laboratory in Nancy.

CiTIQUE was initially launched because there were a number of unanswered questions from scientists and citizens about tick-borne diseases, starting with Lyme disease. Citizens had questions about the ecology of ticks and how to protect themselves from the diseases they cause, but scientists did not have the data to answer them.

The CiTIQUE programme allows citizens to get involved at different levels:

- Raising awareness of the programme;
- Reporting bites;
- Sending the biting ticks to the Tous Chercheurs laboratory in Nancy ;
- Participate in research courses organised by the Tous Chercheurs laboratory to co-construct research questions with scientists, experiment, analyse and interpret the results;
- Participate in the co-construction of a prevention discourse, particularly for professionals subject to the risk of tick bites.

The programme strives to bring together scientific knowledge and the experiential knowledge of participating citizens, to co-construct research questions and generate new scientific knowledge to improve prevention. The programme was launched in 2017 and currently has over a hundred partners throughout France, and the number is continuing to grow. More than 61,000 human and animal bites have been reported and more than 50,000 biting ticks have been collected. To date more than 200 professionals and almost 300 students and citizens have combined forces to try and answer this research questions.

The results obtained are multiple. Thanks to the data collected from citizens, we know that 49% of the reports come from bites in the forest, but 29% are from bites in private gardens and public parks.

This is corroborated by the fact that 33% of citizens state that they were at home, sometimes even in their own houses, when they were bitten. The risk of proximity is therefore important and must be made visible by implementing appropriate awareness-raising approaches.

The research courses carried out with and for citizens brought additional results. In particular, citizens wanted to know whether ticks that bite pets could also pose a health risk to humans. With the help of the researchers they formulated two research questions: (i) Are ticks that bite cats and dogs known to bite humans? (ii) Can the ticks carried by these animals contain the agent that causes Lyme disease? The answer to both questions is yes. The citizens also showed that 8% of the dog-biting ticks and 11% of the cat-biting ticks analysed carried the bacterium responsible for Lyme disease, which is similar to the results obtained on human-biting ticks.

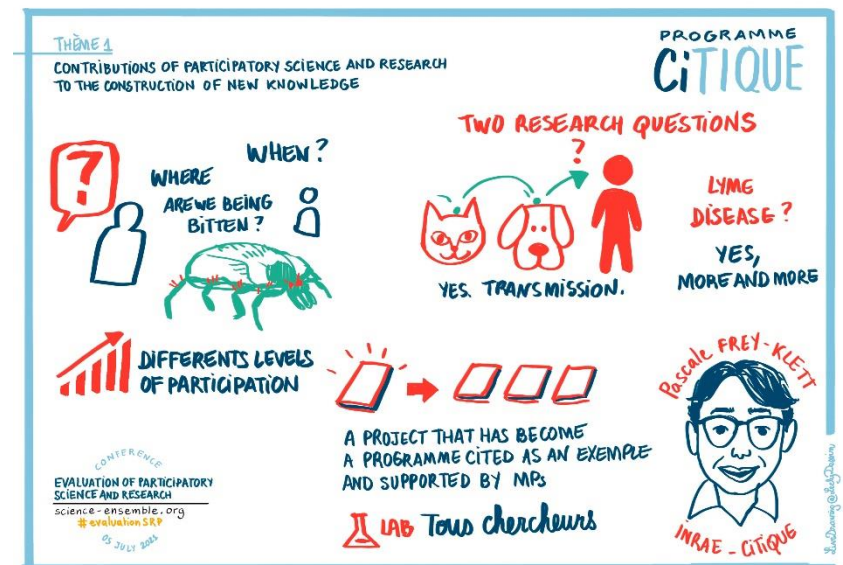
Ticks carried by dogs and cats can therefore present a real risk to human health, making it necessary to work with pet owners, professionals and public authorities to develop appropriate awareness and prevention actions.

In a broader perspective, it should be remembered that many zoonosis that pose a risk to human and animal health are highly influenced by global changes, including climate change. According to the IPCC, the frequency of Lyme disease is set to increase in the coming years. In this context, the CiTIQUE programme contributes to generating essential scientific knowledge on the ecology of ticks and the diseases they transmit, by allowing the participatory monitoring of tick bite reports and the massive collection of ticks over a long period of time, thanks to the mobilisation of citizens.

Several scientific publications have resulted from the CiTIQUE programme, which is also regularly represented at scientific conferences. To communicate with civil society, a press release is published each year and articles are frequently published in the press and community newspapers.

These results have led to new participatory research projects: one of which was recently launched in the Nancy urban community to better understand the factors that determine the presence of ticks in gardens. Data from the CiTIQUE programme is also useful for public authorities; in fact, the programme was recently cited in the parliamentary information report by Véronique Louwagie, a French politician, on the funding and effectiveness of the fight against Lyme disease.

Particular attention is also paid to evaluating the impact of the CiTIQUE programme on participation and changes in the prevention practices of citizens, in collaboration with researchers in social psychology from the University of Lyon.



Alice Millour

Doctor of Computer Science

I have been working on the automatic processing of non-standardised languages and defended my Phd in December 2020. This research was supported by the Sorbonne University and the Délégation générale à la langue française et aux langues de France.

Automatic language processing lies on the border between computer science and linguistics and gives rise to the development of a number of digital services and resources. These may be input tools, machine translation or speech processing tools, dictionaries or educational tools.

However, these automated systems are not very robust to language variations. They have difficulty recognising accents and barely take into account dialectal variations. To include these dimensions, linguists must be employed, which is costly. In addition, experts in this field can be scarce.

My project was therefore to collect linguistic diversity directly from speakers in order to develop functional tools in a real-life context. I worked on Alsatian, Mauritian Creole and Guadeloupean Creole, none of which have a standardised orthography. In French, for example, the 's' in '*moins*' is pronounced in the south of France but not in the north, although the spelling is standardised which smoothes out this variation. Otherwise, there could be many scriptural variations, as is the case for Alsatian, for example.

Finally, we observed an accumulation of dialectal and scriptural variations, the patterns of variation being very poorly known, whereas the written conversational uses specific to digital languages reveal these variations for non-standardised languages.

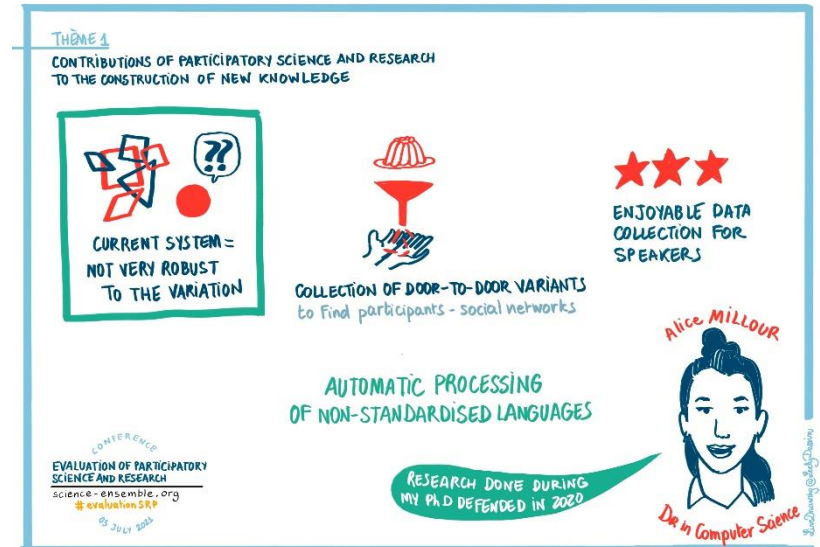
My first task was the automatic recognition of grammatical categories. To achieve this, I developed a tool for the participatory production of annotations of these categories from sentences; the second phase was the recognition of these categories by a computer program from the stock of compiled annotations.

However, two problems arose: the lack of dialectal representativeness of the available corpora and the discomfort expressed by the speakers participating in the process due to linguistic variants different from their own.

I therefore began to think of another way to collect diversity and suggested gathering recipes, poems, quotes and free texts. This approach was considered too difficult and time-consuming by the participants, however, especially as they were reluctant to hand over their own work for academic research. Those who did participate finally practised a preferred orthographic standard.

Faced with these difficulties, I proposed a number of words in a given version and asked the participants to write them in their own way, enabling me to collect variants of a whole series of words. This technique was difficult, as there were no right or wrong answers. However, by asking where the participants came from it was possible to fill in a map of the different linguistic areas in Alsace. This was done with a view to creating computer tools that can recognise grammatical categories and orthographic variants.

The advantages of this method were multiple. It did not present any linguistic difficulty for the speakers whilst providing access to unique and undocumented knowledge. A positive impact on the downstream tasks was also observed, as the collected resources could be integrated into the computer processing. Finally, the collected exchanges showed that the participants were interested and enjoyed the process, which is very positive.



theme 2

The contribution of participatory science and research to knowledge dissemination

Andrée Bergeron

Senior Lecturer

Alexandre Koyré Centre

I am not personally involved in a citizen science project, and it is not my main area of work, which is the history of popularisation of science; however, today, participatory science is promoted by a very diverse range of actors, from the World Bank to popular education associations, the MNHN and international and European bodies.

This way of doing science - by involving the public in the production of knowledge - is often presented as revolutionary. Nevertheless, I think it is important to put this phenomenon into a historical perspective. What is really new about participatory science? To answer this question, I have drawn heavily on the recent work of a group of researchers brought together by Bruno Strasser, who led a transdisciplinary project on participatory science for five years.

So, does participatory science allow for the renewal of audiences? It is difficult to answer this question because although studies on this subject would be very interesting, they are actually very rare. Indeed, the limited studies available on this subject indicate that the majority of participants are young (or at least younger than the average population), white, middle-class males who are often interested, or even passionate, about the issue.

This is similar to what was described for popular science in the second half of the 20th century: the work carried out showed that it first reached people understood the topic and who already had access to education. A similar phenomenon can be observed for participatory science.

In fact, during the golden age of popular science in the 19th century, two very different models coexisted. In France, popularisers quickly structured themselves into professional organisations addressing a diverse community through printed materials. Whereas in Great Britain, the model took the form of a scientific republic whose issue was not primarily to transmit knowledge but to promote the practice of science by all.

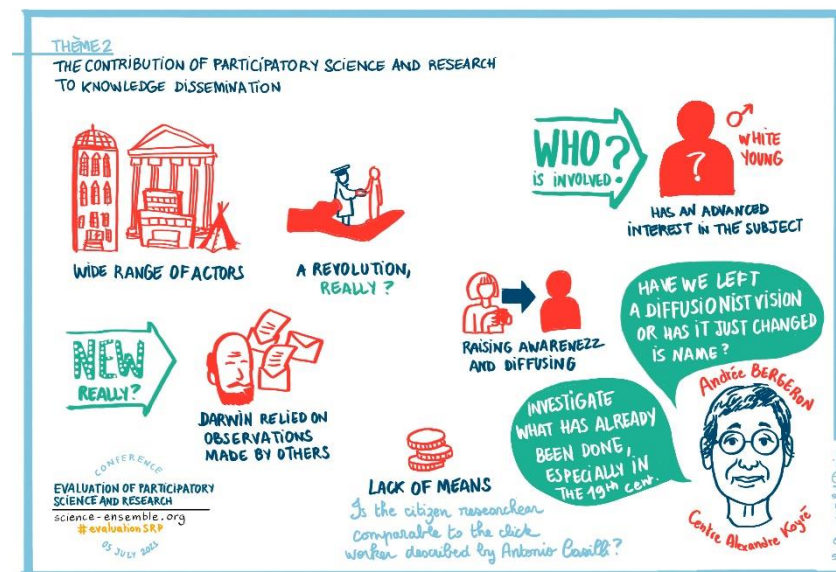
One great example, documented in 1994, was that of the Lancashire artisan botanists who partook in spontaneous discussions in pubs. It seems to me that the contemporary way of remobilising science enthusiasts has a lot to do with this model.

Does the novelty of participatory science lie in the fact that it brings new non-professional actors into the science world? As Bruno Strasser points out, one can only speak of amateur scientists because professional scientists exist. This demarcation was established during the 19th century, although not all scientists at that time practised science as single-mindedly as Darwin, for example.

The example of Darwin is very interesting, as he relied heavily on data obtained by others; in fact, after his long voyage in 1831, extremely precise information continued to arrive by mail every day. Indeed, Darwin was able to work by mobilising an active network of informants, particularly around the Pacific. This kind of practice is not far removed from the current mobilisation of non-professional observers to multiply the data on which professional research is based.

Finally, what is new about participatory science today? Why is this movement being observed now? An initial answer could be the mobilisation of a large portion of the public concerned with the current climate emergency, particularly in terms of biodiversity, which makes it possible to multiply the available data thanks to the work of volunteers, as well as raising awareness among the rest of the population.

Another possibility is that participatory science could be a way of responding to the shortage of resources in research in France and elsewhere. In this context, might not participatory science be a way of developing a scientific version of the click workers as described by Antonio Casilli? These are two answers that I offer to the debate, and I encourage current researchers to look at the history of their practices in order to contribute to their enrichment.



Didier Mathieu

President of the Association des
Planétariums de Langue Française
Planétarium d'Epinal

The *Association des Planétariums de Langue Française* (APLF) brings together 85 fixed and mobile facilities. Our objective is to promote the establishment of planetariums offering animations in French, and to support their development and cultural actions. The aim is to disseminate correct astronomical knowledge that is accessible to all, to contribute to the teaching of astronomy at all levels and to develop the French-speaking scientific culture. For my part, I am involved in the CSTI (center for scientific, technical and industrial culture) and am particularly engaged in the Vigie-Ciel participatory programme.

The *Planétarium d'Epinal* is an associative structure which is part of the popular education movement. Our objective is to make astronomical and spatial knowledge accessible to all. This is done with the support of the local authority, which set up the association and continues to financially support it. The team is made up of four scientific mediators, two administrative staff and seventeen volunteers, who are essential to the work. In addition to this, we are involved in several networks. We also benefit from the GESTE designation, through which the Conseil régional du Grand Est "labels" a certain number of knowledge dissemination structures by financially supporting the implementation of actions. Our activities are divided into four areas:

- The dissemination of knowledge;
- The development of educational tools and materials;
- Training;
- Networking.

We have been participating in Vigie-Ciel and FRIPON for several years. In 2005, prior to this project, we organised a meteorite hunt and invited the public to get involved. These types of participatory science schemes have created important links and credibility with local communities. For example, we collaborated with the public in the measurement of light pollution, for a study carried out in the territory of the SCoT Vosges Centrales.

Our observations on the practice of disseminating knowledge are completely in line with those made by the previous speaker, in that it primarily reaches audiences that are already interested.

However, we have also been able to set up "sky events" in Épinal at specific times, such as Valentine's Day or, even better, Easter, where we are able to address a much wider audience.

We also promote scientific culture by giving talks on shooting stars and meteorites, for example. In this way, we try to engage with people who are maybe not initially interested in science. This approach is also used in other planetariums across France.

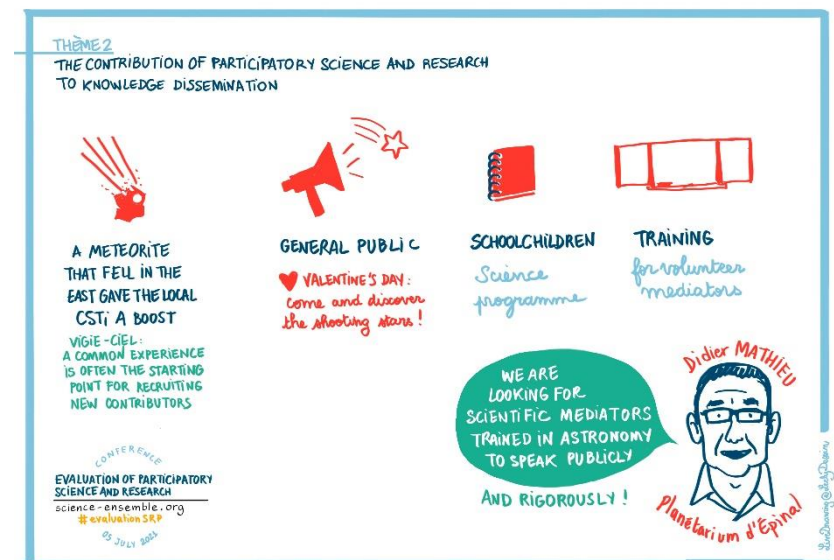
Through the dissemination of knowledge, we aim to target both the general public and schoolchildren. Engaging children is a requirement of the Épinal agglomeration; therefore, our actions take place during term time - from primary school to university, pupils and students visit us to practise handling workshops in line with the official National Education programme.

In addition, we develop educational tools and devote considerable resources to training the public by offering modules on reading the sky or using a telescope. This training also assists the facilitators and volunteers of astronomy (or other) clubs who wish to open up to the public. Furthermore, we have developed training courses, included in the Academic Training Plan (PAF), for teachers who wish to use astronomy as a learning tool. Five courses are currently available.

Finally, part of our work concerns the animation and coordination of networks. We realise that through the PSR projects, and particularly Vigie-Ciel, that we have access to significant feedback because we have the public going out into the field. We also note that Vigie-Ciel makes it possible to connect and link knowledge dissemination, training and network animations.

The Vigie Ciel project has been widely disseminated at a territorial level, as has the FRIPON project, and numerous astronomy clubs have become involved in the Grand Est region. A number of other planetariums have also become involved in the Vigie-Ciel scheme, making it possible to offer locations where the public and scientists can meet. These meetings strengthen the connection between citizens and researchers by completing the top-down approaches to disseminating knowledge.

This link has further been strengthened thanks to scientific mediators, of whom there are still too few in France. Some have university training, but others come from a motivated public who wish to join our structures. Unfortunately, where universities are absent or remote the mediators are not closely linked to research; however, the positive point is that the Vigie-Ciel project has helped to strengthen the role of mediators thanks to the training provided and the relationships established with researchers.



theme 3

Societal impacts of participatory science and research

Marie Pieron

Assistant for Scientific Culture
Ivry-sur-Seine City Hall

My point of view is that of a local authority which benefits from PSR projects. The study I want to talk about concerns walkability in a neighbourhood of 12,000 inhabitants in Ivry-sur-Seine, a working-class commune in the south of Paris with a wide range of populations, both in terms of age and other parameters.

We realised that one of our neighbourhood committees had an under-representation of retired people in workshops presenting future developments, which was problematic. I raised this issue with Mohammed Chetouani, a researcher at the Sorbonne University specialising in engineering and robotics, who told me about a project by the geographer Florence Huguenin-Richard that specialises in walkability. We decided that a stronger understanding of the walking perimeters of our senior citizens would enable us to better understand whether there was a barrier to citizen participation; therefore, we invested in a PRS project.

The area concerned, that of Grand Orly Seine Bièvre, includes the Charles Foix Hospital, the largest geriatric hospital in Europe, as well as Futurâge, which acts as a link between the local authorities and the world of research. Silver Innov, a business centre dedicated to innovative solutions for life extension, which is also present in the area, aims to enable inhabitants to benefit from advances in research and economic innovation. The project area is therefore already strongly committed to ageing well.

The project was first presented to the neighbourhood committee, where it received a very favourable reception. The local authority therefore committed itself to the project, which took the form of a collection of questionnaires, followed by a workshop-debate. This made it possible to draw up a sensitivity map of the neighbourhood before analysing the data and drafting the study. This document will soon be sent to the town of Ivry-sur-Seine, although it will not necessarily be easy to assimilate. The geographer will therefore also produce an infographic with students, which has been the subject of considerable discussion, so that it can be understood by the inhabitants and public servants. Our community will then have to take action on the ground according to the results delivered.

This study will provide information to improve the city: regarding the pavements and any possible hazards, and the perception of lighting and benches, in particular. This last point is often the subject of important debates – currently, young people use the benches, but we will soon have a better idea of where to put them for older people.

This study will also provide information on the fear of falls and the feeling of insecurity, points on which the local authority can act: it is possible to propose workshops to reinforce the sense of balance or to get pensioners to join neighbourhood meetings, etc.

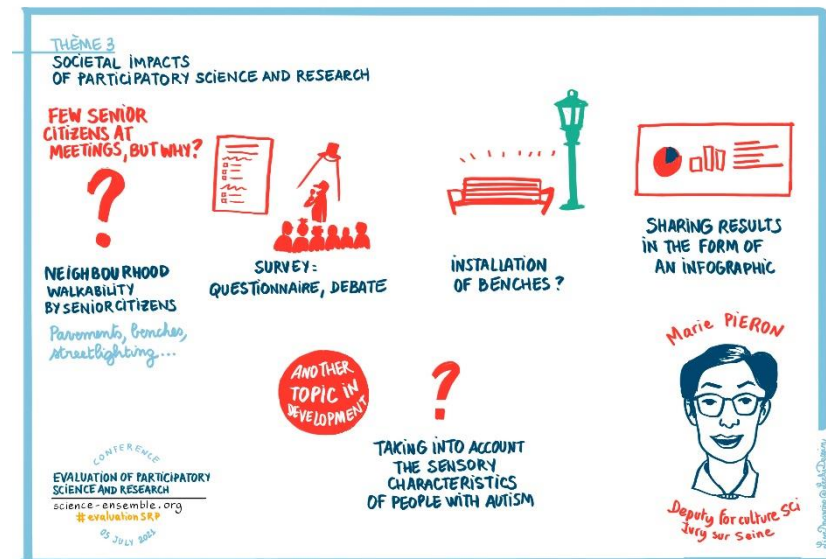
The results of the study will be submitted to the inhabitants, who will be able to add to them. **Infographics** will also be presented and the complete study will be available to everyone. The local authority will need to take all this information on board, as they will be the ones to intervene in the field. The study will be presented to the elected representatives, who will have to vote on the budgetary choices, and it will also be presented at our climate conference in the autumn of 2021, making it possible to propose it to other districts.

We found this experiment in participatory science very interesting, especially because it complements the policy of scientific culture that our local authority has been developing for twenty years. Together with the Sorbonne University, we are preparing the Expoped project, which will measure the air quality to which senior citizens in the same experimental area are exposed. Changes to traffic can then be decided on the basis of these future results.

Our local authority is also committed to a project with the University of Paris taking into account the sensory particularities of autistic people in the city. In conjunction with professionals who work on autism issues but are not clinicians (architects, teachers, etc.) we will be able to act in public places and spaces, as well as with autistic people and their families. Additionally, we want to develop a space dedicated to PSR in Ivry-sur-Seine within the next five years, to allow other projects to emerge and to fully integrate this type of work into the local authority's action.

For a community, there are many reasons to be interested in PSR. First, we are all facing new challenges such as life extension, ecological transition and the post-epidemic world. Our public policies will therefore have to evolve in an innovative way and with the participation of our inhabitants. In this context, PSR is particularly relevant because it pushes the boundaries of knowledge and directly involves citizens.

Finally, the Association des Villes Universitaires de France (AVUF) currently brings together 90 local authorities; my involvement is to promote research for public action. We have already organised a conference on this issue and we are now working to create a network of elected officials in the Ile-de-France region who wish to sign up for participatory research.



Florian Charvolin

Director of Research in Sociology at the CNRS
Max Weber Centre of Lyon and Saint-Etienne

The collection of outdoor data on flora or fauna has developed throughout the Internet since the advent of Web 2.0. This type of approach has also evolved with regard to air pollution, thanks to micro-sensors. The digital dimension of PRS is therefore very strong.

The Faune France Internet platform thus forms a constellation of more or less interoperable platforms with the NaturaList application being available on smartphones. In the case of the CheckBox project, it is sufficient to use the Airbeam micro-sensor and a smartphone to report local measurements of fine particle air pollution.

In the field of biodiversity, PSR protocols are based on a sequence of steps: reconnaissance in the field, reporting on the Internet, dissemination of data collected and returned to the people who reported their observations, in the form of maps, graphs, etc.

In 2018, Faune France had 25,000 active contributors; by 2020 it had 50,000. By 2018, 12 million data on fauna, all species combined, had been collected. The database currently includes around two million photographs. The input interfaces are diversified.

With regard to air pollution, the Airbeam sensor measures the concentration of PMI, PM 2.5 and PM10 particles. It can be worn on a belt, for example, to produce the local measurements of the person wearing it in both indoor and outdoor situations, and it has been specially designed to document the pollution emitted by wood fires.

We conducted a survey of Faune France's audience, obtained some 1,469 responses and are in the process of finalising their analysis. As for the CheckBox project, it features a platform, the Captothèque, which allows the data collected to be represented. The raw data collected is not processed at the outset and PSR initiatives are thus data driven: allowing unprocessed data to be accumulated to form fairly substantial stocks.

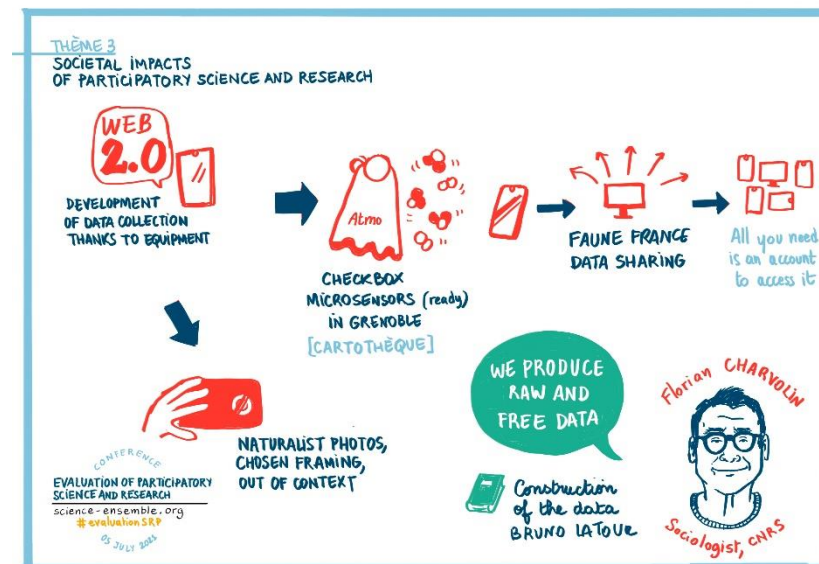
The data is only marginally processed and generally left unsorted. They are displayed in the context of relations with local authorities, financial backers, etc., as quantitative treasuries that show the importance of the databases created.

In Captothèque, the data are listed on maps alongside a diffusion curve over time, a range of colours representing pollution levels from green to red. For Faune France, the database can be consulted on the Internet, with the photo galleries grouped by genre; the user can then add images if they wish and view all the photographs uploaded to the website.

The practice of raw data is accompanied by a virtual absence of interpretation of any kind. However, the data provided free of charge and in open source is the result of questions that the participants have asked themselves and that motivate their data collection activities. As far as Faune France is concerned, the animals are photographed in their natural environment. We interviewed fifteen photographers registered on this platform, and all of them told us that they take images of birds, insects, etc., in the wild, without altering the environment. This practice is in line with that of naturalist guides: the data is therefore not totally raw, since it implies reading conventions.

Finally, as far as air pollution is concerned, it is supposed to be measured without construction and in a spontaneous way, but the measurements must in fact be motivated by creating session names. The database offers standard choices, but each user is also free to name their sessions as they wish. These sessions, therefore, bear very different and precise names: the term folksonomies is used to describe these real “vernacular measures”.

In this context, participants use terms that evoke feelings or that reflect changes and deviations, whether in terms of places or actions. Nevertheless, all these participatory practices are made possible by the Internet, which enables an intermediary stage to be inserted between data capture and processing in the laboratory: the visualisation of data by their producers, in real time, whether in the case of pollution or biodiversity, is a huge innovation.



conclusion

Laure Turcati
Sorbonne University

Science Together took the initiative to organise this meeting because we were dissatisfied with the traditional criteria for evaluating PSR, which focuses simply on the number of participants and the volume of data collected.

We wanted to go beyond these criteria as they are not representative of our activities and approaches, and we realised that we were not alone in questioning PSR evaluation. Cyril Fiorini's intervention reminded us that it was difficult for PSR to free itself from a certain terminological fog and proposed a definition close to the one used by Science Together, which is based on the co-production of knowledge. However, Citizen Science adds an additional criterion, that of responding to a social demand of general interest, which has led to debates about the possible utilitarianism of science.

The work of Citizen Science continued in the 2010s, leading to the emergence of the CO³ mechanism, which allows the evaluation of PSR projects submitted to it and their accompaniment by third-party monitors. Citizen Science also reminds us that science is political and part of society, to which it must be accountable.

We also welcomed Monserrat Prats Lopez, from the Open University of the Netherlands, who uses ECSA's ten criteria for evaluating PSR, including openness and exchange between participants and researchers, a point she emphasised.

At the end of the morning, the participants of this meeting took part in a workshop within the framework of a Datathon: reacting to the evaluation grid proposed by Sciences Together by answering our questionnaire based on one of their projects and providing comments and suggestions. This collective work will be reviewed on the 6th July 2021 by the Science Ensemble network, in order to use its contributions to finalise a new version of the grid.

In the afternoon, we looked at three themes, starting with the contribution of PSR to the construction of new knowledge. Pascale Frey-Klett began by talking about the CiTIQUE programme and how it involves citizens in both data collection and the construction of new research questions. This takes the form of research internships that bring together academic and citizen researchers – a particularity of the programme in that it generates new projects. Alice Millour then spoke about the automatic processing of non-standardised languages, showing the added value of PSR projects in mobilising knowledge that cannot be mobilised in any other way, since the knowledge sought is held only by the speakers.

Alexandra Villarroel
National Museum of Natural History

Asma Steinhausser

National Museum of Natural History

During the presentation of the second theme, the contribution of PSR to the dissemination of knowledge, we discussed the relative novelty of PSR with Andrée Bergeron. Does it represent a radical change for science? Who are the participating public? According to Andrée Bergeron, it seems that PSR is often made up of interested, young, white males. Although the question was debated it deserves more in-depth discussion. Bergeron also emphasised that PSR was a way of mobilising participants in the face of the current ecological emergency, within the framework of a certain scarcity that marks the research world.

Didier Mathieu then spoke about his experience at the *Planétarium d'Epinal* and his involvement in the Vigie-Ciel programme, calling for the training of scientific mediators in public outreach and astronomy. He emphasised that Vigie-Ciel has added an extra dimension to the planetarium's activities, making it possible to create new connections between the different practices while strengthening the link between mediators and researchers. Mathieu also mentioned the training courses for schoolchildren and events for the general public.

Our third theme was the societal impact of PSR. Marie Pieron allowed us to return to the continuity between participatory democracy and PSR by presenting her project on the walkability of a neighbourhood in Ivry-sur-Seine. This PSR project makes the link between geography and robotics, questioning the generalisation of this type of approach to other issues. Pieron then questioned the way in which people engage with PSR, discuss it and used it a local level.

Finally, Florian Charvolin's presentation was based on two different projects that questioned the role of the Internet and the creation and collection of data. He suggested that the data is not as raw as it may appear, since it is produced through various conventions: for example, the animal photographs taken for Faune France reflect the choices made by the participants. This so-called raw data is also used to show the contribution of PRS, which is often intended to be unbiased because it is *data driven*.

Renaud Debailly

Sorbonne University

We would like to thank all the speakers who contributed to this discussion, as well as Aurélie Bordenave for the illustrations, and Jill Cucchi for the translation.



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Evaluation indicators

Of participatory science and research programs

Project Management in participatory mode

Some indicators are specific to one of the three time phases, while others can be used regardless of the project's implementation level.

Project Status	Indicators		
	Before	During	After
Project implementation	The needs, specifically related to participation, are correctly estimated: i/ Human resources ii/ Technical support (web platform, measurement tools...) iii/ Communication requirements		
	The financial resources allocated to the project (including application for funding) and the identified needs are in order		
		During the course of the project, new needs, specifically related to participation, are financially taken into account: i/ Human resources ii/ Technical support (web platform, measuring tools...) iii/ Communication requirements	
Setting up the data collection protocol / Consistency between scientific objectives, data collected and participation.	The scientific questions or issues that the project seeks to address are identified.		
	The data collection protocol needed to answer the research question posed is defined. The limitations of the protocol, risks and ways to overcome them are identified.		
	The time commitment (for the mobilisation of		

	networks of relays, participants, training, etc.) that needs to be developed - at the very least - by the coordinators to respond to the research questions and objectives, is established.		
	The way or ways in which participants are recruited allows the project to function properly. (Target audience and/or number of participants).		
	The potential attractiveness and feasibility of the protocol for future participants is identified. <i>For example, through the implementation of a protocol test phase.</i>		
	The protocol is clear and understandable to the participants.		
	The protocol is co-constructed with the participants, researchers and/or partners.		
	In case prior knowledge is needed to participate, pedagogical tools (including training) are planned and/or designed.		
Participation : methods and tools	Possibility for participants to act at different stages of the research process <i>For example, problem construction, protocol, analysis of the data, publication of the results and their dissemination...</i>		
	The governance of the project includes the stakeholders.		
	The know-how and knowledge of the contributors are valued and integrated into the project. <i>For example, a participant can validate the data collected.</i>		
Acknowledging contributors	Ways of valuing and recognising the commitment of participants/contributors are envisaged and put in place.		
Data access	The data produced are made accessible by the participants and beyond (open science).		
	Tools are available for participants to explore the data.		
	The project provides for the collection of informed consent from participants.		
Data ownership	Intellectual property and copyright conditions are clear to researchers, partners and participants. <i>For example, drafting a charter to manage access and use of data or taking into account sensitive and personal data.</i>		

Impacts generated

Some indicators are specific to one of the three time phases, while others can be used regardless of the project's implementation level.

Impacts generated	Indicators		
	Before	During	After
On the production of scientific knowledge - does my project produce new data for science?	Relevance of participatory mode	Participation adds value to the project through the production of large amounts of scientific data.	
		Participation adds value to the project by producing scientific data that would otherwise be inaccessible (knowledge, private spaces, etc.)	
		Does participation add value to the project through the production of data and/or the emergence of unexpected questions?	
	Link to public policies		Where appropriate, translation of results into public policy. <i>For example, in management indicators or heritage policies.</i>
	Scientific development	The project generates publications for the general public (excluding indexed journals) via association journals, learned societies, local authorities, etc	
	Methods	The project is based on the construction and development of new methods to collect data (methods adapted to participation, methods new to the discipline).	
Education, training, skill development	Increased competence		Through participation, participants gain new knowledge about the project topic.
			Through participation, participants acquire new knowledge about the scientific process.
		The results of the project are disseminated to the public and stakeholders.	
	Link to education	The programme is also used as a tool in the school and/or university curriculum.	
About society	Engagement of individuals		The project motivates the emergence of other forms of participation on the subject or other related participatory science projects.
	Transition		Participation generates new behaviours and perceptions of the object of study among those involved (participants, researchers, partners).

			The experience and knowledge gained through participation strengthens the participants' capacity to act.
	Social relations		The project generates social relations within the network of participants (emergence of communities).
	Network of actors.		The project generates the development of a network of actors and or their professionalisation on the subject concerned. <i>For example, the emergence of a new association.</i>
			The project promotes the emergence of new professions and their professionalisation.
			The project generates new collaborations between the academic and non-academic world.
On research			The project contributes to the recognition of participatory science as a research method. <i>For example, publications based on project data.</i>
			New co-constructed research questions are formalised

Please note:

- Depending on the project, the use of classic indicators such as the number of participants, the amount of data collected, or the number of publications may still be useful for the evaluation.
- The grid proposed below does not constitute a fixed reference for the evaluation of any participatory science and research project. In no case can it be expected that a participatory science or research project will be able to meet all the items identified. Any use of this evaluation framework for the purpose of exhaustiveness would be contrary to the spirit in which this grid was constructed.

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