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Scientias, oudheidkunde, en wetenschap, hoe dan

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Communication of science is important to me and it comes in many formats. Educational resources, research articles, text books, popular science magazines, blogs, TV shows, podcasts, etc (in no particular order). Somewhere during the pandemic, I started listening to podcasts. I had done that, in the early days, but those early podcasts... well, let's say, the format had not materialized yet. But also that it can be quite helpful to not play the podcast at the normal speeds, but at, say 1.25x. Podcasts, like any of the above format have a style, an audience in mind. Maybe the audience is first year students, peer in the research field, or the general audience. Or a politician that wants to get credibility. There are several podcasts that I have been listening. Not as education. The may have episode notes, but not proper scientific references. References is one thing important in the communication. Context is another.

I have many books in my house on these aspects of science. From text books, to primary literature, to links to blog posts. It is not my research field, and (scientific) communication is very much a research field. "It makes sense", does not do, but the awareness of some of the things should be basic academic training. Or probably earlier. Every writing has context. Not a random pointer, but a friend has recently written with several others an interesting chapter on reading scientific literature (doi:10.1515/9783110782844-010, pdf).

Scientias

And while I started the Scientias (with (*the*) Diederik Jekel and Krijn Soeteman) episode to hear more about the science behind "history", there were several topics in the [Over oudheidkunde, nepvondsten en AI: wat weten we écht over het verleden?] episode about the above things, with Jona Lendering as guest.

The things I heard that I got excited about (enough to sit down and write down these thougths) were small comments, other things were more prominent. One more obvious discussion was that a lot of science news is focusing on new facts, and not the science behind it. Not just the methods, but also the stack of assumptions, how they were combined, valued, etc. As Lendering explains how a researcher does that (translated into English by me, with assumptions on the true intention):

> *This is a hypothesis. Now I stack this hypothesis on the previous hypothesis, and I stack another hypothesis on that, and then I stack a hypothesis on that.*

Most science news outlets find that too complicated (for their audience). To me it feels they think their audience is too stupid to understand the full story. Now, the Scientias Podcast made it a unique selling point to explain how those facts were derived from experiments, because they find the full background and experiments behind our knowledge important, exciting. and relevant. I do.

And if I understood Lendering correctly, he too says there actually is plenty of room of that. The full story is more complicated and I cannot do this justice. There is a growing body of scientific literature that cannot be captured in a single blog post. I will not even try. It will likely just backfire.

And I agree. That is not relevant to them nor their point, but it does explain I was excited about the post. It is always nice to hear like-minded people. I do not hear this position about scientific communication a lot, but very, very much agree and try to practice.

Stacking

Lendering about the book he described in the above quote:

> *I think the conclusions are absolutely wrong, because it stacked too many uncertainties in a row.*

I love this quote. Lendering is talking here about archeology, but it applies to at least chemistry and the life sciences too. I once wrote a grant application to the Swedisch national research funder VR, their equivalent of the NWO on that topic (which got rejected, *because the candidate has too many international collaborations*, despite scores in the fundable range).

It also very much resonates with the whole topic of LLMs, where exactly that is happening: the stacking of many uncertainties. The real problem of AI since the 2000s is not the availability of great machine learning methods, but the facts to learn from, and how well those methods can put those facts in perspective (think Red Riding Hood). That is why my research focus swifted from chemometrics (the old name for *AI in chemistry*) and knowledge representation, to knowledge representation and interoperability.

The science behind archeology and history

Most of the podcast is about archeology and how history is discovered. And the whole podcast does a wonderful job at explaining how much has changed in the past 30 years. What I learned as a kid about the Romans has been updated in many ways. The the oldest known documented genocide, in Belgica that started with a Roman military camp on the hill that I can see from my work office, has peaked my interest in Roman history. But what fascinates me most are not the narratives but the science behind it. The new chemical and biological approaches giving new evidence that puts archeological evidence in a richer context. Just listen (or watch) the podcast. And I haven't read it, but I understood Oudheidkunde is een wetenschap covers a good bit of it.

Do I think that Nijmegen is the oldest Dutch city, and not Maastricht? Of course, I lived in Nijmegen for a large part of my life. The competition between the place I studied before and study now is just great amusement. Bring on the popcorn. And that aquaduct in Nijmegen? I cycled everyday on a Roman dike used for that aquaduct. As a researcher, I really do not care the exact dates, or what material that aquaduct was made of. How we could learn those things, well, yeah, the chemistry of physics behind that is cool too. Bring on the nerdy science.

What science should be like

Another topic in the above theme is what science should be. Lendering is negative about the research schools and research institutes (in the Dutch implementation) and explains that different disciplines should communicate and collaborate more. Since my field is in between two established research fields, I can painfully confirm that many (Dutch) researchers are much to focused on their own narrow specialism, that they lost context to put that specialism in a wider context.

> *You only start writing a publication, after you collected and looked at all evidence.*

Lendering then talks about how modern science may have deviated too much from this. For people who have been following the Open Science news, they have seen a good body of scientific literature that show that this indeed is not always to case (sic). For example, Lendering states:

> *There is no substantial peer review anymore. Really weird publications happen, that should never have been published.*

Really, bold, perhaps, but sadly too close to reality with enough primary literature that has studied these issues (some of which you can find convered in my blog posts). Commercial publishers expect a peer review in 10 working days. They value speed over quality. It is there business model. But also researchers that simply submit the manuscript as-is to the next journal, when the previous journal clearly outlined limitations. There are reasons why I had to step down as editor from Springer Nature.

Calls for Action

Before I write a blog post that takes you more time than to listen to the podcast, there are two more quotes I like to cover:

> *I could not resist the opportunity to mention paywalls. And what has been behind paywalls is not released as open access. And there are not plans for this.*

Lendering continues with a good example from desinformation on why this must change. Again, I am very excited about this statement, which I have been arguing for too.

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The next quote I shortened a bit, because I want you to listen to the full discussion in the podcast, but here I do not want to focus on the very convincingly bad urgency of the given example:

> *there is a theory from the 19th century, and that theory has been disproved since then. [..] But due to digitization projects, old literature is available, with the old disproven theories too. This is in itself not an issue. However, because the correcting literature from the last 30 years are hidden behind the paywall, is the disproven theory unchallenged.*

There are many aspects of just this part, and many relate to how knowledge and how we got to knowledge is spread, reused, etc. Bascially, the FAIR data principles are in that sense just a reformalisation of a much older and bigger problem. And I think Lendering is spot on with this observation. Translating this to the bigger issues, the commercial publishers can lecture researchers about FAIR data, but as long as the with strong determination frustrate scientific progress with paywalls, etc, then we will not make the progress we deserve and need.

Action 1: all Dutch literature must become green Open Access

While The Netherlands is just a small player, our national effort towards Open Access has made a clear world wide impact. So has Open Science, and FAIR data, two other (but distinct) movements to improve knowledge dissemination, and both where The Netherlands has made a significant international contribution.

So, Dutch universities should work harder to make the next step, after CC-BY licensing and the Taverne green Open Access law. Let's remove that small print of 100% Open Access that says, "but only of new literature". Open scientists have been working on this for long enough; it is just policy, laws, and the mere willingness. Practically, every Dutch university can just tomorrow contact all (emeritus) professors and make all their literature available under the Taverne rules. Many university libraries have already started this, but this must have UNL backing with a clear mandate to make 100% of all Dutch works available, across the full history.

I repeat, this is not a technical question. It is just doing it.

This goes for every Dutch researcher that want to have their research have the impact it can have. Go to your university library, and send them publisher PDFs of all articles (and book chapters) you ever published at that university. Yes, you can even email the library where you did your PhD.

Taverne is not the full story. Authors have to give permission, via opt-in or opt-out arrangements with their universities. That is a problem when the researcher is no longer around. But can we at least start with all that paywalled literature of which researchers can give that permission, please, for the *full* appointments, going back in time? For the rest, well, we have to start lobbying with our government. That is quite modern and should be trivial.

I think this is essential: you cannot fully understand the impact of an article if you do not have access to the cited and citing literature because it is behind a paywall.

Action 2: make the context of literature easier to record and easier to access

The other point Lendering made is about the self-correcting nature of science (or lack thereof). The peer review problems were mentioned in the podcast, as well as people not easily finding literature that disproves earlier literature. It can be a lot simpler to get informed about the status of any research work. But right now, even something as simple as getting PubPeer and RetractionWatch information about a References list is non-trivial. The choice of commercial publishers to favor PDF over (scientific) HTML has been one driven by perverse incentive, not by scientific needs. Similarly, it is trivial to learn that an article has been disproven, but not simple. University libraries are not yet equiped correctly or funded appropriately to allow researchers (and the general local audience who can also enter university libraries to learn stuff).

My gauntlet to Springer Nature about CiTO citation intent annotations has yet been underwhelming, despite an in my opinion hopeful and promising pilot. I cannot complain, and the interest is there, but it was too difficult for Springer Nature. And with that we are back with the one of the other main themes of the podcast.

With that, I isolated just a few moments from the podcast. I insist you listen to the full podcast to get the proper context of the above quotes. If people want to learn more about the context I see, I invite you to browse my blog (newer posts and older posts).

Finally, thank you Krijn, thank you Jona, for this awesome 83 minutes and 16 seconds at 1.25x speed!