AimHi's Climate & Nature Course

Navigating References (A message from AimHi's Dr. Jaz Hill-Valler)

Our course's reference list consists of news articles, scientific papers, online widgets, databases, videos and teaching resources. All of which have been fact-checked and reviewed by our scientists. These resources have been used to assist in the writing of AimHi's Climate & Nature Course, checking that concepts we are sharing can be backed up by scientific models and to ensure that the opinions we have shared from experts in the field are credible.

More importantly, we are providing a list of references to you after each lesson and encourage you, the students, to explore these resources and familiarise yourself with not only the media response to the climate & nature crisis, but also the scientific presentation of data and how it can be interpreted.

Throughout this course, we will be dealing with very emotional content as well as statistics that can seem overwhelming. These resources can help us to exercise scientific objectivity which will allow us to articulate these ideas, in a way that is concise and understandable for all audiences.

I encourage you to take a step back from the twitter-sphere, short attention span, fake-news, bombardment of modern emotive media and to indulge in these resources like you would a good book.

Here are my top tips for understanding how to approach each of these different types of resources, so that you can make sense of our reference list as well as extract key pieces of information from articles in future and do your own research after this course!

What is a 'credible' resource? It may be a scientific paper that has been peer reviewed, published by a renowned publishing agency, or an article that contains reference to a study

News Articles and Blogs

First of all, the most common way we hear about science is through the news. There are huge differences in the way science is presented between emotive journalism, journalism

with a political agenda and scientific journalism. More often than not, these types of journalism can become confused and a scientific article may digress into a political rant.

New articles are always to be read objectively (word of the day). Often, the way the story is told may be different across the news and will use different types of language. I would recommend the practice of reading an article, say on the Guardian and then look for the same story on the Daily Mail, on Twitter, on Facebook etc and make a conscious effort to think about the different language used and whether the presentation of data or concepts have been exaggerated or embellished. Try not to get bogged down in opinion articles and if something doesn't seem genuine, spend a while doing some research on the story and the content, look up the author, the publisher or website.

'Fake-news' is often fueled by emotive social media streams, blogs that contain overcomplicated pseudo-science and elaborate youtube videos. Pseudo-science is the scientist's mortal enemy and can be very confusing for those that are not used to research or scientific concepts. It can seem scientific, well thought out and even well funded with considerable followers, but on closer inspection it will lack peer reviewed papers by university publishers, it won't have the backing of global academic institutions or the wide-spread endorsement of government databases or organisations.

This doesn't mean that these articles are always spreading fake-news, more often than not articles act as a good summary for more complicated scientific concepts that need an 'explainer'. I recommend that you:

1. Make a list of the main points from the article
2. Make a list of the points you are unsure about, then do a search for these, can you find other web articles on these statements?
3. Look for references to scientific papers, blogs or scientists within the article itself, and check that the statements that have been made can be traced back to a published paper or an article by someone that is an expert in the field
4. Don't be afraid of statistics, have a look for the information they've shared in other resources and perhaps do an image search for charts or graphs to help you understand the content
5. If an article is leading you down a rabbit hole of advertisement heavy blogs, amateur youtube videos or Facebook groups, it's probably not a credible resource.

Scientific Papers

Perhaps the most inaccessible and difficult to read, unfortunately is the most reliable and important resource, the scientific paper. We are often left waiting for these complicated pieces of priceless information to be translated into more human-friendly language. Not all journals and publishers allow access to papers for those not in academic institutions or with

expensive company subscriptions. However, the abstract of any paper is available for everyone to see. Often figures will also be available to the public.

The abstract reads like a robotic summary of the results of the paper, it will have key concepts, results and methods outlined using concise scientific language. The things to look out for are :

1. Phrases that explain the method or results for example "*We present the main findings of this paper …"*
2. Acronyms specific to the topic eg. *"We use GMC modelling to investigate…"* (in this case, a quick search of "GMC Climate Modelling" tells us that this stands for General Circulation Models and refers to a computer model for climate that includes the interactions between clouds, oceans and land masses).
3. Numbers, percentages and uncertainties (indicated by a plus or minus) usually refer to the outcome of computer models or statistics from their own research in combination with others.
4. Figures and tables - these graphs and charts can help us understand the jargon. Always read the caption first and understand that often figures will contain lots of information as well as big error bars (often shown by a faded line or bars over the data points).
5. We scientists have the mantra "bad-data is still data!" So look for words like 'likelihood' or 'convergence' (how well a computer simulation has behaved). You might see some shocking results and then read the caption to see that they've tried to simulate something really complicated and it hasn't quite worked!
6. If you still haven't got a clue what they're on about, wikipedia it or *'ELIF'* on reddit.

Databases

You'll notice that a lot of resources on our list are databases from government sources. Most notably Environmental Protection Agency (EPA USA), U.S. Department of Energy, DEFRA UK (Department of Environment, Food and Rural Affairs), NASA Climate Databases etc.

Often data is available on *open source* platforms such as GitHub. This is most commonly used by coders to share their most updated code. Sometimes raw data can only be processed if you have the means to open the source code or the computer program required to read in the data and analyse it.

The databases we've shared have graphs and widgets, an online interactive graphical user interface (GUI) that lets you plot and explore historical datasets. Please explore these widgets and take time to understand the graphs. If you can't access the raw data, explore

the database website for blog posts by other users and articles published using their datasets.

Some of the graphs you will see in this course are reproduced by our teachers from these databases and plotted in a way that makes it easier to understand. Feel free to ask us questions about these plots and we encourage you to go away and make your own! Use excel, or python if you're a real wizz, or even good old fashioned graph paper and coloured pencils.

Remember! You are only human and not a computer!

There is too much information out there for our humble homo sapien brains to remember. This is why we have all these resources and databases and blogs to dump this information and come back to it later. The vast ocean of resources out there is the collective effort of the entire human race. Memorising it all is hopeless!

However, what we can do is train our brains to navigate all this information and remember only the important bits. Think of these resources as destinations on a map, we have to navigate between all these destinations until we learn the shortcuts to the important places, and which routes we should avoid altogether!

I hope this short essay helps you navigate the turbulent seas of climate and ecological science and gets you from curious to confident on your journey as a leader, communicator and catalyst for positive change.