Citizen Science in Flanders:
Can we count on you?

Violet Soen & Tine Huyse (eds.)

Young Academy position papers – nr. 2

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The aim of this position paper is to raise awareness about the topic of Citizen Science among both researchers and the broader public in Flanders. The paper first explains the concept of Citizen Science, before sketching its historical background and its meaning in society today. It also reflects on the potential for involving broader communities in science, and gives examples of Citizen Science initiatives that have been set up in Flanders. Using the results of a survey on Citizen Science conducted among Flemish researchers, we provide four recommendations for scientists and scholars, academic stakeholders and the governing bodies of universities. Finally, we offer a series of tips, tricks and testimonials for researchers who would like to start Citizen Science projects of their own.

EOS (Magazine for Science) and the Young Academy have created a Citizen Science portal which brings together a number of existing Citizen Science projects in Flanders: www.iedereenwetenschapper.be. We are convinced that this portal will eventually become both the starting point and the ideal platform for Citizen Science in Flanders (and beyond).

This position paper draws on the expertise amassed by the members of the Science Communication working group between the founding of the Young Academy in the spring of 2013 and the redaction of this position paper in the autumn of 2015. It also contains a brief report on the working group's activities and initiatives, which can hopefully serve as inspiration for other Young Academies.

Preface

The Flemish Young Academy is a group of young scientists from a range of different academic backgrounds. Our mission statement, formulated in 2013 by the Royal Flemish Academy of Belgium for Science and the Arts (KVAB), emphasises our intention to play an active role in the field of science communication. A working group for science communication was immediately formed within the Young Academy. This group launched the website and a blog and now co-organizes with the KVAB the science communication awards for Flanders. We also decided to focus our attention on Citizen Science. After all, it is clear that Citizen Science is not just a more active form of science communication – it also opens doors to a new form of scientific and scholarly practice, one which draws on both academic and lay expertise.

One of the first goals of our working group was to put Citizen Science on the agenda in Flanders. Citizen Science has already received quite a lot of attention in Europe and around the world, but Flanders is clearly lagging behind. We wanted to raise awareness, so we began setting up a Citizen Science experiment and also hosted a workshop at the 2014 science communication summer school, which was organised by the science communication units of the five university associations in Flanders. Later that year, on 13 November 2014, we hosted a symposium on Citizen Science for PhD students and other interested parties at the Academy Palace. Straight after the symposium, the participants were invited to get involved in the interactive projects being presented at a Citizen Science 'landscape' event. Finally, in the autumn of 2015, we carried out a survey to assess Flemish researchers' knowledge of and interest in Citizen Science. The results of this survey are presented for the first time in this position paper.

Perhaps the most concrete or tangible outcome of all of these activities is our collaboration with EOS Magazine for Science, which resulted in the launch of a Citizen Science portal in November 2014. This portal was such a success that EOS was able to develop and launch an expanded version in the autumn of 2015: www.iedereenwetenschapper.be. You can also follow us on Twitter, using the hashtags #citizenscience and #wcom.

In a broader sense, our aim is to close the gap between science and the outside world. Scientist do not have to wait for those perfect, press-releasable results before they can 'translate' or communicate them to a broader audience. With Citizen Science, anyone can get involved in research projects from the very start, as well as in processing and sharing research results, and perhaps even influencing the research agenda. In our view, the university of the future will be one that is prepared to consider the opportunities and consequences of Citizen Science, and to encourage and support such projects.

Violet Soen & Tine Huyse
Brussels, March 2016

1. Citizen Science: What's in a name?

The best known example of Citizen Science is probably the Galaxy Zoo project, which was started in 2007 when astronomers from Oxford University developed a website to involve citizens in the classification of nebulas. When the website went online, it was so successful that it crashed almost immediately. The scientists had underestimated public interest: initial data traffic was around 20 times higher than they had expected. Within 24 hours, members of the public had already tagged more than 60,000 images. Since then, more than a quarter of a million users have contributed to more than 60 million classifications, resulting in several scientific publications. In this type of project, ordinary citizens become active participants in scientific research.

Citizen Science may well be the most important new trend in the scientific world: it enables citizens to collaborate on scientific projects regardless of their backgrounds. Citizen Science means they are no longer just the audience for science communication. They are also involved in the science itself – and actively. Other common names for this concept include 'crowd science' and 'civic science'. The Young Academy opted to use the term Citizen Science (CS) – the broadest term – as it can be applied equally to the exact, technological, natural and human sciences. Over time, Citizen Science has also become the most commonly used term among scientists and policy-makers, as well as on social media.

CS usually involves the voluntary collaboration of non-scientists in scientific research. These voluntary collaborators make observations, take measurements, collect data, submit ideas and exchange ideas with scientists. In some cases, however, CS has a negative connotation, for instance when it is thought of as 'amateur science'. Many scientists are sceptical about data collected by the general public and tend to distrust non-academic expertise. Other critics do not believe in the social trend of using the Internet to set up all kinds of do-it-yourself experiments. CS nevertheless has the potential to build bridges between science and the general public, eliminating prejudices on both sides. As evidenced in recent policy documents, the European Union is also starting to recognise the importance of this concept.

In what follows, we explore the concept of Citizen Science in more detail. We begin by describing the various forms that it can take (1.1), before outlining its historical

background and contemporary context (1.2); finally, we look at how CS has been discussed in recent European policy documents (1.3).

1.1 The many forms of Citizen Science

Many of today's science communication programmers involve a one-way, top-down communication process in which scientists and decision makers inform the general public about scientific achievements. Examples include the typical debates or lectures organised by universities, or interviews with scientists in the mainstream media. As this type of communication is unidirectional, it reduces public involvement in science to the final step of knowledge transfer. Yet, public involvement can also take other, more interactive forms, which is where Citizen Science comes in. CS allows a range of different groups to engage in true collaboration with scientists by submitting ideas, exchanging thoughts, providing data or learning new skills – in short, by being actively engaged in science.

Figure 1: http://www.openscientist.org/2013/01/the-levels-of-citizen-science.html
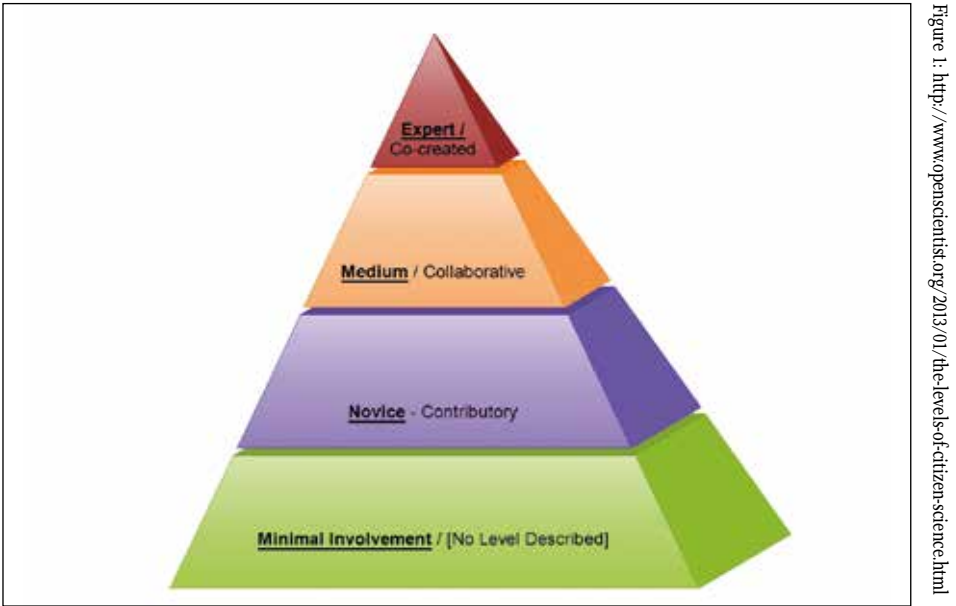
The spectrum of possible CS projects is very broad, with many possible levels and types of collaboration between citizens and scientists. In this next few paragraphs,

we describe the most important features of the spectrum using the pyramid classification proposed by *Open Scientist* (see Figure 1, below). This figure depicts the various levels of citizen involvement in scientific projects, ranging from minimal involvement at the bottom to extensive involvement, or co-creation, at the top. The pyramid shape is used because projects in which citizens are invited to provide data to scientists (minimal involvement) are relatively abundant, while projects in which citizens are actively involved in all phases of the scientific research (co-creation) are relatively rare.

As mentioned above, the majority of CS projects use an approach in which interested parties are invited to participate in the collection of primary data and information. This is the bottom level of the pyramid – the 'minimal involvement' of participants. One example of this approach, and one of the most important projects behind the development of CS in Flanders, was The Great Flu Survey, ongoing now in collaboration with The Netherlands (https://www.degrotegriepmeting.nl/). Every week during the project, the researchers sent out an online survey to investigate the spread of flu and colds. Thus, the survey played a role in the 'participatory' surveillance of infectious diseases. As a result of this initiative, a global network was established with the aim of involving more volunteers in documenting the spread of flu and colds.

Another example of this CS approach in Flanders involved the collection of DNA for genetic-genealogical research. Working with the *Familiekunde* charity, the researchers invited citizens to take their own DNA samples using a do-it-yourself kit and send them to the lab *(see Testimonial 1: Roeland Samson)*. This type of project is more like crowdsourcing, in which the organisers try to mobilise large groups of participants, primarily through the Internet. In many cases, the participants contribute by counting things, like 'passive sensors'. Projects like these range from counting birds in biological research to copying and transcribing marriage certificates for historical research. Crowdsourcing-type projects have many advantages. For example, individual scientists could never collect the same amount of data alone. Individual citizens may also feel motivated to take part because they will benefit from the results, or simply because they believe the study is useful or interesting.

The next level up in the pyramid includes projects in which interested parties both contribute to, and learn from, the research process. In these cases, the collaboration goes beyond citizens simply passing data on to scientists. One example of this sec-

ond type of project is AIRbezen, during which citizens learned to measure air quality using self-cultivated strawberry plants and sample collection *(see Testimonial 2: Maarten Larmuseau).* The participants acquired data collection skills in addition to other scientific and analytical skills.

A third, less common type of CS project – the third level of the pyramid – involves the general public participating in various stages of the research. In addition to knowledge transfer, these projects also allow the participants to generate and present results. One example is *Itinera Nova*, a project in which staff from the Leuven city archives collaborated with academic historians and volunteers to transcribe and digitise the registers of the bench of aldermen, a medieval form of city government, before valorising them in historical contributions to academic journals.

At the top of the CS pyramid are projects in which scientists and volunteers work together to define the research agenda and conduct the research. In the project conducted by Timelab in and around Ghent, citizens came together to list and investigate various topics. Concerned about air quality, they began to design a device that would show them the healthiest way to get to and from their workplaces *(see Testimonial 3: Timelab, Evi Swinnen*). According to the typology developed by Haklay (2013), projects in which citizens submit potential research topics in this way involve a form of participatory science and extreme co-creation. This approach differs from distributed intelligence or crowdsourcing, in which academics define the research question in advance. Projects from the tip of the CS pyramid are found primarily in the bio-medical sector. Patients who lack scientific information on their diseases, for example, may use the Internet to join forces with other patients in collecting medical data (see e.g. Prainsack 2014). Research proposals that make use of this type of data gathering and organisation have already led to new discoveries and treatments.

What exactly falls under the umbrella of Citizen Science is still rather vague at this stage, but this should not prevent us from understanding CS as a promising means of facilitating science and valorising scientific results in an interactive manner. The many possible interpretations of the concept allow scientists a great deal of freedom to experiment further with such interaction. CS also offers citizens the opportunity to exchange ideas with scientists or engage in scientific experiments on their own. The Young Academy therefore recommends taking an inclusive approach to Citizen Science, one which opens doors to new, innovative ways of 'doing' science and citizenship.

1.2 Citizen Science in its historical and social contexts

Some say Citizen Science is back – others say it never went away. Renowned biologist Charles Darwin (1809-1882) could never have written *On the Origin of Species*, for example, without the help of the amateur biologists and acquaintances who sent material to him. In the 19th century, when Darwin was working, it was also common for men to organise discussions and conduct experiments in societies and private clubs for gentlemen. We should take a rather critical view of such collaborations between 'the public' and science, however, as they were very much restricted to exclusive gentlemen's clubs in the upper echelons of society.

It was not until the late 19th century that science and academia became fully independent. The academic world became a 'business', with its own logic, laws and customs. Those who did not proceed through the academic curriculum did not learn the jargon, let alone the new methodologies needed to conduct research. It was often said that scientists and scholars were most comfortable hiding away inside the 'ivory towers' of the university. This offered them the calm environment they needed to conduct their research without being disturbed, and without having to justify or communicate their research results. Science and scholarship became a one-way street. Scientists would notify the general public when they made discoveries, believing that 'the people' needed to be 'enlightened'.

Much changed after the Second World War, and particularly as a result of the wave of democratisation that took place in the 1960s. Never before had so many scientists and scholars (of both sexes) given so many lectures to so many students (of both sexes). Never before had so many scientists been so active all around the world. Universities are now ideal environments for promoting two-way traffic between society and science. And even outside of the lectures theatres, increasing efforts are being made to disseminate research results throughout society. Science communication (as opposed to popularisation) seeks to build bridges between researchers and the general public. In this respect, many different initiatives are able to count on the support of interested parties. In recent decades, universities and governments have made strong contributions to science communication in the form of broad initiatives that range from the Children's University to Science Days and even Science Weeks.

Yet there is an important difference between science communication and Citizen
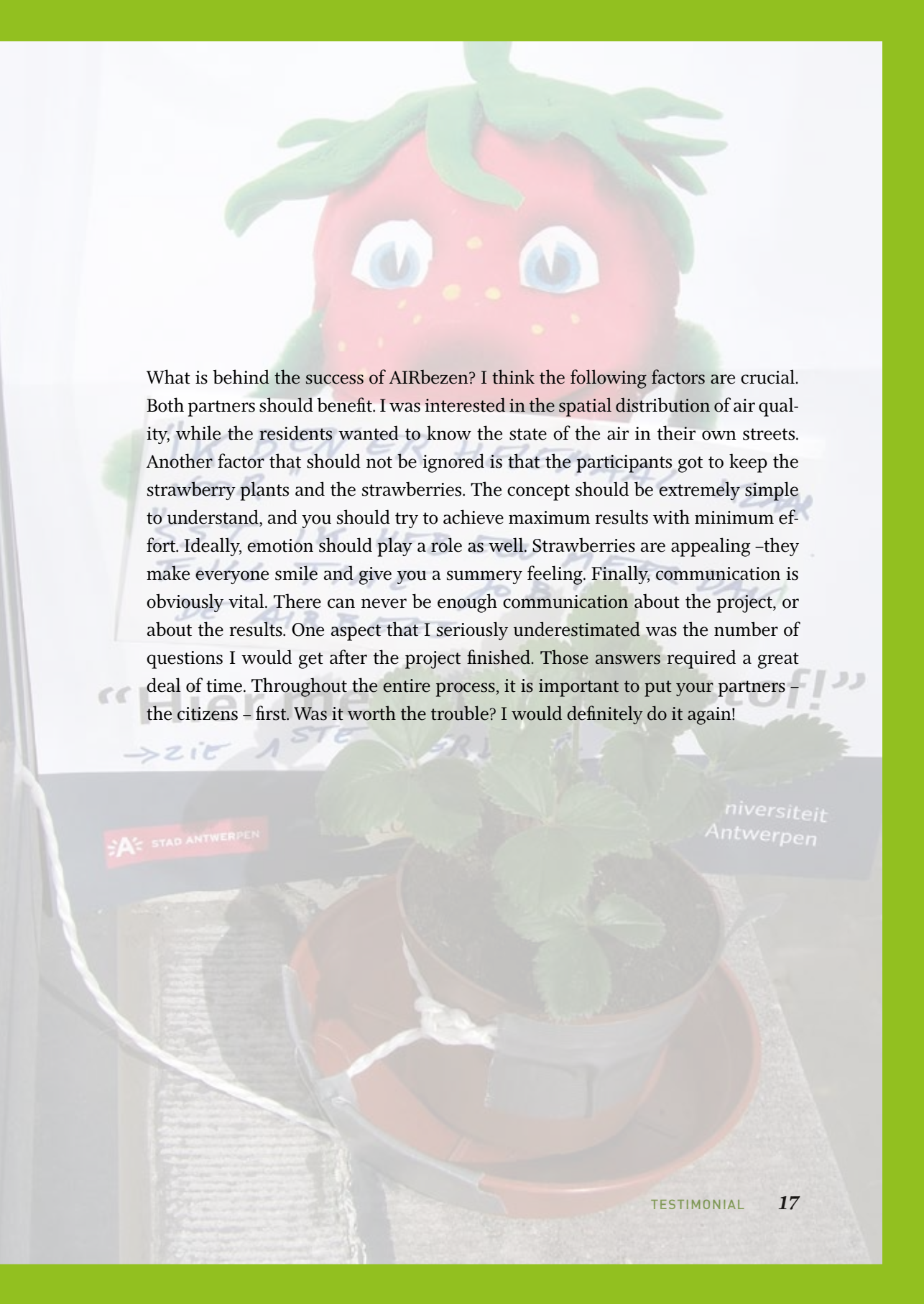
Testimonial 1: Roeland Samson – AIRbezen

After gaining considerable experience of bio-monitoring air quality in cities with my research group, I wanted to share our knowledge and use it to benefit the population. According to the media, air quality is clearly an issue of concern for citizens. Project proposals we had previously submitted to involve citizens in research had been appreciated, but not funded.

When the City of Antwerp announced brainstorming sessions on urban green spaces in the sustainable city, and later invited project proposals, I didn't hesitate. I had 20 minutes to introduce the idea at a forum of interested parties, ranging from citizens to managers. That evening, in late 2013, AIRbezen was born, with the help of a group of enthusiastic and interested Antwerp residents and my PhD student, Jelle Hofman. The purpose of AIRbezen was to chart the air quality in Antwerp using strawberry plants, which the Antwerp residents would care for over a two-month period.

After that first evening, we met a few times to discuss the project further, to design and to plan. Around December, we were ready to start our communications through a website and a Facebook page. The first registrations came in quickly, and the project was picked up by the press. News channels then began to pick the news up from each other and, after several inspiring articles, the number of registrations grew more steadily. Ultimately, when the number of registrations reached 1000, we had to limit the number of participants. In mid-March 2014, the plants were distributed. Over a year later, interest in AIRbezen had not decreased at all, and even today, name recognition is quite high in Antwerp, as well as throughout Flanders and even in the Netherlands.

What is behind the success of AIRbezen? I think the following factors are crucial. Both partners should benefit. I was interested in the spatial distribution of air quality, while the residents wanted to know the state of the air in their own streets. Another factor that should not be ignored is that the participants got to keep the strawberry plants and the strawberries. The concept should be extremely simple to understand, and you should try to achieve maximum results with minimum effort. Ideally, emotion should play a role as well. Strawberries are appealing –they make everyone smile and give you a summery feeling. Finally, communication is obviously vital. There can never be enough communication about the project, or about the results. One aspect that I seriously underestimated was the number of questions I would get after the project finished. Those answers required a great deal of time. Throughout the entire process, it is important to put your partners – the citizens – first. Was it worth the trouble? I would definitely do it again!

Science – the movement that Europe has identified as the way of the future. Science communication encourages dialogue between the university and society, but CS goes a step further to encourage active collaboration between scientists and citizens. The appeal of CS has increased in recent years thanks to advances in technology and digitisation that make CS projects possible. Citizens can now use a wide range of apps to monitor and measure processes. CS also exploits many aspects of internet culture, including forums, gaming and social media. Digitisation has increased the conviction that science can or should be open, transparent and participatory. What's more, citizens now want to be kept informed about the use of taxpayers' money, and to have in say in which lines of research are pursued. From this perspective, CS appears to be a necessary transitional step towards science that is truly 'open', despite the distinctions between the two movements. 'Open science' emerged from the open data movement, which may or may not depend on citizens' cooperation in data collection. Citizen Science focuses on citizen participation, and not on the public availability of the data itself.

1.3 Citizen Science in Europe and across the world

Citizen Science originally emerged in informal, experimental settings, but the many CS projects that have been launched in recent years have also brought it to policy-makers' attention. The European Commission (EC), for example, has begun mapping CS projects and documenting best practices, and published a White Paper on Citizen Science in 2014 (F.S. Sanz et al.). In this publication, the EC proposes that a CS think-tank be established to guide policy choices, coordinate funding programmes and to 'mainstream' the concept in the policy domains of education, research and civil society. Discussing a kind of contract between the public and science, the White Paper argues: "Our society requires a paradigm shift, a new contract between all societal actors in order to address global challenges with a stronger focus on scientific and social values, and not only economic ones."

European policy-makers have been attempting to chart the societal implications of science since the 1960s. They began by establishing ethics committees, and went on to offer support to projects involving participation and public engagement. In terms of 'embeddedness' within society, CS is obviously attractive. It facilitates the involvement of citizens at the very start of the research and development process. It also

serves as the new pillar in the 'responsible research and innovation' (RRI) approach of the EU Horizon 2020 programme. At the same time, the European Commission views CS as a test case for open science, which is now seen as the most interesting means of democratising science. It is important to keep the distinction between the two concepts in mind, however.

The European Research Council (ERC) has also funded a number of CS projects with various degrees of citizen involvement. The September 2015 issue of the ERC newsletter opened with the question, 'How can amateurs contribute to science projects?' and went on to describe how recent ERC grant holders had successfully set up research projects that involved the participation of non-experts.

Citizen Science is certainly not an exclusively European phenomenon, however. The United States and other countries have advocated the use of CS and crowdsourcing to address societal challenges such as climate change.[1] In 2013, the US Office of Science and Technology Policy (OSTP) published a National Action Plan that used CS to make large-scale projects possible. The Obama administration has also published a CS toolkit, and the National Science Foundation offers grants for Citizen Scientists.

Recently, attempts have been made to frame CS as an answer to the human right to science (i.e. the universal right to participate in the production of scientific knowledge). In addition, new professional organisations are now being established internationally, including the European Citizen Science Association (ECSA) in Europe and the Citizen Science Association in the United States, each of which has its own journal and organises conferences devoted to the further design and promotion of CS.

In other words, we are witnessing a shift towards the professionalisation of CS, but this shift is not immediately evident in Flanders. The Young Academy is working on two projects for promoting CS in Flanders: a survey of researchers (see Part 2, below) and the establishment of a new portal for CS projects (Part 3). According to the results of our survey, the lack of an appropriate portal is currently the biggest barrier to CS implementation in scientific circles (see Recommendations 4.1 and 4.2).

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1   https://www.whitehouse.gov/blog/2015/09/30/accelerating-use-citizen-science-and-crowdsourcing-address-societal-and-scientific

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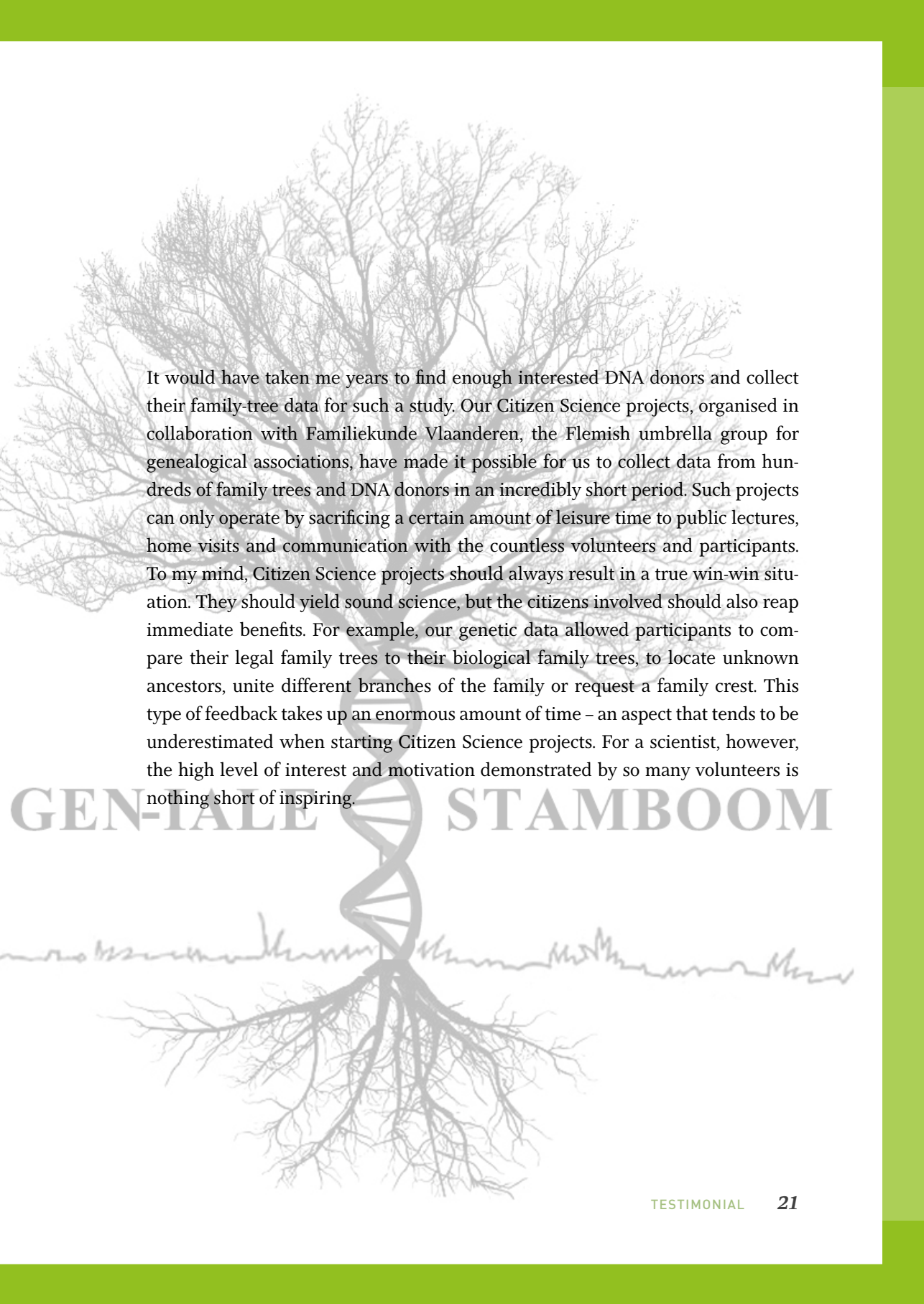
Testimonial 2: Maarten Larmuseau

Genealogy is a particularly popular leisure activity in Flanders, as it is in the rest of the world. Almost everyone has a relative who is passionately drawing up family trees, using many a family gathering as an opportunity to hold forth. According to a recent study, 7 in 10 Flemish people are also truly interested in the history of their own families.

Unfortunately, a family tree is relevant only to that family, despite the years spent digging through archives, often to the frustration of many genealogists. If you issue a call to share family-tree data for scientific purposes, and offer participants the opportunity to enrich their own information and knowledge through genetic analysis, you can expect to be overwhelmed with responses. This is the ideal climate for starting Citizen Science projects, as I myself experience on a daily basis.

My own research in the forensic genetic laboratory at KU Leuven addresses the relationship between genealogy and DNA. By linking genetic markers on the Y chromosome (the chromosome that every man inherits from his father) to paternal ancestor tables, we can solve many interesting research questions in various disciplines, in addition to realising various societal applications. For example, we can learn how common it was in the past to have illegitimate children, how human remains can best be genetically identified by living relatives, and how the distribution of genetic variation in Flanders has changed over time. The relevance of these questions is not limited to forensic geneticists. They are also essential to socio-biologists, historians, demographers and sociologists.

It would have taken me years to find enough interested DNA donors and collect their family-tree data for such a study. Our Citizen Science projects, organised in collaboration with Familiekunde Vlaanderen, the Flemish umbrella group for genealogical associations, have made it possible for us to collect data from hundreds of family trees and DNA donors in an incredibly short period. Such projects can only operate by sacrificing a certain amount of leisure time to public lectures, home visits and communication with the countless volunteers and participants. To my mind, Citizen Science projects should always result in a true win-win situation. They should yield sound science, but the citizens involved should also reap immediate benefits. For example, our genetic data allowed participants to compare their legal family trees to their biological family trees, to locate unknown ancestors, unite different branches of the family or request a family crest. This type of feedback takes up an enormous amount of time – an aspect that tends to be underestimated when starting Citizen Science projects. For a scientist, however, the high level of interest and motivation demonstrated by so many volunteers is nothing short of inspiring.

GEN-TALE · STAMBOOM

Interlude 1: Our Citizen Science experiment, July 2014

During the science communication summer school Let's Talk Science in 2014, the Young Academy launched its campaign for Citizen Science by involving the participants in an experiment. In collaboration with the Qtree company, all of the participants received a badge bearing a QR code. During the opening session, they were told that they could assist in a small research project by letting us scan their badges. Nothing was required; everything was voluntary. The badge did not record names, only gender, university and discipline. It also tracked their movements, so we could find out who they talked to and thus construct interaction models. During lunch, our Young Academy team scanned the badges using iPads. There was enthusiasm: How does it work? What is the goal? Can I scan, too? There was also suspicion: Is this okay, privacy-wise? These were exactly the questions we were looking for.

On the second day, we repeated the experiment, and there was much less resistance. For many participants, it had apparently become acceptable to participate actively (or even pro-actively) in the study. This was another surprising finding. It also gave us data for the mobile data miners. The expertise of the Young Academy staff (and their PhD students) made it possible to hold an on-site hack-a-thon: the information was first examined statistically, and then visualised. This immediately produced some results, which we were able to present during the summer school. According to the results, women acted as the 'super connectors' – building bridges between the many small groups that emerged in the participants. On average, researchers from 'small' universities talked to more people than their colleagues from 'large' universities did. The results revealed that KU Leuven and Ghent University researchers were good at networking within their own ranks, but not with each other! Confounding all clichés, we found that natural scientists were the winners of the popularity test. They had multiple and regular chats both with each other and with colleagues from other disciplines.

Why go to all of this trouble? (Even though the experiment didn't take much time, it did cost a lot of money.) We wanted to demonstrate how interaction models could be used to predict how quickly viruses would spread within a group (a question that was unfortunately rather urgent because of the Ebola virus). Admittedly, the experiment was not yet ready for launch as a CS project, but it was a nice way to start the discussion in the summer of 2014.

2. Survey results

At the 2014 summer school on science communication, the Young Academy launched a true CS experiment with the aim of creating a buzz around CS and starting a conversation (see Interlude 1). We monitored the interactions between participants by scanning their QR badges during lunch breaks. Our goal was to reach every participant and trigger questions like: what is the use of Citizen Science? What about privacy? How far can you go? Data was processed on-site and the results were presented at the end of the summer school.

In the autumn of 2015, the Young Academy launched an online survey among researchers at Flemish research institutions. The goal was to assess their knowledge of and attitudes towards CS as a research method, as well as their experience with actual CS projects. The questionnaire was distributed through a number of channels: the website and social media pages of the Young Academy, the communication departments of the research institutions, the EOS mailing list and, obviously, the network of Young Academy members.

The response was impressive: 775 researchers participated, 401 of whom completed the entire questionnaire (the remaining 374 questionnaires were excluded from further analysis). The respondents were aged between 21 and 77, with an average age of 35.34 years (standard deviation: 12.03). With women making up 45.9% of the respondents, the survey had a relatively even distribution of male and female respondents.

The participants were also working in a good range of academic roles: 42.6% of them held pre-doctoral positions, 17.7% were employed as post-doctoral researchers, 31.5% were professors and 8.2% had non-academic appointments. Researchers from all five Flemish universities participated in the survey, with a varied distribution across scientific and scholarly domains.

Scientific domains of respondents
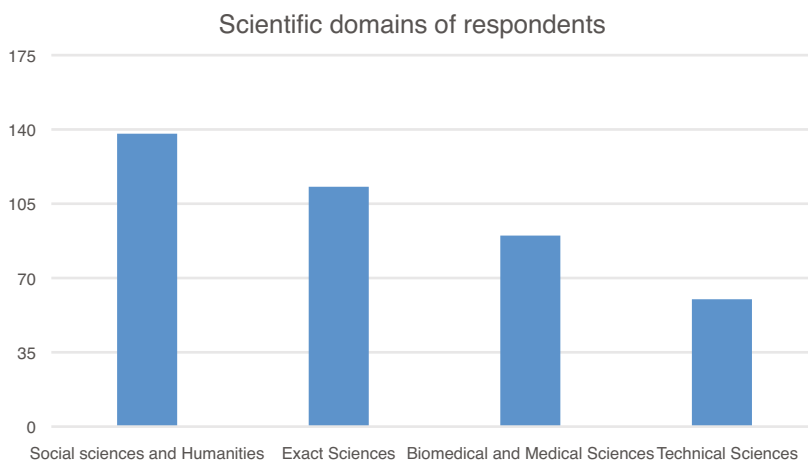

2.1 Knowledge of Citizen Science

As expected, the survey revealed that Citizen Science has yet to become fully established as a concept and research method used by Flemish scientists. Only 22% of the respondents answered yes to the question 'Are you familiar with the concept?'. About the same number of respondents reported that they were familiar with the concept of CS, but that they did not know exactly what it was. The majority (58.9%) of the respondents said they were not familiar with the concept of CS. Respondents were then given an explanation of the CS concept and asked again whether they were already familiar with it. The 'yes' responses increased, and the number of respondents who were completely unaware of the concept decreased to 22.4%.

More than half of the 77.6% who ultimately reported being familiar with CS said they were aware of a specific CS project. It is interesting to note that familiarity with the concept of CS was highest in the Social Sciences and Humanities, as well as in the Exact Sciences. Almost half of all the respondents from these domains knew what CS was, or had already heard of it. In the Biomedical and Medical Sciences this was only 3 in 10, despite the high number of CS projects being carried out in these domains. Around 4 in 10 respondents from the Technical Sciences were familiar with the concept. When asked if they were aware of specific CS projects, those from the Exact Scientists were clearly the best informed. Two thirds of these respondents reported being aware of CS projects, and half of those knew of

CS projects in their own disciplines. For the sake of comparison, about half of the respondents from other scientific domains were aware of actual CS projects.

In terms of age, we observed clear differences in familiarity with the concept of CS. In general, respondents who were not familiar with CS were significantly younger than those who were aware of the concept. This finding is remarkable, and may indicate that the standard curriculums in Bachelor and Master programmes do not yet offer students the opportunity to discover CS. Women were more likely than men to report being unfamiliar with the concept of CS.

Familiarity with Citizen Science, by scientific domain
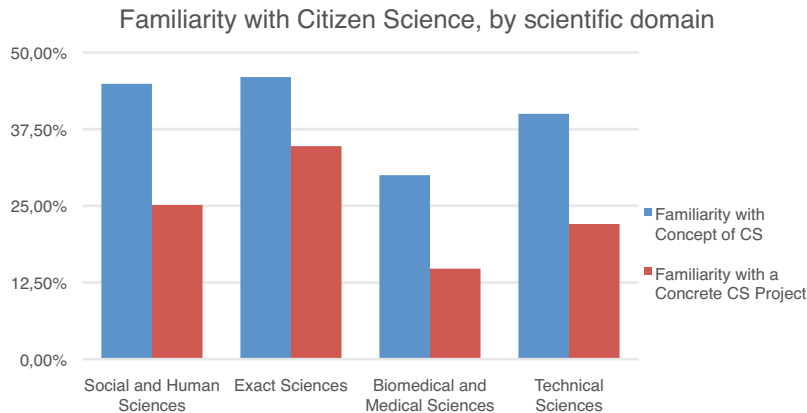
2.2 Experience with Citizen Science

Of the 188 respondents who were familiar with the Citizen Science concept, 26 indicated that they themselves had been involved in a CS project. When asked about their experiences with CS, their ratings averaged 5.5 out of a possible 7 (SD = .76), which corresponds to 'somewhat positive' and 'positive'. The lowest score was 'neutral'. None of the 26 respondents gave a negative evaluation of the CS project. This result suggests that CS is generally experienced as positive, which may have a mobilising effect.

The same 26 respondents were subsequently asked about the advantages and disadvantages of the method and design. On average, the respondents agreed with the five pre-defined advantages. The ability to collect large amounts of data was seen as the biggest advantage, followed by ii) societal valorisation through citizen

involvement and communication to a broader audience, iii) the ability to collect data more quickly, iv) the ability to collect data more cheaply and, finally, v) the ability to collect different types of data. The biggest disadvantages of CS were, in descending order, i) additional administrative work, ii) additional communication work, iii) uncertainty about the quality of the data and iv) uncertainty about the ability to recruit enough participants.

We also asked the 162 respondents who were aware of CS but not yet actively involved in a project to assess the advantages and disadvantages of CS. In general,

Advantages of Citizen Science

Disadvantages of Citizen Science
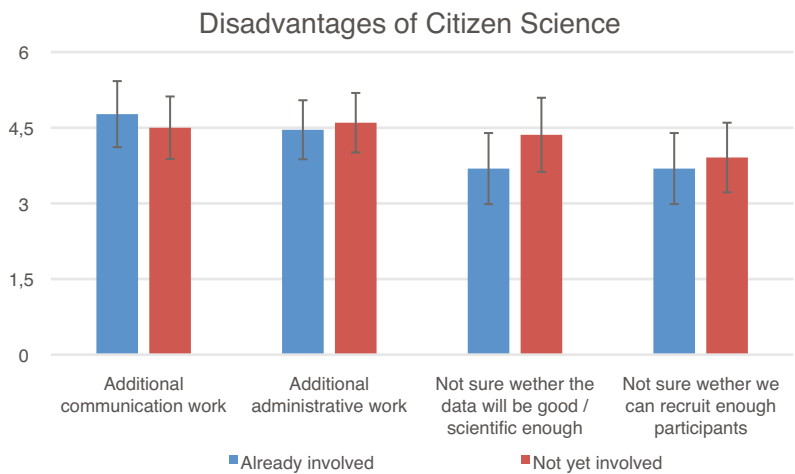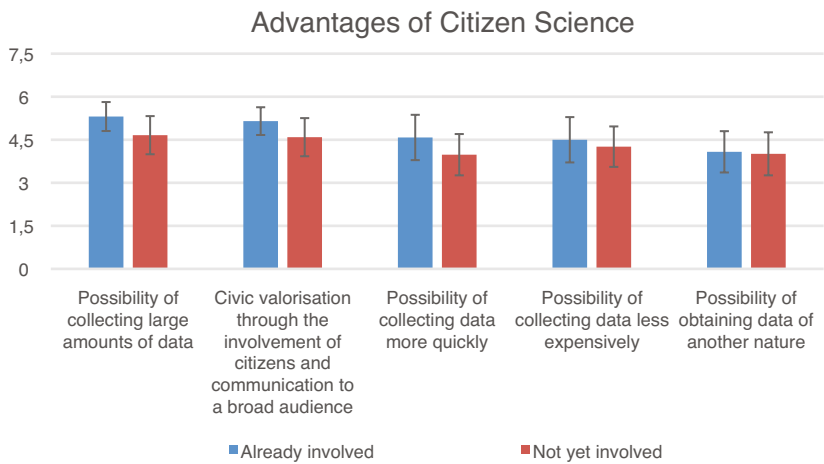
their assessments were similar to those given by respondents who had already had firsthand experience of CS projects. Compared to researchers who had already been involved in a CS project, those who had not yet been involved appeared to overestimate the disadvantages of uncertainty about the quality of the data. They also attributed less importance to CS projects' ability to collect more data and collect data more quickly, as well as to societal valorisation through citizen involvement.

Given that only a minority of those surveyed indicated that they had been involved in CS, it is difficult to draw any far-reaching conclusions. It is clear, however, that the majority of respondents agreed with the the suggested advantages for data collection.

2.3 The future of Citizen Science

We asked the 311 respondents who were familiar with CS whether they would consider starting their own CS projects in the future. Their answers varied, with the average response being slightly more negative than 'neutral' (M = 3.59; SD = 1.44). In contrast, when we asked all 401 respondents whether CS had a future as a research method, their responses were convincingly positive, with 302 respondents answering 'somewhat likely' to 'definitely'. This is something that should be taken into consideration: there is sufficient interest and enthusiasm, but those who are actually involved in CS believe there is insufficient support to continue these efforts in the future.

In other words, according to the survey, there is considerable interest in CS and confidence in its future value as a research method. Still, researchers who have not yet been involved in CS appear to overestimate its possible disadvantages while underestimating its advantages. In Part 4 of this position paper, we present a number of recommendations that could help change this situation.

2.4 Results from the YA/KVAB Science Communication awards

Further evidence that Citizen Science is on the rise is to be found in the shortlists for the YA/KVAB Science Communication awards. Created to recognise academics

who have contributed to the popularisation of science, these awards have been presented annually since 2013. The Young Academy has been involved since 2013; in 2014, the awards became a joint initiative with the KVAB. Each year, one career award and up to 20 'annual awards' are presented. Although the submissions in 2013 and 2014 were outstanding, we noticed that they almost always involved one-way communication: lectures, books, exhibitions and blogs.

In 2015, however, we noticed a subtle shift towards more interactive forms of science communication, including workshops and a board game. Moreover, we were able to recognise two real CS projects, including the previously mentioned AIRbezen project, headed by biologist Roeland Samson (see Testimonial 1). The jury was especially impressed by the original means of involving the public, the high-quality execution of this pioneering work, the intensive interaction with and feedback given to the audience and the overwhelming scale and impact of AIR-bezen. In addition, archaeologist Marit Van Cant was recognised coordinating the preparation of historical human bone material by volunteers and for the partici-pative and scientific manner in which she involved the public in archaeological research.

As interest in CS grows, researchers need to engage in deeper ethical, methodo-logical and scientific-philosophical discussions about its advantages and disadvan-tages. We started the discussion in the autumn of 2014 by organising a symposium and launching a CS portal (see Part 3). Now, we want to invite the government to continue along these lines by increasing awareness and facilitating CS in Belgium (see our recommendations in Part 4).

Wetenschap: jij telt mee!

Citizen Science in Vlaanderen

13 november 2014
Citizen Science
Paleis der Academiën
Hertogsstraat 1
B-1000 Brussel

16-19u

Jonge Academie

Wat is CITIZEN SCIENCE?

Violet Soen en *Tine Huyse*:
toelichting CS-project van de Jonge Academie

Michiel Van Oudheusden:
Algemeen kader, modellen en mogelijkheden

ENKELE VOORBEELDEN

Roeland Samson:
Project AIRbezen: luchtvervuiling

Karolien Poels en *Veronique Hoste*:
AMICA, over cyberpesten

Evy Swinnen:
Timelab, een stadslabo

MODERATOR:
Hans Harbers, wetenschapsfilosoof

CITIZEN SCIENCE LANDSCAPE
Hanny Van Arkel wandelt tijdens de receptie met u door ons Citizen Science landschap en geeft tips en tricks voor meer CS in Vlaanderen.

Inschrijven?
http://jongeacademie.fikket.com/event/wetenschap-jij-telt-mee
Aanmelden CS-landscape via info@jongeacademie.be
of 02 550 23 20

volg ons op facebook en twitter ...

Interlude 2: Report from the Citizen Science debate in November 2014

Jozefien De Marrée on www.wtnschp.be

Although the term Citizen Science would not emerge until 150 years later, Charles Darwin was clearly already a fan when he was writing *On the Origin of Species*. He based his theory of natural selection on evidence that had been sent to him by hundreds of citizen scientists around the world, including plant cultivators, animal breeders, gardeners, explorers and diplomats. Without the help of these enthusiastic 'amateur' scientists, Darwin would never have succeeded in proving his theory. Citizen Science is the name given to research projects that involve citizens from the outset. They help to determine the research question and/or collect data, they disseminate research results and, in some cases, they even analyse data. This new form of science communication is increasing the involvement of society in science, as well as the dialogue between scientists and non-scientists. Citizen Science is still relatively unknown in Flanders (in contrast to the situation in the Netherlands), so the Young Academy has made it its mission to put this new form of scientific practice on the map in Flanders as well. Its symposium entitled 'Citizen Science: Can We Count On You?!', held on 13 November 2014 at the Academy Palace in Brussels, was a first courageous step in the right direction.

Social interaction between the sandwiches
There are many possible Dutch translations of the term 'Citizen Science'. Given that scientists are also citizens, the Young Academy has opted to use the English term. During Let's Talk Science, the summer school organised by the science communication units of the five Flemish university associations in July 2015, the Young Academy began a large-scale Citizen Science experiment. All 300 participants received badges bearing unique QR codes, each of which was scanned during the lunch breaks, a total of 10 times on average. The scan data were subsequently analysed on site. This yielded a mountain of interesting data about the social interactions taking place during the lunch breaks.

We found, for example, that participants usually stayed in small groups of 2–4 people, and that they hopped from one group to another like true networkers. Women were twice as active at networking as men. Another remarkable result was that

PhD students from the smallest universities (Vrije Universiteit Brussel and Hasselt University) sought the most contact with participants from other universities. When arranged by discipline, natural scientists proved to be the most social.

We want more

Other inspiring examples of **Citizen Science** were discussed during the symposium. In one example, Antwerp residents used strawberry plants to measure air quality in the AIRbezen project run by Stadslab 2050 and the University of Antwerp. Another example was the municipal laboratory Timelab, which offers an open laboratory environment. EOS Magazine also introduced its brand-new Citizen Science portal, where anyone can register new projects and recruit participants. In closing, a series of existing initiatives in the field of Citizen Science were introduced during an information fair. The initiatives included our own Brussels Science Shop, which collects research questions formulated by non-profit organisations.

Following this first enthusiastic and inspiring step towards improved collaboration between scientists and society in Flanders, the message is clear: We want more!

# 3. A Flemish portal for Citizen Science projects

3.1. Launch and update

During our symposium in November 2014, we launched an online portal for Citizen Science developed in collaboration with EOS to unite citizens and scientists. The portal site was intended for Dutch speakers, and focused on CS projects both in Flanders and abroad which are open for participation. Both citizens and academics can visit the portal to learn more about on-going projects and follow projects in which they have participated. The site provides scientists with inspiration and allows them to engage in dialogue with citizens. Pilot projects are also invited to present their activities during a CS 'landscape' event, thus engaging the public in their projects from the start. More than 12 projects have already made use of this opportunity and achieved positive results.

The email message below was sent to the Young Academy by the coordinator of one of the pilot projects, reinforcing our conviction that the portal system can work:

Familiekunde Vlaanderen presented its genetic-genealogical DNA projects at the Citizen Science Landscape in Brussels on 13 November 2014. We would like to express our gratitude to the Young Academy and EOS. We received many positive responses to our projects during conversations with participants and visitors to the Citizen Science Landscape. The inclusion of the DNA projects on the portal website also produced a substantial increase in the number of participants in our projects. Such events – and the associated visibility through EOS – are extremely valuable for Citizen Science projects in Flanders. We are very grateful for these initiatives!

Kind regards,

Dr. Valerie Vermassen
Coordinator of Familiekunde Vlaanderen
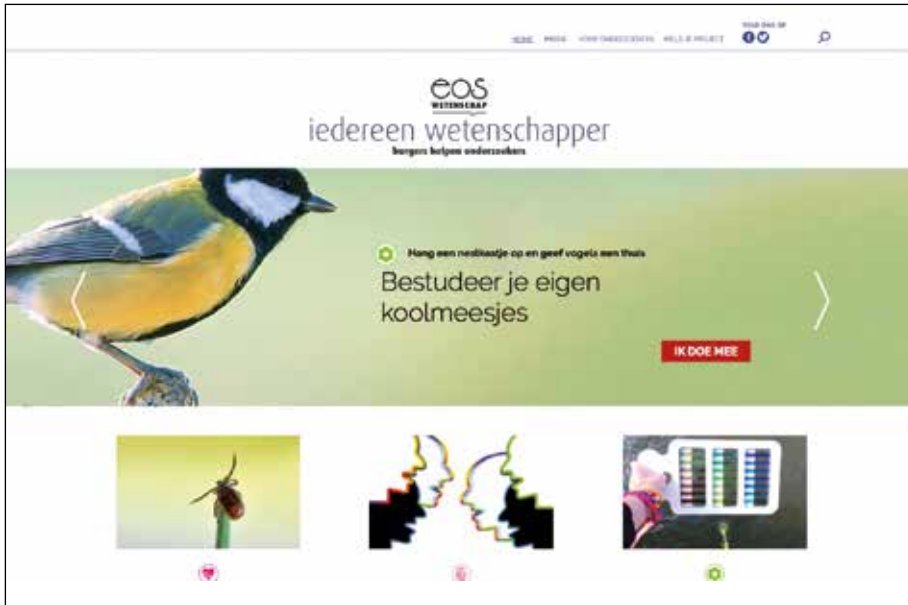
Due to the website's success and potential, we collaborated with EOS to launch a more comprehensive version on Science Day in November 2015: www.iedereen-wetenschapper.be – 'everyone's a scientist'. The portal is intended as a starting point for the public, scientists and stakeholders when it comes to CS in Flanders and the Netherlands. It brings together all projects in which individuals from Flanders and the Netherlands can participate, with the aim of motivating citizens to participate while inspiring scientists to set up their own CS projects. In this way, we hope to build a community of regular participants and scientists interested in CS. The portal site is supplemented by social media channels, newsletters, blogs and articles in magazines and on the EOS website.

Visitors to www.iedereenwetenschapper.be can sign up to participate in projects and find background information on projects and scientists that interest them. In turn, scientists can read about CS, including how to start projects, what to do and what not to do and how to incorporate CS data in publications. They can also register their projects for inclusion on the website and get in touch with other scientists who have experience or an interest in CS.

3.2 Success

Since its launch, www.iedereenwetenschapper.be has received 2000–3000 visits per month, or around 13,000 clicks, at the time of writing. The portal site includes calls for more than 50 projects – Flemish, Dutch and international – in which citizens can participate. In general, reactions from Flemish researchers whose projects have been listed on the website have been quite enthusiastic. We even had to take one Ghent University project offline earlier than planned because the number of participants needed had already been reached.

More than 600 participants have registered on the website to participate directly in a project. To date, more than 300 people have subscribed to the *Iedereen Wetenschapper.be* newsletter. The Facebook page (aimed mainly at participants) has nearly 200 followers, and the Twitter account (mainly for researchers) has more than 50. Major increases are expected once the portal gains more visibility through mailing lists, press releases, contact with universities and expansion in the Netherlands.

Iedereen Wetenschapper.be has since become affiliated with the international Citizen Science Association, and we have also submitted a request for membership in ECSA, the European Citizen Science Association (see 1.3). Partly due to these contacts, the area of the portal for researchers is being expanded. In addition, collaborative efforts between the Jonge Akademie in the Netherlands and the Young Academy in Flanders mean that the portal is currently being prepared for relaunch in the Netherlands.
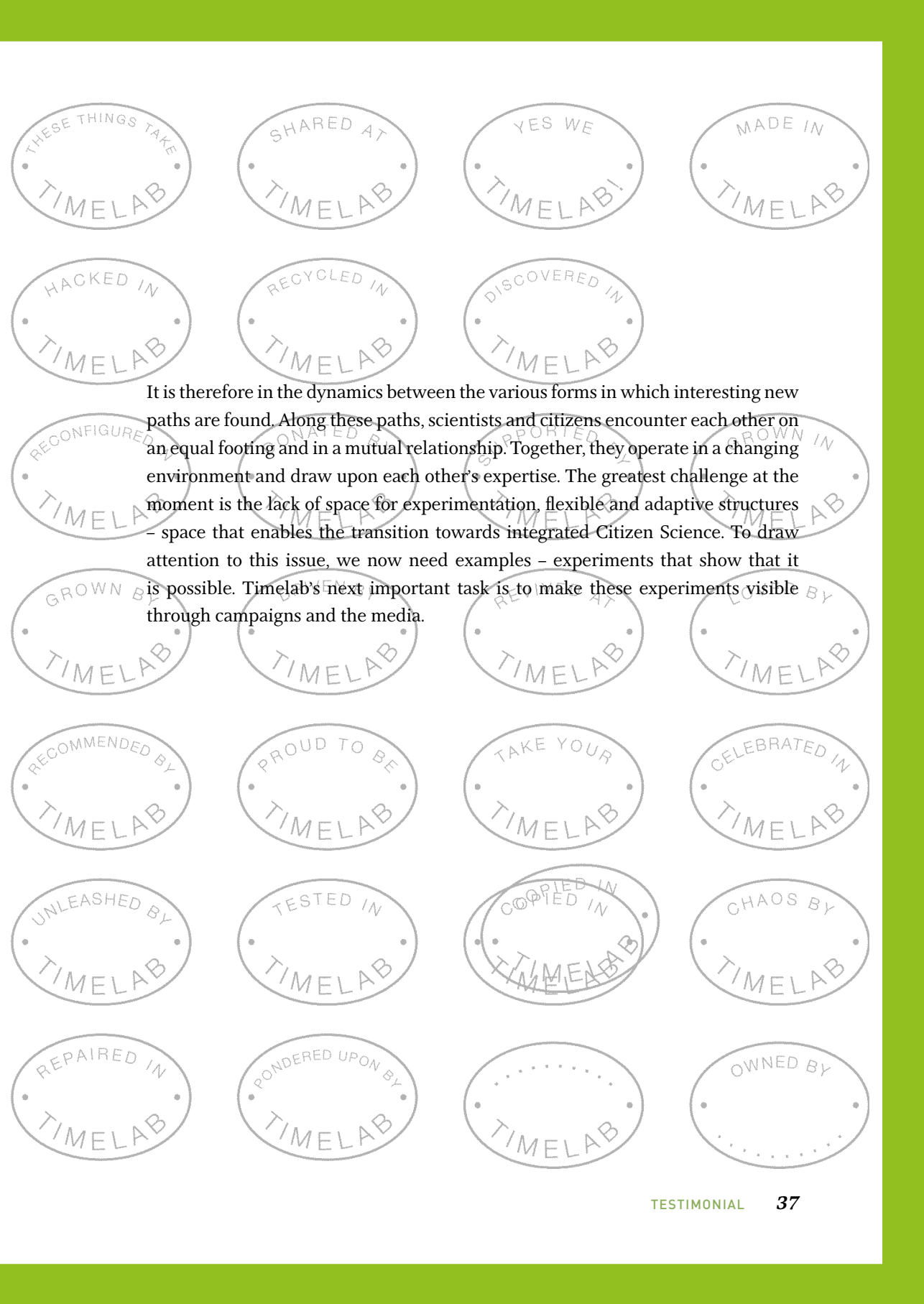
Testimonial 3: Evi Swinnen - Timelab

In Timelab, we develop citizens' questions into projects in order to tackle certain complex issues. Societal necessity leads citizens to unite, to take action and to join forces.

For example, citizens are concerned about air quality. Today, 22 people are coming together in Timelab to use their professional expertise and other types of knowledge to develop a device that will allow them to choose a different route to school or work. Each citizen has his or her own motivations. The result and process are open for all to see – they belong to the 'commons'. The motives are not economic, but societal. Each project contributes to the creation of our shared culture. Project after project, Timelab uses advancing insight to develop a unique method.

The Timelab method unites new insights from business-modelling tools in a usable set of instruments for guiding citizens through the process of developing solutions to specific problems. The method serves as a guideline for feedback on the evolution that is taking place in the Citizen Sciences. In this participatory form of science, citizens themselves contribute to the issue. This is different from crowdsourcing, in which the research question has generally been formulated in advance from a scientific perspective.

In practice, we see that these two types of research are definitely not as clearly defined as it seems. Through collaboration with scientists, citizens who would like to develop a device that suggests alternative routes can simultaneously collect data through mapping. Measuring the impact of such actions using scientific methods is also possible in the scope of a Timelab creation project.

THESE THINGS TAKE
TIMELAB

SHARED AT
TIMELAB

YES WE
TIMELAB!

MADE IN
TIMELAB

HACKED IN
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RECYCLED IN
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DISCOVERED IN
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RECONFIGURED
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DONATED BY
TIMELAB

SUPPORTED
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GROWN IN
TIMELAB

It is therefore in the dynamics between the various forms in which interesting new paths are found. Along these paths, scientists and citizens encounter each other on an equal footing and in a mutual relationship. Together, they operate in a changing environment and draw upon each other's expertise. The greatest challenge at the moment is the lack of space for experimentation, flexible and adaptive structures – space that enables the transition towards integrated Citizen Science. To draw attention to this issue, we now need examples – experiments that show that it is possible. Timelab's next important task is to make these experiments visible through campaigns and the media.

GROWN BY
TIMELAB

DREAMED
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REVIEWED AT
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LOVED BY
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RECOMMENDED BY
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PROUD TO BE
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TAKE YOUR
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CHAOS BY
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OWNED BY

4. Challenges and recommendations for Citizen Science in Flanders

The EOS/YA portal site is making Flemish researchers' initiatives both visible and tangible. Our survey has demonstrated the high level of interest among researchers in starting and promoting Citizen Science projects. This makes it even more important for university and societal policy-makers to engage with the concept and explore the opportunities offered by CS. In terms of government, for example, major opportunities exist for cultivating innovation, experimentation and involvement between citizens and scientists, as well as new knowledge processes and forms of knowledge production. Important opportunities are also emerging for collaboration with industry and for spin-offs from scientific research.

The Young Academy has provided an initial stimulus by organising the portal site, workshops and debates, along with the Citizen Science Landscape event at the Academy Palace. We now ask universities, government bodies and societal actors to get involved and broaden the base of support for CS. In the paragraphs below, we formulate four specific recommendations for developing a future-oriented and broadly supported policy on CS in Flanders.

4.1 Promote the potential of Citizen Science

Citizen Science is sometimes seen simply as a means of reducing the gap between science and the citizen. In other words, CS is understood as just another form of traditional science communication, one in which science is made accessible to the public and scientists/scholars are expected to engage with the public. In this position paper, we aim to demonstrate that a broader approach to CS has the potential to transcend science communication alone. When citizens are actively involved in setting scientific agendas and in scholarly activities, new forms of knowledge production are generated that could benefit both science and society.

If policy-makers wish to capitalise on the potential of CS and promote the exchange of knowledge between scientists and citizens, CS should not be regarded as an secondary activity. Instead, it should be firmly anchored in science and innovation policy. The European budget that is currently provided for CS is rather limited in comparison to the investments currently being made in research and developments directed towards industrial and commercial applications. For this reason, Flanders should urgently reflect on the distribution (or re-distribution) of research budgets. In this regard, it is paramount to prevent CS from being used solely to reduce research costs. It should be used to its fullest extent, with a view to fostering both scientific and social innovation.

The Flemish government could look to Europe for inspiration. Drawing on the idea of 'responsible research and innovation' (RRI), mentioned above, European policy-makers aim to promote dialogue between science and society: RRI calls for cooperation between researchers, industry, non-governmental organisations and the general public throughout the entire process of research and innovation in order to gear science and technology towards the values, needs and expectations of European society (Landeweerd et al. 2015). Because RRI involves an inclusive and participative research process, it opens up opportunities for CS – something that has already been recognised in documents like the aforementioned EU White Paper on Citizen Science from 2014.

A number of European member states have taken the lead in this regard. In Scotland, the Scottish Environmental Protection Agency has already incorporated CS into its policy on invasive species and the monitoring of trees. Germany has launched Citizen Science Platform 13 as part of the preparations for a Citizen Science Strategy 2020. Flanders could start a similar process of reflection, partly by adopting recommendations 4.2, 4.3 and 4.4, below.

4.2 Support the start of Citizen Science projects

The first pioneering Citizen Science projects in Flanders have indicated that coordinating such projects is a task and an art in its own right. The challenges encountered by 'traditional' scientists (e.g. data management and quality control) should also be addressed in the context of CS. Given the scale of some CS projects, how-

ever, these challenges will require additional efforts: some projects involve more than 10,000 individuals in observations or in carrying out mini-tasks. Reaping the benefits of CS will require collaboration across disciplinary boundaries. Experts in the fields of information science, education, data visualisation and sociology, as well as citizens, must learn to collaborate with each other. As mentioned above, the emergence of new organisations (e.g. ECSA), and the associated journals and conferences, demonstrates the growing professionalisation of CS in many parts of the world. This trend has yet to take root in Flanders.

The portal site www.iedereenwetenschapper.be makes it possible to establish a fully-fledged CS community in Flanders. The first step has already been taken by the Young Academy and EOS. The government and universities can do their bit by supporting CS initiatives. As described above, one means of doing this is by recognising CS in the allocation of research budgets. Another would be to allow CS projects to continue beyond the usual period of four years. Researchers in the Great Flu Survey, for example, had seven years to collect and valorise the vast amounts of data.

The United States has already started specific programmes in which researchers can receive funding from the National Science Foundation for CS research[1] and even recognition from the White House for their efforts.[2] In our view, separate CS programmes are necessary, because they differ from more traditional research projects. In CS, the slower start-up and completion phases are particularly precarious, and the staff turnover associated with traditional four-year projects often leads to the undesired or unintended loss of expertise.

Researchers are also drawing attention to the particular needs of CS projects, including the need to determine the legal, financial and ethical consequences of the design (cf. 4.3 infra). In many cases, research institutes do not yet have adequate structures or procedures in place to support CS. For example, Citizen Scientists may not have access to the necessary infrastructures or project funding, and ethics committees may not have full legal responsibility for CS projects.

1   http://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=136445
2   http://www.nsf.gov/news/news_summ.jsp?cntn_id=128359

Most importantly, the Young Academy recommends incentivising young researchers to become engaged in CS projects. Due to their precarious statutes and brief appointments, early-stage researchers run the risk of being forced to choose 'safer' options. It can be difficult to complete CS projects within four years, and this raises the risk of delays. In many cases, the academic training of young researchers fails to familiarise them with non-classical forms of research. During the workshops organised by the Young Academy during the Let's Talk Science summer school in July 2014, the trainers observed that, with some assistance and supervision, young researchers quickly arrive at constructive and innovative ideas for adding CS components to their PhD research. During day-to-day conversations with their supervisors and research teams, however, there is much less opportunity to 'think outside the box'.

In many cases, CS projects require even more resources, expertise and especially more time than traditional scientific projects. They should therefore not be regarded as a replacement for public resources for research – quite the contrary. When used well, CS ultimately leads to win-win situations, although it does require larger initial investments. In a very few cases, such high-risk programmes simply fail. We must take this into consideration.

4.3 Facilitate legal and financial issues in the design of Citizen Science projects

Citizen Science projects often require lengthy legal preparation. How should we protect the privacy of the citizens who participate? What about the liability of the researchers? To give an example: when a citizen reports a case of the flu in the Great Flu Survey, this information obviously appears as a point on a map, though without the exact coordinates. But how should scientists react to questions from citizens who want to know more about their illness? Are those who answer such questions also legally liable? Due to the limited expertise available in this regard, CS researchers often operate within a legal grey area, which can be addressed by legal consultancy. The costs of such consultancy could be avoided by centralising this legal knowledge within research institutions and policy-making bodies in Flanders. This could pave the way for more innovative research. So far, little is known about the obstacles citizens encounter during CS projects. In our view, it is

essential to obtain a thorough knowledge of privacy legislation within the framework of CS projects.

The bottom-up character of Citizen Science has already produced many fine initiatives (e.g. bird and butterfly counting, air-quality measurement, DNA mapping). For researchers, however, the decision to start a project is often financially precarious. As noted above, CS projects often last longer than four years, whereas project funding is confined to this period. Valuable expertise and learning experiences are often lost through the turnover of PhD students or staff members. Gathering additional expertise on how to cope with such situations would be tremendously valuable to both researchers and society.

Scientific questions also arise. CS demands that scientists depart from the traditional procedure of formulating hypotheses and testing them against predefined data (e.g. by comparing a representative sample to a control group). Such controlled settings are not possible in CS, so a different model is needed – a form of scientific and societal experimentation. At present, too, it is the researchers who bear much of the responsibility. The crucial questions remain: How can scientists involve the general public in setting up studies? What should be done with the data, and how should the research results be communicated? Can data be validated? New questions are emerging as well. Are scientists prepared for input from the public? Such input could become much more influential, and could lead to disagreements between citizens and scientists. This question goes right to the heart of science, fostering new forms of knowledge and knowledge production.

4.4 Establish dialogue on ethical questions related to Citizen Science projects

There is also an urgent need for a broader dialogue on the ethical questions surrounding Citizen Science. In many cases, societal debate is overtaken by science or circumstances, and with CS, too, we could miss the boat if we fail to reflect on its consequences. Science is changing, whether we like it or not. At best, CS can (and should) lead to a win-win situation for both citizens and scientists, and contribute to society. At the very least, it should invite us to engage in thorough, critical

consideration of the proper relationship between science, politics and society. At a more fundamental level, CS also challenges us to consider what form the democratisation of science should take, a democratisation that many Citizen Scientists are in favour of and are working towards.

Citizens usually help voluntarily, but who benefits? What if a private company applies for a patent based on research using data provided by citizens? In that case, the knowledge becomes the property of the company, which profits from it. This could lead to hard feelings among participating citizens. Some critics have referred to CS as an inexpensive means of collecting data. Such criticism usually relates to the type of projects located in the lowest level of the CS pyramid (see 1.1, above), where citizens are invited to monitor and count things. Conversely, citizens could also decide to act against the guidelines of science policy and ethics committees. One example of this is Cure Together, a project in which companies – at the request of citizens – develop genetic tests against the wishes of government and health agencies. Ethical discussion and deliberation are needed in this area as well.

Despite the advantages of standardising CS projects, there is no single method for 'doing' science with citizens. The wisdom of aiming for a standard method is itself open to debate. One of the characteristics of CS is its ability to contribute to new forms of knowledge production. In other words, it is often an experiment in its own right. This experimental character would be jeopardised if efforts were made to achieve a standard CS package, especially if it was founded on an established method.

The extent of opportunities for CS in Flanders will depend on the willingness of all actors to question and re-examine the relationship between science and society. This is because, in addition to supplementing traditional science, CS also challenges it. For example, the more radical 'do-it-yourself' enthusiasts tend to disapprove of the close ties between science, market and industry. They advocate a public science that has a clear societal use. Many Citizen Scientists fear that policy-makers, industrial actors and scientists will promote CS as a means of gaining the confidence of citizens, rather than a collaboration on equal footing. One important question about the future of CS therefore has to do with how dialogue between science and society should be achieved, as well as who should be involved and why.

We invite the Flemish research funding agency (FWO), the Flemish universities and the KVAB to respond to this Young Academy position paper by engaging in scientific and societal dialogue about the opportunities, limitations, and implications of Citizen Science.

Tips & tricks

Our survey of successful Citizen Science projects yielded the following tips and tricks.

1 **Collaboration is truly beneficial**
Citizen Science can pay off for all parties. Above all, try to engage in *true* collaboration between equal partners, without any preconceived ideas about 'amateurs' and 'scientists'. Researchers should communicate openly and strive for clear vocabulary and task division. Bring all parties to the table. In addition, schedule feedback sessions for before, during and after the process. Once is never enough. Every feedback session is unique. Take this into account.

2 **Try to aim for a win-win situation**
Citizen Science projects should create win-win situations. On the one hand, the outcome of the project should produce something for the researchers that they cannot achieve in their usual laboratory settings or research environments. While starting a Citizen Science project may be time-consuming, the data processing should definitely not be. Citizens should also gain from the collaboration. For example, they could learn new skills or apply the research results (e.g. to their own situation).

3 **Try to find a balance between creativity and scientific rigour**
Look for the productive balance between thinking/controlling and spontaneous reactions. The added value of Citizen Science is that balance between citizens and scientists, between creativity and representativeness.

4 **There's no such thing as too much communication**
Citizen Science projects are driven by open and frequent communication through a variety of media, and even through the press (e.g. websites, Facebook, email, media, information sessions). Situations involving confidential or sensitive information call for early communication with all parties. Think about whether it is possible or desirable to outsource or delegate such communication. Provide sufficient time to answer questions and motivate volunteers. Organise informal sessions, hold meetings in public locations and create a community.

Pay careful attention to press communication, particularly when addressing sensitive topics. Consider involving local governments.

⑤ Incorporate a test phase at an early stage
Start by conducting a pilot study on a smaller scale, which would allow you to modify or adjust the protocol. Communicate with stakeholders about the status of this test phase and the feedback they are expected to provide. There is always room for improvement.

⑥ Check your budget carefully
The costs of communication, feedback sessions, policy development and social media should be included in the funding application, along with the costs of legal consultancy, software packages, server space and agreements about the storage of general information about finished Citizen Science projects. Use the test phase to obtain a realistic estimate of the costs. Include buffers.

⑦ Become famous!
Sign up at www.iedereenwetenschapper.be and try to build support for your study by reaching out to the public and the local media. The Flemish study on bullying behaviour immediately reached the national television news, and was therefore able to break the taboo around bullying.

Other information:
A more general toolkit is available here:
https://crowdsourcing-toolkit.sites.usa.gov/
This site also provides good tips and tricks:
http://www.nhm.ac.uk/take-part/citizen-science.html,
Specific information for projects on biodiversity:
http://www.nhm.ac.uk/content/dam/nhmwww/take-part/Citizenscience/citizen-science-guide.pdf

A source of inspiration for other Young Academies?

The Flemish Young Academy's Citizen Science project can be implemented in the working programme/policy work/lobbying of other Young Academies in Europe and beyond. Here is a summary of our projects:

1 **Make a local internet portal for CS projects, bringing together both international and local projects with specific linguistic requirements:** www.iedereenwetenschapper.be

2 **Raise awareness through a Citizen Science experiment**
We chose to reach out to 250 Flemish PhD students through an experiment during an interdisciplinary summer school. This created a buzz around the concept of Citizen Science in Flanders, and also started discussions about privacy, ethics, and so on.

3 **Organise a Citizen Science landscape workshop**
A CS 'landscape' is an interactive workshop with ten projects in which participants can get straight to work, helping scientists through apps, analysis, providing data, and so on. The CS projects themselves can really benefit from the chance to demonstrate their methodologies and actively engage audiences. It's great to *do* Citizen Science!

4 **Organise a debate with good practices/pitfalls and space for more philosophical reflection**
In our debate, the sections on "tip & tricks" and "learning from mistakes" were particularly appreciated by participants. The philosophical and ethical discussions were immediate (and welcome) side effects.

5 **Organise workshops for PhD students who want to introduce Citizen Science components in their research**
During our workshop, we helped PhD students think outside the box when introducing CS elements into their ongoing research. With tips and tricks and easy-to-use techniques, you can go a long way. Be creative!

6 **Making a statement**
This position paper is our statement. We are now organising meetings with stakeholders to implement our recommendations, and we will be working together with the Young Academy in the Netherlands to expand our portal.

7 **Develop a social media strategy**
Follow us using #citizenscience and @JongeAcademie.

Please contact us at the Young Academy!

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The aim of this position paper is to raise awareness about the topic of Citizen Science among both researchers and the broader public in Flanders. The paper first explains the concept of Citizen Science, before sketching its historical background and its meaning in society today. It also reflects on the potential for involving broader communities in science, and gives examples of Citizen Science initiatives that have been set up in Flanders. Using the results of a survey on Citizen Science conducted among Flemish researchers, we provide four recommendations for scientists and scholars, academic stakeholders and the governing bodies of universities. Finally, we offer a series of tips, tricks and testimonials for researchers who would like to start Citizen Science projects of their own.