

# History, Trends and an overview

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## What is Citizen Science?

- **Citizen science** is the term that is used to describe a wide range of activities, in which people from all walks of life participate in a scientific project in a meaningful way (beyond being subjects in a medical experiment, or participants in a study in the social sciences)
- **Crowdsourcing** is a term that is used to describe finding a way to engage a (very) large number of people in a project



To start the course, we need to look at the definition of the issue that we're covering. Here we start with deliberately vague and generalised definition of citizen science and crowdsourcing. We will have better definition and an understanding of these areas over the course, but for now, we start with these. For our purpose we will note that there are many activities, in which people participate in a scientific project in a meaningful way. We will see the challenges of defining exactly who are this people and what is meaningful. Within the context of citizen science, we should pay attention to the concept of crowdsourcing, a term that is used to describe the engagement of many people – sometime a very large number of people, in a project.

## Recording the cherry blossom

- Cherry blossom (Sakura) – culturally significant in Japan
- Court diarists in Kyoto have been recording the blossom since 850
- The dates reveal changes in climate, with the shift to earlier dates (from about 15 April to 5 April)



From Wikipedia article on the topic: “A cherry blossom (or commonly known in Japan as sakura) is the flower of any of several trees of genus *Prunus*, particularly the Japanese cherry, *Prunus serrulata* (桜 or 櫻; さくら).

... the cherry blossom is considered the national flower of Japan. ... "Hanami" is the centuries-old practice of picnicking under a blooming sakura or ume tree. The custom is said to have started during the Nara period (710–794), when it was ume blossoms that people admired in the beginning, but by the Heian period (794–1185) cherry blossoms came to attract more attention, and hanami was synonymous with sakura. ... The custom was originally limited to the elite of the Imperial Court, but soon spread to samurai society and, by the Edo period, to the common people as well... Every year the Japanese Meteorological Agency and the public track the sakura zensen (cherry blossom front) as it moves northward up the archipelago with the approach of warmer weather via nightly forecasts following the weather segment of news programs.”

Because of this cultural significance, court diarists in Kyoto started recording the date around 850, so we have nearly 1200 years of recording of the date of this natural phenomenon

# Citizen Science & Science



To think about the historical context of citizen science, let's consider 3 period in the history of modern science – the early, formative period of developing methods, establishing scientific societies, etc. This was followed by a period that science became increasingly professional (especially after the world war II for the most part of the 20<sup>th</sup> century) and it is now entering a new period, in which it is reopening to wide range of people

## Citizen Science in the late 1900's

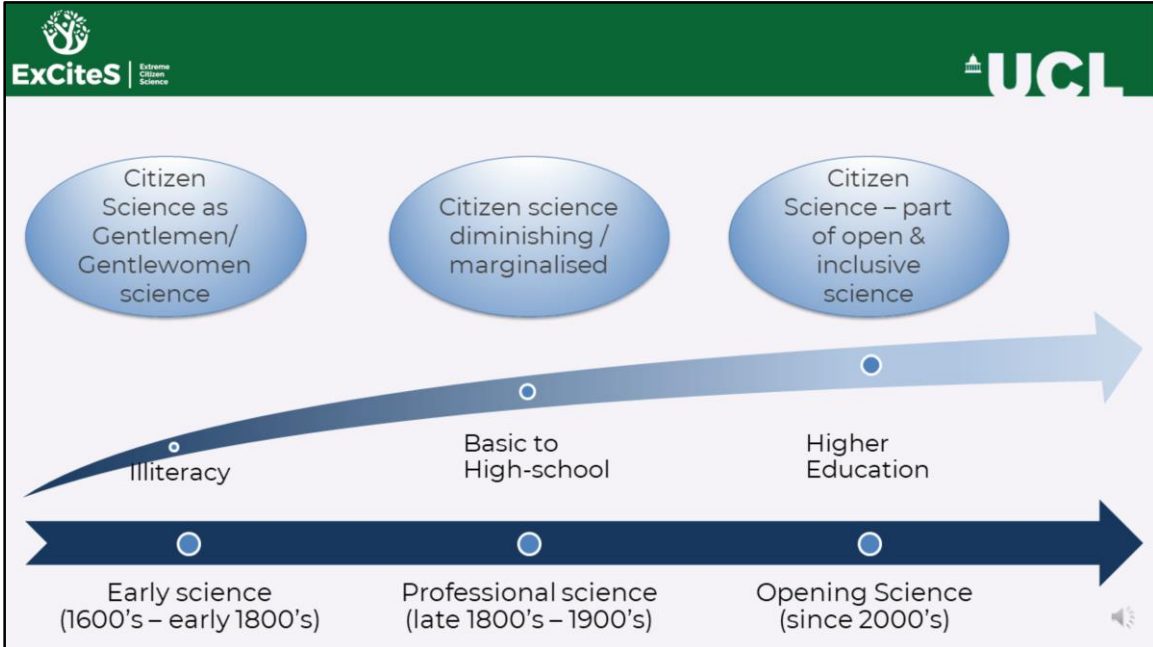
- Volunteers and amateurs continue to operate in fields such as meteorology, biological observations, astronomy & archaeology
- Frequently, they were not acknowledged

Volunteer rainfall observer Rick Grocke checks the rain gauge at Tanami Downs cattle station in the Northern Territory of Australia



Citizen Science evolved during the professionalization of science, in areas such as biological recording and observations, and in weather monitoring. The requests were minimal – skills and communication limitations dictated that. As more automation became possible, towards the end of the 20<sup>th</sup> century, scientists turned to machines, and asked less and less from volunteers, sometime stopping long running programmes (e.g. Phenology). Spare a thought to Rick Grocke, who record precipitations in Tanami Downs – 250mm on avg. And we probably wouldn't know this fact without him!

Generally the volunteers experiences no recognition, and a growing view of volunteers as 'untrustworthy' contributors. Even an expectation that automated sensors will eventually replace them



We are now entering the current state of science and citizen science, in which we're seeing citizen science gain recognition in research and policy, and we also see growth in organisations and activities - we will cover them soon. However, the question that we will now explore is why do we see it now?



## Open Science

- With the emergence of better Information and Communication Technologies, and concerns about some challenges that science facing, suggestions to open up science increased – especially in the past decade.
- Open Science includes: open access, open data, open source software, sharing methodologies



This is a trend that is linked to technology, but is also based on societal aspects. The open science movement has grown from dissatisfaction of the way information and data are shared among scientists, and an emphasis in the 1980s and 1990s on commercial and market based approaches to the results of scientific research. The movement, which mostly concerns scientists but now also include policy makers and small group within the public emphasis that because science is mostly publicly funded, it should be shared openly with anyone who need the information. The open science movement includes calls for sharing the papers and publications from scientists for free, providing access to data and code that is used to process it etc.

## Why Now? 10 important trends

- Societal trends:
  - Education and qualifications
  - Leisure
  - Longevity and healthy ageing
  - Peer production systems
  - Emergence of Open Science
- Technological trends:
  - Internet access (broadband)
  - Mobile devices
  - Collaborative Web
  - Sensors and location information
  - DIY electronics



Trends are a valuable way to consider what were the social and technological process that led to the change that we see now. From looking at the range of activities in citizen science, I would like to suggest that the next 10 trends are the most relevant. We will look at 5 trends that are happening in society, and 5 trends that are happening in technology. We look at them in a more or less chronological order. Let's start with the first one, the education transition



## Citizen Science project goals

- Each citizen science project is a balancing act between the scientific goals, scale and depth of engagement, benefits to different stakeholders (scientists, participants, project funders)



In addition, we need to consider the ways in which each project is trying to achieve all the multiple goals – not all at once, but in each project some of them are appearing at the same time. Goals such as awareness to the scientific issue of the project, production of scientific knowledge and outputs, concerns over sampling and geographical and temporal coverage, we want also to be inclusive, and increase scientific literacy, we want to access people resources (e.g. time), and also create an enjoyable and engaging experience. Balancing all these between these different goals is difficult, and the result is that we have a wider range of projects to look at. So making sense of the field is very important.

## The challenge

- Citizen science is very broad in terms of:
  - activities,
  - technologies,
  - scientific fields,
  - length of time,
  - number of participants,
  - outcomes and outputs



Once you open the box and look at all the things that people call citizen science, you start noticing, even at this early stage, that there is a very broad range of activities – from taking a photo of a ladybird in my garden with my phone, to building new scientific instruments in a makerspace. In technologies, from using pen and paper as the main technology, to building scientific instruments to sequence DNA. In the scientific fields we've seen that it reach many areas of science (arguably all of them). There are also big differences In the length of time – from occasional image taking to taking regular observation of weather every day. Projects can include one participant dedicated to chasing tiger beetles to something that millions participate in, and projects can yield a community report, or a scientific paper in a top academic journal. How do you capture all of that in one classification?